Sign-In Sheet for HSERC Members Or their Voting Representatives

December 5, 1996

Dr. Bruce Anderson
Deputy Director, Environmental Health
Department of Health
Department of Health

Bruce Anderson

Joseph Blackburn
Maui Representative/LEPC Chair
Maui Fire Department
Maui Representative

for J. Blackburn

Robert A. Boesch
Pesticides Program Manager
Pesticides Branch, Department of Agriculture
Board of Agriculture

Robert A. Boesch

Mr. Russel Charlton
Manager
Occupational Health Branch
Department of Labor and Industrial Relations

Russell Charlton

Gilbert S. Coloma-Agaran
Deputy to the Chairperson
Department of Land and Natural Resources
Department of Land and Natural Resources

Capt. Carter Davis
Honolulu Representative/LEPC Chair
Honolulu Fire Department
Honolulu Representative

Mr. Gary Gill
Director
Environmental Quality Control Office
Environmental Quality Control Office

Gary Gill

Dr. John Harrison
Environmental Coordinator
UH Environmental Center
University of Hawaii Environmental Center

Sign-In Sheet for HSERC Members Or their Voting Representatives

December 5, 1996

Mr. Clifford Ikeda
Kauai Representative/LEPC Chair
Kauai Civil Defense
Kauai Representative

Prema Menon
Faculty
University of Hawaii, School of Public Health
School of Public Health, University of Hawaii

Mr. Jay Sasan
Hawaii Representative
Industrial Safety Division
Hawaii Representative

Chris Takeno
Hazardous Materials Officer
Department of Transportation
Department of Transportation

Mr. Glen Lockwood
Manager, Emergency Services
American Red Cross
American Red Cross

Mr. Roy C. Price, Sr.
Vice Director
Civil Defense Division
Department of Defense

Thomas J. Smyth
Business Services Division
Dept. of Business, Economic Dev. & Tourism
Department of Business, Economic Development & T

Sign-In Sheet for the December 5, 1996 HSERC Meeting

Name	Organization	Phone	Fax	E-mail
Marsha Mealey	DOH-HEER	586-4249	586-7537	mmealey@eha.health.State.HI.US
Roydon Kobayashi	USCG MSO Honolulu	5228256		
Michael Ardito	US EPA	(415) 744-2328	744/1916	ardito.michael@epamail.epa.gov
Jim Vinton	BHP Hawaii	(808) 547-3414	547-3689	VINTON.JAMES.JN@BHP.COM.AU
Cyrus Lung for Mike Fuke	BWS	527-5284	527-6195	
Dave Hoffman	CLEAN/BHP	547.3280	547.3689	
Bruce Schlieman	HECo	5434474	5437023	
LELAND NAKAI	OCDA	5275489	5243439	eaa04202@co.honolulu.hi.us
BYRON U. MANIPON	UNITEK	831-3066 x 235	831-3086	

Return to Sender.

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

LAWRENCE MIIKE
DIRECTOR OF HEALTH

Received
11:30 AM
12/5/96

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

IN REPLY, PLEASE REFER TO:
HEER OFFICE

November 21, 1996

HAWAII STATE EMERGENCY RESPONSE COMMISSION
MEETING #26

Thursday, December 5, 1996 from 9:00 a.m. to 12:00 noon.

Department of Health
919 Ala Moana Boulevard, 5th Floor Conference Room
Honolulu, Hawaii 96814

AGENDA

1)	9:00	Call to Order Opening Remarks and Discussion Approval of Minutes from Mtg #25	Bruce Anderson, DOH, Env. Health Admin.
2)	9:15	LEPC Updates and Membership Changes	Jay Sasan, Hawaii LEPC Representative Clifford Ikeda, Kauai LEPC Representative Carter Davis, Oahu LEPC Representative Joe Blackburn, Maui LEPC Representative
3)	10:00	Maui HazMat Plan Update	Joe Blackburn, Maui LEPC Representative
4)	10:15	EPA Updates •CAMEO-Terms & Conditions for Free Copies •Integrated One Plan Guidance •Risk Management Plans under CAA 112r •EPA OSC PREP Exercise '97	Mike Ardito, EPA Region IX
	10:45	Break	
5)	11:00	Clandestine Labs	Bill Perry, OSC, HEER Office
6)	11:15	Command Structure for OHSERP	Curtis Martin, HEER Office
7)	11:30	Operation Kokua	Mike Cripps, OSC, HEER Office
8)	11:45	Other Business	
9)	11:55	Schedule next HSERC meeting	

File: 25DMIN
Type: FAX
Phone #: 8085869104
User ID: 8085869104
Name: Russel Charlton
Time: 5:29 PM
Date: 12/4/96
Pages: 1
Duration: 1:19
Speed: 14400
Status: Failed

File: 25DMIN
Type: FAX
Phone #: 8085869104
User ID: 8085869104
Name: Russel Charlton
Time: 5:25 PM
Date: 12/4/96
Pages: 1
Duration: 1:18
Speed: 14400
Status: Failed

File: 25DMIN
Type: FAX
Phone #: 8085869104
User ID: 8085869104
Name: Russel Charlton
Time: 5:21 PM
Date: 12/4/96
Pages: 1
Duration: 1:18
Speed: 14400
Status: Failed

File: 25DMIN
Type: FAX
Phone #: 8085864444
User ID: 8085864444
Name: Dr. Bruce Anderson
Time: 5:19 PM
Date: 12/4/96
Pages: 4
Duration: 4:15
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 8085873833
User ID: 5873833
Name: Thomas J. Smyth
Time: 5:12 PM
Date: 12/4/96
Pages: 4
Duration: 4:15

Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 8089564585
User ID: 8089564585
Name: Prema Menon
Time: 5:07 PM
Date: 12/4/96
Pages: 4
Duration: 4:15
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 8085870390
User ID: 8085870390
Name: Gilbert Coloma-Agaran
Time: 5:02 PM
Date: 12/4/96
Pages: 4
Duration: 3:54
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 8085872168
User ID: 808 587 2168
Name: Chris Takeno
Time: 4:58 PM
Date: 12/4/96
Pages: 4
Duration: 4:14
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 8089739418
User ID: 33
Name: Bob Boesch
Time: 4:53 PM
Date: 12/4/96
Pages: 4
Duration: 3:54
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 8089563980
User ID: 8089563980
Name: Dr. John Harrison
Time: 4:49 PM

Date: 12/4/96
Pages: 4
Duration: 4:17
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 8087358626
User ID:
Name: Glen Lockwood
Time: 4:44 PM
Date: 12/4/96
Pages: 4
Duration: 4:14
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 8085869104
User ID: 8085869104
Name: Russel Charlton
Time: 4:39 PM
Date: 12/4/96
Pages: 1
Duration: 1:19
Speed: 14400
Status: Failed

File: 25DMIN
Type: FAX
Phone #: 8085864186
User ID: 808 586 4186
Name: Gary Gill
Time: 4:37 PM
Date: 12/4/96
Pages: 4
Duration: 4:18
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 18082416335
User ID: 808 241 6335
Name: Clifford Ikeda
Time: 4:33 PM
Date: 12/4/96
Pages: 4
Duration: 4:14
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 18089618248

User ID: 8089618248
Name: Jay Sasan
Time: 4:28 PM
Date: 12/4/96
Pages: 4
Duration: 4:15
Speed: 9600
Status: Sent

File: 25DMIN
Type: FAX
Phone #: 18082424479
User ID: 18008358417
Name: Captain Joe Blackburn
Time: 4:23 PM
Date: 12/4/96
Pages: 4
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Speed: 9600
Status: Sent

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Type: FAX
Phone #: 8084229691
User ID: 8084229691
Name: Captain Carter Davis
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Pages: 4
Duration: 4:20
Speed: 9600
Status: Sent

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Type: FAX
Phone #: 8085864444
User ID:
Name: Dr. Bruce Anderson
Time: 4:14 PM
Date: 12/4/96
Pages: 0
Duration: 0:00
Speed:
Status: Busy

File: 25DMIN
Type: FAX
Phone #: 8087334287
User ID:
Name: Roy C. Price, Sr.
Time: 4:13 PM
Date: 12/4/96
Pages: 4
Duration: 4:15
Speed: 9600
Status: Sent

12.15.95
HSERC Mtg.

* Have Rick speak to Carter

* What is the published phone # for Maui LEPC ?

* How can the Maui Fire Dept. be encouraged to input HEPCRA info ?

* FBI Speaker

* State toll free number - ask for HEER etc.
  1(800) 468-4644 then ext.

* Schedule HSERC meetings at different locations to promote awareness

02-28-96

* Shell Nawiliwili Harbor for Kathy Ho
Information on Spills

* Talk to Sara Russel

* Pacific Disaster Center was dedicated last wed.

* Keep CIP on agenda for funding updates

* Schedule next mtg in May or June Mike Ardito
LEPC members on agenda

* Get overheads from Chris T.

Glen Lockwood

10.15.95
LEPC Workshop

- 24 hr. contact?

CD • public health:
When do we let people back into a secured area?
Need good consultation after hours.

- public works - supplies adsorbants and pick up waste (mainly oil) on the next working day

- medical waste → EMS

- Kauai's plan says that once the spill is stabilized they turn it over to DOH BUT District Health Office people are not on 24 hr. - so county (police) is responsible for site control

- Annex 3 needs to be rewritten ~~as~~ to reflect Tiered system (I, II, III) Has gone to 4 Tier in some locals

- HSERC - more oil issues

A copy of video for LEPCs

A Kauai facilities out of compliance

A publish notice in the newspaper when each plan becomes final

* Send spills conference info to LEPCs

* Set up HSERC meetings for the entire year

* Calendar about all relevant activities

No. of facilities reporting ~~851~~ 849 ~~826~~ 805 payed fee

28 are military

6 payments outstanding

6 "is Null"

sent comments with forms

\# of facilities fuel related

service station 270

propane 102

CIP → terminals 29

401

Maximum daily amount of fuel - most

10 = >500,000,000 lbs

1 billion

Take out fuel facilities

Top ten chemicals

1. methyl bromide
2. chlorine
3. sulfuric acid
4. N_2
5. Ammonia
6. Oxygen
7. Amm. Hydroxide
8. Sodium Hydroxide
9. Hydrogen Sulfide
10. Diethylene Glycol monoethyl ether

Who has the large quantities?

BHP Chevron ~~Alo~~ Hickam Maui Pineapple Gases HCl CO_2

GasPro, Honolulu Wood Treating

320 have submitted reports so far this year

Hotels with propane.

Anfo

This year we'll try to do some cross checking.

By Island

By Chemical

By Range Code

By SIC Code chemicals

Fax Message

Date: Friday, November 29, 1996 **Time:** 2:56 PM

To: HEER Hawaii DOH

Company: HEER Office FAX

Fax Phone #: 8085867537

CC:

From: Marsha Mealey, EPCRA Coordinator, HEER Office

Subject: Agenda for the December HSERC Meeting

Total # of Pages (including cover): 2

Memo:

The following is the agenda for the next HSERC meeting scheduled for the morning of Thursday December 5, 1996, from 9 to 12. Please contact me by Fax ((808)586-7537 or phone ((808)586-4694)) if you have questions.

If all pages were not received, please call back immediately: (808)5864249

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

LAWRENCE MIIKE
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH

P.O. BOX 3378
HONOLULU, HAWAII 96801

In reply, please refer to:
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November 21, 1996

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DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
Automotive Management Division
Parking Control Branch

Date: November 27, 1998

MEMORANDUM

TO: DAGS, Automotive Management Division
Parking Control Branch Phone: 586-0344 Fax: 586-0354

FROM: Health/Env. Health Admin./HEER Office Fax: 586-4444
DEPT., DIVISION

SUBJECT: REQUEST FOR SPECIAL FUNCTION PARKING

PURPOSE: Hawaii State Emergency Response Commission Meeting

No. of Permits Requested: 13 Preferred Parking Lot: WA

Date(s) of Function: December 8, 1998 Time: 9:00 a.m. to 12:00 p.m.

Place of Function: AAFES Building, 919 Ala Moana Blvd., 5th Floor
(address)

Participants arriving from: Downtown Honolulu

Contact Person: Ariane Akana Phone: 586-4249

SUBMITTED BY: Steven S. Armann, Acting Manager, EHA/HEER Office

Account No. to charge: G 011 H 371 HTH 849

APPROVED FOR DIRECTOR: Pat Johnston

NOTE:
1) SUBMIT ONE REQUEST FOR EACH FUNCTION.
2) REQUESTS MUST BE RECEIVED BY PARKING CONTROL AT LEAST THREE (3) WORKING DAYS, BUT NO MORE THAN 30 DAYS PRIOR TO THE DATE OF THE FUNCTION.
3) PARTICIPANTS WHO ARE ISSUED SPECIAL FUNCTION PERMITS MUST BE ARRIVING FROM LOCATIONS OUTSIDE THE STATE CAPITAL COMPLEX.
4) THIS SPECIAL FUNCTION PERMIT SHALL BE PROMINENTLY DISPLAYED, FACED UP, ON YOUR DASHBOARD ON THE DRIVER'S SIDE.

PARKING CONTROL USE ONLY

DATE RECD: DEC 0 3 1998 APPROVED BY: TM LOT AUTHORIZED: 13-WA/METERS UNMARKED RESERVE

No. of Validated Tickets: ________

AMD-PC-001
REV. 6/92

DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
Automotive Management Division
Parking Control Branch

Date: November 27, 1998

MEMORANDUM

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PARKING CONTROL USE ONLY

DATE RECD: DEC 03 1998 APPROVED BY: TM LOT AUTHORIZED: 13-WA/METERS UNMARKED RESERVE

No. of Validated Tickets:

AMD-PC-001
REV. 6/91

parking pass

File: RECV000
Type: FAX
Phone #: 8085869104
User ID: 8085869104
Name: Russel Charlton
Time: 12:27 PM
Date: 12/4/96
Pages: 1
Duration: 1:03
Speed: 14400
Status: Failed

File: RECV000
Type: FAX
Phone #: 8085869104
User ID: 8085869104
Name: Russel Charlton
Time: 12:23 PM
Date: 12/4/96
Pages: 1
Duration: 1:03
Speed: 14400
Status: Failed

File: RECV000
Type: FAX
Phone #: 8087358626
User ID:
Name: Glen Lockwood
Time: 12:21 PM
Date: 12/4/96
Pages: 2
Duration: 1:28
Speed: 9600
Status: Sent

File: RECV000
Type: FAX
Phone #: 8085869104
User ID: 8085869104
Name: Russel Charlton
Time: 12:17 PM
Date: 12/4/96
Pages: 1
Duration: 1:03
Speed: 14400
Status: Failed

File: RECV000
Type: FAX
Phone #: 8087358626
User ID:
Name: Glen Lockwood
Time: 12:16 PM
Date: 12/4/96
Pages: 0
Duration: 0:00

Speed:
Status: Busy

File: RECV000
Type: FAX
Phone #: 18082424479
User ID: 18008358417
Name: Captain Joe Blackburn
Time: 12:16 PM
Date: 12/4/96
Pages: 2
Duration: 1:44
Speed: 9600
Status: Sent

File: RECV000
Type: FAX
Phone #: 8089564585
User ID: 8089564585
Name: Prema Menon
Time: 12:11 PM
Date: 12/4/96
Pages: 2
Duration: 1:41
Speed: 9600
Status: Sent

File: RECV000
Type: FAX
Phone #: 8085873833
User ID: 5873833
Name: Thomas J. Smyth
Time: 12:09 PM
Date: 12/4/96
Pages: 2
Duration: 1:41
Speed: 9600
Status: Sent

File: RECV000
Type: FAX
Phone #: 8085870390
User ID: 8085870390
Name: Gilbert Coloma-Agaran
Time: 12:06 PM
Date: 12/4/96
Pages: 2
Duration: 1:30
Speed: 9600
Status: Sent

File: RECV000
Type: FAX
Phone #: 8085872168
User ID: 808 587 2168
Name: Chris Takeno
Time: 12:05 PM

Date: 12/4/96
Pages: 2
Duration: 1:42
Speed: 9600
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Type: FAX
Phone #: 8085869104
User ID: 8085869104
Name: Russel Charlton
Time: 12:02 PM
Date: 12/4/96
Pages: 1
Duration: 1:03
Speed: 14400
Status: Failed

File: RECV000
Type: FAX
Phone #: 8087358626
User ID:
Name: Glen Lockwood
Time: 12:01 PM
Date: 12/4/96
Pages: 0
Duration: 0:00
Speed:
Status: Busy

File: RECV000
Type: FAX
Phone #: 8089563980
User ID: 8089563980
Name: Dr. John Harrison
Time: 12:00 PM
Date: 12/4/96
Pages: 2
Duration: 1:42
Speed: 9600
Status: Sent

File: RECV000
Type: FAX
Phone #: 8089739418
User ID: 33
Name: Bob Boesch
Time: 11:58 AM
Date: 12/4/96
Pages: 2
Duration: 1:31
Speed: 9600
Status: Sent

File: RECV000
Type: FAX
Phone #: 8085864444

User ID: 8085864444
Name: Dr. Bruce Anderson
Time: 11:56 AM
Date: 12/4/96
Pages: 2
Duration: 1:42
Speed: 9600
Status: Sent

File: RECV000
Type: FAX
Phone #: 8084229691
User ID: 8084229691
Name: Captain Carter Davis
Time: 11:54 AM
Date: 12/4/96
Pages: 2
Duration: 1:43
Speed: 9600
Status: Sent

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Type: FAX
Phone #: 18082424479
User ID:
Name: Captain Joe Blackburn
Time: 11:52 AM
Date: 12/4/96
Pages: 0
Duration: 0:00
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Status: No Answer

File: RECV000
Type: FAX
Phone #: 18082416335
User ID: 808 241 6335
Name: Clifford Ikeda
Time: 11:51 AM
Date: 12/4/96
Pages: 2
Duration: 1:30
Speed: 9600
Status: Sent

File: RECV000
Type: FAX
Phone #: 8085864186
User ID: 808 586 4186
Name: Gary Gill
Time: 11:49 AM
Date: 12/4/96
Pages: 2
Duration: 1:43
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085379019
User ID:
Name: Hawaii Chapter Sierra Club
Time: 4:06 PM
Date: 11/29/96
Pages: 0
Duration: 0:00
Speed:
Status: No Answer

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Phone #: 8085379019
User ID:
Name: Hawaii Chapter Sierra Club
Time: 4:03 PM
Date: 11/29/96
Pages: 0
Duration: 0:00
Speed:
Status: No Answer

File: 26AGENDA
Type: FAX
Phone #: 8085873077
User ID: 808 587 3077
Name: Kathy Ho
Time: 4:00 PM
Date: 11/29/96
Pages: 2
Duration: 1:47
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085379019
User ID:
Name: Hawaii Chapter Sierra Club
Time: 3:58 PM
Date: 11/29/96
Pages: 0
Duration: 0:00
Speed:
Status: No Answer

File: 26AGENDA
Type: FAX
Phone #: 8085864186
User ID: 808 586 4186
Name: Gary Gill
Time: 3:57 PM
Date: 11/29/96
Pages: 2
Duration: 2:02

Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 14157441796
User ID: 1 415 744 1796
Name: Mike Ardito
Time: 3:52 PM
Date: 11/29/96
Pages: 2
Duration: 1:36
Speed: 14400
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8087338332
User ID: 7338332
Name: Donna Maiava
Time: 3:50 PM
Date: 11/29/96
Pages: 2
Duration: 2:01
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085873077
User ID:
Name: Kathy Ho
Time: 3:48 PM
Date: 11/29/96
Pages: 0
Duration: 0:00
Speed:
Status: Busy

File: 26AGENDA
Type: FAX
Phone #: 8085379019
User ID:
Name: Hawaii Chapter Sierra Club
Time: 3:47 PM
Date: 11/29/96
Pages: 0
Duration: 0:00
Speed:
Status: No Answer

File: 26AGENDA
Type: FAX
Phone #: 8085216841
User ID: 5216841
Name: Sierra Club Legal Defense Fund
Time: 3:46 PM

Date: 11/29/96
Pages: 2
Duration: 2:00
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085873833
User ID: 5873833
Name: Thomas J. Smyth
Time: 3:44 PM
Date: 11/29/96
Pages: 2
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Phone #: 8089564585
User ID: 8089564585
Name: Prema Menon
Time: 3:41 PM
Date: 11/29/96
Pages: 2
Duration: 2:00
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085228270
User ID:
Name: Lt. Cmdr. Ken Hertzler
Time: 3:39 PM
Date: 11/29/96
Pages: 2
Duration: 1:48
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085870390
User ID: 8085870390
Name: Gilbert Coloma-Agaran
Time: 3:36 PM
Date: 11/29/96
Pages: 2
Duration: 1:49
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085872168

User ID: 808 587 2168
Name: Chris Takeno
Time: 3:34 PM
Date: 11/29/96
Pages: 2
Duration: 2:01
Speed: 9600
Status: Sent

File: 26AGENDA
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User ID: 33
Name: Bob Boesch
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Speed: 9600
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Pages: 2
Duration: 2:01
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8087358626
User ID:
Name: Glen Lockwood
Time: 3:26 PM
Date: 11/29/96
Pages: 2
Duration: 1:59
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085869104
User ID: 8085869104
Name: Russel Charlton
Time: 3:24 PM
Date: 11/29/96
Pages: 2
Duration: 1:37
Speed: 14400
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085864186
User ID: 808 586 4186
Name: Gary Gill
Time: 3:22 PM
Date: 11/29/96
Pages: 1
Duration: 1:24
Speed: 9600
Status: Failed

File: 26AGENDA
Type: FAX
Phone #: 18082416335
User ID: 808 241 6335
Name: Clifford Ikeda
Time: 3:20 PM
Date: 11/29/96
Pages: 2
Duration: 2:00
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 18089618248
User ID: 8089618248
Name: Jay Sasan
Time: 3:18 PM
Date: 11/29/96
Pages: 2
Duration: 2:01
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 18082424479
User ID: 18008358417
Name: Captain Joe Blackburn
Time: 3:15 PM
Date: 11/29/96
Pages: 2
Duration: 2:02
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8084229691
User ID: 8084229691
Name: Captain Carter Davis
Time: 3:13 PM
Date: 11/29/96
Pages: 2
Duration: 2:02

Speed: 9600
Status: Sent

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Type: FAX
Phone #: 8085864444
User ID: 8085864444
Name: Dr. Bruce Anderson
Time: 3:10 PM
Date: 11/29/96
Pages: 2
Duration: 2:01
Speed: 9600
Status: Sent

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Phone #: 8087334287
User ID:
Name: Roy C. Price, Sr.
Time: 3:08 PM
Date: 11/29/96
Pages: 2
Duration: 2:00
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085243439
User ID: 808 524 3439
Name: Leland Nakai
Time: 3:05 PM
Date: 11/29/96
Pages: 2
Duration: 1:47
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 8085867537
User ID: 808 586 4249
Name: HEER Hawaii DOH
Time: 3:03 PM
Date: 11/29/96
Pages: 2
Duration: 2:00
Speed: 9600
Status: Sent

File: 26AGENDA
Type: FAX
Phone #: 18089618296
User ID: 9618296
Name: Chief Nelson Tsuji
Time: 3:00 PM

Date: 11/29/96
Pages: 2
Duration: 2:06
Speed: 9600
Status: Sent

The Health State
HAWAII STATE DEPARTMENT OF HEALTH

P. O. BOX 3378
HONOLULU, HAWAII 96801

STATE OF HAWAII
DEPARTMENT OF HEALTH

HAZARD EVALUATION
AND
EMERGENCY RESPONSE OFFICE

DATE: 11/29/96 NO. OF PAGES: 2

TO: Harry Kim

COMPANY: Hawaii CD

TELEPHONE: 935-0031 FAX: 935-6460

FROM: Marsha Mealey

TELEPHONE: (808) 586-4249 FAX: (808) 586-7537

COMMENTS:

File: (Coversheet)
Type: FAX
Phone #: 8085216841
User ID:
Name: Sierra Club Legal Defense Fund
Time: 6:02 PM
Date: 11/15/96
Pages: 0
Duration: 0:00
Speed:
Status: Busy

Resend

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User ID:
Name: Sierra Club Legal Defense Fund
Time: 5:59 PM
Date: 11/15/96
Pages: 0
Duration: 0:00
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Status: Busy

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User ID:
Name: Sierra Club Legal Defense Fund
Time: 5:56 PM
Date: 11/15/96
Pages: 0
Duration: 0:00
Speed:
Status: Busy

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Type: FAX
Phone #: 8085228270
User ID:
Name: Lt. Cmdr. Ken Hertzler
Time: 5:55 PM
Date: 11/15/96
Pages: 1
Duration: 0:54
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8085864444
User ID: 8085864444
Name: Dr. Bruce Anderson
Time: 5:54 PM
Date: 11/15/96
Pages: 1
Duration: 1:01

Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8085216841
User ID:
Name: Sierra Club Legal Defense Fund
Time: 5:50 PM
Date: 11/15/96
Pages: 0
Duration: 0:00
Speed:
Status: Busy

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Type: FAX
Phone #: 8085379019
User ID: 53
Name: Hawaii Chapter Sierra Club
Time: 5:49 PM
Date: 11/15/96
Pages: 1
Duration: 1:01
Speed: 9600
Status: Sent

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Type: FAX
Phone #: 8085873077
User ID: 808 587 3077
Name: Kathy Ho
Time: 5:48 PM
Date: 11/15/96
Pages: 1
Duration: 0:54
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8087338332
User ID: 7338332
Name: Donna Maiava
Time: 5:46 PM
Date: 11/15/96
Pages: 1
Duration: 1:01
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8089564585
User ID: 8089564585
Name: Prema Menon
Time: 5:45 PM

Date: 11/15/96
Pages: 1
Duration: 1:00
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8085873833
User ID: 5873833
Name: Thomas J. Smyth
Time: 5:43 PM
Date: 11/15/96
Pages: 1
Duration: 1:02
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8085228270
User ID:
Name: Lt. Cmdr. Ken Hertzler
Time: 5:42 PM
Date: 11/15/96
Pages: 0
Duration: 0:00
Speed:
Status: Busy

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Type: FAX
Phone #: 8085870390
User ID: 8085870390
Name: Gilbert Coloma-Agaran
Time: 5:41 PM
Date: 11/15/96
Pages: 1
Duration: 0:55
Speed: 9600
Status: Sent

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Type: FAX
Phone #: 8085872168
User ID: 808 587 2168
Name: Chris Takeno
Time: 5:40 PM
Date: 11/15/96
Pages: 1
Duration: 1:01
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8085869104

User ID: 8085869104
Name: Russel Charlton
Time: 5:38 PM
Date: 11/15/96
Pages: 1
Duration: 0:44
Speed: 14400
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8087358626
User ID:
Name: Glen Lockwood
Time: 5:37 PM
Date: 11/15/96
Pages: 1
Duration: 0:53
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8089563980
User ID: 8089563980
Name: Dr. John Harrison
Time: 5:36 PM
Date: 11/15/96
Pages: 1
Duration: 1:01
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8089739418
User ID: 33
Name: Bob Boesch
Time: 5:34 PM
Date: 11/15/96
Pages: 1
Duration: 0:55
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8087334287
User ID:
Name: Roy C. Price, Sr.
Time: 5:33 PM
Date: 11/15/96
Pages: 1
Duration: 1:01
Speed: 9600
Status: Sent

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Type: FAX
Phone #: 8085864444
User ID:
Name: Dr. Bruce Anderson
Time: 5:31 PM
Date: 11/15/96
Pages: 0
Duration: 0:00
Speed:
Status: Busy

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Type: FAX
Phone #: 8084229691
User ID: 8084229691
Name: Captain Carter Davis
Time: 5:31 PM
Date: 11/15/96
Pages: 1
Duration: 1:01
Speed: 9600
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File: (Coversheet)
Type: FAX
Phone #: 18082424479
User ID: 18008358417
Name: Captain Joe Blackburn
Time: 5:30 PM
Date: 11/15/96
Pages: 1
Duration: 1:03
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 18089618248
User ID: 8089618248
Name: Jay Sasan
Time: 5:28 PM
Date: 11/15/96
Pages: 1
Duration: 1:01
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 18082416335
User ID: 808 241 6335
Name: Clifford Ikeda
Time: 5:27 PM
Date: 11/15/96
Pages: 1
Duration: 0:54

Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8085864186
User ID: 808 586 4186
Name: Gary Gill
Time: 5:25 PM
Date: 11/15/96
Pages: 1
Duration: 1:02
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 18089618296
User ID: 9618296
Name: Chief Nelson Tsuji
Time: 5:24 PM
Date: 11/15/96
Pages: 1
Duration: 1:01
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8085867537
User ID: 808 586 4249
Name: HEER Hawaii DOH
Time: 5:22 PM
Date: 11/15/96
Pages: 1
Duration: 1:01
Speed: 9600
Status: Sent

File: (Coversheet)
Type: FAX
Phone #: 8085243439
User ID: 808 524 3439
Name: Leland Nakai
Time: 5:21 PM
Date: 11/15/96
Pages: 1
Duration: 0:53
Speed: 9600
Status: Sent

Mike Ardito

Stephen K. Yamashiro
Mayor

Marsha

Nelson M. Tsuji
Fire Chief

Edward Bumatay
Deputy Fire Chief

County of Hawaii

FIRE DEPARTMENT
777 Kilauea Avenue • Mall Lane, Room 6 • Hilo, Hawaii 96720-4239
(808) 961-8297 • Fax (808) 961-8296

RECEIVED
OCT 23 1996

October 17, 1996

Hawaii State Emergency Response Commission
State Department of Health
P. O. Box 3378
Honolulu, HI 96801

Gentlemen:

I have resigned from the Hawaii County LEPC effective October 15, 1996. Harry Kim, Civil Defense Administrator, will be replacing me as Chairman.

Thank you for all the assistance and cooperation I have received from your agency.

Sincerely,

NELSON M. TSUJI
Fire Chief

NMT/mo

Fax Message

11/18/96
Date: Friday, November 15, 1996 **Time:** 5:18 PM

FROM ~~**To:**~~ Leland Nakai

Company: Oahu Civil Defense

Fax Phone #: 8085243439

CC:

TO: ~~**From:**~~ Marsha Mealey, EPCRA Coordinator, HEER Office

Subject: Announcement for the December HSERC Meeting

Total # of Pages (including cover): 1

Memo:

The following is to announce that the next HSERC meeting is scheduled for the morning of Thursday December 5, 1996, from 9 to 12. Please contact me by Fax ((808)586-7537 or phone ((808)586-4694)) if you have questions.

Marsha,

Both Carter & I are in a Hazmat IC course that entire week. Unsure if we'll be able to make meeting.

Leland

If all pages were not received, please call back immediately: (808)5864249

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

LAWRENCE MIIKE
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

IN REPLY, PLEASE REFER TO:
HEER OFFICE

November 21, 1996

HAWAII STATE EMERGENCY RESPONSE COMMISSION
MEETING #26

Thursday, December 5, 1996 from 9:00 a.m. to 12:00 noon.

'96 NOV 22 P1:15
LIEUTENANT GOVERNOR'S OFFICE

Department of Health
919 Ala Moana Boulevard, 5th Floor Conference Room
Honolulu, Hawaii 96814

AGENDA

1)	9:00	Call to Order Opening Remarks and Discussion Approval of Minutes from Mtg #25	Bruce Anderson, DOH, Env. Health Admin.
2)	9:15	LEPC Updates and Membership Changes	Jay Sasan, Hawaii LEPC Representative Clifford Ikeda, Kauai LEPC Representative Carter Davis, Oahu LEPC Representative Joe Blackburn, Maui LEPC Representative
3)	10:00	Maui HazMat Plan Update	Joe Blackburn, Maui LEPC Representative
4)	10:15	EPA Updates •CAMEO-Terms & Conditions for Free Copies •Integrated One Plan Guidance •Risk Management Plans under CAA 112r •EPA OSC PREP Exercise '97	Mike Ardito, EPA Region IX
	10:45	Break	
5)	11:00	Clandestine Labs	Bill Perry, OSC, HEER Office
6)	11:15	Command Structure for OHSERP	Curtis Martin, HEER Office
7)	11:30	Operation Kokua	Mike Cripps, OSC, HEER Office
8)	11:45	Other Business	
9)	11:55	Schedule next HSERC meeting	

BRIEF

December 3, 1996

HAWAII STATE EMERGENCY RESPONSE COMMISSION
MEETING #26

THURSDAY, DECEMBER 5, 1996 from 9:00 p.m. to 12:00 p.m.

Department of Health
919 Ala Moana Boulevard, 5th Floor Conference Room
Honolulu, Hawaii 96814

AGENDA

(DR. BRUCE ANDERSON, CHAIR)

▼ (CHECK FOR A QUORUM)

1 **9:00** Call to Order

▼ THE MEETING WILL PLEASE COME TO ORDER. Time:_______

Welcome

I'D LIKE TO WELCOME MEMBERS AND OTHERS WHO ARE ATTENDING.

Opening Remarks

TODAY'S MEETING IS LARGELY INFORMATIONAL. THE ONLY ITEMS UP FOR VOTE ARE MINUTES AND MEMBERSHIP CHANGES.

THERE IS A HANDOUT AVAILABLE ON THE SIGN-IN TABLE WHICH DESCRIBES THE USE OF THE NEW CAMPBELL INDUSTRIAL PARK HOTLINE. THE HOTLINE IS OPERATED BY HELEN MARY WESSEL, THE CIP COMPLIANCE COORDINATOR RECENTLY HIRED BY THE DEPARTMENT OF HEALTH. FEEL FREE TO XEROX THE LEAFLET AND PLEASE PASS ALONG THE INFORMATION ABOUT THIS VALUABLE RESOURCE.

Discussion/Approval of Minutes from Meeting #24.

MEMBERS RECEIVED DRAFT COPIES OF THE MAY HSERC MINUTES BY FAX.

THERE ARE EXTRA COPIES FOR THOSE WHO WOULD LIKE THEM. PLEASE

TAKE SOME TIME TO REVIEW THE DRAFT MINUTES.

▼DO I HEAR A MOTION TO ACCEPT THE MINUTES?

▼DOES ANYONE WANT TO SECOND THE MOTION?

▼THE MOTION TO ACCEPT THE MINUTES HAS BEEN SECONDED. IT'S NOW OPEN TO DISCUSSION. ARE THERE ANY CHANGES?

▼THE CHAIR RECOGNIZES...

▼THOSE IN FAVOR OF ACCEPTING THE MINUTES *AS PRINTED/WITH THE CHANGES DISCUSSED* SAY YES. (PAUSE FOR THE YES VOTES) THOSE OPPOSED SAY NO.

THE MOTION IS CARRIED. THE MINUTES ARE ACCEPTED.

2&3 **9:15** THE NEXT ITEM ON THE AGENDA ARE THE PRESENTATIONS BY THE LEPCS. JAY SASAN IS UNABLE TO ATTEND TODAY. HOWEVER, THERE IS NEWS FROM THE BIG ISLAND. CHIEF TSUJI HAS TENDERED HIS RESIGNATION AS CHAIRPERSON OF THE HAWAII LEPC. HE HAS INFORMED THE HSERC THAT THE HAWAII LEPC HAS CHOSEN HARRY KIM TO REPLACE HIM AS CHAIRPERSON.

I'D LIKE TO GIVE THE OTHER LEPC REPRESENTATIVES AN OPPORTUNITY TO UPDATE THE COMMISSION ON COUNTY EMERGENCY PLANNING ACTIVITIES AND TO PRESENT MEMBERSHIP CHANGES FOR THE COMMISSION'S VOTE. WE'VE PUT JOE LAST SO THAT HE COULD GO AHEAD AND GIVE HIS MAUI HAZMAT PLAN UPDATE WHILE HE HAS THE FLOOR.

Clifford Ikeda, Kauai
Carter Davis, Oahu
Joe Blackburn, Maui

4 **10:15** NOW I'D LIKE TO PRESENT **Mike Ardito**, OF THE USEPA, REGION 9, WHO WILL GIVE US UPDATES ON THE CAMEO PROGRAM, ONE PLAN GUIDANCE, CLEAN AIR ACT RISK MANAGEMENT PLANS AND THE EPA's OSC PREP EXERCISE SCHEDULED FOR NEXT YEAR.

A BREAK IS SCHEDULED FROM 10:45 to 11:00.

5 **11:00** THERE HAS BEEN A SWITCH IN PRESENTERS FROM THE HEER OFFICE. **Mike Cripps** WILL BE BRIEFING US ON RECENT DOH ACTIVITIES REGARDING THE CLEAN UP OF CLANDESTINE LABS.

6 **11:15** **Steve Armann**, WILL BE PRESENTING THE OHSERP COMMAND STRUCTURE SINCE CURTIS HAD A SCHEDULING CONFLICT AND COULD NOT ATTEND THE MEETING.

7 **11:30** **Bill Perry**, ONE OF OUR HEER OFFICE ON SCENE COORDINATORS, HAS DONE A GREAT DEAL TO ORCHESTRATE OPERATION KOKUA AND HAS BEEN IN THE FIELD SEEING TO EVERY DETAIL SINCE ITS BEGINNING. NOW, ~~BILL~~ Steve WILL BRING US UP TO DATE ON THE EXCELLENT RESULTS ACHIEVED BY OPERATION KOKUA.

He's been so valuable he's still out there.

8 **11:45** Other Business

IS THERE ADDITIONAL BUSINESS TO BE DISCUSSED?

9 **11:55** Schedule next HSERC meeting

THE CHAIR PROPOSES THAT THE NEXT MEETING BE HELD IN FEBRUARY.

▼DO I HEAR A MOTION TO SCHEDULE THE NEXT HSERC MEETING IN FEBRUARY?

▼DOES ANYONE WANT TO SECOND THE MOTION?

▼THE MOTION HAS BEEN SECONDED.

▼THOSE IN FAVOR SAY YES. (PAUSE FOR THE YES VOTES)
▼THOSE OPPOSED SAY NO.

▼THE MOTION IS CARRIED.

▼DO I HEAR A MOTION TO ADJOURN THE MEETING?

▼DOES ANYONE WANT TO SECOND THE MOTION?

▼THE MOTION TO ADJOURN HAS BEEN SECONDED.

▼THOSE IN FAVOR SAY YES. (PAUSE FOR THE YES VOTES)

▼THOSE OPPOSED SAY NO.

▼THE MOTION IS CARRIED. THE MEETING IS ADJOURNED UNTIL FEBRUARY.

Time: _______

Fax Message

Date: Friday, November 15, 1996 **Time:** 5:18 PM

To: HEER Hawaii DOH

Company: HEER Office FAX

Fax Phone #: 8085867537

CC:

From: Marsha Mealey, EPCRA Coordinator, HEER Office

Subject: Announcement for the December HSERC Meeting

Total # of Pages (including cover): 1

Memo:

The following is to announce that the next HSERC meeting is scheduled for the morning of Thursday December 5, 1996, from 9 to 12. Please contact me by Fax ((808)586-7537 or phone ((808)586-4694)) if you have questions.

If all pages were not received, please call back immediately: (808)5864249

My e-mail address:

ardito.michael@epamail.epa.gov

— EPA's Chemical Emergency Preparedness & Prevention Office
CEPPO webpage:

http://www.epa.gov/swercepp/

— Emergency Planning and Right-to-Know
RTKnet LEPC/SERC website:
http://rtk.net/lepc

— Modem to RTK-Net LEPC/SERC BBS:
(202) 234-8570 or (800) 444-8697

username: lepc
password: lepcepa

federal register

Wednesday
June 5, 1996

Part II

Environmental Protection Agency

Department of Transportation

Coast Guard

Research and Special Programs Administration

Department of the Interior

Minerals Management Service

Department of Labor

Occupational Safety and Health Administration

The National Response Team's Integrated Contingency Plan Guidance; Notice

ENVIRONMENTAL PROTECTION AGENCY

DEPARTMENT OF TRANSPORTATION

Coast Guard

Research and Special Programs Administration

DEPARTMENT OF THE INTERIOR

Minerals Management Service

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

[FRL-5512-8]

The National Response Team's Integrated Contingency Plan Guidance

AGENCY: Environmental Protection Agency (EPA), U.S. Coast Guard (USCG), Minerals Management Service (MMS), Research and Special Programs Administration (RSPA), Occupational Safety and Health Administration (OSHA).

ACTION: Notice.

SUMMARY: The U.S. Environmental Protection Agency, as the chair of the National Response Team (NRT), is announcing the availability of the NRT's Integrated Contingency Plan Guidance ("one plan"). This guidance is intended to be used by facilities to prepare emergency response plans. The intent of the NRT is to provide a mechanism for, consolidating multiple plans that facilities may have prepared to comply with various regulations into one functional emergency response plan or integrated contingency plan (ICP). This notice contains the suggested ICP outline as well as guidance on how to develop an ICP and demonstrate compliance with various regulatory requirements. The policies set out in this notice are intended solely as guidance.

ADDRESSES: Additional copies of this one-plan guidance can be obtained by writing to the following address: William Finan, U.S. Environmental Protection Agency, Mail Code 5101, 401 M Street SW, Washington, DC 20460. Copies of the ICP Guidance are also available by calling the EPCRA/RCRA/Superfund Hotline at (800) 424-9346 (in the Washington, DC, metropolitan area, (703) 412-9810). In addition, this guidance is available electronically at the home page of EPA's Chemical Emergency Preparedness and Prevention Office (http://www.epa.gov/swercepp/).

FOR FURTHER INFORMATION CONTACT: William Finan, U.S. Environmental Protection Agency, Mail Code 5101, 401 M Street, SW., Washington, DC 20460, at (202) 260-0030 (E-Mail homepage.ceppo@epamail.epa.gov—please include "one plan" in the subject line). In addition, the EPCRA/RCRA/Superfund Hotline can answer general questions about the guidance.

For further information and guidance on complying with specific regulations, contact: for EPA's Oil Pollution Prevention Regulation: Bobbie Lively-Diebold, U.S. Environmental Protection Agency, Mail Code 5203G, 401 M Street, SW., Washington, DC 20460, at (703) 356-8774 (E-Mail Lively.Barbara@epamail.epa.gov), or the SPCC Information Line at (202) 260-2342); for the U.S. Coast Guard's Facility Response Plan Regulation: LCDR Mark Hamilton, U.S. Coast Guard, Commandant (G-MOR), 2100 2nd Street, SW., Washington, DC 20593, at 202-267-1983 (E-Mail M.Hamilton/G-M03@CCSMTP.uscg.mil); for DOT/RSPA's Pipeline Response Plan Regulation: Jim Taylor, U.S. Department of Transportation, Room 2335, 400 7th Street, SW., Washington, DC 20590 at (202) 366-8860 (E-Mail OPATEAM@RSPA.DOT.GOV); for pertinent OSHA regulations, contact either your Regional or Area OSHA office; for DOI/MMS' Facility Response Plan Regulation: Larry Ake, U.S. Department of the Interior—Minerals Management Service, MS 4700, 381 Elden Street, Herndon, VA 22070-4817 at (703) 787-1567 (E-Mail Larry_Ake@SMTP.MMS.GOV); for EPA's Risk Management Program Regulation: William Finan (see above); and for RCRA's Contingency Planning Requirements, contact the EPCRA/RCRA/Superfund Hotline (see above).

The NRT welcomes comments on specific implementation issues related to this guidance. Please provide us with information about the successful use of this guidance, about problems with using this guidance, as well as suggestions for improving the guidance. Send comments to William Finan (see above) or to any of the other people listed in the previous paragraph.

SUPPLEMENTARY INFORMATION:

Presidential Review Findings

Section 112(r)(10) of the Clean Air Act required the President to conduct a review of federal release prevention, mitigation, and response authorities. The Presidential Review was delegated to EPA, in coordination with agencies and departments that are members of the National Response Team (NRT). The Presidential Review concluded that, while achieving its statutory goals to protect public safety and the environment, the current system is complex, confusing, and costly. It identified several key problem areas and recommended a second phase to address these issues. One of the issues identified by the Presidential Review is the multiple and overlapping federal requirements for facility emergency response plans.

NRT Policy Statement

This one-plan guidance is intended to be used by facilities to prepare emergency response plans for responding to releases of oil and non-radiological hazardous substances. The intent of NRT is to provide a mechanism for consolidating multiple plans that facilities may have prepared to comply with various regulations into one functional emergency response plan or integrated contingency plan (ICP). A number of statutes and regulations, administered by several federal agencies, include requirements for emergency response planning. A particular facility may be subject to one or more of the following federal regulations:

- EPA's Oil Pollution Prevention Regulation (SPCC and Facility Response Plan Requirements)—40 CFR part 112.7(d) and 112.20-.21;
- MMS's Facility Response Plan Regulation—30 CFR part 254;
- RSPA's Pipeline Response Plan Regulation—49 CFR part 194;
- USCG's Facility Response Plan Regulation—33 CFR part 154, Subpart F;
- EPA's Risk Management Programs Regulation—40 CFR part 68;
- OSHA's Emergency Action Plan Regulation—29 CFR 1910.38(a);
- OSHA's Process Safety Standard—29 CFR 1910.119;
- OSHA's HAZWOPER Regulation—29 CFR 1910.120; and
- EPA's Resource Conservation and Recovery Act Contingency Planning Requirements—40 CFR part 264, Subpart D, 40 CFR part 265, Subpart D, and 40 CFR 279.52.

In addition, facilities may also be subject to state emergency response planning requirements that this guidance does not specifically address. Facilities are encouraged to coordinate development of their ICP with relevant state and local agencies to ensure compliance with any additional regulatory requirements.

Individual agencies' planning requirements and plan review procedures are not changed by the advent of the ICP format option. This one-plan guidance has been developed to assist facilities in demonstrating compliance with the existing federal emergency response planning requirements referenced above. Although it does not relieve facilities from their current obligations, it has been designed specifically to help meet those obligations. Adherence to this guidance is not required in order to comply with federal regulatory requirements. Facilities are free to continue maintaining multiple plans to demonstrate federal regulatory compliance; however, the NRT believes that an integrated plan prepared in accordance with this guidance is a preferable alternative.

The NRT realizes that many existing regulations pertaining to contingency planning require review by a specific agency to determine compliance with applicable requirements. It is not the intent of the NRT to modify existing agency review procedures or to supersede the requirements of a regulation.

This one-plan guidance was developed through a cooperative effort among numerous NRT agencies, state and local officials, and industry and community representatives. The NRT and the agencies responsible for reviewing and approving federal response plans to which the ICP option applies agree that integrated response plans prepared in the format provided in this guidance will be acceptable and be the federally preferred method of response planning. The NRT realizes that alternate formats for integrating multiple plans already exist and that others likely will be developed. Certain facilities may find those formats more desirable than the one proposed here. The NRT believes that a single functional plan is preferable to multiple plans regardless of the specific format chosen. While they are acceptable, other formats may not allow the same ease of coordination with external plans. In any case, whatever format a facility chooses, no individual NRT agency will require an integrated response planning format differing from the ICP format described here. The NRT anticipates that future development of all federal regulations addressing emergency response planning will incorporate use of the ICP guidance. Also, developers of state and local requirements will be encouraged to be consistent with this document.

The ICP guidance does not change existing regulatory requirements; rather, it provides a format for organizing and presenting material currently required by the regulations. Individual regulations are often more detailed than the ICP guidance. To ensure full compliance, facilities should continue to read and comply with all of the federal regulations that apply to them. Furthermore, facilities submitting an ICP (in whatever format) for agency or department review will need to provide a cross-reference to existing regulatory requirements so that plan reviewers can verify compliance with these requirements. The guidance contains a series of matrices designed to assist owners and operators in consolidating various plans and documenting compliance with federal regulatory requirements. (See Attachments 2 and 3.) The matrices can be used as the basis for developing a cross-reference to various regulatory requirements.

This guidance also provides a useful contingency planning template for owners and operators of facilities not subject to the federal regulations cited previously.

Integrated Contingency Plan Philosophy

The ICP will minimize duplication in the preparation and use of emergency response plans at the same facility and will improve economic efficiency for both the regulated and regulating communities. Facility expenditures for the preparation, maintenance, submission, and update of a single plan should be much lower than for multiple plans.

The use of a single emergency response plan per facility will eliminate confusion for facility first responders who often must decide which of their plans is applicable to a particular emergency. The guidance is designed to yield a highly functional document for use in varied emergency situations while providing a mechanism for complying with multiple agency requirements. Use of a single integrated plan should also improve coordination between facility response personnel and local, state, and federal emergency response personnel.

The adoption of a standard plan format should facilitate integration of plans within a facility, in the event that large facilities may need to prepare separate plans for distinct operating units. The ICP concept should also allow coordination of facility plans with plans that are maintained by local emergency planning committees (LEPCs),[1] Area Committees,[2] co-operatives, and mutual aid organizations. In some cases, there are specific regulatory requirements to ensure that facility plans are consistent with external planning efforts. Industry use of this guidance along with active participation on local and Area Committees will improve the level of emergency preparedness and is therefore highly encouraged.

In some areas, it may be possible to go beyond simple coordination of plans and actually integrate certain information from facility plans with corresponding areas of external plans. The adoption of a single, common ICP outline such as the one proposed in this guidance would facilitate a move toward integration of facility plans with local, state, and federal plans.

The projected results described above will ultimately serve the mutual goal of the response community to more efficiently and effectively protect public health, worker safety, the environment, and property.

Scope

This one-plan guidance is provided for any facility subject to federal contingency planning regulations and is also recommended for use by other facilities to improve emergency preparedness through planning. In this context, the term "facility" is meant to have a wide connotation and may include, but is not limited to, any mobile or fixed onshore or offshore building, structure, installation, equipment, pipe, or pipeline.

Facility hazards need to be addressed in a comprehensive and coordinated manner. Accordingly, this guidance is broadly constructed to allow for facilities to address a wide range of risks in a manner tailored to the specific needs of the facility. This includes both physical and chemical hazards associated with events such as chemical releases, oil spills, fires, explosions, and natural disasters.

Organizational Concepts

The ICP format provided in this one-plan guidance (See Attachment 1) is organized into three main sections: an introductory section, a core plan, and a series of supporting annexes. It is important to note that the elements contained in these sections are not new concepts, but accepted emergency response activities that are currently addressed in various forms in existing contingency planning regulations. The goal of the NRT is not to create new planning requirements, but to provide a mechanism to consolidate existing concepts into a single functional plan structure. This approach would provide a consistent basis for addressing

[1] LEPC plans are developed by LEPCs in coordination with facility emergency response coordinators under section 303 of the Emergency Planning and Community Right-to-Know Act.

[2] Area Contingency Plans are developed by Area Committees pursuant to section 4202(a)(6) of the Oil Pollution Act of 1990 (OPA).

emergency response concerns as it gains widespread use among facilities.

The introduction section of the plan format is designed to provide facility response personnel, outside responders, and regulatory officials with basic information about the plan and the entity it covers. It calls for a statement of purpose and scope, a table of contents, information on the current revision date of the plan, general facility information, and the key contact(s) for plan development and maintenance. This section should present the information in a brief factual manner.

The structure of the sample core plan and annexes in this guidance is based on the structure of the National Interagency Incident Management System (NIIMS) Incident Command System (ICS). NIIMS ICS is a nationally recognized system currently in use by numerous federal, state, and local organizations (e.g., some Area Committees under OPA). NIIMS ICS is a type of response management system that has been used successfully in a variety of emergency situations, including releases of oil or hazardous substances. NIIMS ICS provides a commonly understood framework that allows for effective interaction among response personnel. Organizing the ICP along the lines of the NIIMS ICS will allow the plan to dovetail with established response management practices, thus facilitating its ease of use during an emergency.

The core plan is intended to contain essential response guidance and procedures. Annexes would contain more detailed supporting information on specific response management functions. The core plan should contain frequent references to the response critical annexes to direct response personnel to parts of the ICP that contain more detailed information on the appropriate course of action for responders to take during various stages of a response. Facility planners need to find the right balance between the amount of information contained in the core plan versus the response critical annexes (Annexes 1 through 3). Information required to support response actions at facilities with multiple hazards will likely be contained in the annexes. Planners at facilities with fewer hazards may choose to include most if not all information in the core plan. Other annexes (e.g., Annexes 4 through 8) are dedicated to providing information that is non-critical at the time of a response (e.g., cross-references to demonstrate regulatory compliance and background planning information). Consistent with the goal of keeping the size of the ICP as manageable as practicable, it is not necessary for a plan holder to provide its field responders with all the compliance documentation (e.g., Annexes 4 through 8) that it submits to regulatory agencies. Similarly, it may not be necessary for a plan holder to submit all annexes to every regulatory agency for review.

Basic headings are consistent across the core plan and annexes to facilitate ease of use during an emergency. These headings provide a comprehensive list of elements to be addressed in the core plan and response annexes and may not be relevant to all facilities. Planners should address those regulatory elements that are applicable to their particular facilities. Planners at facilities with multiple hazards will need to address most, if not all, elements included in this guidance. Planners at facilities with fewer hazards may not need to address certain elements. If planners choose to strictly adopt the ICP outline contained in this guidance but are not required by regulation to address all elements of the outline, they may simply indicate "not applicable" for those items where no information is provided. A more detailed discussion of the core plan and supporting annexes follows.

Core Plan

The core plan is intended to reflect the essential steps necessary to initiate, conduct, and terminate an emergency response action: recognition, notification, and initial response, including assessment, mobilization, and implementation. This section of the plan should be concise and easy to follow. A rule of thumb is that the core plan should fit in the glovebox of a response vehicle. The core plan need not detail all procedures necessary under these phases of a response but should provide information that is time critical in the earliest stages of a response and a framework to guide responders through key steps necessary to mount an effective response. The response action section should be convenient to use and understandable at the appropriate skill level.

The NRT recommends the use of checklists or flowcharts wherever possible to capture these steps in a concise easy-to-understand manner. The core plan should be constructed to contain references to appropriate sections of the supporting annexes for more detailed guidance on specific procedures. The NRT anticipates that for a large, complex facility with multiple hazards the annexes will contain a significant amount of information on specific procedures to follow. For a small facility with a limited number of hazard scenarios, the core plan may contain most if not all of the information necessary to carry out the response thus obviating the need for more detailed annexes. The checklists, depending on their size and complexity, can be in either the core or the support section.

The core plan should reflect a hierarchy of emergency response levels. A system of response levels is commonly used in emergency planning for classifying emergencies according to seriousness and assigning an appropriate standard response or series of response actions to each level. Both complex and simple industrial facilities use a system of response levels for rapidly assessing the seriousness of an emergency and developing an appropriate response. This process allows response personnel to match the emergency and its potential impacts with appropriate resources and personnel. The concept of response levels should be considered in developing checklists or flowcharts designed to serve as the basis for the core plan. Note that for those facilities subject to planning requirements under OPA, response levels in the core plan may not necessarily correspond to discharge planning amounts (e.g., average most probable discharge, maximum most probable discharge, and worst case discharge).

Facility owners and operators should determine appropriate response levels based on 1) the need to initiate time-urgent response actions to minimize or prevent unacceptable consequences to the health and safety of workers, the public, or the environment; and 2) the need to communicate critical information concerning the emergency to offsite authorities. The consideration and development of response levels should, to the extent practicable, be consistent with similar efforts that may have been taken by the LEPC, local Area Committee, or mutual aid organization. Response levels, which are used in communications with offsite authorities, should be fully coordinated and use consistent terminology.

Annexes

The annexes are designed to provide key supporting information for conducting an emergency response under the core plan as well as document compliance with regulatory requirements not addressed elsewhere in the ICP. Annexes are not meant to duplicate information that is already contained in the core plan, but to augment core plan information. The annexes should relate to the basic headings of the core plan. To accomplish this, the annexes should contain sections on facility information, notification, and a detailed description of response procedures under the response management system (i.e, command, operations, planning, logistics, and finance). The annexes should also address issues related to post accident investigation, incident history, written follow-up reports, training and exercises, plan critique and modification process, prevention, and regulatory compliance, as appropriate.

The ICP format contained in this guidance is based on the NIIMS ICS. If facility owners or operators choose to follow fundamental principles of the NIIMS ICS, then they may adopt NIIMS ICS by reference rather than having to describe the system in detail in the plan. The owner or operator should identify where NIIMS ICS documentation is kept at the facility and how it will be accessed if needed by the facility or requested by the reviewing agency. Regardless of the response management system used, the plan should include an organization chart, specific job descriptions,[3] a description of information flow ensuring liaison with the on-scene coordinator (OSC), and a description of how the selected response management system integrates with a Unified Command.[4] If a system other than NIIMS ICS is used, the plan should also identify how it differs from NIIMS or provide a detailed description of the system used.

The NRT anticipates that the use of linkages (i.e., references to other plans) when developing annexes will serve several purposes. Linkages will facilitate integration with other emergency plans within a facility (until such plans can be fully incorporated into the ICP) and with external plans, such as LEPC plans and Area Contingency Plans (ACPs). Linkages will also help ensure that the annexes do not become too cumbersome. The use of references to information contained in external plans does not relieve facilities from regulatory requirements to address certain elements in a facility-specific manner and to have information readily accessible to responders. When determining what information may be linked by reference and what needs to be contained in the ICP, response planners should carefully consider the time critical nature of the information. If instructions or procedures will be needed immediately during an incident response, they should be presented for ready access in the ICP. The following information would not normally be well-suited for reference to documents external to the ICP: core plan elements, facility and locality information (to allow for quick reference by responders on the layout of the facility and the surrounding environment and mitigating actions for the specific hazard(s) present), notification procedures, details of response management personnel's duties, and procedures for establishing the response management system. Although linkages provide the opportunity to utilize information developed by other organizations, facilities should note that many LEPC plans and ACPs may not currently possess sufficient detail to be of use in facility plans or the ICP. This information may need to be developed by the facility until detailed applicable information from broader plans is available.

In all cases, referenced materials must be readily available to anticipated plan users. Copies of documents that have been incorporated by reference need not be submitted unless it is required by regulation. The appropriate sections of referenced documents that are unique to the facility, those that are not nationally recognized, those that are required by regulation, and those that could not reasonably be expected to be in the possession of the reviewing agency, should be provided when the plan is submitted for review and/or approval. Discretion should be used when submitting documents containing proprietary data. It is, however, necessary to identify in the ICP the specific section of the document being incorporated by reference, where the document is kept, and how it will be accessed if needed by the facility or requested by the reviewing agency. In addition, facility owners or operators are reminded to take note of submission requirements of specific regulations when determining what materials to provide an agency for review as it may not be necessary to submit all parts of an ICP to a particular agency.

As discussed previously, this guidance contains a series of matrices designed to assist owners and operators in the plan consolidation process and in the process of ensuring and documenting compliance with regulatory requirements. The matrix in Attachment 2 to this guidance displays areas of current regulations that align with the suggested elements contained in this guidance document. When addressing each element of the ICP outline, plan drafters can refer to this matrix to identify specific regulatory requirements related to that element. The matrices in Attachment 3 to this guidance display regulatory requirements as contained in each of the regulations listed in the NRT policy statement above (which are applicable to many facilities) along with an indication of where in the suggested ICP outline these requirements should be addressed. If a facility chooses to follow the ICP outline, these matrices can be included as Annex 8 to a facility's ICP to provide the necessary cross-reference for plan reviewers to document compliance with various regulatory requirements. To the extent that a plan deviates from the suggested ICP outline, plan drafters will have to alter the matrices to ensure that the location of regulatory requirements within the ICP is clearly identified for plan reviewers.

Integrated Contingency Plan Elements

Presented below is a list of elements to be addressed in the ICP and a brief explanation, displayed in italicized text, of the nature of the information to be contained in that section of the ICP. Attachment 1 presents the complete outline of the ICP without the explanatory text. As discussed previously, the elements are organized into three main sections: plan introduction, core plan, and response annexes.

Section I—Plan Introduction Elements

1. Purpose and Scope of Plan Coverage

This section should provide a brief overview of facility operations and describe in general the physical area, and nature of hazards or events to which the plan is applicable. This brief description will help plan users quickly assess the relevancy of the plan to a particular type of emergency in a given location. This section should also include a list of which regulation(s) are being addressed in the ICP.

[3] OPA 90 planning requirements for marine transfer facilities (33 CFR 154.1035) require job descriptions for each spill management team member regardless of the response management system employed by the facility.

[4] Under NIIMS ICS, the command module has traditionally been represented by a single incident commander (supported by a command staff) who directs efforts of and receives input from the four supporting functional areas (planning, logistics, operations, and finance). More recently, a Unified Command System as described in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) found at 40 CFR part 300 has been used for larger spill responses where the command module is comprised of representatives from the federal government (i.e., federal on-scene coordinator), state government (state on-scene coordinator), and the responsible party working in a cooperative manner. Unified Command allows all parties who have jurisdictional or functional responsibility for the incident to jointly develop a common set of incident objectives and strategies. Such coordination should be guided by procedures found in the NCP (see figure 1a at 40 CFR 300.105(e)(1)) and the applicable Area Contingency Plan.

2. Table of Contents

This section should clearly identify the structure of the plan and include a list of annexes. This will facilitate rapid use of the plan during an emergency.

3. Current Revision Date

This section should indicate the date that the plan was last revised to provide plan users with information on the currency of the plan. More detailed information on plan update history (i.e., a record of amendments) may be maintained in Annex 6 (Response Critique and Plan Review and Modification Process).

4. General Facility Identification Information

a. Facility name
b. Owner/operator/agent (include physical and mailing address and phone number)
c. Physical address of the facility (include county/parish/borough, latitude/longitude, and directions)
d. Mailing address of the facility (correspondence contact)
e. Other identifying information (e.g., ID numbers, SIC Code, oil storage start-up date)
f. Key contact(s) for plan development and maintenance
g. Phone number(s) for key contact(s)
h. Facility phone number
i. Facility fax number

This section should contain a brief profile of the facility and its key personnel to facilitate rapid identification of key administrative information.

Section II - Core Plan Elements

1. Discovery

This section should address the initial action the person(s) discovering an incident will take to assess the problem at hand and access the response system. Recognition, basic assessment, source control (as appropriate), and initial notification of proper personnel should be addressed in a manner that can be easily understood by everybody in the facility. The use of checklists or flowcharts is highly recommended.

2. Initial Response

a. Procedures for internal and external notifications (i.e., contact, organization name, and phone number of facility emergency response coordinator, facility response team personnel, federal, state, and local officials)
b. Establishment of a response management system
c. Procedures for preliminary assessment of the situation, including an identification of incident type, hazards involved, magnitude of the problem, and resources threatened
d. Procedures for establishment of objectives and priorities for response to the specific incident, including:
(1) Immediate goals/tactical planning (e.g., protection of workers and public as priorities)
(2) Mitigating actions (e.g., discharge/release control, containment, and recovery, as appropriate)
(3) Identification of resources required for response
e. Procedures for implementation of tactical plan
f. Procedures for mobilization of resources

This section should provide for activation of the response system following discovery of the incident. It should include an established 24-hour contact point (i.e., that person and alternate who is called to set the response in motion) and instructions for that person on who to call and what critical information to pass. Plan drafters should also consider the need for bilingual notification. It is important to note that different incident types require that different parties be notified. Appropriate federal, State, and local notification requirements should be reflected in this section of the ICP. Detailed notification lists may be included here or in Annex 2, depending upon the variety of notification schemes that a facility may need to implement. For example, the release of an extremely hazardous substance will require more extensive notifications (i.e., to State Emergency Response Commissions (SERCs) and LEPCs) than a discharge of oil. Even though no impacts or awareness are anticipated outside the site, immediate external notifications are required for releases of CERCLA and EPCRA substances. Again, the use of forms, such as flowcharts, checklists, call-down lists, is recommended.

This section should instruct personnel in the implementation of a response management system for coordinating the response effort. More detailed information on specific components and functions of the response management system (e.g., detailed hazard assessment, resource protection strategies) may be provided in annexes to the ICP.

This part of the plan should then provide information on problem assessment, establishment of objectives and priorities, implementation of a tactical plan, and mobilization of resources. In establishing objectives and priorities for response, facilities should perform a hazard assessment using resources such as Material Safety Data Sheets (MSDSs) or the Chemical Hazard Response Information System (CHRIS) manual. Hazardous Materials Emergency Planning Guide (NRT-1), developed by the NRT to assist community personnel with emergency response planning, provides guidance on developing hazard analyses. If a facility elects to provide detailed hazard analysis information in a response annex, then a reference to that annex should be provided in this part of the core plan.

Mitigating actions must be tailored to the type of hazard present. For example, containment might be applicable to an oil spill (i.e., use of booming strategies) but would not be relevant to a gas release. The plan holder is encouraged to develop checklists, flowcharts, and brief descriptions of actions to be taken to control different types of incidents. Relevant questions to ask in developing such materials include:

- *What type of emergency is occurring?*
- *What areas/resources have been or will be affected?*
- *Do we need an exclusion zone?*
- *Is the source under control?*
- *What type of response resources are needed?*

3. Sustained Actions

This section should address the transition of a response from the initial emergency stage to the sustained action stage where more prolonged mitigation and recovery actions progress under a response management structure. The NRT recognizes that most incidents are able to be handled by a few individuals without implementing an extensive response management system. This section of the core plan should be brief and rely heavily on references to specific annexes to the ICP.

4. Termination and Follow-Up Actions

This section should briefly address the development of a mechanism to ensure that the person in charge of mitigating the incident can, in coordination with the federal or state OSC as necessary, terminate the response. In the case of spills, certain regulations may become effective once the "emergency" is declared over. The section should describe how the orderly demobilization of response resources will occur. In addition, follow-up actions associated with termination of a response (e.g., accident investigation, response critique, plan review, written follow-up reports) should also be outlined in this section. Plan drafters *may reference appropriate annexes to the ICP in this section of the core plan.*

Section III—Annexes

Annex 1. Facility and Locality Information

a. Facility maps
b. Facility drawings
c. Facility description/layout, including identification of facility hazards and vulnerable resources and populations on and off the facility which may be impacted by an incident

This annex should provide detailed information to responders on the layout of the facility and the surrounding environment. The use of maps and drawings to allow for quick reference is preferable to detailed written descriptions. These should contain information critical to the response such as the location of discharge sources, emergency shut-off valves and response equipment, and nearby environmentally and economically sensitive resources and human populations (e.g., nursing homes, hospitals, schools). The ACP and LEPC plan may provide specific information on sensitive environments and populations in the area. EPA Regional Offices, Coast Guard Marine Safety Offices, and LEPCs can provide information on the status of efforts to identify such resources. Plan holders may need to provide additional detail on sensitive areas near the facility. In addition, this annex should contain other facility information that is critical to response and should complement but not duplicate information contained in part 4 of the plan introduction section containing administrative information on the facility.

Annex 2. Notification

a. Internal notifications
b. Community notifications
c. Federal and state agency notifications

This annex should detail the process of making people aware of an incident (i.e., who to call, when the call must be made, and what information/data to provide on the incident). The incident commander is responsible for ensuring that notifications are carried out in a timely manner but is not necessarily responsible for making the notifications. ACPs, Regional Contingency Plans (RCPs), and LEPC plans should be consulted and referenced as a source of information on the roles and responsibilities of external parties that are to be contacted. This information is important to help company responders understand how external response officials fit into the picture. Call-down lists must be readily accessible to ensure rapid response. Notification lists provided in the core plan need not be duplicated here but need to be referenced.

Annex 3. Response Management System

This annex should contain a general description of the facility's response management system as well as contain specific information necessary to guide or support the actions of each response management function (i.e., command, operations, planning, logistics, and finance) during a response.

a. General

If facility owners or operators choose to follow the fundamental principles of NIIMS ICS (see discussion of annexes above), then they may adopt NIIMS ICS by reference rather than having to describe the response management system in detail in the plan. In this section of Annex 3, planners should briefly address either 1) basic areas where their response management system is at variance with NIIMS ICS or 2) how the facility's organization fits into the NIIMS ICS structure. This may be accomplished through a simple organizational diagram.

If facility owners or operators choose not to adopt the fundamental principles of NIIMS ICS, this section should describe in detail the structure of the facility response management system. Regardless of the response management system used, this section of the annex should include the following information:

- *Organizational chart;*
- *Specific job description for each position;*[5]
- *A detailed description of information flow; and*
- *Description of the formation of a unified command within the response management system.*

b. Command

(1) List facility Incident Commander and Qualified Individual (if applicable) by name and/or title and provide information on their authorities and duties.

This section of Annex 3 should describe the command aspects of the response management system that will be used (i.e., reference NIIMS ICS or detail the facility's response management system). The location(s) of predesignated command posts should also be identified.

(2) Information (i.e., internal and external communications).

This section of Annex 3 should address how the facility will disseminate information internally (i.e., to facility/response employees) and externally (i.e., to the public). For example, this section might address how the facility would interact with local officials to assist with public evacuation and other needs. Items to consider in developing this section include press release statement forms, plans for coordination with the news media, community relations plan, needs of special populations, and plans for families of employees.

(3) Safety.

This section of Annex 3 should include a process for ensuring the safety of responders. Facilities should reference responsibilities of the safety officer, federal/state requirements (e.g., HAZWOPER), and safety provisions of the ACP. Procedures for protecting facility personnel should be addressed (i.e., evacuation signals and routes, sheltering in place).

(4) Liaison—Staff Mobilization.

This section of Annex 3 should address the process by which the internal and external emergency response teams will interact. Given that parallel mobilization may be occurring by various response groups, the process of integration (i.e., unified command) should be addressed. This includes a process for communicating with local emergency management especially where safety of the general public is concerned.

c. Operations

(1) Operational response objectives
(2) Discharge or release control
(3) Assessment/monitoring
(4) Containment
(5) Recovery
(6) Decontamination
(7) Non-responder medical needs, including information on ambulances and hospitals
(8) Salvage plans

This section of Annex 3 should contain a discussion of specific operational procedures to respond to an incident. It is important to note that response operations are driven by the type of incident. That is, a response to an oil spill will differ markedly from a response to a release of a toxic gas to the air. Plan drafters should tailor response procedures to the particular hazards in place at the facility. A facility with limited hazards may have relatively few procedures. A larger more complex facility with numerous hazards is likely to have a series of procedures

[5] OPA 90 planning requirements for marine transfer facilities (33 CFR 154.1035) require job descriptions for each spill management team member regardless of the response management system employed by the facility.

designed to address the nuances associated with each type of incident.

d. Planning

(1) Hazard assessment, including facility hazards identification, vulnerability analysis, prioritization of potential risks.

This section of Annex 3 should present a detailed assessment of all potential hazards present at the facility, an analysis of vulnerable receptors (e.g., human populations, both workers and the general public, environmentally sensitive areas, and other facility-specific concerns) and a discussion of which risks deserve primary consideration during an incident. NRT-1 contains guidance on conducting a hazard analysis. Also, ACPs and LEPC plans may provide information on environmentally sensitive and economically important areas, human populations, and protection priorities. Plan drafters should address the full range of risks present at the facility. By covering actions necessary to respond to a range of incident types, plan holders can be prepared for small, operational discharges and large catastrophic releases. One approach that is required by certain regulations, such as the Clean Air Act (CAA) and OPA is to develop planning scenarios for certain types and sizes of releases (i.e., worst case discharge). Facilities may address such planning scenarios and associated calculations in this section of Annex 3 or as part of a separate annex depending on the size and complexity of the facility.

(2) Protection

This section of Annex 3 should present a discussion of strategies for protecting the vulnerable receptors identified through the hazard analysis. Primary consideration should be given to minimizing those risks identified as a high priority. Activities to be considered in developing this section include: population protection; protective booming; dispersant use, in-situ burning, bioremediation; water intake protection; wildlife recovery/rehabilitation; natural remediation; vapor suppression; and monitoring, sampling, and modeling. ACPs and LEPC plans may contain much of this information.

(3) Coordination with natural resource trustees.

This section should address coordination with government natural resource trustees. In their role as managers of and experts in natural resources, trustees assist the federal OSC in developing or selecting removal actions to protect these resources. In this role, they serve as part of the response organization working for the federal OSC. A key area to address is interaction with facility response personnel in protection of natural resources.

Natural resource trustees are also responsible to act on behalf of the public to present a claim for and recover damages to natural resources injured by an oil spill or hazardous substance release. The process followed by the natural resource trustees, natural resource damage assessment (NRDA), generally involves some data collection during emergency response. NRDA regulations provide that the process may be carried out in cooperation with the responsible party. Thus, the facility may wish to plan for how that cooperation will occur, including designation of personnel to work with trustees in NRDA.

(4) Waste management.

This section should address procedures for the disposal of contaminated materials in accordance with federal, state, and local requirements.

e. Logistics

(1) Medical needs of responders
(2) Site security
(3) Communications (internal and external resources)
(4) Transportation (air, land, water)
(5) Personnel support (e.g., meals, housing, equipment)
(6) Equipment maintenance and support

This section of the Annex 3 should address how the facility will provide for the operational needs of response operations in each of the areas listed above. For example, the discussion of personnel support should address issues such as: volunteer training; management; overnight accommodations; meals; operational/administrative spaces; and emergency procedures. The NRT recognizes that certain logistical considerations may not be applicable to small facilities with limited hazards.

f. Finance/procurement/administration

(1) Resource list
(2) Personnel management
(3) Response equipment
(4) Support equipment
(5) Contracting
(6) Claims procedures
(7) Cost documentation

This section of Annex 3 should address the acquisition of resources (i.e., personnel and equipment) for the response and monitoring of incident-related costs. Lists of available equipment in the local and regional area and how to procure such equipment as necessary should be included. Information on previously established agreements (e.g., contracts) with organizations supplying personnel and equipment (e.g., oil spill removal organizations) also should be included. This section should also address methods to account for resources expended and to process claims resulting from the incident.

Annex 4. Incident Documentation

a. Post accident investigation
b. Incident history

This annex should describe the company's procedures for conducting a follow-up investigation of the cause of the accident, including coordination with federal, State, and local officials. This annex should also contain an accounting of incidents that have occurred at the facility, including information on cause, amount released, resources impacted, injuries, response actions, etc. This annex should also include information that may be required to prove that the facility met its legal notification requirements with respect to a given incident, such as a signed record of initial notifications and certified copies of written follow-up reports submitted after a response.

Annex 5. Training and Exercises/Drills

This annex should contain a description of the training and exercise program conducted at the facility as well as evidence (i.e., logs) that required training and exercises have been conducted on a regular basis. Facilities may follow appropriate training or exercise guidelines (e.g., National Preparedness for Response Exercise Program Guidelines) as allowed under the various regulatory requirements.

Annex 6. Response Critique and Plan Review and Modification Process

This annex should describe procedures for modifying the plan based on periodic plan review or lessons learned through an exercise or a response to an actual incident. Procedures to critique an actual or simulated response should be a part of this discussion. A list of plan amendments (i.e., history of updates) should also be contained in this annex. Plan modification should be viewed as a part of a facility's continuous improvement process.

Annex 7. Prevention

Some federal regulations that primarily address prevention of accidents include elements that relate to contingency planning (e.g., EPA's RMP and SPCC regulations and OSHA's Process Safety Standard). This annex is designed to allow facilities to include *prevention-based requirements (e.g., maintenance, testing, in-house inspections, release detection, site security, containment, fail safe engineering) that are required in contingency planning regulations or that have the potential to impact response activities covered in a contingency plan. The modular nature of the suggested plan outline provides planners with necessary flexibility to include prevention requirements in the ICP. This annex may not need to be submitted to regulatory agencies for review.*

Annex 8. Regulatory Compliance and Cross-Reference Matrices

This annex should include information necessary for plan reviewers to determine compliance with specific regulatory requirements. To the extent that plan drafters did not include regulatory required elements in the balance of the ICP, they should be addressed in this annex. This annex should also include signatory pages to convey management approval and certifications required by the regulations, such as certification of adequate response resources and/or statements of regulatory applicability as required by regulations under OPA authority. Finally, this annex should contain cross-references that indicate where specific regulatory requirements are addressed in the ICP for each regulation covered under the plan. As discussed previously, Attachment 3 contains a series of matrices designed to fulfill this need in those instances where plan drafters adhere to the outline contained in this guidance.

Attachment 1—ICP Outline

Section I—Plan Introduction Elements

1. Purpose and Scope of Plan Coverage
2. Table of Contents
3. Current Revision Date
4. General Facility Identification Information
   a. Facility name
   b. Owner/operator/agent (include physical and mailing address and phone number)
   c. Physical address of the facility (include county/parish/borough, latitude/longitude, and directions)
   d. Mailing address of the facility (correspondence contact)
   e. Other identifying information (e.g., ID numbers, SIC Code, oil storage start-up date)
   f. Key contact(s) for plan development and maintenance
   g. Phone number for key contact(s)
   h. Facility phone number
   i. Facility fax number

Section II—Core Plan Elements

1. Discovery
2. Initial Response
   a. Procedures for internal and external notifications (i.e., contact, organization name, and phone number of facility emergency response coordinator, facility response team personnel, federal, state, and local officials)
   b. Establishment of a response management system
   c. Procedures for preliminary assessment of the situation, including an identification of incident type, hazards involved, magnitude of the problem, and resources threatened
   d. Procedures for establishment of objectives and priorities for response to the specific incident, including:
      (1) Immediate goals/tactical planning (e.g., protection of workers and public as priorities)
      (2) Mitigating actions (e.g., discharge/release control, containment, and recovery, as appropriate)
      (3) Identification of resources required for response
   e. Procedures for implementation of tactical plan
   f. Procedure for mobilization of resources
3. Sustained Actions
4. Termination and Follow-Up Actions

Section III-Annexes

Annex 1. Facility and Locality Information

a. Facility maps
b. Facility drawings
c. Facility description/layout, including identification of facility hazards and vulnerable resources and populations on and off the facility which may be impacted by an incident

Annex 2. Notification

a. Internal notifications
b. Community notifications
c. Federal and state agency notifications

Annex 3. Response Management System

a. General
b. Command
   (1) List facility Incident Commander and Qualified Individual (if applicable) by name and/or title and provide information on their authorities and duties
   (2) Information (i.e., internal and external communications)
   (3) Safety
   (4) Liaison—Staff mobilization
c. Operations
   (1) Operational response objectives
   (2) Discharge or release control
   (3) Assessment/monitoring
   (4) Containment
   (5) Recovery
   (6) Decontamination
   (7) Non-responder medical needs including information on ambulances and hospitals
   (8) Salvage plans
d. Planning
   (1) Hazard assessment, including facility hazards identification, vulnerability analysis, prioritization of potential risks
   (2) Protection
   (3) Coordination with natural resource trustees
   (4) Waste management
e. Logistics
   (1) Medical needs of responders
   (2) Site security
   (3) Communications (internal and external resources)
   (4) Transportation (air, land, water)
   (5) Personnel support (e.g., meals, housing, equipment)
   (6) Equipment maintenance and support
f. Finance/procurement/administration
   (1) Resource list
   (2) Personnel management
   (3) Response equipment
   (4) Support equipment
   (5) Contracting
   (6) Claims procedures
   (7) Cost documentation

Annex 4. Incident Documentation

a. Post accident investigation
b. Incident history

Annex 5. Training and Exercises/Drills

Annex 6. Response Critique and Plan Review and Modification Process

Annex 7. Prevention

Annex 8. Regulatory Compliance and Cross-Reference Matrices

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Attachment 2: ICP Development Matrix

ICP Elements	RCRA (40 CFR part 264, Subpart D, 40 CFR part 265, Subpart D, and 40 CFR 279.52)	EPA's Oil Pollution Prevention Regulation (40 CFR part 112)	USCG-FRP (33 CFR part 154)	DOT/RSPA-FRP (49 CFR part 194)	OSHA Emergency Action Plans (29 CFR 1910.38(a)) and Process Safety (29 CFR 1910.119)	OSHA HAZWOPER (29 CFR 1910.120)	CAA RMP (40 CFR part 68)
Section I - Plan Introduction Elements							
1. Purpose and scope of plan coverage	264.51 265.51 279.52(b)(1) 264.52(a) 265.52(a) 279.52(b)(2)(i)				38(a)(1)[1] 119(n) 272(d)	(l)[2] (p)(8) (q)(1)	
2. Table of contents		112.20(h) Appendix F	1035(a)(4)[3] 1030(b)	Appendix A			
3. Current revision date		F1.2	1035(a)(6)				
4. General facility identification information		F1.2 F1.9		194.107(d)(1)(i) 194.113 194.113(b)(1)			
a. Facility name		F1.2	1035(a)(1)				
b. Owner/operator/ agent		112.20(h)(2) F1.2 F2.0	1035(a)(3)	194.113(a)(1) A-1			
c. Physical address and directions		112.20(h)(2) F1.2 F2.0	1035(a)(1) 1035(a)(2) 1035(e)	194.113(a)(2) 194.113(b)(3),(4) A-1			
d. Mailing address		112.20(h)(2)	1035(a)(1)	194.113(a)(1)			
e. Other identifying information							

[1] All citations refer to part 1910 unless otherwise noted.
[2] All citations refer to 29 CFR 1910.120 unless otherwise noted.
[3] All citations refer to part 154 unless otherwise noted.

ICP Elements	RCRA (40 CFR part 264, Subpart D, 40 CFR part 265, Subpart D, and 40 CFR 279.52)	EPA's Oil Pollution Prevention Regulation (40 CFR part 112)	USCG-FRP (33 CFR part 154)	DOT/RSPA-FRP (49 CFR part 194)	OSHA Emergency Action Plans (29 CFR 1910.38(a)) and Process Safety (29 CFR 1910.119)	OSHA HAZWOPER (29 CFR 1910.120)	CAA RMP (40 CFR part 68)
f. Key contact(s) for plan development and maintenance					38(a)(2)(vi)	(l)(2)(i),(ii) (p)(8)(ii)(A),(B) (q)(2)(i),(ii)	
g. Phone number for key contact(s)							
h. Facility phone number		F1.2 F2.1	1035(a)(1)				
i. Facility fax number			1035(a)(1)				
Section II - Core Plan Elements							
1. Discovery		112.20(h)(6) F1.6.1, F1.6.2	1035(b)(3)(i)	194.107(d)(1)(iii) A-3	119(n)	(l)(2)(iii) (p)(8)(ii)(C) (q)(2)(iii)	68.95(a)(1)(iii)
2. Initial response		112.20(h)(7)(i) F1.3.6 F1.7	1035(b)(2)(ii) 1035(b)(3)(i) 1035(b)(3)(ii)	A-2	38(a)(2)(i) 38(a)(2)(ii) 119(n)	(l)(2)(ix) (p)(8)(ii)(I) (q)(2)(ix)	68.95(a)(1)(iii)
a. Procedures for internal and external notifications	264.52(d) 265.52(d) 279.52(b)(2)(iv) 264.55 265.55 279.52(b)(5) 264.56(a)(1),(2) 265.56(a)(1),(2) 279.52(b)(6)(i)(A),(B) 264.56(d)(1),(2) 265.56(d)(1),(2) 279.52(b)(6)(iv)(A),(B)	112.20(h)(1)(iii) 112.20(h)(3)(iii) 112.20(h)(3)(iii) 112.20(h)(3)(iv) F1.2 F1.3.1	1026 1035(a)(3) 1035(b)(1)(i) 1035(e)(2)	194.107(d)(1)(ii) 194.113(b)(2) A-1, A-1(b)(2) A-2 A-5	38(a)(2)(v) 38(a)(2)(vi) 38(a)(3)(i) 38(a)(3)(ii) 165	(l)(2)(ix) (p)(8)(ii)(I) (q)(2)(ix)	68.95(a)(1)(i)
b. Establishment of a response management structure	264.37 265.37 279.52(a)(6) 264.52(c) 265.52(c) 279.52(b)(2)(iii)	112.20(h)(1)(v) 112.20(h)(3)(v) F1.3.4	1035(b)(3)(iii)	194.107(d)(1)(v) A-4 A-9		(l)(2)(i),(ii) (p)(8)(ii)(A),(B) (q)(2)(i),(ii) (q)(3)(i)	
c. Preliminary assessment	264.56(b),(c) 265.56(b),(c) 279.52(b)(6)(ii),(iii)	112.20(h)(3)(ix) 112.20(h)(4) F1.4, F1.4.2	1035(b)(3) 1035(b)(4)(i)	194.107(d)(1)(ii)	38(a)(2)(i) 38(a)(2)(ii)	(l)(2)(i) (l)(3)(vii) (p)(8)(ii)(A) (q)(2)(i) (q)(3)(ii),(iii)	

ICP Elements	RCRA (40 CFR part 264, Subpart D, 40 CFR part 265, Subpart D, and 40 CFR 279.52)	EPA's Oil Pollution Prevention Regulation (40 CFR part 112)	USCG-FRP (33 CFR part 154)	DOT/RSPA-FRP (49 CFR part 194)	OSHA Emergency Action Plans (29 CFR 1910.38(a)) and Process Safety (29 CFR 1910.119)	OSHA HAZWOPER (29 CFR 1910.120)	CAA RMP (40 CFR part 68)
d. Establishment of objectives and priorities for response, including: (1) Immediate goals/tactical planning (2) Mitigating actions (3) Response resources	264.52(e) 265.52(e) 279.52(b)(2)(v)	112.20(h)(1)(iv) 112.20(h)(1)(vii) 112.20(h)(3)(vi) 112.20(h)(3)(ix) 112.20(h)(7) F1.3.2 F1.7.1, F1.7.3	1035(b)(2) 1035(b)(3)(iv),(v)	194.107(d)(1)(iii) 194.107(d)(1)(v)	38(a)(4) 119(n)	(l)(2)(vi),(viii) (p)(8)(ii)(F),(H) (q)(2)(vi),(viii) (p)(8)(iv)(F) (q)(3)(ii),(iii),(iv),(vi),(vii)	
e. Implementation of tactical plan	264.52(e) 265.52(e) 279.52(b)(2)(v)	112.20(h)(3)(ix) 112.20(h)(7)	1035(b)(2)(iii) 1035(b)(3) 1035(b)(4)(iii)	194.107(d)(1)(v) A-3	38(a)(2)(ii)	(l)(3)(vii) (p)(8)(iv)(F) (q)(3)(iii)	
f. Mobilization of resources	264.52(e) 265.52(e) 279.52(b)(2)(v)	112.20(h)(7) F1.7.1	1035(b)(2)(iii) 1035(b)(3) 1035(b)(4)(iii)	194.115 194.107(d)(1)(v) A-1 A-3		(l)(2)(ix) (p)(8)(ii)(I) (q)(2)(ix)	
3. Sustained actions		112.20(h)(7)	1035(b)(3)	194.107(d)(1)(v) A-9	38(a)(2)(iii)	(l)(2)(x) (p)(8)(ii)(J) (q)(2)(x)	68.95(a)(1)(iii)
4. Termination and follow-up actions	264.56(i) 265.56(i)	112.20(h)(7)	1035(b)(3)			(l)(2)(ix) (p)(8)(ii)(I) (q)(2)(ix)	68.95(a)(1)(iii)
Section III - Annexes							
1. Facility and locality information		112.20(h)(2) F1.2 F2.0	1035(a) 1035(e)(1)	194.107(d)(1)(i) 194.113 194.113(b)(1)			
a. Facility maps		112.20(h)(1)(viii) F1.9		194.113(b)(2) A-9			
b. Facility drawings		112.20(h)(1)(viii) 112.20(h)(9) F1.9	1035(e)	A-9			
c. Facility description/layout		F1.9	1035(b)(4)	A-9		(l)(3)(i)(A) (p)(8)(iv)(A)(1)	

ICP Elements	RCRA (40 CFR part 264, Subpart D, 40 CFR part 265, Subpart D, and 40 CFR 279.52)	EPA's Oil Pollution Prevention Regulation (40 CFR part 112)	USCG-FRP (33 CFR part 154)	DOT/RSPA-FRP (49 CFR part 194)	OSHA Emergency Action Plans (29 CFR 1910.38(a)) and Process Safety (29 CFR 1910.119)	OSHA HAZWOPER (29 CFR 1910.120)	CAA RMP (40 CFR part 68)
2. Notification	264.52(d) 265.52(d) 279.52(b)(2)(iv) 264.56(a)(1),(2) 265.56(a)(1),(2) 279.52(b)(6)(i)(A),(B) 264.56(d)(1),(2) 265.56(d)(1),(2) 279.52(b)(6)(iv)(A),(B)	112.20(h)(1)(ii)		194.107(d)(1)(ii) A-2	119(n) 165(b)(1) 165(b)(4) 272(d)	(l)(3)(i)(B) (l)(2)(ix) (p)(8)(ii)(l) (p)(8)(iv)(A)(2) (q)(2)(ix)	68.95(a)(1)(i)
a. Internal		112.20(h)(3)(iii) F1.3.1	1035(b)(1)(i) 1035(b)(1)(ii) 1035(e)(2)	194.107(d)(1)(iv)	119(n) 165(b)(1)	(l)(2)(ix) (q)(2)(ix) (p)(8)(ii)(l)	
b. Community		112.20(h)(3)(iii) 112.20(h)(3)(ix) F1.3.1	1035(b)(1)(i) 1035(b)(1)(ii) 1035(e)(2)		119(n)	(l)(2)(i),(ii),(ix) (p)(8)(ii)(A),(B),(l) (q)(2)(i),(ii),(ix)	
c. Federal and state agency		112.20(h)(3)(iii) 112.20(h)(3)(ix) F1.3.1	1035(b)(1)(i) 1035(b)(1)(ii) 1035(e)(2)	194.107(d)(1)(vi)		(l)(2)(i),(ii),(ix) (p)(8)(ii)(A),(B),(l) (q)(2)(i),(ii),(ix)	
3. Response management structure		112.20(h)(1)(v) 112.20(h)(3)(v) F1.3.4	1035(b)(3)(iii)	194.107(d)(1)(v) A-9		(q)(3)(i)	
a. General	264.52(c) 265.52(c) 279.52(b)(2)(iii)		1035(b)(3)(iii)			(q)(3)(i)	
b. Command		112.20(h)(3)(iv)				(q)(3)(i)	
(1) Facility incident commander and qualified individual	264.55 265.55 279.52(b)(5)	112.20(h)(1)(i) F1.2.5	1026	A-4		(q)(3)(i)	
(2) Information	264.56(a)(1),(2) 265.56(a)(1),(2) 279.52(b)(6)(i)(A),(B)	112.20(h)(3)(iii)	1035(b)(3)(iii) 1035(e)(4)	194.107(d)(1)(v) A-2	38(a)(2)(vi) 38(a)(5)(iii)	(q)(3)(i)	
(3) Safety	264.52(f) 265.52(f) 279.52(b)(2)(vi)	112.20(h)(1)(vi) 112.20(h)(3)(vii) 112.20(h)(3)(viii) F1.3.5	1035(b)(3)(iii) 1035(e)(5)		38(a)(2)(i) 38(a)(2)(iii) 38(a)(2)(iv) 38(a)(4)	(l)(2)(iv),(vi) (p)(8)(ii)(D),(F) (q)(2)(iv),(vi) (q)(3)(vii),(viii)	
(4) Liaison			1035(b)(3)(iii)		38(a)(2)(vi)	(l)(2)(i),(ii) (p)(8)(ii)(A),(B) (q)(2)(i),(ii)	

ICP Elements	RCRA (40 CFR part 264, Subpart D, 40 CFR part 265, Subpart D, and 40 CFR 279.52)	EPA's Oil Pollution Prevention Regulation (40 CFR part 112)	USCG-FRP (33 CFR part 154)	DOT/RSPA-FRP (49 CFR part 194)	OSHA Emergency Action Plans (29 CFR 1910.38(a)) and Process Safety (29 CFR 1910.119)	OSHA HAZWOPER (29 CFR 1910.120)	CAA RMP (40 CFR part 68)
c. Operations			1035(b)(3)(iii)	194.107(d)(1)(v)	38(a)(2)(i)-(iv)	(q)(3)(iii),(v)	
(1) Response objectives			1035(b)(2)(iii) 1035(b)(4)(iii)		38(a)(1)	(q)(3)(iii)	
(2) Discharge or release control	264.56(e) 265.56(e) 279.52(b)(6)(v)	112.20(h)(3)(i) 112.20(h)(7)(iv) 112.20(h)(1)(vii)	1035(b)(2) 1035(b)(2)(iii) 1035(b)(4)(iii)	194.107(d)(1)(v) A-3			
(3) Assessment/monitoring	264.56(b),(c),(d),(f) 265.56(b),(c),(d),(f) 279.52(b)(6)(ii),(iii),(iv),(vi)	112.20(h)(3)(ix) F1.7.1	1035(b)(2)(iii) 1035(b)(3) 1035(b)(4)(iii)		38(a)(3)(ii) 38(a)(4)	(q)(3)(ii)	
(4) Containment	264.56(e) 265.56(e) 279.52(b)(6)(v)	112.20(h)(1)(vii) 112.20(h)(3)(i) 112.20(h)(7)(iv) F1.7.3	1035(b)(2)(iii) 1035(b)(3)(iv) 1035(b)(4)(iii)	194.107(d)(1)(v)			
(5) Recovery		112.20(h)(3)(i) 112.20(h)(7)(iii) F1.7.2	1035(b)(2)(iii) 1035(b)(3)(iv) 1035(b)(4)(iii)	194.107(d)(1)(v)			
(6) Decontamination	264.56(h)(2) 265.56(h)(2) 279.52(b)(6)(viii)(B)	112.20(h)(7)(iii) F1.7.2		194.107(d)(1)(v)		(k) (l)(2)(vii) (p)(8)(ii)(G) (q)(2)(vii) (q)(3)(ix)	
(7) Non-responder medical needs			1035(e)(5)		38(a)(2)(iv)	(l)(2)(viii) (p)(8)(ii)(H) (q)(2)(viii)	68.95(a)(1)(ii)
(8) Salvage plans				194.107(d)(1)(v)			
d. Planning				194.107(a) 194.115	38(a)(1) 38(a)(4)	(l)(2)(i),(ix) (p)(8)(ii)(A),(I) (q)(1) (q)(2)(i),(ix)	
(1) Hazard assessment		112.20(h)(3)(ix) 112.20(h)(4) 112.20(h)(5) 112.20(h)(7)(ii) F1.4.1-F1.4.3 F1.5.1, F1.5.2	1029 1035(b)(4)(ii)	194.105 194.113(b)(6)	38(a)(4)	(l)(1)(ii)(C),(D) (p)(8)(iv)(A)(1),(F) (q)(3)(iii)	68.20-36 68.50 68.67
(2) Protection		112.20(h)(7)(i) 112.20(h)(7)(iv) F1.7.1, F1.7.3	1035(b)(4)			(l)(2)(iv),(v),(vi) (p)(8)(ii)(D),(E),(K) (q)(2)(iv),(v),(vi) (q)(3)(iii)	

ICP Elements	RCRA (40 CFR part 264, Subpart D, 40 CFR part 265, Subpart D, and 40 CFR 279.52)	EPA's Oil Pollution Prevention Regulation (40 CFR part 112)	USCG-FRP (33 CFR part 154)	DOT/RSPA-FRP (49 CFR part 194)	OSHA Emergency Action Plans (29 CFR 1910.38(a)) and Process Safety (29 CFR 1910.119)	OSHA HAZWOPER (29 CFR 1910.120)	CAA RMP (40 CFR part 68)
(3) Coordination with natural resource trustees		112.20(g)	1030(f)	194.107(c)			
(4) Waste management	264.56(h)(1) 265.56(h)(1) 279.52(b)(6)(viii)(A) 264.56(g) 265.56(g) 279.52(b)(6)(vii)	112.20(h)(7)(iv) F1.7.2	1035(b)(5)	194.107(d)(1)(v)			
e. Logistics			1035(b)(3)(iii)			(l)(3)(iii) (p)(8)(iv)(B) (q)(2)(xii)	
(1) Medical needs			1035(e)(5)		38(a)(2)(iv)	(l)(2)(viii) (p)(8)(ii)(H) (q)(2)(viii)	68.95(a)(1)(ii)
(2) Site security		112.20(h)(10) F1.10				(l)(2)(v) (p)(8)(ii)(E) (q)(2)(v)	
(3) Communications		112.20(h)(1)(iv) 112.20(h)(3)(vi) F1.3.2	1035(e)(3)	194.107(d)(1)(v) A-2	38(a)(3) 119(e)(3)(iii) 165(b)	(q)(3)(i)	
(4) Transportation							
(5) Personnel support		112.20(h)(1)(v) 112.20(h)(1)(vi) 112.20(h)(3)(i-ii) 112.20(h)(3)(v) 112.20(h)(3)(vii) F1.3.5			38(a)(5)(i)	(l)(2)(ii) (p)(8)(ii)(B) (q)(2)(ii) (q)(3)(v),(vi)	
(6) Equipment maintenance and support		112.20(h)(1)(iv) 112.20(h)(3)(vi) 112.20(h)(8) F1.3.3 F1.8.1	1035(b)(3)(iv) 1035(e)(3) 1057	194.107(d)(1)(viii)	119(j)(4) 119(j)(5) 165(d)	(l)(2)(xi) (p)(8)(ii)(K) (q)(2)(xi)	68.95(a)(2)
f. Finance/procurement/administration		112.20(h)(3)(ix)	1028 1035(b)(3)(iii)				
(1) Resource list	264.52(e) 265.52(e) 279.52(b)(2)(v)	112.20(h)(1)(iv) 112.20(h)(3)(vi) F1.3.2 F1.7.1	1035(b)(3)(iv) 1035(e)(3)				
(2) Personnel		112.20(h)(1)(v) 112.20(h)(3)(v) F1.3.4	1035(b)(3)(iv)				

ICP Elements	RCRA (40 CFR part 264, Subpart D, 40 CFR part 265, Subpart D, and 40 CFR 279.52)	EPA's Oil Pollution Prevention Regulation (40 CFR part 112)	USCG-FRP (33 CFR part 154)	DOT/RSPA-FRP (49 CFR part 194)	OSHA Emergency Action Plans (29 CFR 1910.38(a)) and Process Safety (29 CFR 1910.119)	OSHA HAZWOPER (29 CFR 1910.120)	CAA RMP (40 CFR part 68)
(3) Response equipment	264.52(e) 265.52(e) 279.52(b)(2)(v)	112.20(h)(1)(iv) 112.20(h)(3)(vi) F1.3.2 F1.7.1	1035(b)(2)(ii) 1035(b)(4)(iii) 1035(e)(3) Appendix C			(l)(2)(xi) (p)(8)(ii)(K) (q)(2)(xi)	
(4) Support equipment	264.52(e) 265.52(e) 279.52(b)(2)(v)	F1.3.2 F1.7.1	1035(e)(3)				
(5) Contracting		112.20(h)(3)(ii)	1028(a)(1) 1035(e)(3)	194.115			
(6) Claims procedures							
(7) Cost documentation							
4. Incident documentation					38(a)(2)(iii) 119(e)(3)(ii)	(l)(2)(x) (p)(8)(ii)(J) (q)(2)(x)	
a. Post-accident investigation	264.56(j) 265.56(j) 279.52(b)(6)(ix)				119(m)	(l)(2)(x) (p)(8)(ii)(J) (q)(2)(x)	68.60 68.81
b. Incident history		112.20(h)(4) F1.4.4			119(e)(3)(ii)		68.42
5. Training and exercises/drills		112.20(h)(8) 112.21 F1.8.2, F1.8.3	1035(c) 1050 1055 Appendix D	194.107(d)(1)(vii) 194.107(d)(1)(ix) 194.117 A-6 A-7	38(a)(5) 119(g)(1)(i)	(l)(3)(iv) (p)(8)(iii) (q)(6)	68.95(a)(3)
6. Response critique and plan review and modification process	264.54 265.54 279.52(b)(4)	112.20(g)	1035(a)(6) 1035(d) 1065	194.107(d)(1)(x) 194.111 194.119 194.121 A-8	119(l) 119(o)(1)	(l)(2)(x) (p)(8)(ii)(J) (q)(2)(x)	68.95(a)(4)
7. Prevention						(l)(2)(iii) (p)(8)(ii)(C) (q)(2)(iii)	

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ATTACHMENT 3: REGULATORY CROSS-COMPARISON MATRICES

	ICP Citation(s)
RCRA (40 CFR Part 264 Subpart D[1], 40 CFR Part 265 Subpart D[2], 40 CFR Part 279.52(b)[3])	
264.52 Content of contingency plan:	
(a) Emergency response actions.[4]	
(b) Amendments to SPCC plan.	
(c) Coordination with State and local response parties[5]	II.2.b;III.3.a.
(d) Emergency coordinator(s)	II.2.a; III.2.
(e) Detailed description of emergency equipment on-site	II.2.d.(3); II.2.e; II.2.f; III.3.f.(1); III.3.f.(3); III.3.f.(4).
(f) Evacuation plan if applicable	III.3.b.(3).
264.53 Copies of contingency plan.	III.6.
264.54 Amendment of contingency plan	II.2.a; III.3.b.(1).
264.55 Emergency coordinator	
264.56 Emergency procedures:	
(a) Notification	II.2.a; III.2; III.3.b.(2).
(b) Emergency identification/characterization	II.2.c; III.3.c.(3).
(c) Health/environmental assessment	II.2.c; III.3.c.(3).
(d) Reporting	II.2.a; III.2; III.3.c.(3).
(e) Containment	III.3.c.(2); III.3.c.(4).
(f) Monitoring	III.3.b.(3); III.3.c.(3).
(g) Treatment, storage, or disposal of wastes	III.3.d.(4).
(h) Cleanup procedures:	
(1) Disposal	III.3.d.(4).
(2) Decontamination	III.3.c.(6).
(i) Follow-up procedures	II.4.
(j) Follow-up report	III.4.a.
265.52 Content of contingency plan:	
(a) Emergency response actions.[6]	
(b) Amendments to SPCC plan.	
(c) Coordination with State and local response parties[7]	II.2.b; III.3.a.
(d) Emergency coordinator(s)	II.2.a; III.2.
(e) Detailed description of emergency equipment on-site	II.2.d.(3); II.2.e; II.2.f; III.3.f.(1); III.3.f.(3); III.3.f.(4).
(f) Evacuation plan if applicable	III.3.b.(3).
265.53 Copies of contingency plan.	III.6.
265.54 Amendment of contingency plan	II.2.a; III.3.b.(1).
265.55 Emergency coordinator	
265.56 Emergency procedures:	
(a) Notification	II.2.a; III.2; III.3.b.(2).
(b) Emergency identification/characterization	II.2.c; III.3.c.(3).
(c) Health/environmental assessment	II.2.c; III.3.c.(3).
(d) Reporting	II.2.a; III.2; III.3.c.(3).
(e) Containment	III.3.c.(2); III.3.c.(4).
(f) Monitoring	III.3.b.(3); III.3.c.(3).
(g) Treatment, storage, or disposal of wastes	III.3.d.(4).
(h) Cleanup procedures:	
(1) Disposal	III.3.d.(4).
(2) Decontamination	III.3.c.(6).
(i) Follow-up procedures	II.4.
(j) Follow-up report	III.4.a.
279.52(b)(2) Content of contingency plan:	
(i) Emergency response actions[8]	
(ii) Amendments to SPCC plan.	
(iii) Coordination with State and local response parties[9]	II.2.b; III.3.a.
(iv) Emergency coordinator(s)	II.2.a; III.2.
(v) Detailed description of emergency equipment on-site	II.2.d.(3); II.2.e; II.2.f; III.3.f.(1); III.3.f.(3); III.3.f(4).
(vi) Evacuation plan if applicable	III.3.b.(3).
(3) Copies of contingency plan.	III.6.
(4) Amendment of contingency plan	II.2.a; III.3.b.(1).
(5) Emergency coordinator	
(6) Emergency procedures:	
(i) Notification	II.2.a; III.2; III.3.b.(2).
(ii) Emergency identification/characterization	II.2.c; III.3.c.(3).
(iii) Health/environmental assessment	II.2.c; III.3.c.(3).
(iv) Reporting	II.2.a; III.2; III.3.c.(3).
(v) Containment	III.3.c.(2); III.3.c.(4).
(vi) Monitoring	III.3.b.(3); III.3.c.(3).
(vii) Treatment, storage, or disposal of wastes	III.3.d.(4).
(viii) Cleanup procedures:	
(A) Disposal	III.3.d.(4).
(B) Decontamination	III.3.c.(6).

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	ICP Citation(s)
(ix) Follow-up report	III.4.a.
EPA's Oil Pollution Prevention Regulation (40 CFR 112)	
112.7(d)(1) Strong spill contingency plan and written commitment of manpower, equipment, and materials.[10,11]	III.3.d.(3); III.6.
112.20(g) General response planning requirements	I.2; III.8.
112.20(h) Response plan elements	III.3.b.(1).
(1) Emergency response action plan (Appendix F1.1):	
(i) Identity and telephone number of qualified individual (F1.2.5)	III.2.
(ii) Identity of individuals/organizations to contact if there is a discharge (F1.3.1)	II.2.a.
(iii) Description of information to pass to response personnel in event of a reportable spill (F1.3).	II.2.d.(3); III.3.e.(3); III.3.e.(6); III.3.f.(1); III.3.f.(3).
(iv) Description of facility's response equipment and its location (F1.3.2)	II.2.b; III.3; III.3.e.(5); III.3.f.(2);
(v) Description of response personnel capabilities (F1.3.4)	III.3.b.(3); III.3.e.(5)
(vi) Plans for evacuation of the facility and a reference to community evacuation plans (F1.3.5).	II.2.d.(2); III.3.c.(2); III.3.c.(4).
(vii) Description of immediate measures to secure the source (F1.7.1)	III.1.a–b.
(viii) Diagram of the facility (F1.9)	I.4.b–d; III.1.
(2) Facility information (F1.2, F2.0)	III.3.c.(2); III.3.c.(4)–(5); III.3.e.(5).
(3) Information about emergency responses:	
(i) Identity of private personnel and equipment to remove to the maximum extent practicable a WCD or other discharges (F1.3.2, F1.3.4).	III.3.e.(5); III.3.f.(5)
(ii) Evidence of contracts or other approved means for ensuring personnel and equipment availability.	II.2.a; III.2.b–d; III.3.b.(2).
(iii) Identity and telephone of individuals/organizations to be contacted in event of a discharge (F1.3.1).	II.2.a.
(iv) Description of information to pass to response personnel in event of a reportable spill (F1.3.1).	II.2.b; III.3; III.3.e.(5); III.3.f.(2).
(v) Description of response personnel capabilities (F1.3.4)	II.2.d.(3); III.3.e.(3); III.3.e.(6); III.3.f.(1); III.3.f.(3).
(vi) Description of a facility's response equipment, location of the equipment, and equipment testing (F1.3.2, F1.3.3).	III.3.b.(3); III.3.e.(5).
(vii) Plans for evacuation of the facility and a reference to community evacuation plans as appropriate (F1.3.5).	III.3.b.(3).
(viii) Diagram of evacuation routes (F1.9).	II.2.c; II.2.d.(1); I.2.e; III.2.b–c; III.3.c.(3); III.3.d.(1); III.3.f.
(ix) Duties of the qualified individual (F1.3.6)	II.2.c; III.3.d.(1); III.4.b.
(4) Hazard evaluation (F1.4)	II.3.d.(1).
(5) Response planning levels (F1.5, F1.5.1, F1.5.2)	II.1.
(6) Discharge detection systems (F1.6, F1.6.1, F1.6.2)	II.2.d–f; II.3; II.4.
(7) Plan implementation (F1.7)	II.2; III.3.d.(2).
(i) Response actions to be carried out (F1.7.1.1)	III.3.d.(1).
(ii) Description of response equipment to be used for each scenario (F1.7.1.1)	III.3.c.(5)–(6)
(iii) Plans to dispose of contaminated cleanup materials (F1.7.2)	III.3.c.(2); III.3.c.(4); III.3.d.(2); III.3.d.(4).
(iv) Measures to provide adequate containment and drainage of spilled oil (F1.7.3)	III.3.e.(6); III.5.
(8) Self-inspection, drills/exercises, and response training (F1.8.1–F1.8.3.2)	III.1.b.
(9) Diagrams (F1.9)	III.3.e.(2).
(10) Security systems (F1.10)	
(11) Response plan cover sheet (F2.0).	III.5.
112.21 Facility response training and drills/exercises (F1.8.2, F1.8.3)	I.2.
Appendix F Facility-Specific Response Plan:[12]	
1.0 Model Facility-Specific Response Plan.	
1.1 Emergency Response Action Plan.	I.3; I.4.a; I.4.b–c; I.4.h; II.2.a; III.1.
1.2 Facility Information	II.2.a; III.2.a–c.
1.3 Emergency Response Information:	II.2.d.(3); III.3.e.(3); III.3.f.(1); III.3.f.(3)–(4).
1.3.1 Notification	III.3.e.(6).
1.3.2 Response Equipment List	II.2.b; III.3; III.3.f.(2).
1.3.3 Response Equipment Testing/Deployment	III.3.b.(3); III.3.e.(5).
1.3.4 Personnel	II.2.
1.3.5 Evacuation Plans	II.2.c.
1.3.6 Qualified Individual's Duties	III.1.c; III.3.d.(1).
1.4 Hazard Evaluation	II.2.c; III.3.d.(1).
1.4.1 Hazard Identification	III.3.d.(1).
1.4.2 Vulnerability Analysis	III.4.b.
1.4.3 Analysis of the Potential for an Oil Spill	
1.4.4 Facility Reportable Oil Spill History	III.3.d.(1).
1.5 Discharge Scenarios:	
1.5.1 Small and Medium Discharges	III.3.d.(1).
1.5.2 Worst Case Discharge	II.1.
1.6 Discharge Detection Systems:	
1.6.1 Discharge Detection By Personnel	

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	ICP Citation(s)
1.6.2 Automated Discharge Detection	II.1.
1.7 Plan Implementation	II.2.
1.7.1 Response Resources for Small, Medium, and Worst Case Spills	II.2.d.(3); II.2.f; III.3.c.(3); III.3.d.(2); III.3.f.(1); III.3.f.(3)–(4).
1.7.2 Disposal Plans	III.3.c.(5)–(6); III.3.d.(4).
1.7.3 Containment and Drainage Planning	II.2.d; III.3.c.(4); III.3.d.(2).
1.8 Self-Inspection, Drills/Exercises, and Response Training:	
1.8.1 Facility Self-Inspection	III.3.e.(6).
1.8.2 Facility Drills/Exercises	III.5.
1.8.3 Response Training	III.5.
1.9 Diagrams	I.4; III.1.a–c.
1.10 Security	III.3.e.(2).
2.0 Response Plan Cover Sheet	I.4.b; I.4.c; I.4.h; III.1.
USCG FRP (33 CFR part 154)	
154.1026 Qualified individual and alternate qualified individual	II.2.a; III.3.b.(1).
154.1028 Availability of response resources by contract or other approved means	III.3.f or III.8; III.3.f.(5).
154.1029 Worst case discharge	III.3.d.(1).
154.1030 General response plan contents:.	
(a) The plan must be written in English.	
(b) Organization of the plan [13]	I.2.
(c) Required contents.	
(d) Sections submitted to COTP.	
(e) Cross-references	III.8.
(f) Consistency with NCP and ACPs	III.3.d.(3).
154.1035 Significant and substantial harm facilities:	III.1.
(a) Introduction and plan content	I.4.a; I.4.c–d; I.4.h–i
(1) Facility's name, physical and mailing address, county, telephone, and fax	I.4.c.
(2) Description of a facility's location in a manner that could aid in locating the facility	I.4.b; II.2.a
(3) Name, address, and procedures for contacting the owner/operator on 24-hour basis.	I.2.
(4) Table of contents	III.8.
(5) Cross index, if appropriate	I.3; III.6.
(6) Record of change(s) to record information on plan updates	
(b) Emergency Response Action Plan:	
(1) Notification procedures:	
(i) Prioritized list identifying person(s), including name, telephone number, and role in plan, to be notified in event of threat or actual discharge.	II.2.a; III.2.a–c.
(ii) Information to be provided in initial and follow-up notifications to federal, state, and local agencies.	III.3.b; III.2.a–c.
(2) Facility's spill mitigation procedures [14]	II.2.d.(2); III.3.c.(2).
(i) Volume(s) of persistent and non-persistent oil groups.	II.2.
(ii) Prioritized procedures/task delegation to mitigate or prevent a potential or actual discharge or emergencies involving certain equipment/scenarios.	II.2.e–f; III.3.f.(3); III.3.c.(1)–(5).
(iii) List of equipment and responsibilities of facility personnel to mitigate an average most probable discharge.	II.2.c; II.2.e–f; II.3; II.4; III.3.c.(3).
(3) Facility response activities [15]	II.1; II.2.
(i) Description of facility personnel's responsibilities to initiate/supervise response until arrival of qualified individual.	II.2.
(ii) Qualified individual's responsibilities/authority	II.2.b; II.3; III.3.a; III.3.b.(2)–(4); III.3.c; III.3.d.(1); III.3.e–f.
(iii) Facility or corporate organizational structure used to manage response actions	II.2.d.(3); III.3.c.(4)–(5); III.3.e.(6); III.3.f.(1)–(2); III.3.f.(5).
(iv) Oil spill response organization(s)/spill management team available by contract or other approved means.	II.2.d.(3).
(v) For mobile facilities that operate in more than one COTP, the oil spill response organization(s)/spill management team in the applicable geographic-specific appendix.	III.1.c; III.3.d.(1)–(2).
(4) Fish and wildlife sensitive environments	II.2.c.
(i) Areas of economic importance and environmental sensitivity as identified in the ACP that are potentially impacted by a WCD.	
(ii) List areas and provide maps/charts and describe response actions.	II.2.e–f; III.3.f.(3); III.3.c.(1)–(5).
(iii) Equipment and personnel necessary to protect identified areas	III.3.d.(4).
(5) Disposal plan	III.5.
(c) Training and exercises	III.6.
(d) Plan review and update procedures	I.4.c; III.1.b.
(e) Appendices	III.1.
(1) Facility specific information	II.2.a; III.2.a–c; III.3.b.(1).
(2) List of contacts	III.3.e.(3); III.3.e.(6); III.3.f.(1); III.3.f.(3)–(5).
(3) Equipment lists and records	III.3.b.(2).
(4) Communications plan	III.3.b.(3); III.3.c.(7); III.3.e. (1).
(5) Site-specific safety and health plan	

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	ICP Citation(s)
(6) List of acronyms and definitions.	
(7) A geographic-specific appendix.	
154.1040 Specific requirements for substantial harm facilities.	
154.1041 Specific response information to be maintained on mobile MTR facilities.	
154.1045 Groups I–IV petroleum oils.	
154.1047 Group V petroleum oils.	
154.1050 Training	III.5.
154.1055 Drills	III.5.
154.1057 Inspection and maintenance of response resources	III.3.e.(6).
154.1060 Submission and approval procedures.	
154.1065 Plan revision and amendment procedures	III.6.
154.1070 Deficiencies.	
154.1075 Appeal Process.	
Appendix C—Guidelines for determining and evaluating required response resources for facility response plans.	III.3.f.(3).
Appendix D—Training elements for oil spill response plans	III.5.
DOT/RSPA FRP (49 CFR Part 194)	
194.101 Operators required to submit plans.	
194.103 Significant and substantial harm: operator's statement	III.8.
194.105 Worst case discharge	III.3.d.(1).
194.107 General response plan requirements:	
(a) Resource planning requirements	III.3.d.
(b) Language requirements.	
(c) Consistency with NCP and ACP(s)	III.3.d.(3); III.8.
(d) Each response plan must include:	
(1) Core Plan Contents:	
(i) An information summary as required in 194.113	I.4; III.1.
194.113(a) Core plan information summary:	
(1) Name and address of operator	I.4.b; I.4.d.
(2) Description of each response zone	I.4.c.
(b) Response zone appendix information summary:	
(1) Core plan information summary	I.4; III.1.
(2) Name^O^S^A^A^O Submission and approval procedures	III.6.
194.121 Response plan review and update procedures	III.6.
^Apendix^S^A^Aecommended guidelines for the preparation of response plans	I.2.
Section 1—Information summary	I.4.b–c; II.2.a; II.2.f; III.8.
Section 2—Notification procedures	II.2.a; III.2; III.3.b.(2); III.3.e.(3).
Section 3—Spill detection and on-scene spill mitigation procedures	II.1; II.2.e–f; III.3.c.(2).
Section 4—Response activities	II.2.b; III.3.b.(1).
Section 5—List of contacts	II.2.a.
Section 6—Training procedures	III.5.
Section 7—Drill procedures	III.5.
Section 8—Response plan review and update procedures	III.6.
Section 9—Response zone appendices	II.2.b; II.3; III.1.a–c; III.3.
OSHA Emergency Action Plans (29 CFR 1910.38(a)) and Process Safety (29 CFR 1910.119)	
1910.38(a) Emergency action plan:	
(1) Scope and applicability	III.3.c.(1); III.3.d.
(2) Elements:	
(i) Emergency escape procedures and emergency escape route assignments	II.2; II.2.c; III.3.b.(3); III.3.c.
(ii) Procedures to be followed by employees who remain to operate critical plant operations before they evacuate.	II.2; II.2.c; II.2.e; III.3.c.
(iii) Procedures to account for all employees after emergency evacuation has been completed.	II.2.a; III.3.b.(2); III.3.b.(3); III.3.c; III.4.
(iv) Rescue and medical duties for those employees who are to perform them	III.3.b.(3); III.3.c; III.3.c.(7); III.3.e.(1).
(v) The preferred means of reporting fires and other emergencies	II.2.a; III.3.b.
(vi) Names or regular job titles of persons or departments who can be contacted for further information or explanation of duties under the plan.	I.4.f; II.2.a; III.3.b.(2); III.3.b.(4).
(3) Alarm system [16]	II.2.a; III.3.c.(3); III.3.e.(3).
(4) Evacuation	II.2.d; III.3.b.(3); III.3.c.(3); III.3.d; III.3.d.(1).
(5) Training	III.3.e.(5); III.5.
1910.119 Process safety management of highly hazardous chemicals:	
(e)(3)(ii) Investigation of previous incidents	III.4; III.4.b.
(e)(3)(iii) Process hazard analysis requirements	III.3.e.(3).
(g)(1)(i) Employee training in process/operating procedures	III.5.
(j)(4) Inspection/testing of process equipment	III.3.e.(6).
(j)(5) Equipment repair	III.3.e.(6).
(l) Management of change(s)	III.5.
(m) Incident investigation	III.4.a.

ATTACHMENT 3: REGULATORY CROSS-COMPARISON MATRICES—Continued

	ICP Citation(s)
(n) Emergency planning and response	I.1; II.1; II.2; II.2.d; III.2; III.2.a; III.2.b. III.6.
(o)(1) Certification of compliance	III.3.e.(3).
1910.165 Employee alarm systems:	
(b) General requirements	III.2; III.2.a.
(b)(1) Purpose of alarm system	III.2.
(b)(4) Preferred means of reporting emergencies	III.3.e.(6).
(d) Maintenance and testing	
1910.272 Grain handling facilities:	
(d) Development/implementation of emergency action plan	I.1; III.2.
OSHA HAZWOPER (29 CFR 1910.120)	
1910.120(k) Decontamination	III.3.c.(6).
1910.120(l) Emergency response program	I.1.
(1) Emergency response plan:	
(i) An emergency response plan shall be developed and implemented by all employers within the scope of this section to handle anticipated emergencies prior to the commencement of hazardous waste operations.	
(ii) Employers who will evacuate their employees from the workplace when an emergency occurs, and who do not permit any of their employees to assist in handling the emergency, are exempt from the requirements of this paragraph if they provide an emergency action plan complying with section 1910.38(a) of this part.	
(2) Elements of an emergency response plan:	
(i) Pre-emergency planning and coordination with outside parties	I.4.f; II.2.b; II.2.c; III.2.b; III.2.c; III.3.b.(4); III.3.d.
(ii) Personnel roles, lines of authority, and communication	I.4.f; II.2.b; III.2.a; III.2.c; III.3.b.(4); III.3.e.(4).
(iii) Emergency recognition and prevention	II.1; III.7.
(iv) Safe distances and places of refuge	III.3.b.(3); III.3.d.(2).
(v) Site security and control	III.3.d.(2); III.3.e.(2).
(vi) Evacuation routes and procedures	II.2.d; III.3.b.(3)
(vii) Decontamination procedures	III.3.c.(6).
(viii) Emergency medical treatment and response procedures	II.2.d; III.3.c.(7); III.3.e.(1).
(ix) Emergency alerting and response procedures	II.2; II.2.a; II.2.f; II.4; III.2; III.2.a; III.2.b; III.2.c; III.3.d.
(x) Critique of response and follow-up	II.3; III.4; III.4.a; III.6.
(xi) PPE and emergency equipment	III.3.e.(6); III.3.f.(3); III.3.d.(2); III.3.e.(6); III.3.f.(3).
(3) Procedures for handling emergency incidents:	
(i) Additional elements of emergency response plans:	
(A) Site topography, layout, and prevailing weather conditions	III.1.c.
(B) Procedures for reporting incidents to local, state, and federal government agencies.	II.2.a; III.2.
(ii) The emergency response plan shall be a separate section of the Site Safety and Health Plan.	
(iii) The emergency response plan shall be compatible with the disaster, fire, and/or emergency response plans of local, state, and federal agencies.	III.3.e.
(iv) The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.	III.5.
(v) The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.	
(vi) An employee alarm system shall be installed in accordance with 29 CFR 1910.165 to notify employees of an emergency situation; to stop work activities if necessary; to lower background noise in order to speed communications; and to begin emergency procedures.	
(vii) Based upon the information available at time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan.	II.2.c; II.2.d.
1910.120(p)(8) Emergency response program:	I.1
(i) Emergency response plan.	
(ii) Elements of an emergency response plan:	
(A) Pre-emergency planning and coordination with outside parties	I.4.f; II.2.b; II.2.b; III.2.b; III.2.c; III.3.b.(4); III.3.d.
(B) Personnel roles, lines of authority, and communication	I.4.f; II.2.b; III.2.c; III.2.c; III.3.b.(4); III.3.e.(4).
(C) Emergency recognition and prevention	II.1; III.7
(D) Safe distances and places of refuge	III.3.b.(3); III.3.d.(2)
(E) Site security and control	III.3.d.(2); III.3.e.(2)
(F) Evacuation routes and procedures	II.2.d; III.3.b.(3).
(G) Decontamination procedures	III.3.c.(6).
(H) Emergency medical treatment and response procedures	II.2.d; III.3.c.(7); III.3.e.(1).
(I) Emergency alerting and response procedures	II.2; II.2.a; II.2.f; II.4; III.2; III.2.a; III.2.b; III.2.c; III.3.d.

ATTACHMENT 3: REGULATORY CROSS-COMPARISON MATRICES—Continued

	ICP Citation(s)
(J) Critique of response and follow-up	II.3; III.4; III.4.a; III.6.
(K) PPE and emergency equipment	III.3.e.(6); III.3.f.(3); III.3.d.(2); III.3.e.(6); III.3.f.(3).
(iii) Training	III.5.
(iv) Procedures for handling emergency incidents:	
(A) Additional elements of emergency response plans:	
(1) Site topography, layout, and prevailing weather conditions	III.1.c; III.3.d.(1).
(2) Procedures for reporting incidents to local, state, and federal government agencies.	II.2.a; III.2.
(B) The emergency response plan shall be compatible and integrated with the disaster, fire and/or emergency response plans of local, state, and federal agencies.	III.3.e.
(C) The emergency response plan shall be rehearsed regularly as part of the overall training program for site operations.	
(D) The site emergency response plan shall be reviewed periodically and, as necessary, be amended to keep it current with new or changing site conditions or information.	
(E) An employee alarm system shall be installed in accordance with 29 CFR 1910.165.	
(F) Based upon the information available at the time of the emergency, the employer shall evaluate the incident and the site response capabilities and proceed with the appropriate steps to implement the site emergency response plan	II.2.d; II.2.e; III.3.d.(1).
1910.120(q) Emergency response to hazardous substance releases:	
(1) Emergency response plan	III.3.1.
(2) Elements of an emergency response plan:	
(i) Pre-emergency planning and coordination with outside parties	I.4.f; II.2.b; II.2.c; III.2.b; III.2.c; III.3.b.(4); III.3.d.
(ii) Personnel roles, lines of authority, training, and communication	I.4.f; II.2.b; III.2.b; III.2.c; III.3.b.(4); III.3.e.(4).
(iii) Emergency recognition and prevention	II.1; III.7.
(iv) Safe distances and places of refuge	III.3.b.(3); III.3.d.(2).
(v) Site security and control	III.3.d.(2); III.3.e.(2).
(vi) Evacuation routes and procedures	II.2.d; III.3.b.(3).
(vii) Decontamination procedures	III.3.c.(6).
(viii) Emergency medical treatment and response procedures	II.2.d; III.3.c.(7); III.3.e.(1).
(ix) Emergency alerting and response procedures	II.2; II.2.a; II.2.f; II.4; III.2; III.2.a; III.2.b; III.2.c; III.3.d.
(x) Critique of response and follow-up	II.3; III.4; III.4.a; III.6.
(xi) PPE and emergency equipment	III.3.e.(6); III.3.f.(3); III.3.d.(2); III.3.e.(6); III.3.f.(3).
(xii) Emergency response plan coordination and integration	III.3.e; III.8.
(3) Procedures for handling emergency response:	
(i) The senior emergency response official responding to an emergency shall become the individual in charge of a site-specific Incident Command System (ICS).	II.2.b; III.3; III.3.a; III.3.b; III.3.b.(1); III.3.b.(2); III.3.e.(3).
(ii) The individual in charge of the ICS shall identify, to the extent possible, all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies.	II.2.c; II.2.d; III.3.c.(3).
(iii) Implementation of appropriate emergency operations and use of PPE	II.2.c; II.2.d; II.2.e; III.3.c; III.3.c.(1); III.3.d.(1); III.3.d.(2).
(iv) Employees engaged in emergency response and exposed to hazardous substances presenting an inhalation hazard or potential inhalation hazard shall wear positive pressure self-contained breathing apparatus while engaged in emergency response.	II.2.d.
(v) The individual in charge of the ICS shall limit the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations.	III.3.c; III.3.e.(5).
(vi) Backup personnel shall stand by with equipment ready to provide assistance or rescue.	II.2.d; III.3.e.(5).
(vii) The individual in charge of the ICS shall designate a safety official, who is knowledgeable in the operations being implemented at the emergency response site.	II.2.d; III.3.b.(3).
(viii) When activities are judged by the safety official to be an IDLH condition and/or to involve an imminent danger condition, the safety official shall have authority to alter, suspend, or terminate those activities.	III.3.b.(3).
(ix) After emergency operations have terminated, the individual in charge of the ICS shall implement appropriate decontamination procedures.	III.3.c.(6).

ATTACHMENT 3: REGULATORY CROSS-COMPARISON MATRICES—Continued

	ICP Citation(s)
(x) When deemed necessary for meeting the tasks at hand, approved self-contained compressed air breathing apparatus may be used with approved cylinders from other approved self-contained compressed air breathing apparatus provided that such cylinders are of the same capacity and pressure rating.	
(4) Skilled support personnel.	
(5) Specialist employees.	
(6) Training	III.5.
(7) Trainers.	
(8) Refresher training.	
(9) Medical surveillance and consultation.	
(10) Chemical protective clothing.	
(11) Post-emergency response operations.	
EPA's Risk Management Program (40 CFR Part 68)	
68.20–36 Offsite consequence analysis	III.3.d.(1).
68.42 Five-year accident history	III.4.b.
68.50 Hazard review	III.3.d.(1).
68.60 Incident investigation	III.4.a
68.67 Process hazards analysis	III.3.d.(1)
68.81 Incident investigation	III.4.a
68.95(a) Elements of an emergency response program:	
(1) Elements of an emergency response plan:	
(i) Procedures for informing the public and emergency response agencies about accidental releases.	II.2.a; III.2.
(ii) Documentation of proper first-aid and emergency medical treatment necessary to treat accidental human exposures.	III.3.c.(7); III.3.e.(1).
(iii) Procedures and measures for emergency response after an accidental release of a regulated substance.	II.1; II.2; II.3; II.4; III.3.a–c.
(2) Procedures for the use of emergency response equipment and for its inspection, testing, and maintenance.	III.3.e.(6).
(3) Training for all employees in relevant procedures	III.5.
(4) Procedures to review and update the emergency response plan	III.6.
68.95(b) Compliance with other federal contingency plan regulations.	
68.95(c) Coordination with the community emergency response plan.	

Notes to Attachment 3

[1] Facilities should be aware that most states have been authorized by EPA to implement RCRA contingency planning requirements in place of the federal requirements listed. Thus, in many cases state requirements may not track this matrix. Facilities must coordinate with their respective states to ensure an ICP complies with state RCRA requirements.

[2] Facilities should be aware that most states have been authorized by EPA to implement RCRA contingency planning requirements in place of the federal requirements listed. Thus, in many cases state requirements may not track this matrix. Facilities must coordinate with their respective states to ensure an ICP complies with state RCRA requirements.

[3] Facilities should be aware that most states have been authorized by EPA to implement RCRA contingency planning requirements in place of the federal requirements listed. Thus, in many cases state requirements may not track this matrix. Facilities must coordinate with their respective states to ensure an ICP complies with state RCRA requirements.

[4] Section 264.56 is incorporated by reference at § 264.52(a).

[5] Incorporates by reference § 264.37.

[6] Section 265.56 is incorporated by reference at § 265.52(a).

[7] Incorporates by reference § 265.37.

[8] Section 279.52(b)(6) is incorporated by reference at § 279.52(b)(2)(i).

[9] Incorporates by reference § 279.52(a)(6).

[10] Non-response planning parts of this regulation (e.g., prevention provisions) require a specified format.

[11] If a facility is required to develop a strong oil spill contingency plan under this section, the requirement can be met through the ICP.

[12] The appendix further describes the required elements in 120.20(h). It contains regulatory requirements as well as recommendations.

[13] Specific plan requirements for sections listed under 154.1030(b) are contained in 154.1035(a)–(g).

[14] Note: Sections 154.1045 and 154.1047 contain requirements specific to facilities that handle, store, or transport Group I–IV oils and Group V oils, respectively.

[15] Ibid.

[16] Section 1910.38(a)(3) incorporates 29 CFR 1910.165 by reference.

Dated: April 18, 1996.

Elliott P. Laws,

Assistant Administrator, Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency.

Dated: April 22, 1996.

Rear Admiral James C. Card,

Chief, Marine Safety and Environmental Protection Directorate, U.S. Coast Guard.

Dated: April 18, 1996.

Richard B. Felder,

Associate Administrator for Pipeline Safety, Research and Special Programs Administration, U.S. Department of Transportation.

Dated: April 18, 1996.

John B. Moran,

Director of Policy, Occupational Safety and Health Administration, Department of Labor.

Dated: April 18, 1996.

Thomas Gernhofer,

Associate Director, Offshore Minerals Management, Minerals Management Service, Department of the Interior.

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federal register

Thursday
June 20, 1996

Part III

Environmental Protection Agency

40 CFR Part 68

Accidental Release Prevention Requirements: Risk Management Programs Under the Clean Air Act, Section 112(r)(7); List of Regulated Substances and Thresholds for Accidental Release Prevention, Stay of Effectiveness; and Accidental Release Prevention Requirements: Risk Management Programs Under Section 112(r)(7) of the Clean Air Act as Amended, Guidelines; Final Rules and Notice

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 68

[FRL–5516–5]

RIN 2050–AD26

Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)

AGENCY: Environmental Protection Agency.

ACTION: Final rule.

SUMMARY: The Clean Air Act requires EPA to promulgate regulations to prevent accidental releases of regulated substances and reduce the severity of those releases that do occur. EPA is promulgating rules that apply to all stationary sources with processes that contain more than a threshold quantity of a regulated substance. Processes will be divided into three categories based on: the potential for offsite consequences associated with a worst-case accidental release; accident history; or compliance with the prevention requirements under OSHA's Process Safety Management Standard. Processes that have no potential impact on the public in the case of an accidental release will have minimal requirements. For other processes, sources will implement a risk management program that includes more detailed requirements for hazard assessment, prevention, and emergency response. Processes in industry categories with a history of accidental releases and processes already complying with OSHA's Process Safety Management Standard will be subject to a prevention program that is identical to parallel elements of the OSHA Standard. All other processes will be subject to streamlined prevention requirements. All sources must prepare a risk management plan based on the risk management programs established at the source. The source must submit the plan to a central point specified by EPA; the plan will be available to state and local governments and the public. These regulations will encourage sources to reduce the probability of accidental releases of substances that have the potential to cause immediate harm to public health and the environment and will stimulate the dialogue between industry and the public to improve accident prevention and emergency response practices.

DATES: The rule is effective August 19, 1996.

ADDRESSES: Supporting material used in developing the proposed rule, supplemental notice, and final rule is contained in Docket No. A–91–73. The docket is available for public inspection and copying between 8:00 a.m. and 5:30 p.m., Monday through Friday (except government holidays) at Room 1500, 401 M St. SW, Washington, DC 20460. A reasonable fee may charged for copying.

FOR FURTHER INFORMATION CONTACT: Craig Matthiessen at (202) 260–8600, Chemical Emergency Preparedness and Prevention Office, U.S. Environmental Protection Agency, 401 M St. SW, Washington, DC 20460, or the Emergency Planning and Community Right-to-Know Hotline at 1–800–424–9346 (in the Washington, DC, metropolitan area, (703) 412–9810).

SUPPLEMENTARY INFORMATION: *Judicial Review.* Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7) were proposed in the Federal Register on October 20, 1993 (58 FR 54190). A supplemental notice was issued on March 13, 1995 (60 FR 13526). This Federal Register action announces the EPA's final decisions on the rule. Under section 307(b)(1) of the Act, judicial review of the Accidental Release Prevention Requirements: Risk Management Programs is available only by the petition for review in the U.S. Court of Appeals for the District of Columbia Circuit within 60 days of today's publication of this final rule. Under section 307(b)(2) of the Act, the requirements that are the subject of today's notice may not be challenged later in civil or criminal proceedings brought by the EPA to enforce these requirements.

Regulated Entities

Entities potentially regulated by this action are those stationary sources that have more than a threshold quantity of a regulated substance in a process. Regulated categories and entities include:

Category	Examples of regulated entities
Chemical Manufacturers	Industrial organics & inorganics, paints, pharmaceuticals, adhesives, sealants, fibers
Petrochemical	Refineries, industrial gases, plastics & resins, synthetic rubber
Other Manufacturing	Electronics, semiconductors, paper, fabricated metals, industrial machinery, furniture, textiles
Agriculture	Fertilzers, pesticides
Public Sources	Drinking and waste water treatment works
Utilities	Electric and Gas Utilities
Others	Food and cold storage, propane retail, warehousing and wholesalers
Federal Sources	Military and energy installations

This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This table lists the types of entities that EPA is now aware could potentially be regulated by this action. Other types of entities not listed in the table could also be regulated. To determine whether a stationary source is regulated by this action, carefully examine the provisions associated with the list of substances and thresholds under § 68.130 (59 FR 4478), the proposed modifications (61 FR 16598, April 15, 1996) and the stay of implementation of the affected provisions until the proposed modifications are final published elsewhere in today's Federal Register, and the applicability criteria in § 68.10 of today's rule. If you have questions regarding the applicability of this action to a particular entity, consult the person listed in the preceding FOR FURTHER INFORMATION CONTACT section.

The following outline is provided to aid in reading this preamble:

I. Introduction and Background

A. Statutory Authority

This rule is promulgated under sections 112(r), 301(a)(1), Title V of the Clean Air Act (CAA) as amended (42 U.S.C. 7412(r), 7601(a)(1), 7661–7661f).

B. Background

The CAA Amendments of 1990 amend section 112 and add paragraph (r). The intent of section 112(r) is to prevent accidental releases to the air and mitigate the consequences of such releases by focusing prevention measures on chemicals that pose the greatest risk to the public and the environment. Section 112(r)(3) mandates that EPA promulgate a list of regulated substances, with threshold quantities; this list defines the stationary sources that will be subject to accident prevention regulations mandated by section 112(r)(7). EPA promulgated its list of substances on January 31, 1994 (59 FR 4478) ("List Rule").

As noted elsewhere in today's Federal Register, EPA has stayed certain provisions of part 68 that were promulgated as part of the List Rule. The stayed provisions are being addressed in amendments to the List Rule, which were proposed in 61 FR 16598 (April 15, 1996). Therefore, EPA has not taken final action on provisions of the Risk Management Program rule that apply to regulated substances, mixtures, and stationary sources addressed by the stayed provisions. Final action will be deferred until EPA takes final action on the proposed amendments to the List Rule.

Section 112(r)(7) mandates that EPA promulgate regulations and develop guidance to prevent, detect, and respond to accidental releases. Stationary sources covered by these regulations must develop and implement a risk management program that includes a hazard assessment, a prevention program, and an emergency response program. The risk management program must be described in a risk management plan (RMP) that must be registered with EPA, submitted to state and local authorities, and made available to the public. On October 20, 1993, EPA published a Notice of Proposed Rulemaking (NPRM) for the section 112(r)(7) regulations (58 FR 54190). (For a summary of the statutory requirements of section 112(r) and related statutory provisions, see the October 20, 1993, NPRM).

Following publication of the proposed rule, EPA held four public hearings and received approximately 770 written comments. Because of these comments, EPA issued a supplemental notice of proposed rulemaking (SNPRM) on March 13, 1995 (60 FR 13526) for comment on: approaches for setting different requirements for sources that pose different levels of hazard (tiering); worst-case releases and other hazard assessment issues; accident information reporting; public participation; inherently safer approaches; and implementation and integration of section 112(r) with state programs, particularly state air permitting programs. EPA held a public hearing on March 31, 1995, in Washington, DC, and received more than 280 written comments. Today's rule reflects EPA's consideration of all comments; major issues raised by commenters and EPA's response are briefly discussed in Section III of this preamble. A summary of all comments submitted and EPA's response to them is available in the Docket (see ADDRESSES).

EPA has proposed to delist explosives from § 68.130. Consequently, explosives are not addressed in this rule. EPA had also requested at the time of the final List Rule comments on whether flammable substances, when used as fuel, posed a lesser intrinsic hazard than the same substance handled otherwise (59 FR 4500, January 31, 1994). The comments submitted lacked data that would justify a lesser level of hazard consideration for flammable fuels; hence, the Agency will not adopt a fuel use exemption for purposes of threshold quantity determination.

With today's rule, EPA continues the philosophy that the Agency embraced in implementing the Emergency Planning and Community Right-to-Know Act of

1986 (EPCRA). Specifically, EPA recognizes that regulatory requirements, by themselves, will not guarantee safety. Instead, EPA believes that information about hazards in a community can and should lead public officials and the general public to work with industry to prevent accidents. For example, today's rule requires covered sources to provide information about possible worst-case scenarios. EPA intends that officials and the public use this information to understand the chemical hazards in the community and then engage in a dialogue with industry to reduce risk. In this way, accident prevention is focused primarily at the local level where the risk is found. Further, today's rule builds on existing programs and standards. For example, EPA has coordinated with Occupational Safety and Health Administration (OSHA) and the Department of Transportation (DOT) in developing this regulation. To the extent possible, covered sources will not face inconsistent requirements under these agencies' rules. EPA is encouraging sources to use existing emergency response programs, rather than develop a separate and duplicative program under this rule. In addition, today's rule scales requirements based on the potential risk posed by a source and the steps needed to address the risk, rather than imposing identical requirements on all sources.

To accommodate the concerns of small businesses, EPA is providing guidance with reference tables that covered sources can use to model the offsite consequences of a release. EPA is providing a model RMP guidance for the ammonia refrigeration industry, and will develop similar guidance for propane handlers and drinking water systems. As today's rule is implemented, EPA hopes that other industry sectors will work with EPA to develop model RMPs for other processes, thereby reducing costs for individual sources. Finally, today's rule requires industry to submit RMPs centrally in a format and method to be determined by EPA. Working with stakeholders, EPA will develop mechanisms to allow industry to use appropriate electronic technology to register with EPA and submit RMPs. In turn, all interested parties will be able to access electronically the data in RMPs. This method of submission and access avoids a potentially significant amount of paperwork for all involved parties and promotes uniformity. Users will be able to develop databases for specific purposes and compare RMPs for various sites across the country. In turn, industries' use of the data will promote continuous improvement, for example, through new safety technologies. As the method for submitting RMPs is developed, EPA invites the participation of all stakeholders, including industry, state and local governments, local emergency planning committees, environmental groups, and the general public.

II. Discussion of Final Rule

A. Applicability

The owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process must comply with these requirements no later than June 21, 1999; three years after the date on which a regulated substance is first listed under § 68.130; or the date on which a regulated substance is first present in more than a threshold quantity in a process, whichever is later.

B. Program Criteria and Requirements

Under today's rule, processes subject to these requirements are divided into three tiers, labeled Programs 1, 2, and 3. EPA has adopted the term "Program" to replace the term "Tier" found in the SNPRM to avoid confusion with Tier I and Tier II forms submitted under EPCRA, also known as Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA Title III). Eligibility for any given Program is based on process criteria so that classification of one process in a Program does not influence the classification of other processes at the source. For example, if a process meets Program 1 criteria, the source need only satisfy Program 1 requirements for that process, even if other processes at the source are subject to Program 2 or Program 3. A source, therefore, could have processes in one or more of the three Programs.

Program 1 is available to any process that has not had an accidental release with offsite consequences in the five years prior to the submission date of the RMP and has no public receptors within the distance to a specified toxic or flammable endpoint associated with a worst-case release scenario. Program 3 applies to processes in Standard Industrial Classification (SIC) codes 2611 (pulp mills), 2812 (chlor-alkali), 2819 (industrial inorganics), 2821 (plastics and resins), 2865 (cyclic crudes), 2869 (industrial organics), 2873 (nitrogen fertilizers), 2879 (agricultural chemicals), and 2911 (petroleum refineries). Program 3 also applies to all processes subject to the OSHA Process Safety Management (PSM) standard (29 CFR 1910.119), unless the process is eligible for Program 1. Owners or operators will need to determine individual SIC codes for each covered process to determine whether Program 3 applies. All other covered processes must satisfy Program 2 requirements. Program requirements and differences are illustrated on Tables 1 and 2:

TABLE 1—PROGRAM ELIGIBILITY CRITERIA

Program 1	Program 2	Program 3
No offsite accident history		Process is subject to OSHA PSM.
No public receptors in worst-case circle	The process is not eligible for Program 1 or 3	Process is in SIC code 2611, 2812, 2819, 2821, 2865, 2869, 2873, 2879, or 2911.
Emergency response coordinated with local responders.		

TABLE 2—COMPARISON OF PROGRAM REQUIREMENTS

Program 1	Program 2	Program 3
Hazard Assessment:		
Worst-case analysis	Worst-case analysis	Worst-case analysis.
	Alternative releases	Alternative releases.
5-year accident history	5-year accident history	5-year accident history.
Management Program:	Document management system	Document management system.

TABLE 2—COMPARISON OF PROGRAM REQUIREMENTS—Continued

Program 1	Program 2	Program 3
Prevention Program:		
Certify no additional steps needed	Safety Information	Process Safety Information.
	Hazard Review	Process Hazard Analysis.
	Operating Procedures	Operating Procedures.
	Training	Training.
	Maintenance	Mechanical Integrity.
	Incident Investigation	Incident Investigation.
	Compliance Audit	Compliance Audit.
		Management of Change.
		Pre-startup Review.
		Contractors.
		Employee Participation.
		Hot Work Permits.
Emergency Response Program:		
Coordinate with local responders	Develop plan and program	Develop plan and program.
Risk Management Plan Contents:		
Executive Summary	Executive Summary.	Executive Summary
Registration	Registration	Registration.
Worst-case data	Worst-case data	Worst-case data.
5-year accident history	Alternative release data	Alternative release data.
Certification	5-year accident history	5-year accident history.
	Prevention program data	Prevention program data.
	Emergency response data	Emergency response data.
	Certification	Certification.

The owner or operator of a covered process must: (1) prepare and submit a single risk management plan (RMP), including registration that covers all affected processes and chemicals; (2) conduct a worst-case release scenario analysis, review accident history, ensure emergency response procedures are coordinated with community response organizations to determine eligibility for Program 1 and, if eligible, document the worst case and complete a Program 1 certification for the RMP; (3) conduct a hazard assessment, document a management system, implement a more extensive, but still streamlined prevention program, and implement an emergency response program for Program 2 processes; and (4) conduct a hazard assessment, document a management system, implement a prevention program that is fundamentally identical to the OSHA PSM Standard, and implement an emergency response program for Program 3 processes.

Measures taken by sources to comply with OSHA PSM for any process that meets OSHA's PSM standard are sufficient to comply with the prevention program requirements of all three Programs. EPA will retain its authority to enforce the prevention program requirements and the general duty requirements of CAA Section 112(r)(1). EPA and OSHA are working closely to coordinate interpretation and enforcement of PSM and accident prevention programs. EPA will also work with state and local agencies to coordinate oversight of worker and public safety and environmental protection programs.

C. Hazard Assessment

EPA has adopted the worst-case definition proposed in the SNPRM. For all substances, the worst-case release scenario will be defined as the release of the largest quantity of a regulated substance from a vessel or process line failure, including administrative controls and passive mitigation that limit the total quantity involved or the release rate. For most gases, the worst-case release scenario assumes that the quantity is released in 10 minutes. For liquids, the scenario assumes an instantaneous spill; the release rate to the air is the volatilization rate from a pool 1 cm deep unless passive mitigation systems contain the substance in a smaller area. For flammables, the worst case assumes an instantaneous release and a vapor cloud explosion.

For the final rule, EPA has adopted the term "alternative release scenarios" to replace the term "other more likely scenarios" found in the NPRM and SNPRM. The non-worst-case accidental releases for the hazard assessment portion of the risk management plan were presumed "more likely to occur" and "more realistic" than the worst case. EPA believes sources should have flexibility to select non-worst-case scenarios that are the most useful for communication with the public and first responders and for emergency response preparedness and planning. Catastrophic accidental releases are typically rare events; the words "more likely" suggests certainty of occurrence. Consequently, the scenarios other than worst case provided in the hazard assessment are called alternative release scenarios. For alternative scenarios, sources may consider the effects of both passive and active mitigation systems.

One worst-case release scenario will be defined to represent all toxics, and one worst-case release scenario will be defined to represent all flammables held above the threshold at the source. Additional worst-case release scenario(s) must be analyzed and reported if such a release from another covered process at the source potentially affects public receptors that would not be potentially affected by the first scenario. EPA recognizes that this approach may be problematic for some sources such as batch processors and warehouses where use of listed substances or inventory may vary considerably within an RMP reporting period. EPA suggests that owners or operators of such processes develop a worst-case scenario for future chemical use and inventory based on past practices to minimize the need for frequent revision of their worst-case scenario. For alternative release scenarios, one scenario is required for each toxic substance and one to represent all flammable substances held in covered processes at the source.

An endpoint is needed for the offsite consequence analysis. Appendix A of today's rule lists the endpoints for toxic substances that must be used in worst-case and alternative scenario assessment. The endpoint for a toxic substance is its Emergency Response Planning Guideline level 2 (ERPG–2) developed by the American Industrial Hygiene Association (AIHA). If a substance has no ERPG–2, then the endpoint is the level of concern (LOC) from the Technical Guidance for Hazards Analysis, updated where necessary to reflect new toxicity data. EPA recognizes the limitations associated with ERPG–2 and LOC values and is working with other agencies to develop Acute Exposure Guideline Limits (AEGLs). When these values have been developed and peer-reviewed, EPA intends to adopt them through rulemaking as the toxic endpoints for this rule. For flammables, vapor cloud explosion distances will be based on an overpressure of 1 psi; for alternative flammable releases, radiant heat distances will be based on an exposure of 5 kW/m² for 40 seconds. For vapor cloud fires and jet fires, the lower flammability limit provided by the National Fire Protection Association (NFPA) or other sources shall be used.

EPA selected 1.5 meter per second (m/s) wind speed and F atmospheric stability class as the default worst-case scenario meteorological conditions. If the owner or operator has meteorological data that show that higher minimum wind speeds or less stable atmospheric class conditions existed at the source at all times in the previous three years, then the higher wind speed and different stability class may be used. Alternative release analyses may use site-specific, typical meteorological conditions. If the owner or operator has no data on typical meteorological conditions, then conditions used in the RMP Offsite Consequence Analysis Guidance (3 m/s and D stability), may be used. Although EPA is providing technical guidance and reference tables for worst-case and alternative release scenario assessments, owners or operators may use any generally recognized, commercially or publicly available air dispersion modeling techniques, provided the modeling parameters specified in the rule are used.

For the hazard assessment and the RMP, populations potentially affected are defined as those within a circle that has as its center the point of release and its radius the distance to the toxic or flammable endpoint. Owners or operators may use Census data to define this population, and may update those data if they are inaccurate. EPA suggests that owners or operators use LandView, an electronic publication of environmental, geographic and demographic information published by EPA and the Bureau of Census. The presence of schools, hospitals, other institutions, public arenas, recreational areas, and large commercial and industrial developments that can be identified on street maps within this circle must be noted in the RMP, but the number of people occupying them need not be enumerated. The presence of environmental receptors within this circle must also be listed. EPA has defined environmental receptors as natural areas such as national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, refuges, or areas; and Federal wilderness areas, that can be exposed to an accidental release. All of these can be identified on local U.S. Geological Survey maps or maps based on USGS data.

The five-year accident history will cover all accidents involving regulated substances, but only from covered processes at the source that resulted in serious on site or certain known offsite impacts in the five years prior to the submission of each RMP. EPA has replaced the definition of significant accidental release with specific definitions of the types of releases to be covered under each of the specific requirements previously associated with this definition.

D. Prevention Programs

EPA has retained the management system requirement proposed in the NPRM, but only for Program 2 and 3 processes. EPA has moved the management system requirement from the prevention program section to the general requirements section because it should be designed to oversee the implementation of all elements of the risk management program. The owner or operator must designate a qualified person or position with overall responsibility for the program and specify the lines of authority if responsibility for implementing individual requirements is assigned to other persons or positions.

In the SNPRM, EPA proposed a Program 2 prevention program that covered training, maintenance, safety precautions, and monitoring, but did not specify any particular actions. EPA solicited comment on whether specific prevention activities should be required for Program 2 sources, such as any of the specific activities initially proposed in the NPRM. For today's rule, EPA has developed seven specific elements for the Program 2 prevention program: safety information (§ 68.48), hazard review (§ 68.50), operating procedures (§ 68.52), training (§ 68.54), maintenance (§ 68.56), compliance audits (§ 68.58), and incident investigation (§ 68.60). Most Program 2 processes are likely to be relatively simple and located at smaller businesses. EPA believes owners or operators of Program 2 processes can successfully prevent accidents without a program as detailed as the OSHA PSM, which was primarily designed for the chemical industry. EPA combined and tailored elements common to OSHA's PSM and EPA's NPRM to generate Program 2 requirements and applied them to non-petrochemical industry processes. EPA is also developing model risk management programs (and RMPs) for several industry sectors that will have Program 2 processes. These model guidances will help sources comply by providing standard elements that can be adopted to a specific source. EPA expects that many Program 2 processes will already be in compliance with most of the requirements through compliance with other Federal regulations, state laws, industry standards and codes, and good engineering practices.

The Program 3 prevention program includes the requirements of the OSHA PSM standard, 29 CFR 1910.119 (c) through (m) and (o), with minor wording changes to address statutory differences. This makes it clear that one accident prevention program to protect workers, the general public, and the environment will satisfy both OSHA and EPA. For elements that are in both the EPA and OSHA rules, EPA has used OSHA's language verbatim, with the following changes: the replacement of the terms "highly hazardous substance," "employer," "standard" and "facility" with "regulated substance," "owner or operator," "part or rule," and "stationary source"; the deletion of specific references to workplace impacts or to "safety and health;" changes to specific schedule dates; and changes to references within the standard. The "safety and health" and "workplace impacts" references occur in OSHA's PSM standard in process safety information (29 CFR 1910.119 (d)(2)(E)), process hazards analysis (29 CFR 1910.119(e)(3)(vii)), and incident investigation (29 CFR 1910.119(m)(1)). These changes are designed to ensure that OSHA retains its oversight of actions designed to protect workers while EPA retains its oversight of actions to protect public health and the environment and to remove possible interpretations that certain elements of process safety management fail to account for offsite impacts. Commenters were particularly concerned about the phase-in of process hazard analyses

(PHAs). Under the final rule, PHAs conducted for OSHA are considered adequate to meet EPA's requirements. They will be updated on the OSHA schedule (i.e., by the fifth anniversary of their initial completion). This approach will eliminate any need for duplicative analyses. Documentation for the PHA developed for OSHA will be sufficient to meet EPA's purposes.

EPA anticipates that sources whose processes are already in compliance with OSHA PSM will not need to take any additional steps or create any new documentation to comply with EPA's Program 3 prevention program. Any PSM modifications necessary to account for protection of public health and the environment along with protection of workers can be made when PSM elements are updated under the OSHA requirements. EPA has modified the OSHA definition of catastrophic release, which serves as the trigger for an incident investigation, to include events "that present imminent and substantial endangerment to public health and the environment." As a result, this rule requires investigation of accidental releases that pose a risk to the public or the environment, whereas the OSHA rule does not. EPA recognizes that catastrophic accidental releases primarily affect the workplace and that this change will have little effect on incident investigation programs already established. However, EPA needs to ensure that deviations that could have had only an offsite impact are also addressed.

E. Emergency Response

EPA has adopted the emergency response requirements found in the statute, without additional specific planning requirements beyond those necessary to implement the statute. This action is consistent with the Agency's effort to develop a single Federal approach for emergency response planning. The Presidential Review of Federal release prevention, mitigation, and response authorities (required under section 112(r)(10) of the Clean Air Act) found that there is seldom harmony in the required formats or elements of response plans prepared to meet various Federal regulations. Accordingly, EPA has committed not to specify new plan elements and/or a specific plan format in today's rule beyond those that are statutorily required. EPA believes that plans developed to comply with other EPA contingency planning requirements and the OSHA Hazardous Waste and Emergency Operations (HAZWOPER) rule (29 CFR 1910.120) will meet most of the requirements for the emergency response program. In addition, EPA and other National Response Team agencies have prepared Integrated Contingency Plan Guidance ("one plan") (NRT, May 1996). The NRT and the agencies responsible for reviewing and approving federal response plans to which the one plan option applies agree that integrated response plans prepared in the format provided in this guidance will be acceptable and be the federally preferred method of response planning. An emergency response plan that includes the elements specified in this guidance can be used to meet the requirements in today's rule. The final rule also provides relief for sources that are too small to respond to releases with their own employees; these sources will not be required to develop emergency response plans provided that procedures for notifying non-employee emergency responders have been adopted and that appropriate responses to their hazards have been addressed in the community emergency response plan developed under EPCRA (42 U.S.C. 11003) for toxics or coordinated with the local fire department for flammables.

F. Risk Management Plan (RMP)

Owners or operators must submit their first RMP by the date specified in § 68.10. After the RMP is submitted, changes at the source may require updates to the RMP other than the standard update every five years. If a new substance or new process is added, the RMP will need to be revised and submitted by the date the substance is first in the process above the threshold quantity. If changes to processes require revised hazard assessments or PHAs, or if a process changes Program level, the source must submit a revised RMP within six months.

EPA intends that the RMP will be submitted in a method and format to a central point as specified by EPA. States, local entities including local emergency planning committees (LEPCs), and the public will be able to access all RMPs electronically. This process will relieve states and local entities of the burden of filing documents and providing public access to them without limiting these agencies' or the public's access to the information.

The RMP is a multi-purpose document. The CAA requires that the RMP indicate compliance with the regulations and also include the hazard assessment, prevention program, and emergency response program. EPA is mandated to develop a program for auditing RMPs and requiring revisions, where appropriate. The RMP, therefore, must include enough data to allow the implementing agency to determine, through review of the RMP, whether the source is in compliance with the rule. EPA, however, believes that the RMP must serve another function; to provide information to the public in a form that will be understandable and will encourage the public to use the information to improve the dialogue with sources on issues related to prevention and preparedness.

To meet both of these purposes, the RMP will consist of the source's registration; an executive summary that will provide a brief description of the source's activities as they relate to covered processes and program elements; and data elements that address compliance with each of the rule elements. While the public and implementing agencies could make use of all sections of the RMP, the executive summary will provide text descriptions and give the source a chance to explain its programs in a format that will be easy for communities to read and understand. The data elements will provide the implementing agency with the basic data it needs to assess compliance without asking for detailed documentation. The Agency is considering development of an RMP form where the data elements of the form would provide the implementing agency with the basic data it needs to assess compliance without asking for detailed documentation. All data elements would be checkoff boxes, yes/no answers, or numerical entries.

This approach will provide data that anyone can download or search. States, communities, trade associations, or public interest groups may want to use the data or a subset of the data to create databases that allow them to compare sources in the same industry or same area. For example, a local entity will be able to download data from all reporting sources that are similar to ones in its community to determine whether the quantities stored and process controls used are typical. The information will provide the public with data that will enhance their dialogue with sources. It will also help sources and trade associations to understand practices in their industries and identify practices that could be used to reduce risks. The risk management program documentation will remain at the source and will be available for review by EPA and the implementing agency.

G. Air Permitting

The SNPRM discussed the relationship between section 112(r) and CAA air permitting requirements for sources subject to both provisions. Under the CAA, air permitting authorities must ensure that sources are in compliance with applicable requirements to issue a permit. Because section 112(r) is an applicable requirement, EPA has identified in the final rule the permit conditions and the actions owners or operators and air permitting authorities must take to ensure compliance. The permit must identify part 68 as an applicable requirement and establish conditions that require the owner or operator of the source to submit either a compliance schedule for meeting the requirements of part 68 by the date specified in § 68.10(a) or, as part of the compliance certification submitted under 40 CFR 70.6(c)(5), a certification statement that, to the best of the owner or operator's knowledge, the source is in compliance with all requirements of this part, including the registration and submission of the RMP. The owner or operator must also submit any additional relevant information requested by the air permitting authority or designated agency to ensure compliance with the requirements of this section. If a permit is already issued that does not contain the provisions described above, then, the owner or operator or air permitting authority shall initiate permit revision or reopening according to the procedures in 40 CFR 70.7 or 71.7 to incorporate the terms and conditions as described above. EPA also allows the state to assign the authority to implement and enforce these requirements to another agency or agencies (the "designated agency") to take advantage of resources or accident prevention expertise that might be available in these other agencies. Finally, the air permitting authority or designated agency must: (1) Verify that the source owner or operator has registered and submitted an RMP or a revised plan when required; (2) verify that the source owner or operator has submitted the proper certification or compliance schedule; (3) for some or all sources, use one or more mechanisms such as, but not limited to, a completeness check, source audits, record reviews or facility inspections to ensure that permitted sources are in compliance; and (4) initiate enforcement action, based on the requirements of this section, as appropriate.

H. Other Issues

In the SNPRM, EPA discussed three other issues raised by commenters: accident information reporting, public participation, and inherently safer technologies. EPA has decided not to develop any requirements related to these issues at this time. Although EPA continues to believe that accident reports that provide more detail on the causes and impacts of accidents could be useful, the Agency has decided to limit such reporting required under this rule to the five-year accident history mandated by the CAA. When necessary, EPA will use its authority to investigate individual accidents and to seek additional information to the extent authorized by CAA section 114 (i.e., to determine compliance with this rule and CAA section 112(r)(1), to support further rule development, and to assist research on hazard assessment).

Secondly, the Agency encourages sources, the public, and local entities to work together on accident prevention issues, but believes that the wide variety and large number of sources subject to this rule make any single mandatory approach to public participation inappropriate. RMP information should be used as the basis for dialogue between the community and sources on accidental release prevention, risk reduction and preparedness for emergency response. Industry and the public should continue to use the LEPC as a mechanism for this dialogue.

Finally, EPA does not believe that a requirement that owners or operators conduct searches or analyses of alternative process technologies for new or existing processes will produce significant additional benefits. Many commenters, including those who support these analyses, indicated that an assessment of inherently safer design alternatives has the most benefit in the development of new processes. Industry generally examines new process alternatives to avoid the addition of more costly administrative or engineering controls associated with a design that may be more hazardous in nature. Although some existing processes may be judged to be inherently less safe than others, EPA believes most of these processes can be safely operated through management and control of the hazards without spending resources searching for unavailable or unaffordable new process technologies. Application of good PHA techniques often reveals opportunities for continuous improvement of existing processes and operations without a separate analysis of alternatives. EPA encourages owners or operators to continue to examine and adopt viable alternative processing technologies, system safeguards, or process modifications to make new and existing processes and operations inherently safer. Through the process and prevention program information in the RMP, sources can demonstrate, and users of the RMP information can observe and promote, progress toward safer processes and operations.

EPA is considering the development of incentives and awards to stimulate inherently safer alternative research and development, public outreach and education, and risk communication efforts. The Agency welcomes ideas and participation in this effort.

III. Discussion of Comments

EPA received 1220 comments, including 180 relevant comments submitted for the List Rule, 757 comments on the NPRM, and 283 comments on the SNPRM. The commenters represented 92 chemical manufacturers, 81 other chemical users, 111 petroleum industry companies, 174 industry trade associations, 40 other trade associations, 58 agricultural supply retailers, 102 propane retailers, 132 explosives users, 29 water treatment facilities, 26 utilities, 66 state agencies, 63 local governments, 8 other Federal agencies, 52 academics and consultants, 61 environmental groups, 6 labor unions, and 31 private citizens. The remaining 88 letters were requests for extensions of the comment period, interim or duplicate sets of comments, or had been sent to the incorrect docket. The major issues raised by the commenters are briefly addressed below; a complete presentation of the Agency's response to the comments received on this rulemaking is available in the Risk Management Program Rule: Summary and Response to Comments in the docket (see ADDRESSES).

Many commenters requested that EPA's list be identical to OSHA's list of highly hazardous substances and no thresholds should be less than OSHA's. These comments were addressed in the final list rule (59 FR 4478; January 21, 1994) and background material related to these issues is available in docket number A-91-74 (see ADDRESSES).

A. Tiering

Commenters on the NPRM suggested that EPA create different levels of requirements for sources that pose different risks. In the SNPRM, EPA proposed three tiers: a low hazard tier for sources whose worst-case release would not affect any public or environmental receptors of concern; a medium hazard tier for sources that were not eligible or covered by the low or high hazard tiers; and a high hazard tier based on either industry sector accident history and number of employees or simply based on the number of employees. Generally, commenters were concerned that all processes at a source would need to be eligible for Program 1 before any process could be. EPA has revised the rule to clarify that eligibility for any tier

(Program) is based on process criteria, not source. If a process meets Program 1 criteria, the owners or operators need only meet Program 1 requirements for that process even if other processes at the source are subject to Program 2 or Program 3.

1. Rationale. Only 2 of the 57 commenters opposed tiering arguing that the CAA mandates that all covered sources be required to complete a full prevention program and that Congress had considered and rejected exemptions. One commenter argued that EPA had already accounted for "differences in size, operations, processes, class and categories of sources" in developing the list and thresholds. Most commenters supported tiering as an appropriate way to recognize different levels of risks and to allow sources and emergency responders to focus on the highest risk processes.

EPA disagrees that the CAA requires all covered processes to comply with the same detailed risk management program. EPA listed regulated substances because of their inherent hazards, such as toxicity and volatility. EPA did not consider, nor does the CAA indicate that it may consider, "differences in size, operations, processes, class and categories of sources" in selecting chemicals or setting thresholds. In establishing section 112(r)(7) requirements, however, Congress clearly recognized that a "one-size-fits-all" approach may not be appropriate for these regulations and directed EPA to consider these factors in the development of the accident prevention regulations. Furthermore, EPA strongly disputes the assertion that it has exempted any source from regulation by creating different programs for different sources. As noted below, all covered processes will be addressed in RMPs that contain hazard assessment, prevention, and response information, as required by statute.

2. Program 1 vs. Program 2 and Program 3 Criteria. Commenters generally supported Program 1 for low-risk sources, but argued that few, if any, sources would qualify because the requirements were too stringent.

a. Potential for Offsite Impact. Commenters generally agreed that sources that can demonstrate no offsite impact should be eligible for Program 1, but only public health should be considered, not environmental impacts. Others stated that only sources posing a threat of "considerable" impacts should not be eligible for Program 1. One commenter stated that EPA's worst-case scenario is unrealistic and its use as a Program 1 trigger is unreasonable. Other commenters want EPA to allow site-specific modeling for the offsite consequence analysis, rather than look-up tables.

In today's rule, EPA specifically allows owners or operators to use site-specific air dispersion modeling for their offsite consequence analyses. EPA disagrees that offsite impacts should be limited to "considerable" impacts. When offsite impacts are possible, it may be reasonable to implement some additional measures to reduce accidental releases, especially when the burden of measures such as additional training or safety precautions is low. Programs 2 and 3 provide flexibility to allow source-specific consideration of the appropriate level of effort. Program 1 requires no additional prevention measures, which is only categorically justifiable if such measures would not reduce offsite impact. It is reasonable to couple a no impact criterion with a conservative worst-case scenario to conclude categorically the public would not benefit from additional prevention measures. If no impact can be demonstrated for a conservative worst-case release, then no impact is likely to occur for any other release event, and the process could be judged to pose a low threat to the surrounding area.

EPA has decided that potential impact on environmental receptors resulting from a worst-case scenario will not be a criterion to determine eligibility for Program 1. EPA agrees that very little, if any, data exist on the potential acute environmental impacts or environmental endpoints associated with listed chemicals upon accidental release. In addition, the offsite consequence distances estimated using human acute toxicity or overpressure effects may not be directly relevant to environmental effects. However, owners or operators will be required to document in the RMP the presence of such receptors within the distance determined for the worst case. EPA believes that natural resource agencies and the public will be able to benefit from the environmental receptors information in the RMP in discussions with the source.

b. Accident History for Program 1. Many commenters objected to accident history as a Program 1 criterion, arguing that a process that had a significant accidental release in the previous five years may have been changed to reduce or eliminate future events and public impact. Several commenters suggested that such processes that otherwise meet Program 1 criteria should remain eligible, but be required to justify and document the changes. Some commenters also objected to EPA's proposed definition of significant accidental release, arguing that many companies and emergency responders conservatively evacuate or shelter-in-place during minor incidents. Under the proposed definition, these actions disqualify a process from Program 1 even if there were no offsite impacts. Some commenters stated that the accident history provision was unnecessary because, by definition, a Program 1 process is not capable of an accidental release that could affect public receptors.

EPA has decided to retain the accident history criterion for Program 1 processes, excluding events with evacuations and shelterings in place, and to drop the definition of significant accidental release. Program 1 eligibility is not a one-time exercise; owners or operators must certify in each RMP that no qualifying releases have occurred since the previous RMP submission and provide current worst-case release data indicating no offsite impacts are anticipated in the future. Program 1 criteria and accident history provide owners or operators an opportunity to demonstrate to the community ongoing excellence in accident prevention and an incentive to search for and implement ways, such as inventory reduction, to reduce the potential for offsite impacts associated with large scale accidental releases. Further, the unique circumstances surrounding past accidents can provide a reality check on the theoretical modeling and worst-case scenario claims used for the offsite consequence assessment and serve to verify that administrative controls and passive mitigation measures work as intended. EPA decided to delete public evacuations or shelterings-in-place as criteria for Program 1 eligibility. EPA is that inclusion of these criteria in Program 1 eligibility may create a perverse incentive not to report releases and it may encourage sources and local emergency officials to take more chances during an event when there may be potential exposures that do not rise to the endpoint specified in this rule but would otherwise be worthy of precautionary actions by the source or by local officials. If the evacuation or sheltering takes place because of a concern for public exposure to an endpoint as specified in this rule, then public receptors necessarily would be under the worst case distance and the process would not be eligible for Program 1 under the criteria of the rule. Owners or operators of processes that meet Program 1 eligibility requirements are required to report a 5 year accident history for that process. If local emergency planners, first responders or the public have concerns about processes in Program 1 because of a past evacuation or sheltering-in-place event, then mechanisms under EPCRA could be used to gather more information from the source about its prevention program (such as EPCRA sections 302(b)(2) [designation of a facility if it does not already handle extremely hazardous substances listed under section 302] and 303(d)(3) [provision of information to the emergency planning committee]) and involve the source in emergency planning. Sources and local first responders should be discussing evacuation and sheltering-in-place criteria and decisions as part of emergency response planning.

c. Other. Many commenters asked that specific industries such as ammonia refrigeration, retail fertilizer outlets, all flammables, and all non-PSM sources be assigned to Program 1. EPA disagrees because each source has unique surroundings that must be considered in the worst-case assessment and each source must demonstrate favorable accident history. All ammonia refrigeration units covered by this rule are already subject to OSHA PSM; many of these have had accidents that affected the community and should be required to complete the requirements of the hazard assessment and emergency response program and provide the community with full RMP information. According to the industry, a typical ammonia fertilizer retailer handles 200 tons of ammonia. Some retailers may be very geographically isolated and can qualify for Program 1, but EPA expects that most will be subject to Program 2. Given the large quantity of ammonia involved, EPA considers it important that the community have information on offsite consequences from these sources and that the owner or operator takes the necessary steps to address accidental release prevention and emergency response.

EPA expects that some sources handling flammables will qualify for Program 1 because the distance to a 1 psi overpressure is generally less than distances to toxic endpoints. Nonetheless, those sources handling flammables in sufficient quantity to generate a potential offsite impact should provide the community with information on hazards and address prevention and response steps. Many sources handling flammables are already subject to PSM; the only additional steps required under this rule are completion of the hazard assessment and emergency response programs and submission of an RMP.

EPA does not agree that non-PSM sources should be assigned to Program 1. Many of these sources could have an accidental release that can affect the community. OSHA exempted retailers because they are covered by other OSHA or state regulations that address workplace safety, not because they are incapable of having offsite impacts. All retailers are in Program 2 unless they can meet Program 1 criteria; thus, they should be taking prevention steps and will be providing the community with information. Compliance with other existing Federal and state programs may satisfy many Program 2 prevention requirements, thereby limiting the burden. In addition, EPA expects to develop model risk management programs for these sectors. Public sources in states without delegated OSHA programs are not covered by OSHA PSM because OSHA is barred by law from regulating them. Nonetheless, these sources may pose a threat to the community. Today's rule places these sources in Program 2.

3. Program 2 vs. Program 3 Criteria. In the SNPRM, EPA's preferred approach assigned sources to Program 3 based on SIC code and number of employees; sources in specified SIC codes with 100 or more full-time employees (FTE) would have been subject to the full program in 3 years; sources in a subset of these SIC codes with 20 to 99 FTEs would have been subject to the full program in 8 years. The alternative was to impose the full program on all sources with more than 100 FTEs. Most SNPRM commenters submitted suggestions and arguments about this approach.

a. Number of Employees. Only two commenters supported using the number of employees as the sole criterion, arguing it would be the easiest approach to implement with the greatest amount of industry participation. Commenters opposed it because the number of employees proposed does not reliably correlate with risk, hazard, or quantity on site, and because it could act as an incentive to reduce employment. In addition, some commenters stated that smaller sources may have fewer resources to manage hazards and, therefore, may pose a greater risk to the public.

EPA agrees and has deleted the number of employees as a Program 3 criterion. Although size of a source in the manufacturing sectors may be related to the quantities on site and complexity of the processes, many other sources may have similar characteristics with fewer employees. Complexity is more directly associated with the type of industry (i.e., SIC code) than with number of employees; a highly automated process may involve fewer employees and be more complex than a more labor intensive process. Quantity, if relevant, can be directly measured rather than indirectly by number of employees. In addition, EPA was concerned that the data on which the Agency based its proposed approach may not be representative of all accidental releases. These data, drawn from reports to the National Response Center and EPA regions, appear to indicate that larger sources have more and larger accidental releases than do smaller sources. This finding, however, may in part reflect different levels of reporting, rather than different levels of accidents. Both Federal and state officials report that the number of releases has risen in recent years as more sources learn about their reporting obligations. EPA has decided that, because the processes within the SIC codes basically handle the same chemicals in the same way, smaller sources should not be moved to a different Program based on the number of employees.

b. SIC Code. Fifty-seven commenters, particularly those in the oil industry, utilities, and public systems, supported the use of SIC codes based on accident history; 28 commenters opposed it. Supporters argued that industry accident records represented a reasonable criterion for identifying high-risk sources. If an entire industry has a long history without accidental release, it may indicate that the materials handled and handling conditions generate a smaller potential for serious releases or that the industry is effectively controlled by government or industry standards. Some commenters argued that industry accident histories reflect underlying risk better than individual source accident histories because accidents are rare events; a source with no accidental releases over the previous five years is not necessarily safe.

Commenters opposing the use of SIC codes stated that the approach is arbitrary, that accidents with only onsite effects should not be used, that sources in other industry sectors handle similar quantities and pose similar risks, and that sources within an industry that have successful risk management practices are penalized by a few isolated sources within the industry.

EPA has decided to retain the use of SIC codes, adding SIC 2865 based on further review of accident histories, and to add coverage by the OSHA PSM standard as a separate criterion for Program 3. EPA selected the SIC codes by analyzing accident data filed by sources in response to EPA's request for information in the Accidental Release Information Program (ARIP). ARIP collects data from certain sources that report releases under CERCLA section 103. EPA selected the SIC codes that showed a high frequency of the most serious accidents across a significant percentage of all sources within the SIC code to avoid mischaracterizing an industry based on isolated, problematic sources. Data on the selection criteria were summarized in the SNPRM and the docket at the time of the SNPRM. The accident history of the cyclic crudes industry (SIC code 2865) is similar to that of the categories selected. EPA disagrees that only offsite impacts should be considered; accidental releases that caused death, hospitalizations, or injuries on site are also of concern because they indicate significant safety problems that could lead to releases that cause impacts offsite. The SIC codes selected by EPA are basically the same ones OSHA selected for its PSM program inspection focus. EPA disagrees that sources are "penalized" by this approach because owners or operators of processes in these SIC codes have an opportunity to present their safety record, demonstrate the success of their accident prevention programs, and communicate with the local community the basis for their risk management practices. Sources that receive Merit or Star status in the OSHA Voluntary Protection Program will be favorably distinguished from others in the same industry when implementing agencies are selecting sources for audits (see section III.T.1 below).

EPA agrees that serious accidents occur infrequently even at sources with poor safety practices and that industry-wide accident records provide a better mechanism than the accident history at a single source for identifying those sectors whose chemicals and processes may lead to serious releases. A high proportion of the sources in some SIC codes reported releases; EPA's analysis specifically took into account the number of reports from individual sources to avoid selecting an SIC code because of a small number of sources with serious safety problems.

The OSHA PSM already applies to most covered processes in the selected SIC codes. EPA expects that there will be fewer than 400 additional processes assigned to Program 3 that are not already subject to the OSHA PSM standard at the approximately 1,400 sources in these SIC codes and that all of these sources will already have other processes covered by OSHA PSM. Consequently, fulfilling the RMP requirements imposes little additional burden.

EPA decided to include all covered processes currently subject to the OSHA PSM standard in Program 3 to eliminate any confusion and inconsistency between the prevention requirements that the owners or operators of such processes must meet. EPA's Program 3 prevention program is identical to the OSHA PSM standard. Including OSHA PSM processes in Program 3, therefore, imposes no additional burden on these processes; the only new requirements for such processes are the hazard assessment, emergency response program, and the RMP, which are the same under Programs 2 and 3.

c. Site-Specific, Risk-based Criteria. Many commenters stated that Program assignment should be based on site-specific risk-based criteria. Accident history is one such criterion and is discussed separately in Section III.A.3.d. Other criteria suggested include population density or proximity, quantity on site, number of substances held above the threshold, process conditions, toxicity, volatility, alternative release scenario results, or combinations of these factors as a risk index.

EPA agrees with commenters that Program assignments should be risk-based to the extent possible; however, as the variety of suggestions indicates, a considerable number of variables would need to be considered. EPA knows of no standard approach or equation that is used and generally accepted. The variety of suggestions indicate the likelihood that any proposed formula would meet opposition. No commenter provided a method to comprehensively address these factors on a nation-wide basis.

An important consideration for EPA in developing the rule provisions for Program assignment was to avoid undue complexity, confusion, and resource expenditure by sources and implementing agencies implementing the rule's criteria. To some extent, EPA has incorporated risk factors, including site-specific factors, in determining which sources are eligible for which Program. For example, Program 1 eligibility already considers the potential for offsite impacts; any process for which there are no public receptors within the distance to an endpoint from a worst-case release may be eligible for Program 1, provided there have been no releases with certain offsite consequences within the previous five years. Today's rule allows sources to consider passive mitigation and administrative controls in conducting the worst-case release analysis. Such site-specific considerations affect the extent of potential exposure to a worst-case release, and thus are reflected in the Program 1 eligibility criteria. Elements of risk such as process complexity and accident history are also reflected the design of Program 2 and Program 3 requirements and the assignment of processes to these Programs. Program 2 sources generally handle and store regulated substances, but do not react or manufacture them. EPA believes Program 2 sources can take prevention steps that are less detailed than those in the OSHA PSM standard and still accomplish accident prevention that is protective of any population nearby. Program 3 is reserved for processes already subject to the OSHA PSM standard and processes with high accidental release histories. The SIC codes with an accident history selected by EPA for Program 3 are typically complex processes. The PSM standard was designed for, and is particularly appropriate for, these processes.

EPA takes issue with the appropriateness of some of the suggested factors. Meteorological conditions vary too much to be considered in determining a risk level. Chemical quantity alone does not accurately relate to risk because the location and handling conditions can dramatically change the potential for exposures.

In addition, EPA has implementation concerns about a detailed, national, multi-factor, risk-based approach, were it to be feasible. States such as Delaware have used a simple version of a risk-based approach and found that it created serious problems for the state and the sources. Smaller sources and those without technical staff have had great difficulty in implementing the approach and have had to rely on state officials to determine applicability for them. Delaware specifically recommended that EPA not attempt implementing a similar approach on a national basis because of the burden it imposes on the state and the confusion and uncertainty it creates for sources. Delaware has fewer than 100 sources; nationally, EPA estimates that 66,000 sources will be subject to the rule, approximately 62,000 of which are outside of the chemical and refining sectors. If implementing agencies had to help most of these sources determine the index score and Program for each process, not only would the burden on the agencies be extreme, but implementation would also be delayed. Furthermore, were EPA to simply identify risk factors without an index and leave the determination of Program level to sources or implementing agencies, the process for such site-specific determinations would be even more complex and resource intensive for sources and implementing agencies; it would create disincentives for a state to become involved and to take on the role of an implementing agency. EPA believes it is better to have sources and agencies focus their resources on prevention activities.

EPA considered, but decided against, a less comprehensive risk-based approach using proximity or population density as criteria for distinguishing between Program 2 and 3. EPA recognizes that accidental releases from sources near or in densely populated areas may harm more individuals and be perceived to pose a greater risk than other sources. However, as stated above, EPA believes that the type of process, its complexity and accident history should be considered for Program 2 or 3 assignment, regardless of the number of people potentially exposed. In other words, EPA does not believe the streamlined Program 2 prevention elements should apply to a complex Program 3 process just because fewer persons could be potentially exposed or that the Program 3 prevention elements should apply to a Program 2 process because more people could be potentially exposed. EPA believes that populations offsite should be protected from harm based on the type of process; the Program 2 prevention elements, properly applied to the expected types of Program 2 processes, serves to protect off-site populations, just as the Program 3 prevention elements for complex processes serves to protect offsite populations.

If Program assignments were based on the alternative release scenario results, sources would not have the flexibility and latitude in today's rule for these scenarios because more definite criteria would need to be considered to ensure the proper scenarios and results are assessed. This places more emphasis and burden for sources on the offsite consequence assessment rather than on accident prevention and communication with the public and first responders. Furthermore, because active mitigation includes process and control equipment that may fail, considering such equipment in evaluating risk would not be appropriate without detailed review by the source and oversight by the implementing agency.

Some commenters suggested yet another variation of a less comprehensive, "risk"-based approach that would have EPA use a site-specific analysis of likelihood of release to assign Program levels. Many of the same difficulties in developing a "risk index" for determining Program assignments would apply to an attempt to incorporate likelihood in a more sophisticated manner than EPA was able to do in its analysis of accident history by SIC code. In addition to the substance-specific properties considered as part of the chemical listing criteria, the site-specific likelihood of a release depends on a number of factors, including the appropriateness of the equipment in use, the maintenance of that equipment, operator performance, and safety systems and their performance. Evaluating site-specific likelihood of release requires data on each of these items; such data rarely exist especially for complex processes where a variety of equipment must be evaluated along with the performance of multiple operators and maintenance workers. Using surrogate data (e.g., manufacturer's failure rate data) introduces error of an unknown magnitude to the analysis. Such analyses are very costly and produce results that are, at best, questionable.

EPA also believes that assessing the likelihood of a release at most sites for site-specific individualized Program-level determinations is neither technically feasible nor cost-effective. In most cases, the data do not exist to conduct a meaningful analysis; where they do exist, the cost of developing a defensible analysis and overseeing it could well exceed the cost of compliance with the rule. Such an approach would resemble a permit program, which would be resource-intensive for sources and implementing agencies. EPA determined that the simpler approach for assigning sources to Program 1 would provide regulatory relief for those sources that could not affect the public while allowing other sources to devote their resources to prevention activities rather than to analyses that would be subject to legal challenges.

EPA notes that sources have the flexibility to implement appropriate accident prevention measures based on the hazards and risks discovered in the hazard review or process hazard analysis. The structure of Programs 2 and 3, therefore, reflect site-specific risk criteria. Further, the purpose of the risk management program and RMP effort is to prevent accidents and facilitate local level dialogue about the risks, prevention measures, and emergency response effort in place at the source. The local community and first responders may have far different concerns that should, and can be addressed better through today's approach than those reflected by a risk index approach.

d. Accident History. Some commenters argued that EPA should assign sources to Program 3 based on the accident history of the source. One commenter suggested that any source with no accidental release that exceeded a reportable quantity (as defined in CERCLA) for the previous five years should be in Program 2. Others argued that a source should be in Program 2 if it had no significant accidental release in the previous five years. Some commenters said that a one-release standard was too stringent and that two or more significant accidental releases should be allowed before a source was assigned to Program 3. Another commenter suggested that a source with no significant accidental releases in the past five years and with few potentially impacted neighbors should be placed in Program 2.

Other commenters opposed this approach, arguing that, in many cases, sources take steps to prevent recurrences following a serious release. In some cases, the offsite impacts from releases are minor and would not justify assigning a source to a particular Program. Other commenters stated that the absence of an accidental release can be indicative of lower risk, but it can also simply mean that a release has not yet occurred. Several commenters noted that a five-year time period is statistically insignificant because accidental releases are infrequent events.

EPA agrees that source-specific accident history is not a reasonable basis for assigning processes to Programs 2 and 3. Given the relative infrequency of serious accidents, a five- or even ten-year period without an accident may not be indicative of safe operations. In addition, the criteria necessary to define the types of past accidental release for the purposes of program classification would need to be based on a wide variety of variables and site-specific factors, which would lead to confusion and unnecessary complexity. Factors such as weather conditions at the time of the release, rather than the size of a source or its management practices, often determine whether a release has offsite consequences. EPA believes that accident history is appropriately used on an industry-wide basis as described above for selection of Program 3 sources. If accidental releases with consequences appear to occur at a large proportion of sources within an SIC code, where similar processes, equipment and chemicals are used, then it is reasonable to conclude that processes in that SIC code pose a greater likelihood of a high hazard release than others. This approach removes the need for at least one accident to occur at every source that EPA believes ought to be assigned to a particular Program, especially when such accidents are rare events. EPA is also concerned that using source-specific accident history as a criterion would create an incentive for sources to fail to report releases. Finally, as EPA has stated, assignments to Program 2 and 3 also consider the appropriateness of the prevention steps for the types of sources. EPA believes that both Programs move sources to greater accident prevention.

e. Other. Some commenters asked that the implementing agency be given discretion to move a source into a different Program based on local concerns and knowledge. EPA notes that states have the authority, under the CAA, to impose more, but not less, stringent standards than EPA (see CAA section 112(r)(11)).

A few commenters suggested that Program 2 be limited to sources for which a model risk management program had been developed. The models would be designed to reflect risks associated with categories of sources that all use the same type of equipment and handle the substances in the same way (e.g., propane retailers and users, ammonia retailers). EPA considered this approach and decided that the Program 2 prevention program provides a better, generic prevention approach for processes for which the more detailed PSM program would be inappropriate. Limiting Program 2 to those industrial sectors where industry-specific models are feasible would place some manufacturing sources at a disadvantage simply because their chemical uses, processes, and equipment were too varied to allow development of a model or because there are too few sources to justify use of EPA or industry resources to develop a model. In addition, if EPA were to limit Program 2 to sources with model programs, Program 2 regulations would need sufficient specificity to enforce the use of these models; otherwise, sources would be able to ignore both PSM and the models. EPA is also concerned that codifying the model plans could stifle innovation in safety practices. If industry codes or other Federal regulations on which parts of the models may be based were updated, EPA would have to revise its models; given the time needed to propose and adopt regulations, sources might have to delay implementation of new systems and, in some cases, might be caught between complying with a revised EPA or OSHA regulation or state law or complying with the model. Consequently, EPA decided it was better to have models available as guidance, but not require compliance with them. Further, EPA believes that the key elements of good accident prevention practices are captured within the requirements of the Program 2 prevention program. Model programs and plans are likely to build on these approaches, making it easier for sources in Program 2 to use models that are later developed by others.

EPA is working with industry to develop model risk management programs and RMPs for ammonia refrigeration systems, propane distributors and users, and water treatment systems. EPA also expects to develop models for ammonia retailers and wastewater treatment systems. EPA encourages other industrial sectors to work together on additional model development.

4. Program 1 Requirements. Commenters were generally opposed to posting signs, and certification of no environmental impact.

a. Certification of No Environmental Impact. Many commenters stated that it would be "virtually impossible" to certify "no potential for environmental impacts," as required by the SNPRM. Commenters said that the definition of environmental impact was too vague, that the list of environments suggested in the SNPRM was too broad, and that the language seemed to require a full environmental consequence assessment, making the requirement impossible. One commenter noted that companies would find it difficult to assert that there could be "no environmental impacts" even after an environmental consequence assessment reveals insignificant impacts. Two commenters suggested that EPA substitute "low potential for environmental impact" or "no potential for long-term, adverse environmental impact." Other commenters requested that environmental impact be dropped or that the requirement be changed to mirror the Program 1 eligibility criteria with an indication in the RMP that no environmental receptors of concern were within the worst-case distance to an endpoint.

As described above in section III.A.2.a. Potential for Offsite Impact, EPA has decided not to make the presence of environmental receptors a part of the eligibility criteria for Program 1 and has deleted the certification requirement. Instead, owners or operators of all covered processes will have to identify in the RMP any environmental receptors that are within the distance potentially affected by the worst case.

b. Signs. Commenters generally opposed the SNPRM requirement that sources with Program 1 processes post signs warning of the hazards on site if the only regulated substances present at the site above the threshold quantity were listed for flammability. Commenters stated that local and state fire and safety codes often already require such signs. In addition, sources are already required under EPCRA section 312 to file annual inventories with the LEPC and fire department that identify hazards on site. Signs would have fulfilled the emergency response program requirements for a source. Because Program 1 eligibility will now be determined on a by-process basis rather than by source-wide criteria and because EPA has revised the emergency response program provisions as noted below, EPA has dropped the requirement for signs.

c. Emergency Response Program. In the SNPRM, EPA asked whether additional emergency response planning and coordination should be required for Program 1 processes. Some commenters supported this requirement, while others stated that most sources are already covered by EPCRA and participate in community response planning. Commenters stated that because the worst-case release could not reach public receptors, such efforts were not necessary.

In the final rule, EPA is requiring the owner or operator of a Program 1 process to ensure that any necessary response actions have been coordinated with local response agencies. EPA believes that local responders may become involved in an incident, even if the public is not threatened. No additional CAA-related planning activities are required, however.

d. Other. Many commenters stated that, since Program 1 processes generate no offsite impact, they should be exempt from this rule. One commenter objected to Program 1 because members of the public, particularly first responders and business visitors, could still be hurt by a release. Other commenters suggested that the annual EPCRA section 312 form could be amended to indicate that a source was covered by the rule, replacing the RMP registration form.

The CAA requires that all sources with more than a threshold quantity of a listed substance register an RMP, perform a hazard assessment, and develop accidental release prevention and emergency response programs. Therefore, total exemption of processes that meet Program 1 criteria is not possible. See S. Rep. No. 228, 101st Cong., 1st session, at 208 ("Senate Report") (precursor of RMP provision mandating hazard assessments for sources that exceed threshold for listed substance); 136 Congressional Record S16927 (daily ed. October 27, 1990) (remarks of Sen. Durenburger, sources with more than a threshold quantity are subject to regulations); 136 Cong. Rec. H12879 (daily ed. Oct. 26, 1990)(remarks of Rep. Barton)(all users of hazardous chemicals are required to plan for accidents). Moreover, even if an exemption for processes that exceed a threshold were permissible, the owner or operator would need to take steps that are equivalent to the hazard assessment to establish eligibility for the exemption. The offsite consequence analysis is the most significant burden for a Program 1 process under this rule. The minimal additional actions required in today's rule for Program 1 simply establish a record of eligibility and a response coordination mechanism.

EPA recognizes that emergency responders and site visitors could be hurt by an accidental release from any process, but notes that responder safety is covered by OSHA and EPA under the HAZWOPER regulations. It is the owners' or operators' responsibility to inform visitors about the hazards and the appropriate steps to take in the event of an accidental release from any process subject to today's rule.

Finally, EPA has based the registration information requirements in today's rule on the EPCRA section 312 Tier II form. The CAA requires that the RMP be registered with EPA. Because the EPCRA form is not submitted to EPA, it would not substitute for registration with EPA either in its present or amended form. Completion of the registration portion of the RMP should impose little additional burden on owners or operators. However, EPA recognizes the information overlap between the Tier II form and the RMP registration and is considering use of the RMP registration for the Tier II reporting requirement.

5. Program 2 Requirements. Commenters were generally concerned about the lack of specific requirements for the Program 2 streamlined prevention program and emergency response requirements, and how compliance with other regulations would be incorporated.

a. Streamlined Program. Commenters stated that the Program 2 prevention program does not provide much, if any, regulatory relief because sources would need to address most of the ten elements of the Program 3 prevention program. Others said that the majority of the sources affected by the rule are already covered by OSHA PSM and chemical industry standards, the Program 2 requirements do not satisfy the CAA mandate, and that only a full process hazard analysis would meet the hazard assessment requirements under section 112(r). Another commenter argued that EPA's statement that sources must comply with the CAA's general duty clause was inadequate because EPA has not used, and has no policy about, the clause.

EPA agrees that the preferred approach in the SNPRM did not provide sufficient detail on Program 2 prevention requirements to distinguish it from Program 3. EPA solicited comments on whether Program 2 should require additional, specific prevention steps. Today's rule provides specific requirements as discussed in section I.D above and in Section IV below. In the RMP, the owner or operator will be required to report on other Federal or state regulations, industry codes, and standards used to comply with prevention elements as well as any major hazards, process controls, mitigation systems, monitoring and detection systems examined in the hazard review. This streamlined prevention program addresses many of the PSM elements as the basis for sound prevention practices, but is tailored to processes with less complex chemical uses; this program provides considerable regulatory relief by substantially reducing the documentation and recordkeeping burden of PSM. In addition, EPA will provide guidance and model risk management programs to further assist Program 2 processes in developing and maintaining good prevention program practices.

EPA disagrees that only a full PHA would meet the requirements of the Act. Section 112(r) does not contain detailed requirements for the hazard assessment, beyond the key components of accidental release scenarios and a five-year accident history. EPA believes that a PHA is more appropriately considered an element of a prevention program, such as PSM. The statute does not mandate detailed PHA engineering analyses for all sources, whether as part of the hazard assessment or the prevention program. EPA believes PHAs involve a more detailed engineering analysis than is necessary to prevent accidents at Program 2 sources. The "hazard review" provisions of Program 2 should be sufficient to detect process hazards at these simpler processes. EPA recognizes that although hazard assessments and PHAs or process hazard reviews are discreet elements that can be performed independently, hazard assessment results can enhance PHA or process hazards reviews and in turn, the results of the PHA or review can enhance the hazard assessment. EPA encourages owners or operators to make maximum use of the PHA or review and hazard assessment information to manage risks and prevent accidents.

Finally, sources with Program 2 requirements, as well as sources with Program 1 or 3 requirements, must comply with the general duty clause of CAA Section 112(r)(1). The general duty clause provides that owners and operators have a general duty to identify hazards that may result from accidental releases, design and maintain a safe facility, and minimize the consequences of any releases that occur. The general duty clause is a self-executing statutory requirement: it requires no regulations or other EPA action to take effect. The clause provides a separate statutory mechanism that EPA will use in appropriate circumstances to ensure the protection of public health and the environment. To date, EPA has undertaken several inspections designed in part to determine compliance with Section 112(r)(1). As appropriate at a future date, EPA may issue policies or guidance on application of the general duty clause.

b. Other Regulations. Commenters generally agree that OSHA PSM, HAZWOPER, the OSHA hazard communication standard (29 CFR 1910.1200), and NFPA-58 are examples of other regulations or voluntary industry standards that could be cited to meet the requirements of a Program 2 prevention program. Commenters requested that EPA provide a matrix or crosswalk that indicates which other regulations, standards, and codes met specific requirements. One commenter opposed the use of other regulations or referencing of voluntary industry standards, stating that, other than OSHA PSM, no other OSHA standard addresses safety precautions or maintenance. Another commenter objected that this approach creates another documentation burden without any commensurate benefit.

EPA agrees that the SNPRM preferred approach for Program 2 was not specific enough and has provided more detailed requirements in this rule as noted above. EPA continues to believe that many of the Program 2 prevention requirements are already met through industry compliance with existing regulations and voluntary standards. For example, ammonia retailers whose processes are designed to meet the OSHA ammonia handling rule (29 CFR

1910.111) should be able to meet the Program 2 requirement that the process design meets good engineering practices. This effectively allows sources to cite compliance with these other regulations and standards instead of developing specific, duplicative elements solely to comply with Program 2. EPA will also use these existing regulations and standards as it develops model programs.

c. Emergency Response Program. Commenters supported considering HAZWOPER programs as adequate to meet the Program 2 emergency response program. A few commenters said that HAZWOPER is inadequate because it does not consider offsite impacts or the environment. Some commenters also said that coverage of a source by an EPCRA community emergency response plan should be sufficient. Others said that any contingency plan developed under Federal or state law should be considered sufficient because the requirements under these programs are generally consistent with EPA's proposed emergency response program; one commenter noted that, for flammable processes, compliance with 29 CFR 1910.38 should be adequate because the response is usually evacuation of employees. Five commenters opposed any requirement that sources with Program 2 processes conduct drills or exercises because they represent lower hazards.

Consistent with its efforts to consolidate Federal emergency planning requirements, EPA has included language in the final rule that will allow any source in compliance with another Federal emergency response program that includes the elements specified in this rule to use that program to meet these requirements. In particular, this applies to response plans prepared in accordance with the National Response Team's Integrated Contingency Plan Guidance ("one plan") (NRT, May 1996). EPA believes that sources should have a single response plan; creation of multiple response plans to meet slightly different Federal or state standards is counterproductive, diverting resources that could be used to develop better response capabilities.

EPA recognizes that some sources will only evacuate their employees in the event of a release. For these sources, EPA will not require the development of emergency response plans, provided that appropriate responses to their hazards have been discussed in the community emergency response plan developed under 42 U.S.C. 11003 for toxics or coordinated with the local fire department for flammables.

B. Offsite Consequence Analysis

1. Worst-Case Release Scenario. EPA proposed in the NPRM to define the worst-case release as the "loss of all of the regulated substance from the process * * * that leads to the worst offsite consequences" and that the scenario should assume "instantaneous release." Hundreds of commenters stated that instantaneous loss of the total process contents is not technically feasible for complex systems and, therefore, represents a non-credible worst case that would provide no useful information to the public or the source for risk communication, accident prevention, and emergency preparedness. Many commenters also argued that this approach differed from the release modeling assumptions contained in EPA's Technical Guidance for Hazards Analysis, which has been the basis for community emergency planning activities under EPCRA. Although some commenters were generally opposed to the concept of worst case, most of the commenters were supportive of an approach similar to that taken in the Technical Guidance.

In response to these comments, EPA proposed in the SNPRM to redefine a worst-case scenario as the release, over a 10-minute period, of the largest quantity of a regulated substance resulting from a vessel or process piping failure. The 10-minute release time is drawn from the Technical Guidance for Hazards Analysis. EPA believes this duration is reasonable and accounts for comments arguing that an "instantaneous" release is unrealistic for large-scale releases.

EPA has decided to adopt the SNPRM approach for worst-case toxic vapor releases in the final rule because most of the SNPRM comments agreed that the redefinition is generally more credible and that the 10-minute time frame particularly applies to vapor releases. Although some commenters argued that this approach still does not account for all process-specific conditions, EPA believes it is reasonable and representative of accident history. EPA notes that owners or operators may use air dispersion modeling techniques that better account for site-specific conditions, provided modeling parameters as specified in the rule are applied. This release scenario will apply to substances that are gases at ambient conditions, including those liquefied under pressure. Gases liquefied by refrigeration only may be analyzed as liquids if the spill would be contained by passive mitigation systems to a depth greater than 1 cm.

Under the SNPRM, worst-case liquid spills were assumed to form a pool in 10 minutes, with the release rate to the air determined by volatilization rate. EPA recognized that this approach differs from the use of an instantaneous release in the Technical Guidance, which EPA cited as an alternative to its favored approach. The few comments received were divided between support of this approach and arguments that the 10-minute time frame was unrealistic for liquid releases (particularly for pipelines and connected equipment) and thus did not properly account for process-specific conditions.

EPA's approach for the liquid worst-case scenario in the final rule is similar to the Technical Guidance methodology, in which the total quantity of liquid in a vessel or pipeline is instantaneously spilled upon failure, considering administrative controls or passive mitigation discussed below. The rate of release to the air is not instantaneous; it is determined by the volatilization rate of the spilled liquid, which depends on the surface area of the pool formed after the spill. The pool surface area is determined by assuming the spilled liquid rapidly spreads out and forms a one-centimeter deep pool, unless passive mitigation systems contain the pool to a smaller area. EPA believes this approach is reasonable because total vessel or pipeline failure will generally lead to immediate and rapid spillage followed by pool volatilization. Further, if the liquid were assumed to spill over a particular time frame rather than instantaneously, owners or operators would need to calculate the amount of vapor emitted to the air as the liquid is spilled, in addition to the volatilization rate as the pool spreads out and reaches its maximum size. Computer-based models are available for such calculations, but they are complex and require considerable data input to use. EPA believes that liquid spillage from a worst-case scenario is likely to be extremely rapid such that the most significant portion of the release rate is given by pool volatilization; consequently, liquid release time is not necessary. Liquid spill rates and times could be reflected in alternative scenarios discussed below.

As proposed, the worst-case for flammables assumes that the total quantity of the substance in the vessel or pipeline vaporizes, resulting in a vapor cloud explosion. If the vapor cloud explosion is modeled using a TNT-equivalent methodology, then a 10 percent yield factor must be used.

EPA requested comment in the SNPRM on whether the worst-case scenario should include an additional amount of substance that could potentially drain or flow from process equipment interconnected with the failed vessel or pipeline. Many commenters opposed this option, suggesting that it is technically uncertain and would have little value in terms of what they saw as EPA's intended purpose for the worst-case assessment. Other commenters requested that "interconnected equipment" be defined and clarified. Given the assumption of rapid release associated with initial equipment failure, EPA agrees that determination of the spill rate from connected piping and equipment is likely to be technically complex, very different from that of the quantity in the vessel or failed pipeline, and likely to extend the duration of volatilization rather than affecting the rate overall. Therefore, EPA has not included this requirement in the final rule.

EPA also sought comment in the SNPRM on options for the determination of the relevant quantity of regulated substance in a vessel or process piping for a worst-case release scenario: the maximum possible vessel inventory (design capacity) at any time without regard for operational practices and administrative controls; the maximum possible vessel inventory unless there are internal administrative controls (written procedural restrictions) that limit inventories to less than the maximum; or historic or projected maximum operating inventories without regard to administrative controls. EPA preferred that the maximum vessel inventory including administrative controls that might limit or raise the vessel quantity to be used in the worst-case assessment and reported in the worst-case release analysis section of the RMP. If the quantity used in the assessment were exceeded (e.g., an administrative control were ignored), then the source would be in violation of the rule (i.e., failure to perform a worst-case analysis) and RMP reporting unless the administrative control was revised, the worst-case analysis updated to reflect any changes in the analysis, and a revised RMP submitted. This approach acknowledges the efforts by sources to increase process safety by intentionally reducing the inventory of regulated substances (e.g., vessels kept at half capacity to allow for process upsets, emergency shutdowns, and deinventorying or maintenance turnarounds). EPA notes that at some sources, as a result of inventory reduction measures, the largest quantity may be held in a transportation container that is loaded or unloaded at the source (See section P.2).

A few commenters supported the other options, noting that administrative controls may fail, potentially generating a larger scenario. However, the majority of commenters supported EPA's preferred approach based on the historical reliability of such controls at many sources and the role that such a provision could play in encouraging their use at additional locations. Other commenters asked whether mechanical controls, alone or in combination with administrative controls, should be incorporated into the proposal. Although mechanical controls may also serve to limit the quantity, EPA has decided not to include them in the quantity determination for the worst-case release scenario because the definition for administrative control as "written procedural mechanisms used for hazard control" provides a backup for possible failure of mechanical controls. For more discussion of mechanical controls, see section III(B)(2), mitigation systems, below.

In the SNPRM, EPA considered providing the implementing agency with the discretion to determine the appropriate quantity for the worst-case release scenario on a site-specific or industry-specific basis. EPA noted in the SNPRM, and most of the few comments received on this issue agreed, that implementing agency discretion would result in increased administrative burden on the implementing agency and cross-jurisdictional differences in the methodology used for the worst-case analyses. EPA has decided not to incorporate this approach in the final rule. States, however, may impose more stringent requirements, such as additional modeling, under state authority.

In the NPRM worst-case definition, EPA did not specify what constitutes or how to determine the worst offsite consequences. Some commenters indicated that without clear direction, EPA's proposed worst case might not actually capture the scenario that leads to the most severe offsite impact. In the SNPRM, EPA indicated that the worst-case scenario should be the scenario that generates the greatest distance to a specified endpoint (i.e., the toxic vapor cloud or blast wave from a vapor cloud explosion that travels the farthest).

EPA recognizes that there may be other release scenarios that could generate a greater distance than the release from the largest vessel or pipeline. Consequently, EPA has added paragraph (h) to § 68.25 to require owners or operators to consider other scenarios if those scenarios generate greater distances to the endpoint than the distance generated by the largest vessel or pipeline scenario. Owners or operators need to consider releases from smaller vessels if those vessels contain the substance at higher temperature or pressures or if they are closer to public receptors. In some cases, the largest vessel will be a storage vessel where the substance is held at ambient conditions. A reactor vessel may hold a smaller quantity, but at high pressures and temperatures, generating a release that could travel farther offsite to an endpoint. Vessel location is important, especially at large sources. A smaller vessel located nearer to the stationary source boundary may generate a greater impact distance than a larger vessel farther away. This difference may be particularly important for flammables, because impact distances for flammables are generally shorter than those for toxic releases.

2. Mitigation Systems

a. Worst-case scenario. In the NPRM worst-case scenario, EPA indicated that sources must assume that both active and passive systems fail to mitigate the release. Commenters were generally split between those who wanted passive (as well as certain redundant active) mitigation systems to be included and those who argued that historical evidence from catastrophic releases suggests that the worst case should assume the failure of all such systems. Those who supported mitigation argued that inclusion provides a more credible scenario for improved risk communication, accident prevention, and emergency planning.

EPA proposed in the SNPRM to include passive mitigation systems in the worst-case release scenario as long as the system is capable of withstanding, and continuing to function as intended during and after a destructive event, such as an earthquake, storm, or explosion, which causes a vessel or pipeline to fail. Passive systems such as dikes, catch basins, and drains for liquids, and enclosures for both liquids and gases, could be assumed to mitigate the release. Some commenters opposed this approach, arguing again that the worst case should account for the possibility of passive mitigation failure. The majority supported this approach because the assumption that passive systems specifically designed and installed as protection against a potential catastrophe fail is unrealistic. Furthermore, the approach recognizes and encourages prevention through additional passive mitigation and supports more realistic emergency planning. A few commenters also suggested that active mitigation measures that were unlikely to fail (e.g., redundant or backup systems) should be considered, for similar reasons. Historical data, however, indicate that certain events compromise active mitigation systems (e.g., explosions have destroyed fire water piping systems).

For the final rule, EPA has decided to adopt the SNPRM approach. Passive mitigation systems would be defined as those systems that operate without human, mechanical, or other energy input and would include building enclosures, dikes, and containment walls. EPA also agrees that reservoirs or vessels sufficiently buried underground are passively mitigated or prevented from failing catastrophically. In this case, sources should evaluate the failure of piping connected to underground storage for the worst case or alternative case scenarios. In addition to the requirements outlined in § 68.25, EPA provides guidance on how passive mitigation would affect release rate and distance to endpoints in its RMP Offsite Consequence Analysis Guidance.

b. Alternative scenarios. EPA initially proposed that sources could include passive mitigation systems in their alternative scenario assessments, but that active mitigation systems (e.g., excess flow valves, fail-safe and automatic shutdown valves, scrubbers, flares, deluge systems, and water curtains) would be assumed to fail. Some commenters generally opposed inclusion of any mitigation systems in the hazard assessment, while other commenters noted that the alternative release scenario should recognize and encourage industry accident prevention efforts, specifically the installation of additional mitigation systems, and support more realistic emergency planning.

EPA proposed in the SNPRM to allow sources to consider passive and active mitigation measures in the alternative release scenario assessment. Commenters supported this approach and EPA has decided to retain it in the final rule. EPA agrees that the assumption that both passive and active mitigation measures fail when such measures are specifically designed and installed to mitigate catastrophic releases is unrealistic for the alternative scenarios. Although not required, EPA notes that sources may choose to apply passive and active mitigation measures to a worst-case type scenario to illustrate the capabilities of such systems to reduce the potential impact of a worst-case accidental release. In addition to the requirements outlined in § 68.28, EPA provides guidance in its RMP Offsite Consequence Analysis Guidance on how passive and active mitigation would affect release rate and distance to endpoints.

3. Populations Affected. EPA described in the NPRM preamble certain locations (e.g., schools and hospitals) where sensitive populations might be present and proposed in the rule that owners or operators identify potentially exposed populations as part of the offsite consequence assessment. Commenters generally opposed requirements for population surveys; several commenters suggested that Census data or other readily available population information should be sufficient, while other commenters indicated that the LEPC or other local planning entities were the appropriate entity to prepare these data.

EPA believes owners or operators need to be aware of the magnitude of impact on populations associated with the worst-case and alternative scenarios. However, EPA learned that, although much of this information is readily available, identification of some sensitive populations could require considerable effort, especially if the distance to an endpoint generated in the offsite consequence assessment is large or crosses several jurisdictions. Consequently, EPA proposed in the SNPRM that offsite populations be defined using available Census data; information on the number of children and people over 65 could be considered a proxy for sensitive populations, thereby accomplishing the same objective as the proposed rule. EPA also indicated that it has developed a geographic information system, LandView, that will facilitate analysis of resident populations. (LandView can be ordered from the U.S. Bureau of the Census customer service at (301) 457–4100.) In general, commenters agreed with the SNPRM approach. However, some commenters questioned the accuracy of potentially ten-year-old Census data and requested additional flexibility, or a greater role for local government, in this analysis.

EPA has decided to adopt the approach outlined in the SNPRM for the final rule. Sources will be allowed to use available Census data to estimate populations potentially affected. Sources may update these data if they believe the data are inaccurate, but are not required to do so. Populations shall be reported to two significant digits. Because Census data are limited to residential populations, sources will also have to note in the RMP whether other, non-residential populations, such as schools, hospitals, prisons, public recreational areas or arenas, and major commercial or industrial areas, are within the distance to an endpoint. These institutions and areas are those that can generally be found on local street maps. Sources will not be required to estimate the number of people who might be present at these locations. EPA provides further guidance on the identification of affected populations in its RMP Offsite Consequence Analysis Guidance.

4. Number of Scenarios In the NPRM. EPA required a worst-case release scenario for each regulated substance. Commenters requested clarification, because one substance could be present in more than one process at the source and sources would need to select the "worst" worst case for substances in multiple processes. In addition, one process may have several, similar listed substances and multiple worst-case analyses of similar substances (e.g., flammables) would not provide additional useful information to the public.

EPA proposed in the SNPRM that sources report in the RMP one worst-case release scenario representative of all toxic substances present at the source and one worst-case release scenario representative of all flammable substances present at the source. Even though additional screening analyses to determine the appropriate worst-case scenario might be necessary, this approach reduces to a maximum of two the number of worst-case analyses reported in the RMP by a source. In general, commenters favored this approach, particularly for flammables, which do not produce markedly different adverse effects. A few commenters argued that a single toxic substance should not be considered representative of all toxic substances at a source, since there are considerable differences in toxic endpoint and adverse affect.

EPA has decided to adopt the approach outlined in the SNPRM for the final rule: report one worst-case release scenario for all flammables and one worst-case release scenario for all toxics at the source. EPA notes that the worst-case scenario is designed principally to support a dialogue between the source and the community on release prevention, and not to serve as the sole or primary basis for local emergency planning. The "worst" worst-case release scenario will inform the broadest range of individuals that they may be impacted by the source so that they may participate in dialogue with the source about prevention, preparedness, and emergency response actions. Lesser worst-case release scenarios would not inform any person not already within the range of the "worst" worst case even though the health effects may be different; consequently, EPA believes that only a single toxic worst case is necessary. However, sources must also analyze and report another worst-case release scenario (for flammables or toxics) if such a release from another location at the source potentially affects public receptors different from those potentially affected by the first scenario (e.g., if a large-sized source is located between two communities and has a covered process adjacent to each community).

In the NPRM, EPA did not specify the number of alternative scenarios to be reported for each regulated substance. EPA noted in the preamble that this approach, while providing flexibility, may also create uncertainty about what EPA will consider to be an adequate number of scenarios. While a few commenters argued against scenarios beyond the worst case, many commenters supported a requirement for a maximum of two: the worst case plus one additional scenario; others supported a maximum of three. Many of the commenters noted that local entities could request further information under EPCRA section 303(d)(3) authority if they desired. At the same time, a number of commenters suggested that this determination should be made by the source based on their scenario analysis, perhaps in coordination with a local agency.

In the SNPRM, EPA proposed to require one alternative release scenario for all flammable substances at the source and one alternative scenario for each toxic substance at the source. As discussed above, the listed flammable substances behave similarly upon release and have the same endpoint, while each toxic substance has a different endpoint and different atmospheric behavior. EPA sought comment on whether one toxic substance alternative scenario could represent all toxic substances at a source or in a process. Although commenters generally agreed with the approach for flammables, only a few argued that a single alternative scenario for all toxics was also appropriate; most others supported EPA's proposal.

Upon review of the comments, EPA has decided to adopt the approach outlined in the SNPRM: an alternative release scenario must be reported in the RMP for each toxic held above the threshold at the source, and one alternative scenario must be reported that represents all flammables held above the threshold. As EPA noted in the SNPRM preamble and commenters echoed, the differences in the hazards posed by individual toxic regulated substances are significant and should be reflected in the alternative scenarios. This information has significant value for emergency planning purposes and could increase public interest in prevention at the source.

5. Technical Guidance The proposed rule required sources to evaluate the consequences (vapor cloud dispersion, blast wave, or radiant heat modeling calculations) associated with the worst-case and alternative release scenarios. EPA did not specify a methodology or models, expecting that sources would have, contract for, or find the expertise and modeling tools needed to perform potentially complex modeling calculations. Because of the potential burden associated with this approach, EPA began working on the development of a set of simple, generic tools that could provide useful results and become part of the technical guidance for the rule. Based on its experience in developing the Technical Guidance for Hazards Analysis and on advice from commenters, EPA understands that a generic methodology depends on approximations to capture a wide variety of situations, will likely ignore site-specific conditions, and potentially may generate overly conservative or less realistic estimates of offsite impacts. In spite of these limitations, EPA believes that generic modeling tools are capable of supporting greater understanding of the hazards posed by substances and emergency planning. Commenters agreed this approach would reduce the burden on smaller sources unfamiliar with such activities as long as use of the guidance was not mandatory, and the guidance addressed specific industry sectors or was used as part of a screening process to focus resources on significant problem areas. Many commenters recommended that sources be given the flexibility to use any appropriate modeling techniques for the offsite consequence analysis to take advantage of expertise and to apply site-specific considerations to the hazard assessment. Other commenters argued that EPA should establish mandatory guidelines or specify certain dispersion modeling tools to make release scenario results more comparable across sources. Some commenters were concerned about the development of modeling tools by EPA outside of the rulemaking process and requested the opportunity to participate in their development.

In the SNPRM, EPA stated it would develop a generic methodology and reference tables in an offsite consequence assessment guidance to assist sources with the analyses required by the rule. EPA believed that the Technical Guidance could be revised, expanded, and updated to address the rule requirements. The methodologies and tables would be subject to public review prior to publication of the final rule; once finalized, the tables would replace the Technical Guidance. EPA added that sources that wish to conduct more sophisticated modeling could do so, provided the techniques used account for the modeling parameters described in the rule. Alternatively, EPA proposed that only Program 2 sources use the guidance; Program 3 sources would be required to conduct their own dispersion modeling.

Most commenters supported the SNPRM approach, especially if sources were given the option to use their own site-specific modeling. Some commenters argued that the generic methodology and reference tables and the option for site-specific modeling should be applied to processes in all three Programs, while others suggested that they be applied only to a specific Program. In recognition of these comments, EPA prepared draft modeling methodologies and reference tables, provided an opportunity for their review (see 61 FR 3031, January 30, 1996), and has published them as the RMP Offsite Consequence Analysis Guidance. EPA intends to conduct peer review of the RMP Offsite Consequence Analysis Guidance and will revise it as appropriate. For the final rule, EPA will allow sources in all Programs to use the guidance or conduct their own site-specific modeling, provided the modeling techniques used account for the parameters described in the rule. For example, EPA's Office of Air Quality Planning and Standards has prepared a publicly available modeling tool called TScreen that can assist owners and operators with consequence assessments. EPA also encourages local emergency planners, fire departments, and others who use tools such as CAMEO/ALOHA or other modeling techniques to assist businesses in their community who may need help in their modeling efforts. EPA believes the final rule approach takes advantage of the broad range of expertise and modeling tools already available and will provide more useful results at the local level for chemical emergency prevention, preparedness, and response. This approach will also stimulate accidental release modeling research, new and existing model development, and model validation to generate new tools for better understanding of hazards and the behavior of substances in accidental release situations.

6. Modeling Parameters. a. Endpoints. In the NPRM, EPA did not specify toxic or flammable substance endpoints that must be used in the offsite consequence assessment modeling. Most commenters recommended that EPA specify endpoints to provide a consistent basis for modeling; many favored the use of existing standards or guidelines, primarily the emergency response planning guidelines (ERPGs) developed by the American Industrial Hygiene Association for toxic substances. For flammables, commenters suggested overpressure, heat radiation, and explosion or flammability limits. In addition to other specific standards, a few commenters recommended a hierarchy of values if certain levels for some chemicals were not available.

In the SNPRM, EPA indicated that it would select one endpoint for each toxic substance for use in the offsite consequence assessment methodology and sought comment on whether it should use a single endpoint to the extent possible (e.g., the Immediately Dangerous to Life and Health (IDLH) value developed by the National Institute for Occupational Safety and Health (NIOSH), unless one does not exist for a substance), or a hierarchy of endpoints (e.g., ERPGs; if one does not exist, then the IDLH; and finally toxicity data if no other value is available). EPA also asked whether overpressure or both overpressure and radiant heat effects should be used for flammable substance endpoints. Some commenters supported the use of ERPG values for the toxic substance endpoint, or a hierarchy of values beginning with the ERPG. Others opposed IDLH or the IDLH divided by 10 for technical reasons.

EPA agrees with commenters that one toxic endpoint should be set for each substance. The endpoint for each listed toxic substance is provided in Appendix A to the final rule. The endpoint, applicable whether the source uses the EPA guidance or conducts site-specific modeling described below, is the AIHA ERPG–2 or, if no ERPG–2 is available, the level of concern (LOC) developed for the Technical Guidance, corrected where necessary to account for new toxicity data. The LOCs that were based on IDLHs have been updated only if the IDLHs were revised between the original LOC listing in 1987 and the 1995 IDLH revisions. The most recent IDLH revisions were not used because they are based on a methodology that EPA has not reviewed; the previous IDLH methodology was reviewed by EPA's Science Advisory Board for use as LOCs. EPA chose the ERPG–2 first because ERPGs are subject to peer review and are specifically developed by a scientific committee for emergency planning to protect the general public in emergency situations. The ERPG–2 represents the maximum airborne concentration below which the committee judges that nearly all individuals could be exposed for up to an hour without experiencing or developing irreversible or other serious human health effects or symptoms that could impair their ability to take protective action. EPA rejected the ERPG–3, which is a lethal exposure level, because it is not protective enough of the public in emergency situations. About 30 listed toxic substances have ERPGs. EPA chose to use LOC levels for substances with no ERPG because LOCs have been peer reviewed by EPA's Science Advisory Board, they are intended to be protective of the general public for exposure periods of up to an hour, they are widely used by the emergency response planning community, and, for a majority of the listed toxic substances, there are no acceptable alternatives. EPA notes that, for substances with both values, the LOC is comparable to, and in some cases is identical to, the ERPG–2.

EPA recognizes potential limitations associated with the ERPG and LOC and is working with other agencies to develop Acute Exposure Guideline Limits (AEGLs). See Establishment of a National Advisory Committee for Acute Exposure Guideline Levels (AEGLs) for Hazardous Substances, (60 FR 55376; October 31, 1995). When these values have been developed and peer-reviewed, EPA intends to adopt them, through rulemaking, as the toxic endpoint for substances under this rule.

As proposed, vapor cloud explosion distances will be based on an overpressure of 1 psi, and for analysis of worst-case releases, a yield factor of 10 percent. Yield factors (the percentage of the available energy released in the explosion process) can vary considerably. EPA selected 10 percent to generate conservative worst-case consequences. For flammables, EPA selected a radiant heat exposure level of 5 kW/m^2 for 40 seconds as recommended by the commenters, and, for vapor cloud fire and jet fire dispersion analysis, the lower flammability limit (LFL) as specified by NFPA or other recognized sources.

b. Meteorology. In the NPRM, EPA proposed that sources model the downwind dispersion of the worst-case release scenario using an F atmospheric stability class and 1.5 m/s wind speed and model the alternative release scenarios using both the worst-case conditions and the meteorological conditions prevailing at the source. EPA did not revise the meteorological assumptions in the SNPRM.

Several commenters argued that the worst-case meteorological conditions were too conservative or not applicable on a national basis and that site-specific conditions should be used, while others agreed that for worst case, minimum wind speeds and the most stable atmospheric conditions should be used. In the final rule, EPA has decided that sources must conduct worst-case dispersion modeling using an F atmospheric stability class and a 1.5 m/s wind speed. A higher wind speed or less stable atmospheric stability class may be used if the owner or operator has local meteorological data applicable to the source that show that the lowest recorded wind speed was always greater or the atmospheric stability class was always less stable during the previous three years.

In the final rule, EPA also requires sources to conduct alternative release scenario dispersion modeling using the typical meteorological conditions applicable to the source. If meteorological data are not available, typical conditions in the RMP Offsite Consequence Analysis Guidance may be used. EPA believes typical meteorological conditions should be used to generate realistic hazard assessments for communication with the public and first responders and for emergency planning.

C. Consideration of Environmental Impact

The issue of whether and how environmental impacts should be addressed in the hazard assessment and the rule in general drew considerable comment. The comments divide into three questions: Should EPA consider environmental impacts from accidental releases? If so, which environments should be identified? What constitutes an environmental impact?

1. Inclusion of Environmental Impacts. Environmental groups argued that the CAA requires assessment of potential impacts to the environment and that the environmental receptors listed in the SNPRM should be broadened. One commenter stated that since the CAA Amendments of 1990 strengthened limits of continuous air toxic emissions, wildlife is now threatened more by accidental releases. However, the majority of commenters on this issue, principally industry groups, opposed consideration of the environment because it is adequately protected by other environmental statutes, environmental protection in section 112(r) relates only to emergency

response, and Congress intended in section 112(r) for the environment to be addressed only to the extent that human health is protected. Several commenters argued that flammable substances were unlikely to generate environmental impacts. Commenters also stated that many industries have voluntarily developed nature reserves around their sources, often at the urging of government agencies. Additional regulations based on "environmental" impact consideration would "penalize" these sources for their efforts. Finally, two commenters noted that EPA's endpoints are based on acute human effects; applying these to the environment may not be valid.

EPA disagrees that section 112(r) was not intended to protect the environment as well as human health. Although section 112(r)(5) links the threshold quantity to human health, section 112(r)(3) requires EPA to select substances that could impact human health and the environment. EPA agrees that the only time sections 112(r)(7)(B)(I) and (ii) mention protection of the environment is in conjunction with emergency response; however, this is also true for protection of human health. Congress did not intend to limit concern about either impact strictly to emergency response procedures; Congress may not have mentioned either impact relative to prevention because the act of preventing an accident eliminates the impact on both. When accidents occur, human health and the environment need protection. By mentioning both impacts in the response or post accident phase, Congress was stressing its concern for the environment as well as human health. Given the integrated nature of the RMP, it would be an inappropriately narrow reading of CAA section 112(r)(7)(B) to say environmental impacts must be ignored in hazard assessments and in the design of the prevention program, but must be accounted for in emergency response. In addition, section 112(r)(9) provides authority for EPA to take emergency action when an actual or threatened accidental release of a regulated substance may cause imminent and substantial endangerment to human health, welfare, or the environment. Clearly, section 112(r)(9) allows EPA to take action to prevent, as opposed to simply respond to, accidental releases to protect the environment. Because section 112(r)(7) is intended to prevent situations that could lead to emergency orders under section 112(r)(9), it is logical to conclude that Congress meant EPA to develop regulations that would prevent accidental releases that could cause environmental damage. Although the consequences may not be precisely known, EPA believes that impacts could occur at environmental receptors located within the distance to a human acute exposure endpoint associated with a worst-case or alternative scenario because wildlife may be more sensitive or require less exposure to cause an adverse effect than humans.

2. Environmental Receptors to Be Considered. In the SNPRM, EPA proposed that sources report in their RMP which sensitive environments listed by the National Oceanographic and Atmospheric Administration (NOAA) for the Clean Water Act are within the distance determined by the worst-case or alternative case scenario. A few commenters argued that the list should include state and local level analogues to Federal entities (e.g., state parks), all surface waters that are fishable or swimmable or supply drinking water, and ground water recharge areas. Many commenters opposed the NOAA list, arguing that the list is extremely broad, covers millions of acres in primarily rural areas, and contains areas that are difficult for both the regulated community and the government to clearly identify (e.g., habitat used by proposed threatened or endangered species, cultural resources, and wetlands). They stated that the NOAA list is not appropriate for this rule because it represents guidance applicable to offshore sources, and to a limited number of very large onshore sources, that could have catastrophic oil spills. A few commenters suggested limiting the list to Federal Class I areas designated under the CAA prevention of significant deterioration program, or reducing the list of sensitive areas to national parks and the designated critical habitat for listed endangered species, and limiting environmental concern to those accidents that generate a significant and long-term impact, such as an actual "taking" of an endangered species.

For the final rule, EPA has not used the NOAA list. Instead EPA requires owners or operators to indicate in the RMP the environmental receptors located within circles whose radii are the distances to an endpoint for the worst-case and alternative release scenarios. EPA agrees with commenters that the locations of certain natural resources are difficult to identify. Consequently, EPA has defined environmental receptors as natural areas such as national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, refuges, or areas; and Federal wilderness areas, that can be exposed to an accidental release. All such receptors typically can be found on local U.S. Geological Survey (USGS) maps or maps based on USGS data. Habitats of endangered or threatened species are not included because the locations of these habitats are frequently not made public to protect the species. Natural resource agencies will have access to the RMP information and can raise concerns with local officials about potential harm to these habitats, as necessary. Local emergency planners and responders may want to consult with environmental management agencies as part of emergency preparedness.

3. Level of Analysis Required. In the SNPRM, EPA proposed that sources only identify sensitive environments within the area of the worst-case release, rather than analyzing potential impacts. A few commenters opposed this approach, stating that the CAA requires that sources analyze impacts. Most commenters supported EPA's position because extensive expertise at considerable cost is required to adequately assess all environmental impacts associated with the environments list EPA provided. Commenters stated that this cost would make fewer resources available for prevention activities and providing no benefit. Other commenters noted that much of the data needed for such analyses is not available.

EPA agrees that extensive environmental analysis is not justified. Irreversible adverse effect exposure level data for the wide variety of environmental species potentially exposed in an accidental release event are not available for most of the listed substances. EPA believes that identification of potentially affected environmental receptors in the RMP is sufficient for purposes of accident prevention, preparedness, and response by the source and at the local level.

D. Program 3 Consistency with OSHA PSM Standard

1. Prevention Program. In EPA's original proposal, the prevention program requirements were based on the elements of OSHA's PSM standard (29 CFR 1910.119), and some commenters supported this approach. But EPA added a paragraph to each OSHA prevention program element to explain the purpose of the provision and, in some instances, added additional recordkeeping, reporting, or substantive provisions to ensure that statutory requirements were met. Several commenters argued that these additions cause confusion and appear to require sources to create two separate

prevention programs, which could cause conflicting inspection and enforcement actions and greater cost for sources that must comply with both the OSHA and EPA requirements. Many commenters suggested that EPA simply reference the OSHA requirements.

EPA agrees that the Program 3 prevention program requirements should be identical to OSHA's PSM standard to avoid confusion and redundant requirements and to ensure that sources develop one accidental release prevention program that protects workers, the general public, and the environment. Therefore, EPA has moved the Management System requirement (see section I.D) supported by most commenters to a section separate from the Prevention Program and deleted the introductory paragraphs and modifications to the PSM language. The Agency recognizes that many workplace hazards also threaten public receptors and that the majority of accident prevention steps taken to protect workers also protect the general public and the environment; thus, a source owner or operator responsible for a process in compliance with the OSHA PSM standard should already be in compliance with the Program 3 prevention program requirements.

EPA did not cross-reference sections of the PSM standard in today's rule because, under Office of Federal Register requirements at 1 CFR 21.21(c)(2), EPA cannot adopt OSHA's requirements. EPA and OSHA have separate legal authority to regulate chemical process safety to prevent accidental releases. Furthermore, cross-referencing the OSHA standard would be tantamount to a delegation of authority to set standards in this area from the Administrator of EPA to the Secretary of Labor, because OSHA would be able to modify the PSM requirements without an EPA rulemaking under CAA § 307(d). The Senate explicitly considered and rejected the possibility of the Administrator delegating to OSHA responsibility for hazard assessment. Senate Report at 226. As that term was used in the Senate bill, hazard assessment included many of the elements of PSM.

With the exception of some key terms and phrases, the Program 3 prevention program language in the final rule is identical to the OSHA standard language (the rulemaking docket contains a side-by-side analysis of the OSHA standard and EPA rule text with word differences highlighted). Most of the differences are terms based on specific legislative authorities given to OSHA or EPA that have essentially the same meaning:

OSHA term	EPA term
Highly hazardous substance	Regulated substance.
Employer	Owner or operator.
Facility	Stationary source.
Standard	Rule or part.

EPA also agrees with commenters that sound process safety management systems ideally address chemical accident prevention in a way that protects workers, the public, and the environment. Since OSHA's responsibility is to protect workers, there are phrases in the OSHA standard that are designed to focus employer attention on accidents that affect the workplace. It could be argued that these phrases inadvertently exclude consideration of offsite impacts. EPA has deleted the phrases noted below to ensure that all sources implement process safety management in a way that protects not only workers, but also the public and the environment:

OSHA PSM requirement	EPA program 3 requirement
1910.119(d)(2)(E) An evaluation of the consequences of deviations, including those affecting the safety and health of employees.	68.65(c)(1)(v) An evaluation of the consequences of deviations.
1910.119(e)(3)(ii) The identification of any previous incident which had a likely potential for catastrophic consequences in the workplace.	68.67(c)(2) The identification of any previous incident which had a likely potential for catastrophic consequences.
1910.119(e)(3)(vii) A qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace.	68.67(c)(7) A qualitative evaluation of a range of the possible safety and health effects of failure of controls.
1910.119(m)(1) The employer shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of a highly hazardous chemical in the workplace.	68.81(a) The owner or operator shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of a regulated substance.

EPA also made changes to specific schedule dates to coordinate with the OSHA PSM requirements, made internal references consistent, and added a provision to the PHA section specifically grandfathering all OSHA PHAs and allowing sources to update and revalidate these PHAs on their OSHA schedule. EPA believes these modifications do not cause source owners or operators to make major adjustments to their PSM systems established under OSHA. These minor modifications ultimately lead to the development of one comprehensive process safety management system satisfying both OSHA and EPA that works to prevent accidents affecting workers, the public, and the environment.

EPA also modified the OSHA definition of catastrophic release, which serves as a trigger for an accident investigation, to include events "that present imminent and substantial endangerment to public health and the environment." This modification, in combination with the changes noted above, ensure that sources covered by both OSHA and EPA requirements must investigate not only accidents that threaten workers, but also those that threaten the public or the environment. EPA agrees with commenters and recognizes that most catastrophic accidental releases affect workers first. However, the Agency also believes that there are accidental release situations where workers are protected but the public and the environment are threatened, e.g. vessel overpressurizations that cause emergency relief devices to work as designed and vent hazardous atmospheres away from the workplace and into the air where they are carried downwind. Although many sources through the PHA process will have recognized and addressed the potential impact offsite associated with safety measures that protect workers (e.g. an emergency vent scrubber system), EPA believes that the requirements in today's rule ensure that all sources routinely consider such possibilities and integrate the protection of workers, the public, and the environment into one program.

2. Enforcement. Many commenters expressed concern for conflicting audit procedures, interpretations, and enforcement actions when EPA and OSHA auditors inspect the same processes. EPA has no authority to exempt a source covered under the PSM standard and today's rule from any prospect of an EPA enforcement action for violations of section 112(r) and EPA regulations issued under it. EPA and OSHA are working closely to ensure that enforcement actions are based on consistent interpretations and coordinated to avoid overlapping audits. Such coordination in enforcement was recognized as an appropriate method for exercising the Administrator's duty to coordinate the EPA program with OSHA (Senate Report at 244).

3. Exemptions. Many commenters suggested that the Agency exempt small businesses or certain industry sectors because the rule is too costly, some industries are already subject to substantial regulation by other Federal or state agencies, OSHA exempts certain industries from the PSM standard, and some sources have effective self-policing regimes in place.

Regardless of whether the source is covered under some other Federal, state, or local program, EPA has no authority to exempt a source that has more than a threshold quantity of a regulated substance from complying with the risk management program rule (CAA section 112(r)(7)(B)(ii)). EPA established the tiered approach to acknowledge that different industries pose different potential risks to human health and the environment and that elements of other regulatory programs may serve to prevent accidents. EPA believes that owners or operators can indicate in their Program and RMP how compliance with other particular regulations and standards satisfies Program or RMP elements, thereby, avoid duplication. Only those processes in certain SIC codes or covered by OSHA's PSM standard must implement the full PSM program under Program 3. A source owner or operator can demonstrate compliance with the Program 2 or 3 prevention program under today's rule for a covered process by showing that it complies with the PSM standard. This approach is consistent with the authority to set different standards for different types of sources under CAA section 112(r)(7)(B)(I).

E. Relationship to Air Permitting

Several commenters on the NPRM requested that EPA clarify the relationship between the risk management program and the air permit program under Title V of the CAA for sources subject to both requirements. In the SNPRM, EPA indicated that in Title V, section 502(b)(5)(A), Congress clearly requires that permitting authorities must have the authority to "assure compliance by all sources required to have a permit under this title with each applicable standard, regulation or requirement under this Act." EPA further states in part 70.2 that "Applicable Requirement means * * * (4) Any standard or other requirement under section 112 of the Act, including any requirement concerning accident prevention under section 112(r)(7) of the Act; * * *" Consequently, EPA must require that air permitting authorities implementing Title V permit programs be able to assure compliance with section 112(r). In the SNPRM, EPA attempted to identify the section 112(r) "applicable requirements," clarify the minimum content of part 70 permits with respect to these requirements, and to specify the role and responsibilities of the part 70 permitting authority in assuring compliance with these requirements.

The sections below address the major issue areas raised by commenters on the SNPRM. More detail can be found in the Risk Management Program Rule: Summary and Response to Comments in the Docket. The SNPRM also addressed the role and responsibilities of the implementing agency with respect to section 112(r). This issue is addressed separately in Section R below.

1. General relationship between the part 68 and air permitting programs. Some commenters agreed with EPA's proposed role for the air permitting authority with respect to section 112(r), but encouraged EPA to avoid new, confusing, and duplicative state and source permitting requirements. A few commenters suggested that all part 68 requirements should become permit conditions, that it be fully enforced through the part 70 permitting program, and that anything less violates the CAA. Most commenters (state air permitting authorities and industry), opposed EPA's proposal stating that Congress did not intend, and legislative history does not support, section 112(r) to be implemented or enforced through the Title V permit program.

EPA agrees that Congress did not intend for section 112(r) to be implemented and enforced primarily through Title V and recognizes the potential for confusion and burden on sources and air permitting authorities associated with section 112(r). EPA believes that the requirements in today's rule are flexible, impose minimal burden, address the concerns raised by commenters and satisfy the CAA requirement for assurance of compliance with section 112(r) as an applicable requirement for permitting. The requirements apply only to sources subject to both part 68 and parts 70 or 71; there are no permitting requirements on sources subject solely to part 68. EPA agrees that ideally, one authority should implement part 68 oversight; however, air permitting authorities should not be responsible for implementation just as implementing agencies should not be responsible for permitting (see implementing agency discussion in Section R, below). The air permitting authority has the flexibility under today's rule to obtain assistance, expertise or resources from other agencies in fulfilling its responsibilities with respect to section 112(r). This will foster interaction and coordination of air pollution, pollution prevention, public and worker safety and health and environmental programs at the state and local levels leading to more effective oversight.

2. Impact of EPA's proposal on air permitting programs. Several commenters stated that EPA's proposal places an unreasonable burden on air permitting programs because states would need to amend or develop new legislative authority and implementing regulations which diverts limited state resources away from the development and operation of more important routine emissions permit programs.

EPA disagrees that today's rule places an unreasonable burden on air permitting programs. Part of the approval process for a state air permitting program is confirmation that states have the authority to ensure that sources are in compliance with air toxics requirements under section 112 including section 112(r). The provisions of section 68.215 are sufficient to meet the obligations under part 70. Thus, for state and local agencies that have approved part 70 programs, states would need to develop new legislative authorities only if they seek delegation to implement part 68 beyond the narrow responsibilities provided in § 68.215 (see Section R, below). State obligations under § 68.215, which should be covered by permit fees (see section E.11, below), should not impose a substantial burden on state resources because the rule streamlines the RMP requirements and establishes centralized recordkeeping for RMPs.

3. Part 68 as an "applicable requirement" under part 70. As described above, the CAA requires that air permitting authorities ensure that sources are in compliance with applicable requirements as a condition of permitting. In the preamble of previous rulemakings for part 70 (57 FR 32301), EPA indicated that the definition of "applicable requirement" under Title V includes "any requirement under section 112(r) to prepare and register a risk management plan (RMP)." This explanatory statement preceded development of part 68, which implements section 112(r)(7). In the SNPRM, EPA proposed more specific provisions to assure compliance with applicable requirements for section 112(r) than the part 70 preamble so that air permitting authority responsibility is clear. EPA believed that all elements of part 68 are applicable requirements; however, compliance with applicable requirements could be assured by including generic terms in permits and certain minimal oversight activities. Together, these steps ensure that permitted sources fulfill their accident prevention and information sharing responsibilities.

EPA proposed standard permit conditions that would allow air permitting authorities to verify compliance with part 68. Commenters stated that alteration of the part 70 rule definition of the term 'applicable requirement' under the part 68 rulemaking is inappropriate and that the role of the air permitting authority with respect to section 112(r) should be defined in part 70 rulemakings rather than in part 68.

EPA's action today does not alter the definition of "applicable requirements" under 40 CFR 70.2, which already includes "any requirement concerning accident prevention under section 112(r)(7)." Rather, EPA is establishing very simple permit terms and flexible, minimal oversight responsibilities that will assure compliance with part 68. EPA disagrees that part 68 cannot establish more specific terms for permits than those given in part 70 or 71 with respect to section 112(r). As mentioned in the SNPRM preamble, part 70 does not preclude EPA from clarifying or even expanding air permitting responsibilities. Specific permit requirements are useful to clearly establish the minimum permit conditions and state responsibilities essential to ensuring compliance with part 68 and to reduce uncertainties that may lead to overly broad interpretations of the requirements. However, air permitting authorities still have the flexibility to establish additional terms for the permit if it so chooses.

4. Role of the air permitting authority. In the SNPRM, EPA proposed certain air permitting authority responsibilities necessary to ensure that sources are in compliance with part 68 for purposes of permitting. Commenters stated that the role of the Title V permitting authority should be defined in part 70, not in part 68 and opposed EPA's proposal arguing that it causes unnecessary confusion for sources. Commenters also argued that air permitting authorities do not have the relevant expertise needed and that states should have the flexibility to implement risk management programs in whichever agency they see fit. Other commenters argued that air permitting authorities, without section 112(l) delegation, could not accept the responsibilities assigned by the SNPRM and that EPA was unlawfully attempting to delegate the responsibility for implementing section 112(r) to the state permitting authorities. Several commenters believed the permitting authority should have no responsibilities beyond those set forth in EPA's April 13, 1993, policy memorandum from John Seitz, Director of the Office of Air and Quality Planning and Standards (OAQPS), to EPA Regional Air Division Directors, available in the docket because states invested significant resources and effort into the development of their programs, guided by this EPA memorandum. However, a state permitting authority stated that the EPA memorandum did not account for many of the key program elements, including the necessary incorporation of standard permit conditions. Many commenters also opposed requiring extensive details or all aspects of part 68 compliance in the permit, finding this approach excessive and overly burdensome on both state air permitting authorities and sources and contrary to the law and Congressional intent in that it would have required section 112(r)(7) to be fully implemented by state permit programs.

Several commenters were concerned that a single violation of part 68 could potentially be enforced by both the permitting authority and the implementing agency. One commenter suggested that the only case where a violation of a part 68 requirement should also be considered a violation of part 70 would be the failure to register an RMP on time under the requirements of § 68.12. Another commenter requested that, at § 68.58(b)(3), EPA should allow the state the discretion to determine whether a penalty should be assessed. Several commenters, uncertain how the Programs proposed by EPA in the SNPRM would affect the role of the permitting authority, suggested that EPA develop a process to inform states of the tiering approach and to exclude Program 1 and 2 sources from additional permitting requirements.

EPA believes that part 68 should more clearly define the role of the air permitting authority with respect to section 112(r). Part 70 requirements were established well before part 68 and are therefore vague. Consequently, EPA is using part 68 to clarify the applicable requirements, to specify permit terms and to establish the minimum permit conditions and activities to avoid misinterpretations and to ensure compliance with part 68. EPA agrees that air permitting authorities may not have the expertise necessary with respect to part 68; consequently, the requirements in today's rule only specify the actions the state must take to assure that sources have met their part 68 responsibilities while giving the state flexibility to assign or designate by agreement entities other than the permitting authority to carry out these activities. The elements in today's rule are the minimal components of a successful compliance program; anything less falls short of the statutory requirements of assuring compliance with all applicable requirements. EPA also disagrees that it is forcing delegation on air permitting authorities to implement section 112(r). As described in the SNPRM and above, air permitting authorities must ensure that sources are in compliance with applicable requirements for purposes of permitting. This is not section 112(r) implementation (see section R below). EPA is merely specifying more clearly the requirements already upon air permitting authorities; without the specification given in today's rule, it could be argued that air permitting authorities are obligated to review and evaluate the adequacy of RMP submissions. EPA agrees that oversight of the adequacy of part 68 compliance, including RMPs, is not an appropriate activity for the air permitting authority and is more appropriately an implementing agency duty. Delegation of these implementing agency activities can only be accomplished through a delegation consistent with part 63, subpart E.

EPA also maintains that the air permitting authority role should be more specifically defined than that offered by the April 13, 1993, memorandum. The April 1993 policy was prepared prior to the NPRM and SNPRM, it does not account for implementation of the risk management program by the source (as opposed to implementation of the plan), and there is no mechanism, such as a review of the RMP by the permitting authority, to ensure that the plan contains the elements required by part 68. These deficiencies were previously indicated by EPA in a June 24, 1994, memorandum from John Seitz and Jim Makris, Director of the Chemical Emergency Preparedness and Prevention Office (CEPPO) to EPA Regional Division Directors, which stated that "approval criteria in the April 13 memorandum may not be sufficient to ensure compliance with all 'applicable requirements' established" in the risk management program rule. EPA acknowledges that states may have invested considerable resources and effort in development of air permitting programs based on the April 13, 1993 policy. However, EPA also believes that the minimum requirements and flexibility offered by today's rule allow air permitting authorities to fold these activities into their programs with minimal burden. EPA recognizes that there may be multiple agency oversight related to permitting and part 68. As mentioned above, today's rule allows the air permitting authority the flexibility to use other agencies, such as the implementing agency or a designated agency (upon agreement), to better coordinate at the state and local level. In addition, EPA must note that there is no 'approval' of either initial or revised RMP submissions.

EPA agrees that requiring the permit to contain extensive details of part 68 compliance goes well beyond the need for part 70 permits to assure compliance with applicable section 112(r) requirements and it would impose considerable resource and expertise burdens on the permitting authority. EPA has maintained that it is not appropriate to include risk management program elements as permit conditions since these elements will be highly source-specific and subject to change as the source develops and implements its programs.

While enforcement would primarily occur using part 68 authority, EPA agrees that the permitting authority also has the authority to pursue violations under part 70 and sources could be subject to multiple violations. This is no different from any other standard promulgated by EPA that becomes an applicable requirement for permitting. EPA agrees that the air permitting authority has the discretion to coordinate with the implementing agency with respect to penalty assessment associated with § 68.58(b)(3) in the SNPRM (§ 68.215(e)(4) under today's rule).

Finally, the tiering (Program) approach benefits sources as well as air permitting authorities. EPA has simplified the tiering provisions so sources and air permitting authorities should be able to readily determine the Program requirements each process must satisfy, leading to more effective oversight. EPA has also streamlined the RMP reporting requirements and is working on electronic submission of RMP information which serve to reduce the burden on air permitting authorities and implementing agencies.

5. Title V permit application contents. Many commenters stated that sources regulated under parts 70 or 71 and part 68 should only be required to certify whether they are subject to section 112(r) in their initial permit application to allow timely processing. Although EPA indicated that it did not want the RMP included in permit applications or in the permit, many commenters stated their opposition because the additional time required for RMP review could delay permit grants and, in some states, the RMP could be included in the source's permit. Several commenters suggested that the air permitting authority should decide whether it wants the RMP; one commenter stated that sources would have a significant incentive to comply with such a request, given the permitting authority's ability to withdraw an application shield. Others stated that the permitting authority should be prohibited from asking for the RMP as part of the permit application.

As EPA has indicated, the RMP should not be submitted with the permit application or made part of the permit. EPA is working to streamline permit application requirements and has indicated that the minimum with respect to section 112(r) is a "check box" for the source to note whether it is subject to section 112(r), and either certification that the source is in compliance with part 68 or has a plan for achieving compliance. Any other requirements are up to the air permitting authority. All sources will be required to submit their RMP to a central point to be specified by EPA and will be immediately available to local responders and the state which may elect to make it available to air permitting authorities.

6. Air permit contents. EPA proposed in the SNPRM that each permit contain standard conditions that address key compliance elements in part 68 and mechanisms for compliance plans, certifications and revisions. Although EPA indicated it did not believe the RMP should be part of the permit, two commenters suggested that it should be included while most others indicated that it should not or that the air permitting authority should decide. Several commenters supported no more than the four conditions proposed in the SNPRM while others suggested requirements including: prompt development and updating of a complete RMP; no conditions other than an indication that a source is subject to part 68; provisions stating the need to register according to § 68.12; a condition stating that the source will comply with all part 68 requirements; and a standard provision recognizing that the implementing agency has the section 112(r) enforcement authority.

Except for the provisions of § 68.215(a), EPA does not believe that the RMP or all or any portion of the remainder of part 68 should become permit conditions because the RMP and part 68 elements will be highly source-specific and subject to frequent change introducing unnecessary complexity and delaying permit implementation. The provisions of § 68.215 should allow the air permitting authority to implement the conditions in a standardized way across many sources with minimal burden. EPA has revised § 68.215 to require that all permits contain a statement listing part 68 as an applicable requirement and that conditions shall be added that require the source to submit a compliance schedule for meeting the requirements of part 68 or, as part of the compliance certification all permitted sources must submit under 40 CFR 70.6(c)(5), a certification statement that, to the best of the owner or operator's knowledge, the source is in compliance with all requirements of this part, including the registration and submission of the RMP. EPA had amended the authority citation for part 68 to include CAA Title V because EPA is promulgating permit terms and oversight duties. Consistent with parts 70 and 71, the permit shield provisions of parts 70 and 71 would not apply to the substantive requirements of part 68 because the detailed substantive requirements of part 68 are not addressed in the Title V permit or permit application. If a permit without these conditions has already been issued, then when the permit comes up for renewal under part 70 or 71 requirements (40 CFR Part 70.7), the owner or operator shall submit an application for a revision to its permit to incorporate these conditions. The suggested alternative conditions, not adopted, generally help assure compliance only with portions of part 68, such as registration or the preparation of the RMP, or omit critical information, such as whether the source is subject to part 68 or what its compliance status is. The implementing agency's enforcement authority is apparent on the face of the CAA.

7. Completeness review. As part of ensuring compliance, EPA proposed in the SNPRM that within a certain time-frame the air permitting authority must verify that an RMP containing the required elements had been submitted and indicated in the preamble that it would assist air permitting authorities by developing a checklist. EPA stated that this review is independent of completeness reviews required for permit applications to avoid interfering with the permit process. Further, air permitting authorities could arrange for other agencies, including the implementing agency, to perform the completeness review. EPA also requested comment on whether the permitting authority should be able to require sources to make revisions to an RMP.

Most commenters disagreed with this proposal arguing that if a completeness check is necessary, it should be performed by the implementing agency since most air permitting authorities will not have the technical expertise (e.g., chemical process safety) required to adequately review RMPs for technical completeness. Commenters also argued that a completeness review would be merely procedural, it duplicates effort without creating any real benefit, it consumes scarce resources, and it leads to inconsistent RMP review without ensuring the source is in compliance with risk management program requirements. Some commenters suggested that the completeness review could be better defined only as a review of source self-certification that a complete RMP was submitted rather than a substantive review. Some commenters generally agreed that completeness checks should be completed within sixty days. Finally, most commenters argued that only the implementing agency should be able to require revisions to the RMP. Otherwise, another revision review, appeal and verification process would be necessary, duplicating the process already established for the implementing agency.

Based on these comments, EPA has decided not to require that air permitting authorities perform a completeness check as part of the verification of compliance with part 68. EPA has modified the rule requirements so that the air permitting authority may select for itself one or more appropriate mechanisms (such as source audits, record reviews, source inspections or completeness checks) and time-frame in conjunction with source certifications, to ensure that permitted sources are in compliance with the part 68 requirements. Without some kind of oversight, source self-certification is not a sufficient means of compliance assurance, given that an RMP contains information essential at the local level for emergency prevention, preparedness, and response and is not subject to routine, case-by-case review for quality. These oversight mechanisms do not need to be used on each source in order to be effective. EPA agrees that the review for quality or adequacy of the RMP is best accomplished by the implementing agency on a frequency and scope that may vary. EPA is willing to work with air permitting authorities on guidance, checklists or other tools to assist in the development of compliance mechanisms related to the RMP. In addition, EPA is willing to assist air permitting authorities in electronic checks once the electronic system for RMP submittal is developed. EPA emphasizes that if an RMP completeness check is used by the air permitting authority, it should remain independent of the completeness determination for the permit application. The RMP will most likely be submitted at a different time than a permit application, since almost all permit applications will have been submitted well in advance of the risk management program rule deadline. If the completeness check determines that an incomplete RMP has been submitted, the permitting authority can request additional information under § 68.215(b) and should coordinate with the implementing agency on necessary RMP revisions. The completeness checks are facial reviews of RMPs to verify that there are no omissions. Such checks could be performed on a select basis and occasionally integrated with a multi-purpose source inspection conducted to ensure that the air source is in compliance with its permit.

8. Interaction of the implementing agency and the permitting authority. In the SNPRM, EPA attempted to delineate the specific requirements unique to the air permitting authority and the implementing agency. The role of the state is described in more detail in E.4 while the implementing agency is discussed in R. Commenters on the SNPRM suggested that EPA should require the implementing agency to certify to permitting authorities whether part 68 sources regulated under part 70 are in compliance with part 68 requirements. Such certification should be deemed sufficient to "assure compliance" with the applicable requirement under part 70. Other commenters suggested that the permitting authority could simply consult with the implementing agency when it believes there is a problem requiring attention or that the implementing agency should notify the permitting authority of any problems in part 68 compliance, so that the permitting authority may then expand the permit conditions accordingly.

EPA does not believe it is necessary to define the interaction between the permitting authority and the implementing agency. Ideally, this coordination and interaction should occur at the state or local level. Coordination of other CAA programs (Title V, SBAP, and other 112 programs) with the 112(r) program will ensure that the programs are more consistently implemented and enforced, while easing regulatory burden and providing the public greater access to information. However, when EPA is the implementing agency, it stands ready to work with air permitting authorities on oversight associated with permitting and enforcement of the part 68 requirements. Today's rule also provides the state the flexibility to assign some or all of its responsibilities by prior cooperative agreements or memoranda of understanding to the implementing agency or another state, local, or Federal "designated agency." EPA recognizes that each state is structured differently and will have different impediments and opportunities; therefore each state has the flexibility to place the program in an appropriate agency or department, including the air permitting agency.

9. The "designated agency." In the SNPRM, EPA proposed to define the designated agency as the state or local agency designated by the air permitting authority as the agency responsible for the review of an RMP for completeness. This provision was designed to give the air permitting authority the flexibility to obtain expertise from other agencies to fulfill its responsibilities. Several commenters believed the SNPRM does not clearly allow the permitting authority to delegate tasks to a designated agency and the permitting authority should be able to delegate more than the completeness review, e.g., enforcement. Some commenters requested that EPA redefine the term to allow permitting authorities to delegate tasks to EPA or other Federal agencies; while one commenter argued that EPA should not allow the permitting authority to designate EPA as the designated agency.

EPA agrees that the definition should be revised to give the air permitting authority more flexibility. EPA has dropped the mandatory completeness review, added broader implementation and enforcement activities, and included Federal agencies in the designated agency definition. Thus, a "designated agency" may be any state, local, or Federal agency designated by the state as the agency to carry out the provisions of § 68.215, provided that such designation is in writing and, in the case of a Federal agency, consented to by the agency. The parties to any such designation should negotiate the terms and details of any agreements.

10. Reopening part 70 permits to incorporate section 112(r) requirements. In the preamble to the SNPRM, EPA indicated that part 68 requirements should be incorporated into part 70 or 71 permits using the part 70 administrative amendment process because of the timing difference between part 68 and air permitting. Most commenters agreed with this approach or indicated that permits should not be reopened at all; instead, sources that submitted permit applications prior to promulgation of the final section 112(r) regulations should not be subject to enforcement action under Title V until after the first renewal of the permit (i.e., after 5 years).

As discussed under section E.6, if a permit without the necessary part 68 conditions has already been issued, then the owner or operator or air permitting authority shall initiate a permit revision or reopening according to the procedures detailed in 40 CFR 70.7 or 71.7 to incorporate the terms and conditions under paragraph (a) of § 68.215. Although EPA has not completed part 70 permit streamlining efforts, the requirements for permit revisions or reopenings should be complete by the time sources will be required to be in compliance with the part 68 requirements. Under the most recent part 70 proposal, the part 68 requirements would be classified as "less environmentally significant" and the associated procedures would be followed. Sources with such permits shall be subject to enforcement under authorities other than Title V.

11. Use of Title V funds. In the SNPRM, EPA indicated that activities conducted by air permitting authorities should be covered by fees collected under part 70 since part 68 is an "applicable requirement." EPA also acknowledged that air permitting authorities may not have planned for section 112(r) activities and requested input on alternative funding mechanisms or whether resources would need to be reduced in other programs to allow completion of part 68 responsibilities.

Several commenters raised concerns about the impact of the section 112(r) requirements on state and local air permitting authorities because funding will be needed and it may not be possible in the current political climate for the permitting authorities to raise the necessary fees through Title V. Some commenters argued that funding decisions should be left up to the air permitting authorities.

EPA agrees that funding decisions regarding the part 68 program should be made at the discretion of the state and local agencies. However, air permitting authorities need to be aware that the CAA requires states to impose permit fees that are sufficient to cover the direct and indirect costs of implementing the permit program, including part 68 activities and activities conducted by state designated agencies. EPA believes the straightforward and flexible requirements established in today's rule impose minimal additional burden on air permitting authorities. Funding associated with section 112(r) implementation is addressed in section R, below.

12. Other issues. In the SNPRM preamble, EPA stated that it worked closely with and directly involved several state and local air program officials and state emergency response and prevention representatives in the development of the preamble and regulatory language to prepare the approaches described. EPA stated that the proposed approaches "best reflect the concerns of the states about air permit program implementation and the needs for comprehensive participation in chemical accident prevention, preparedness, and response at the state and local level." Two commenters disagreed, arguing that in January 1995, the National Governors Association (NGA) and ECOS (organization of state environmental officials) presented numerous recommendations to EPA Assistant Administrator Mary Nichols for changes in several clean air programs; regarding section 112(r), NGA/ECOS recommended that Title V permitting authorities be required only to certify that an RMP has been submitted. These commenters believe that the SNPRM fails to adequately address states' central concern; requiring permitting authorities to review RMPs will encumber an already overtaxed system.

Although EPA disagrees that the proposal fails to adequately address states' concerns, EPA agreed that the air permitting authority requirements could be more sharply focused to minimize the burden. EPA believes that today's rule is the product of many hours of hard work with state and local air permitting authorities to recognize their concerns and to develop a rule that is effective, flexible and imposes the least economic burden possible.

F. General Definitions

1. Significant Accidental Release. In the NPRM, EPA proposed to define significant accidental release as "any release of a regulated substance that has caused or has the potential to cause offsite consequences such as death, injury, or adverse effects to human health or the environment or to cause the public to shelter in place or be evacuated to avoid such consequences." This definition was key to the applicability of a number of rule requirements, including hazard assessment, accident history, and accident investigation. Only four of more than 115 commenters supported this proposal arguing that the definition should be protective of the public and should consider inconvenience to the public and precautionary measures taken. Other commenters argued that Congress intended for the section 112(r) rules to address catastrophic releases, not those with minor impacts, and that this definition overly broadens the scope of the rule diverting resources and increasing cost for little additional benefit. Many commenters stated that "injury" and "adverse effects" are undefined and could mean any health impact from irreversible effects to minor irritation requiring no medical treatment. "Potential to cause" was also considered too vague. As discussed in Section III.C, many commenters objected to consideration of environmental impacts. Commenters also opposed sheltering-in-place and evacuation as criteria because these actions are often precautionary and, in many cases, are later viewed as unnecessary and may discourage owners or operators from making recommendations to evacuate or shelter-in-place. Several commenters submitted alternative definitions where injuries were limited to those that require hospitalization, adverse effects were limited to serious effects, and environmental effects were limited to those that generate human deaths or hospitalizations. Some suggested that all environmental effects be dropped.

EPA agrees that the definition as proposed was too vague and subject to a wide variety of interpretations. In addition, EPA decided that a single definition does not adequately address the criteria needed for all affected sections of the rule. For example, the five-year accident history requirement depends on the offsite impacts generated by the accident while endpoint criteria are used for the worst-case and alternate scenario offsite consequence assessments. Consequently, EPA has decided to drop the definition and instead identify the criteria for the types of releases or impacts that should be addressed by the appropriate requirement. EPA has considered the suggestions offered by commenters and added definitions of the terms "environmental receptor," "injury," "medical treatment," and "public receptor" and adopted (with modifications as described above) the OSHA definition of catastrophic release. EPA notes that sources should be aware that within the definition of Injury, direct consequences include effects caused by shrapnel and debris set in motion by a vapor cloud explosion. EPA adopted its Medical Treatment definition from one OSHA uses for logging occupational injuries and illness. Finally, under the environmental and public receptor definitions, sources should note that certain parks and recreational areas may be both if the public could be exposed as a result of an accidental release.

2. Stationary Source. Commenters requested that EPA state whether the term stationary source covers the entire "facility" or simply a single process and provide guidance on which requirements apply source-wide and which are process-specific. EPA also received comments regarding the relationship or overlap between the stationary source definition and DOT regulations. These are discussed in section III.P.2 below.

In the List and Thresholds rule, EPA defined stationary source to include an entire "facility." Sources will be required to submit one RMP and one registration as part of that RMP for all processes at the source with more than a threshold quantity of a regulated substance. Although the management system applies to all Program 2 and 3 processes, the prevention program elements are process-specific. The hazard assessment requirements apply to the regulated substances, but only in covered processes. As a practical matter, the emergency response program will probably apply to the entire source although technically it applies only to covered processes.

3. Process. Several commenters argued that the definition of process was susceptible to overly expansive interpretations and asked that certain activities such as storage at sources or distribution terminals be excluded. Many commenters sought clarification of "close proximity" and "interconnected vessel." Commenters also wanted the definition to be consistent with OSHA.

EPA adopted OSHA's definition of process in the original proposal and for the final rule. This definition specifically covers storage (as well as handling and processing) of regulated substances. EPA disagrees that storage-only sources are adequately covered by SPCC regulations since the regulations under SPCC and OPA–90 cover oil terminals and releases to water. This rule is directed at accidental releases of regulated substances (not including oil) to the ambient air. Generally, OSHA PSM also covers these chemical terminals; consequently, the only additional steps these sources will need to take will be to conduct the hazard assessment and submit the RMP, as existing emergency response plans may meet the emergency response program requirements.

Since EPA's definition is identical to OSHA's, EPA will coordinate interpretations of the definition of process with OSHA to ensure that the rule is applied consistently. OSHA has stated that processes are in "close proximity" if a release from one could lead to a release from the other. Owners or operators must be able to demonstrate that an "effective barrier" exists to prevent a release from one process from affecting another. OSHA has interpreted "interconnected vessel" to mean vessels connected by any means, such as piping, valves or hoses, even if these are occasionally disconnected. EPA will also adhere to these interpretations.

4. Offsite. One commenter stated that EPA's proposed definition of offsite should be expanded to include the air above and below the point of release to cover exposure to the upper atmosphere and groundwater. Another asked EPA to limit the definition to areas frequented by the public. Two commenters opposed including areas on site where the public has access because OSHA already covers these areas.

In the final rule, EPA has retained a definition of offsite as "areas beyond the property boundary of the stationary source or areas within the property boundary to which the public has routine and unrestricted access during or outside business hours." OSHA's jurisdiction includes visitors that may be on the property of a facility who are conducting business as employees of other companies but does not necessarily extend to casual visitors or to areas within a facility boundary to which the public has routine and unrestricted access at any time.

5. Other Definitions. Commenters raised questions about several other definitions. Three commenters suggested changes or clarifications to the definition of accidental release. EPA's definition is the statutory definition. Commenters also proposed modifications to the definition of "analysis of offsite consequence." As noted above, EPA has determined that this definition is not needed and has deleted it from the final rule.

Commenters sought clarification of the definition of mitigation systems and whether personnel should be considered an active mitigation system. Others asked for a list of passive mitigation systems and provided proposals. These commenters also objected to limiting passive systems to those that capture or control released substances; they suggested that systems that are designed to prevent releases or control the volume or rate of a release, such as vent/catch tanks, quench tanks, blowdown tanks, elevated stacks and high velocity stacks, adsorbents including carbon beds, neutralization tanks, double-walled vessels or pipelines, chemical sewers, closed drain header systems for flammables, vapor-liquid separators, fire barriers, explosion-resistant walls, isolation distances, barriers to prevent free access of air flow after a release, containment buildings, pre-charged water spray systems, closed vent systems, and filters should also be considered passive mitigation. One commenter suggested that active mitigation systems should be defined as those that require manual activation or an energy source (other than gravitational attraction) to perform their intended function.

For the final rule, EPA has decided to define passive mitigation systems as those systems that operate without human, mechanical, or other energy input and would include building enclosures, dikes, and containment walls but excludes active mitigation systems such as excess flow valves, fail-safe systems, scrubbers, flares, deluge systems, and water curtains. In addition to the requirements outlined in §§ 68.25 and 68.28, EPA provides further guidance on the consideration of the effect of passive mitigation in its RMP Offsite Consequence Analysis Guidance. EPA does not believe that all systems designed to prevent releases or control the volume or rate of a release should be considered passive mitigation, consistent with its intent to reflect the potential for failure of any system that requires human, mechanical, or other energy inputs.

C. Risk Management Plan (RMP)

In the NPRM, EPA proposed that owners or operators of stationary sources covered by the requirements submit an RMP summarizing the key elements of its risk management program. In the NPRM preamble, EPA indicated that summaries of the information requested (e.g., hazard assessment and emergency response program) would provide the most useful information to the public and local agencies without overburdening them with unneeded detailed information. EPA further stated that the RMP should serve to provide local and state agencies and the public with sufficient information to determine if additional details are needed. These details would be available, if needed, to implementing agency officials conducting audits or compliance inspections.

1. Level of Detail. Most commenters agreed with EPA's proposal noting that the public should be able to identify key hazard and risk management information from the RMP without being overwhelmed by extraneous documentation that is more appropriately maintained on site. A detailed submission would not be cost-effective and could threaten plant security; these commenters expressed fears of terrorism, thieves, and saboteurs.

Other commenters disagreed and argued that summaries would not provide enough information while "full disclosure" would support an informed public. Some commenters argued that the public could be misled by a summary derived from a "full" RMP withheld from the public by the source. Further, several commenters made the general argument that right-to-know provisions should be strengthened and that the public should be given full access to all risk management program information including PHAs and actual operating procedures. Individual commenters also requested public access to specific information regarding such details as worst-case scenarios and descriptions of chemical accidents. Some commenters argued that an informed public and public scrutiny, in general, can act as a powerful force in reducing risk and preventing accidents at stationary sources.

EPA agrees that an informed public is a key element of sound chemical emergency prevention, preparedness, and response. However, EPA also believes that it is essential for the public to focus on the information essential at the local level for prevention, preparedness, and response and has decided to maintain its proposed requirement that the RMP provide certain information about the risk management programs at a source. EPA notes that its previous use of the word summary was not intended to imply that the source prepares a "full" RMP document from which a source extracts summary information that is shared with the public. Rather, the source is obligated to develop certain information about the hazards, prevention, and emergency response programs from the array of documentation at the source to prepare an RMP. EPA believes it would be impractical to require sources to share all documentation used for the safe operation of the processes at a source. Not only is much of this information likely to be confidential, but significant technical expertise and time are necessary to extract, understand, and to make meaningful judgments about the adequacy of the information. The RMP will consist of an executive summary and required data elements addressing all elements of the risk management program as described below. Detailed supporting documentation will be maintained on site available to the implementing agency for review.

2. RMP Contents. Most commenters requested that EPA generally limit the level of detail required, the number of scenarios, or the number of pages in the RMP. Other commenters recommended EPA require submission of only information specified in the CAA and incorporate other detailed information by reference. Commenters also noted that documenting each action taken to address a hazard, the date on which the action started (or is scheduled to start), and the actual or scheduled completion date would prove impractical. EPA received many comments stating that the requirement that exact dates on which training, emergency exercises, or rescue drills, are conducted would be impractical and unnecessary.

Commenters seeking more comprehensive RMPs argued in favor of requiring an index or bibliography of detailed information or a catalog of all available documents, an investigation and analysis of all other credible release scenarios, and submission of assumptions, methodology, and modeling methods used to determine worst-case accidents.

As described above, EPA is considering development of a reporting mechanism and form to collect key data elements. As discussed below, this approach will foster electronic submission and immediate availability to Federal, state and local entities, and the public. To make such submission possible, EPA wants to collect data that generally can be reported by numerical information, yes/no answers, and check boxes. For the offsite consequence analyses, owners or operators will be asked to provide distance to the endpoint, populations and environments affected, and enough of the data used to determine these distances so that local entities and the public can check the distance against the distance derived from EPA's reference tables or a model identified in the RMP. If EPA's guidance was not used, sources will need to indicate which models were used. Many of the parameters for modeling are set in the rule and do not need to be respecified in the RMP. The rule requires only one alternative release scenario per toxic substance and one for all flammables; owners or operators may submit additional scenarios.

For prevention programs, owners or operators must provide information (primarily dates) that will allow the implementing agency to assess whether the source is in compliance with the rule elements. For the PHA, owners or operators must state which technique was used for each covered process, the general hazards associated with the chemicals and process, the process controls in use, mitigation and monitoring or detection systems in use, and changes instituted since the last PHA (Program 3) or hazard review (Program 2) update. Through lists and checkoff boxes, EPA can collect a significant amount of information on current safety practices without requiring sources to develop lengthy documentation that would have proved a burden to both the source and any government or public data user and reduced the potential for electronic submission. EPA believes this approach provides the Agency and others with a mechanism for identifying industry practices and controls from almost 70,000 sources that would not be feasible otherwise. EPA notes that some of the largest chemical sources and refineries may be providing data on 30 or more processes. In the format proposed in the NPRM, these sources might have submitted several thousand pages each; analyzing such submissions would have been a daunting task for the implementing agencies and probably would have made it impossible for public interest groups to review an industry as a whole. With electronic submission, such reviews will be easier. The implementing agency or EPA can seek additional details from individual sources, as needed. EPA has eliminated the requirement to provide dates of training and emergency exercises or drills because the Agency agrees that this amount of detail is unnecessary and impractical.

3. Submission. In the NPRM preamble, EPA proposed that computer software be developed that would provide sources with a standard format for completing the information required in the RMP; that local authorities be allowed to designate the state as the receiving entity; or that RMPs be submitted only on request from the state, or local entity.

Many commenters, particularly those in the potentially regulated community, supported submission of the RMP upon request or mandatory submission to the implementing agency with submission by request to other organizations. Others recommended submission to the LEPC and public with submission by request to the implementing agency, and SERC. Most commenters favored reducing the paperwork burden and electronic submission because it would reduce time and errors, provide more consistency, and make information more useful for the LEPC and regulatory agencies. Only two commenters opposed electronic filing because all sources may not have the computer capability.

Commenters also supported the development of a standard RMP format regardless of whether the RMP is submitted electronically because standardization would ensure submissions were manageable and useful and would ease burdens on both regulated and reviewing entities.

EPA has decided to work toward electronic submission of RMPs. The Agency believes this will meet numerous objectives of the program and will address several issues. First, electronic submission would reduce the burden on regulated and receiving entities. The Agency has noted that information management of regulatory documents is not a cost-free requirement, and that duplication of effort, including system development, personnel resources, and storage and maintenance efforts could be significant. Electronic submissions would reduce the paperwork burden on sources and state and local governments and would further serve to comply with the Paperwork Reduction Act of 1995, which supports the maximum feasible use of electronic submission. Second, EPA wishes to limit the information management burden on local entities so they can focus on the chemical safety issues raised by this rule.

Third, electronic submissions would benefit affected communities and the general public. Besides having the RMP provide the statutorily required information on compliance with the regulations to the implementing agency, EPA believes the specific value of RMP information is for the local community to understand its community's risk from chemical accidents and to help them work with sources using these chemicals to reduce such risks. The Agency believes this objective would not be served well with a centralized paper information source and that using an electronic medium would support better access to information. With electronic submission of RMPs to a central point, states, local entities, and the public will have access to all RMPs electronically. RMP information may also be made available on-line via libraries and other institutions. Electronic submissions further address the issue of standardized RMPs. The RMP data elements included in the submission will be checkoff boxes, yes/no answers, or numerical entries to ease the burden of submission and reception and will promote consistency and uniformity. The Agency intends to develop technical guidance for the submission of the RMPs, which will provide for submission and receipt of an electronic formatted document containing the data elements outlined in §§ 68.160 through 68.180.

4. Other Issues. In the NPRM, EPA proposed that RMPs be resubmitted within six months of an information change. Several commenters argued it would generate a continual flow of paperwork and recommended an update frequency requirement of once a year.

EPA has retained the requirement that the RMP be resubmitted within six months of the elimination of a substance in a process or at the source, a change in Program status for a process, or if a process change at the source requires a revised hazard assessment or hazard review/PHA. To be consistent with the statutory requirements for compliance, the RMP would also have to be updated on the date an already regulated substance becomes present in a process above the threshold or within three years of the date when EPA lists a new substance. EPA believes that with a standardized format and electronic filing, updates can be rapidly and easily made, and this information should be promptly shared. EPA changed the update schedule for hazard assessments to make them consistent with the RMP update. EPA also specified when offsite consequence analyses require update; the rule states that these analyses need to be reviewed and changed if on-site changes may be reasonably expected to change the distance to an endpoint by a factor of two or more. EPA notes that this change is likely to reduce the number of updates required. For PHAs, only major changes to a process or installation of new processes is likely to trigger a revised PHA. EPA expects that relatively few sources will need to update either their offsite consequence analyses or PHAs/hazard reviews more frequently than once every five years because the majority of sources have simple processes that do not change frequently. Chemical industry sources may need to submit more updates if processes are changing significantly. The RMP should reflect such significant changes.

EPA proposed that RMPs be submitted to implementing agencies, SERCs, and LEPCs, and be made available to the public. Several commenters recommended that additional parties, local fire officials in particular, also receive RMPs. One commenter stated that EPCRA requires various reports go to local fire departments, and another commenter noted that RMP information may be better used by emergency management agencies, fire departments, and hazardous materials teams. Because EPA plans to have RMPs submitted to and available from a central point in electronic format, any agency that wants the information will be able to access it directly on-line. The RMP will be immediately available to local responders and the state. Thus, this manner of submission fulfills the requirements of CAA section 112(r)(7)(B)(iii). Additional submission requirements are, therefore, unnecessary.

The Department of Defense (DOD) commented concerning the lack of a rule provision explicitly declaring that information that is classified under applicable laws and Executive Orders (E.O.s) is not to be included in the RMP. EPA is clarifying that such classified information is protected from disclosure by including a specific regulatory exemption for such information. Furthermore, EPA is clarifying that no provision of part 68 requires the disclosure of classified information in violation of Federal law, regulations, or E.O.s. Finally, EPA is also promulgating a definition of "classified information" that adopts the definition under the Classified Information Procedures Act.

EPA has found no relevant statutory language superseding or impliedly repealing the Classified Information Procedures Act or applicable E.O.s regarding disclosure of classified information, nor has EPA found any legislative history indicating that Congress intended to supersede or repeal these provisions when it established the requirement to prepare publicly-available RMPs. The provision for exemptions from standards and limitations established under CAA section 112 narrowly addresses the procedures for an exemption when "the President determines that the technology to implement such standard is not available and * * * it is in the national security interests of the United States to do so." CAA § 112(i)(4). The focus of section 112(i)(4) is on the technical capability to meet a limitation; for example, the provision would apply when an emission standard requires a control device that precludes national security-related equipment from functioning. Section 112(i)(4) does not consider or address the availability or distribution of classified information to the public, nor does the legislative history demonstrate that such disclosure was contemplated.

The requirement of section 112(r)(7)(B)(iii) to make RMPs publicly available must read in congruence with the provisions prohibiting disclosure of classified information. "Classified information," as defined by the Classified Information Procedures Act, 18 U.S.C. App. 3, section 1(a), is "any information or material that has been determined by the United States Government pursuant to an Executive order, statute, or regulation, to require protection against unauthorized disclosure for reasons of national security. * * *" "National security * * * means the national defense and foreign relations of the United States" 18 U.S.C. App. 3, section 1(b). Criminal penalties exist for unauthorized disclosure of classified information that has been designated by the Department of Defense or defense agencies for limited or restricted dissemination or distribution. 18 U.S.C. 793. It is not reasonable to interpret the CAA to require the disclosure of classified information in violation of criminal law. It has been EPA's long-standing policy to interpret information disclosure provisions in its statutes as being consistent with national security law to the maximum extent possible and to require such information to be maintained in accordance with the originating agency's requirements. *Federal Facilities Compliance Strategy* (November 1988), at page V–6. Therefore, EPA is promulgating language in § 68.150(d) to clarify its intent with respect to the disclosure of classified information in RMPs by specifically exempting classified information from the RMP except by means of a classified annex submitted to appropriately cleared Federal or state representatives with proper security clearances. Furthermore, EPA is promulgating § 68.210(b) to clarify that disclosure of classified information is controlled by the Classified Information Procedures Act, E.O.s 12958 and 12968, and other laws, regulations, and E.O.s applicable to classified information. Finally, in § 68.3, EPA is defining classified information by promulgating the definition under the Classified Information Procedures Act.

H. Prevention Program

In the NPRM preamble, EPA noted that the CAA requires the risk management program to include a prevention program that covers safety precautions and maintenance, monitoring, and employee training measures. Because OSHA PSM covers this same set of elements, EPA proposed a prevention program that adopted and built on OSHA PSM. The proposed requirements for EPA's prevention program included a management system requirement and sections covering nine elements: process hazard analysis, process safety information, operating procedures (SOPs), training, maintenance, pre-startup review, management of change, safety audits, and accident investigation.

To assist in describing its prevention program, EPA included a section in its preamble comparing its prevention program to OSHA PSM standard. EPA noted that with the exception of the management system requirement, the proposed prevention program covered the same elements as OSHA's PSM and generally used identical language except where the statutory mandates of the two agencies dictated differences. EPA added introductory paragraphs to most sections to provide additional information. Further, in some of the sections, EPA proposed additional requirements and established different deadlines. The majority of comments EPA received concerned conflicts and differences between EPA's proposed requirements and OSHA PSM standard.

In the final rule, the Program 3 prevention program is the OSHA PSM standard for parallel elements, with minor wording changes to address statutory differences. For elements that are in both the EPA and OSHA rules, EPA has used OSHA's language verbatim, changing only certain regulatory terms (e.g., highly hazardous chemical to regulated substance and employer to owner/operator) and dates. The sections of the OSHA PSM standard were not cross-referenced for the reasons discussed in section III.D of this preamble. Key issues under PSM are discussed below; the remainder are addressed in the Response to Comments Document.

Management. In the NPRM preamble, EPA stated the purpose of its proposed management system is to ensure integration of all prevention program elements. EPA proposed that owners or operators identify a single person or position that has the overall responsibility for the development, implementation, and integration of the risk management program requirements. When responsibility for implementing individual requirements of the risk management program is assigned to persons other than the person designated, the names or positions of these people shall be documented and the lines of authority defined through an organization chart or similar document.

Several commenters agreed with this approach because it serves a useful purpose and many PSM sources already implement management systems. Many commenters opposed the requirement for submission of an organization chart of their source because it would be of no value to EPA and that continual updating would waste company resources.

EPA has decided to maintain its management system requirements in the final rule for sources with processes in Program 2 and 3, but has moved it to general requirements (§ 68.15) because it is the entire risk management program that should be managed, not just the prevention program. EPA has also revised the requirement to provide flexibility in indicating lines of authority; an organization chart is not absolutely required and is not included in the RMP.

Management of Change. Some commenters objected to EPA's definition of replacement in kind, asking that EPA adopt the OSHA PSM definition. Other commenters stated that management of change procedures should only be implemented when the changes had the potential to increase the risk (e.g., an increase in inventory, an introduction of a new substance).

As part of its efforts to strengthen coordination between the two programs, EPA will use the OSHA definition for "replacements in kind": "a replacement which satisfies the design specification." OSHA defined this term to address a concern expressed by commenters on its standard that failing to define "replacements in kind" could result in misunderstandings such as employers believing that only a replacement with the same brand and model number could be characterized as a "replacement in kind." OSHA promulgated a definition in recognition of these comments, and EPA understands it to reflect a concept understood in industry.

Further, EPA does not agree that management of change requirements should exclude changes that reduce the risk of an accidental release. The Agency does not believe that only changes to "critical systems" should be subject to management of change procedures. As EPA stated in the NPRM preamble, most process changes improve process safety or efficiency. However, even these changes may result in unintended effects when source owners and operators fail to evaluate the consequences of the change. Therefore, the Agency continues to believe that a change that reduces the risk of an accidental chemical release may, nonetheless, be an appropriate subject for a management of change procedure. Failure to subject such changes to a management of change process could inadvertently result in a change that was believed to lower risk when such a change, in fact, increases risk. Regarding the comment about critical systems, EPA notes that chemical processes are integrated systems, and that a change in one part of the process can have unintended effects in other parts of the system—irrespective of whether the system is "critical." Consequently, EPA agrees with OSHA that source owners and operators must establish and implement written management of change procedures for any change to a regulated substance, process technology, or equipment and any change to a source that affects the covered process.

Other Provisions. Several commenters stated that EPA should include in its risk management program the OSHA PSM provisions on contractors, employee participation, and hot work permits that EPA had not proposed in its prevention program. The NPRM solicited comment on whether to include these provisions (58 FR 54205; October 20, 1993). Commenters argued that contractors have been responsible for a number of accidents that have affected the public and the environment. Commenters presented the same argument to support inclusion of the hot work permit requirements. A substantial number of commenters also argued that employee participation is a key factor in successful implementation of PSM. A few commenters supported EPA's initial position that these requirements were more properly OSHA concerns.

In response to the former commenters' arguments and to ensure consistency between the elements of the two rules, EPA has decided to add these sections to its Program 3 prevention program. EPA believes that each of these elements is important to the implementation of an effective prevention program. Worker participation in PHAs and other elements is critical to the success of process safety because workers are intimately familiar with the process and equipment operation, possible failure modes and consequences of deviations. It also serves as a mechanism for greater communication and understanding of specific process hazards (as opposed to the general chemical hazards) and the importance of developing and following proper procedures. Similarly, contract employees have been involved in a number of major accidents in recent years; for example, the explosion in Pasadena, Texas, in 1989, which killed 23 workers, has been attributed to improper maintenance practices by contractor employees. Oversight of contractors, therefore, can be critical for accident prevention. Finally, hot work permits ensure that use of flame or spark-producing equipment is carefully controlled. Not only are many of the listed substances highly flammable, but fires in the vicinity of vessels or pipes containing the toxic substances can lead to releases of these substances.

I. Accident History

In the NPRM, EPA required sources to document a five-year history of releases that caused or had the potential to cause offsite consequences for each regulated substance handled at the source. EPA specified that the accident history should include the nature of any offsite consequences, such as deaths, injuries, hospitalizations, medical treatments, evacuations, sheltering-in-place, and major offsite environmental impacts such as soil, groundwater, or drinking water contamination, fish kills, and vegetation damage.

A few commenters argued that releases with only the potential for offsite consequences should not be included, while other commenters were evenly divided on whether near-miss events should be included in the accident history. A number of commenters indicated that releases with on-site consequences should be added to the accident history. Several commenters requested that EPA clarify that the accident history applies only to covered processes.

In recognition of these comments, in the final rule, only those accidents from covered processes that resulted in deaths, injuries, or significant property damage on-site, or known offsite deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage need to be included in the five-year accident history. Near-miss accidents or accidents with only the potential for offsite consequences (that did not meet any of the previous criteria) would not need to be included. Because the accident history is, by statute, an aspect of the hazard assessment, and the hazard assessment provisions apply only to covered processes, EPA believes that requiring the accident history to address accidental releases from processes not covered by this rule would be inconsistent with the structure of part 68. EPA notes that such releases may be subject to reporting under other statutes; the Agency may investigate such releases to determine the need for a response action under CERCLA and to determine whether CAA section 112(r)(1) has been violated.

J. Emergency Response Program

In the proposed rule, EPA required sources to develop an emergency response plan that defines the steps the source and each employee should take during an accidental release of a regulated substance. EPA noted that most sources are already required to have at least part of the emergency response plan in place as a result of other EPA (Spill Prevention, Control, and Countermeasures and Resource Conservation and Recovery Act) and OSHA (emergency action plans and HAZWOPER) regulations and requested comment on how the proposed requirements could best be integrated with these existing programs to minimize duplication. Many of the commenters were particularly concerned with the potential for increased duplication of emergency planning requirements at the state and Federal levels that would require expenditure of additional resources without improving source emergency response capabilities. Most of these commenters suggested that EPA allow compliance with other Federal regulatory programs to meet the mandate of the Clean Air Act for an emergency response program, while other commenters recommended that EPA work with other agencies to develop a format for a single, comprehensive response plan for the source. Some commenters addressed related concerns with respect to state program or voluntary initiatives.

EPA has decided to adopt the emergency response requirements found in the statute, without additional specific planning requirements. This action is consistent with the Agency's effort to develop a single Federal approach for emergency response planning. The Review of Federal Authorities for Hazardous Materials Accident Safety, (required under section

112(r)(10) of the Clean Air Act) reported little harmony in the required formats or elements of response plans prepared to meet various Federal regulations. Accordingly, EPA has committed not to specify new plan elements or a specific plan format in today's rule. EPA believes that plans developed to comply with other EPA contingency planning requirements and the OSHA Hazardous Waste and Emergency Operations (HAZWOPER) rule (29 CFR 1910.120) will meet the requirements for the emergency response program provided that they address the elements in section 68.95(a). EPA believes that coordination of the emergency response plan with the community emergency response plan will help ensure that offsite response issues are addressed. In addition, EPA and other National Response Team agencies have prepared Integrated Contingency Plan Guidance ("one plan") (NRT, May 1996). An emergency response plan that includes the elements specified in this guidance can be used to meet the requirements in today's rule. The final rule also provides relief for sources that are too small to respond to releases with their own employees; these sources will not be required to develop emergency response plans provided that appropriate responses to their hazards have been discussed in the community emergency response plan developed under EPCRA (42 U.S.C. 11003) for toxics or coordinated with the local fire department for flammables.

K. Registration

In the NPRM, EPA proposed that sources register with the EPA Administrator by three years after the publication date of the final rule, or within three years of the date on which a source becomes subject to the risk management program requirements as mandated by the CAA. While a number of commenters agreed with this proposal, a greater number requested that EPA accelerate the registration to between six months and two years of promulgation of the rule so that implementing agencies could better determine resource allocation and conduct more extensive outreach and technical assistance to sources developing risk management programs and preparing RMPs.

EPA agrees that earlier registration could aid outreach efforts and help implementing agencies focus resources. However, since the first RMP need not be submitted until June 21, 1999, an earlier, pre-registration would impose an additional burden on sources. Some sources may reduce inventories, make process modifications or switch chemicals prior to the first RMP due date and, consequently, will not be subject to the rule. If EPA required a pre-registration, these sources would have to deregister at that time. Further, states and local agencies already have information gathered under EPCRA section 312 that could be used for early identification and outreach to sources covered by this rule. EPA is also working with trade associations and other representatives of affected industries to ensure that sources are aware of the rule. Instead, in today's rule, the registration is included as part of the RMP to limit the number of filings made by sources.

EPA also proposed that sources submit written registration information. A number of commenters advocated either the modification of existing forms (e.g., the EPCRA Tier II form) or an electronic filing system for the submission of this information. Since the RMP and the registration are consolidated into one submission, this issue is addressed generally in Section III.G.

Under the proposed rule sources would need to submit an amended notice to the Administrator and the implementing agency within 60 days if information in the registration is no longer accurate. Many commenters argued that six months or a year is needed to ensure compliance with the certification requirements. EPA agrees with commenters and in the final rule has lengthened the time for submission of an amended registration to six months which should be enough time to modify the information and to electronically resubmit the registration and RMP.

L. Model Risk Management Programs

Commenters supported the development of model risk management programs and RMPs, stating that the models were needed by smaller businesses and public systems that lack the expertise to implement process safety management. Commenters specifically supported development of models for industries with well-understood processes and practices, such as chlorination systems, propane and ammonia retailers, and refrigeration systems. A few commenters asked that the models be made available for public review. Others said the models should be published as guidance, not regulations.

EPA is working with industry groups to develop model programs for ammonia refrigeration, propane handling, and water treatment. After having provided the public with an opportunity to review a draft of the ammonia model program, EPA today is issuing a guidance on a model program for this industry (see Model Risk Management Program for Ammonia Refrigeration). EPA encourages other industry groups to work with the Agency to develop models for their sectors. EPA notes that the models are particularly relevant to sources with Program 2 processes. Because EPA has adopted the OSHA PSM standard, EPA has not provided an EPA guidance on PSM compliance. EPA will also publish general technical guidance to help sources understand and comply with the rule which will include Program 2 prevention program guidance. The RMP Offsite Consequence Analysis Guidance contains reference tables for the offsite consequence analysis, which can be used instead of site-specific modeling. EPA emphasizes that the models are guidance, not regulations; sources are not required to use them.

M. Implementing Agency Audits

EPA originally proposed in § 68.60 seven criteria an implementing agency could use to determine whether to audit a source's RMP. EPA also proposed that the implementing agency have the authority to determine whether an RMP should be revised and to direct the owner or operator to make revisions. Many commenters suggested that the Agency lacked statutory authority to specify measures to correct risk management program elements through the RMP, and that RMP changes based on implementing agency directives will be costly.

EPA or other implementing agencies have general inspection and enforcement authority under CAA sections 112(r)(7)(E), 113, and 114 to compel source owners and operators to correct deficiencies in the risk management program. EPA intends to use the audit process as a way to verify the quality of the program summarized in the RMP. When it is reasonable, EPA will require modifications to the RMP that may lead to quality improvements in the underlying program.

EPA notes that many commenters were uncertain of the distinction among audits conducted under § 68.220, reviews by the permitting authority under § 68.215, and inspections. CAA section 112(r)(7)(B)(iii) requires EPA to develop, by regulation, a system for auditing RMPs. These audits will review the information submitted by sources to determine whether the source is in compliance with the rule elements. For example, the implementing agency will consider whether the dates for reviews and revisions of various elements are consistent with the steps sources are required to take. If a source reported a major change on a date later than the last date on which safety information and operating procedures were reviewed, the implementing agency could seek further information about why such reviews had not been conducted and require updates if the agency determined that the source should have reviewed the documents. Audits may be detailed paper reviews or may be done at a source to confirm that on-site documentation is consistent with reported information.

In contrast, the air permitting authority or its designated agency may be reviewing the RMP for completeness, rather that the quality of the RMP contents. Inspections are generally more extensive in scope than audits although they may include a review of the accuracy of the RMP information. Inspections will consider whether the source is in compliance with part 68 as a whole, not just with the RMP requirements, and may review both the documentation kept at the source and operating practices.

Regarding comments that making changes to the RMP would be too costly, EPA has endeavored to ameliorate the cost burden of this rule by using a tiering approach to make the risk management program elements on which the RMP rests appropriate for sources of various sizes and complexity. In addition, EPA is considering development of a standard RMP reporting format and data elements, which should significantly reduce the time and effort necessary to revise the RMP. Any source owner or operator can further limit the costs associated with revising its RMP by submitting a timely, complete, and valid plan in the first instance.

N. Public Participation

In the SNPRM, EPA requested comments on how public participation in the risk management program process might be encouraged. EPA's preferred approach was to encourage the public and sources to use existing groups, primarily the LEPC, as a conduit for communications between the source and the public throughout the RMP development process. A substantial number of commenters supported this approach, stating that the LEPC was well placed to interpret the RMP information for the public. Commenters said that LEPCs and their member organizations have considerable experience and have established rapport in dealing with the community. Others stated that this role is a logical extension of current LEPC responsibilities under EPCRA, although funding for LEPCs was a concern.

A number of commenters opposed this approach because some LEPCs are not functional and that LEPCs are not a substitute for public participation. A few LEPCs also objected to assuming any additional role. Commenters suggested that EPA should require public participation in the development of the RMP and require all major sources to have a public participation strategy. Industry commenters generally opposed any mandated public participation requirements because direct involvement in risk management program development would delay the process and would represent an unwarranted and inappropriate interference in management and site control responsibilities. A few commenters supported the SNPRM suggestion that public participation be limited to sources with Program 3 processes because these sources represent the greatest risk. Other commenters opposed this idea, preferring the decision to be left to local authorities.

EPA has not adopted any specific public participation requirements. EPA plans to make the RMP immediately available to any member of the public. LEPCs and others will be able to compare their sources with similar sources in other areas to determine whether quantities on sites, process controls, mitigation systems, and monitoring systems are significantly different. This information will give the public an opportunity to gain a better understanding of local industries and carry on a more informed dialogue with sources on their prevention practices. EPA continues to encourage sources to work with the LEPCs and other community groups to provide information to the public and ensure an on-going dialogue during and after RMP development and submission. The public is a valuable resource and a key stakeholder in chemical accident prevention, preparedness, and response at the local level.

A number of commenters said that EPA should prohibit the public from triggering an audit through petitions because this approach would open the process to litigation; a petition process would be expensive, time-consuming, and increase the time needed to complete the RMP. Some commenters said it would impose an excessive burden on the implementing agency. Two commenters favored public petitions to trigger audits. One said that the audits should be conducted by qualified third parties, subject to community selection and supervision.

EPA has not included public petitions as a mechanism for periodic audits of sources under § 68.220. States, however, are able to adopt more stringent requirements.

O. Inherently Safer Technologies

In response to the NPRM, a number of commenters stated that EPA should require sources to conduct "technology options analyses" to identify inherently safer technologies. In the SNPRM, EPA solicited comments on this issue, but did not propose a requirement for such analyses.

A number of commenters stated that EPA should require analyses of inherently safer technologies, at least for sources with Program 3 processes or new processes. Some commenters argued that inherent safety is primary prevention (directed at the source of the hazard), while EPA's proposed requirements are secondary prevention (control of the hazard). One commenter asked that sources be required to provide full economic and technical analyses of options. Commenters argued that without a technology options analysis requirement, industry will not conduct these analyses because, unlike its pollution prevention efforts, EPA has provided no incentive for safer plants.

Other commenters strongly opposed any requirement for these analyses because PHA teams regularly suggest viable, effective (and inherently safer) alternatives for risk reduction, which may include features such as inventory reduction, material substitution, and process control changes. These changes are made as opportunities arise, without regulation or adopting of completely new and unproven process technologies. Commenters said that similar analyses are frequently conducted during the design phase of a process or source where there are sufficient economic incentives to design a process with as few costly additional safety features as possible without new EPA requirements. Commenters also said that a requirement would prove costly, without providing commensurate benefits.

EPA has decided not to mandate inherently safer technology analyses. EPA does not believe that a requirement that sources conduct searches or analyses of alternative processing technologies for new or existing processes will produce additional benefits beyond those accruing to the rule already. As many commenters, including those that support such analyses, pointed out, an assessment of inherently safer design alternatives has the most benefit in the development of new processes. Industry generally examines new process alternatives to avoid the addition of more costly administrative or engineering controls to mitigate a design that may be more hazardous in nature. Although some existing processes may be superficially judged to be inherently less safe than other processes, EPA believes these processes can be safely operated through management and control of the hazards without spending resources searching for unavailable or unaffordable new process technologies. Good PHA techniques often reveal opportunities for continuous improvement of existing processes and operations. EPA encourages sources to continue to examine and adopt viable alternative processing technologies, system safeguards, or process modifications to make new and existing processes and operations inherently safer. EPA included questions related to process modifications in the RMP so that sources can demonstrate, and users of the RMP information can observe, progress toward safer processes and operations.

P. Coverage by Other Regulations

A large number of commenters expressed concerns about duplication between the risk management program rule and other Federal and state regulations. Issues related to overlap between this rule and OSHA PSM are discussed in Section III.D of this preamble; issues related to overlap between this rule and other emergency response planning regulations are discussed in Section III.J of this preamble.

1. General Issues. A substantial number of commenters stated that EPA had failed to consider other regulations to which sources are subject that cover some of the same requirements as this rule. They noted that many sources are covered by DOT rules, other EPA rules, OSHA rules, and, in some cases, other agency or state rules. Some commenters argued that these other regulations essentially prevent accidents and, therefore, this rule is not needed. Commenters stated that EPA should define jurisdictional and enforcement boundaries so that sources subject to multiple regulations are not subjected to multiple enforcement actions for the same violation. Other commenters said that EPA should clearly identify which similar requirements imposed by other programs satisfy this rule and what additional steps are needed. Some commenters said that any source covered by another, similar rule should be excluded from this rule. Others suggested that EPA explicitly cross-reference other applicable rules. A few commenters stated that EPCRA reporting requirements provide ample information to local entities and no further reporting is needed.

EPA disagrees with some of these comments. Except for the OSHA PSM rule, no other rule cited by the commenters addresses accidental releases of regulated substances to the extent that today's rule does. Some Federal and state rules for certain industries provide design standards; compliance with these rules will satisfy parts of today's rule. For example, sources in compliance with 29 CFR 1910.111 for handling of anhydrous ammonia may not need to take additional steps to ensure the safe design of the process. These other standards generally do not cover training, maintenance, hazards analysis, and accident investigation, which are all key elements in process safety management. In addition, none of the Federal rules require offsite consequence analyses or reporting to the public on the results of these analyses and on prevention steps. Information submitted under EPCRA, which consists primarily of annual inventories, is not equivalent to the RMP information.

Nevertheless, EPA agrees with commenters that duplication should be minimized, which is why the emergency response and Program 2 prevention program steps recognize that meeting other requirements will satisfy elements of this rule. The model risk management programs that EPA is developing with industry will explicitly cite other regulations, as well as codes and standards, that satisfy specific elements of this rule.

2. DOT Transportation Regulations. Commenters concerned with overlap with DOT regulations focused on two issues: pipeline regulations, and loading/unloading and storage regulations. Commenters asked EPA to exclude pipelines and transportation containers connected for loading or unloading since these are adequately covered by DOT regulations. Some commenters disagreed and wanted loading and unloading of transportation containers to be included because many accidents occur during these procedures.

In the final List Rule, EPA defined stationary source to include "transportation containers that are no longer under active shipping orders and transportation containers that are connected to equipment at the stationary source for the purposes of temporary storage, loading, or unloading." One commenter stated that the 1993 oleum release in Richmond, California, demonstrated that DOT regulations do not adequately address risk management of loading and unloading. The other commenters, however, said that loading and unloading were covered by DOT regulations and should not be subject to this rule. They noted that DOT has adopted regulations requiring training for anyone who loads or unloads hazardous materials. They further said that at distribution centers, regulated substances are not used or processed, and, if in packages, the containers are not opened.

Several commenters were concerned that EPA regulation in this area could create problems with DOT's preemption of state rules. Under U.S. law, states may not adopt regulations in certain specified areas that are not substantively the same as DOT rules or in other areas that pose an obstacle to DOT goals under Federal Hazardous Materials Transportation Law. If state laws are authorized by Federal law, however, states could develop different requirements than DOT imposes. In this case, the commenter said, if EPA were to regulate loading and unloading under the CAA, the states would have the authority under the CAA to impose more stringent requirements on this activity.

EPA disagrees with the commenters concerning the scope of the Hazardous Materials Transportation Act preemption authority in this area. EPA's definition of stationary source clearly covers transportation containers only when they are no longer in transportation in commerce and was addressed in the List Rule. EPA believes commenters have overstated the extent of any preemption problem. EPA's interpretation today is consistent with DOT's, as explained in "California and Los Angeles County Requirements Applicable to the On-Site Handling and Transportation of Hazardous Materials—Preemption Determination" (60 FR 8774, 8776–78, February 15, 1995). EPA notes that in many cases warehouses and wholesalers take delivery of materials and resell them; EPA considers this storage to be covered by today's rule. EPA believes that DOT standards for container integrity satisfy process safety information requirements. The same applies to DOT standards for training requirements for loading and unloading; that training satisfies the training requirements of this rule for loading and unloading. Requirements for the PHA only apply to connections to transportation containers and for storage of containers.

3. Other EPA Regulations. Many commenters stated that other EPA regulations cover the same activities and

should be deferred to or referenced to prevent duplicative requirements and enforcement. A number of commenters said that regulations under the Clean Water Act, specifically the Spill Prevention, Control, and Countermeasure (SPCC) and Oil Pollution Act of 1990 (OPA–90) rules, duplicate many of the provisions of this rule. Other commenters argued the Underground Storage Tank (UST) rules require sources to comply with requirements equivalent to many of the notification, prevention, and emergency response provisions. A few commenters stated that EPCRA already covers the right-to-know provisions; others stated that the risk management program regulations should support existing EPCRA rules. Three commenters said that EPA should exempt any source covered by the Resource Conservation and Recovery Act (RCRA) because the rules under that act already impose comprehensive risk management requirements.

As discussed in Section III.J, emergency response plans developed under SPCC, OPA–90, or RCRA can be used to meet the emergency response requirements of this rule. EPA notes, however, that SPCC, OPA–90, and UST rules do not address storage, handling, and release prevention for regulated substances. SPCC and OPA–90 rules apply to oil; UST rules apply to oil and gasoline. The processes addressed by these rules, therefore, do not overlap with the processes covered by today's rule.

RCRA requirements apply only to certain activities undertaken at sources that may be subject to the requirements of today's final rule. As noted above, EPA anticipates that emergency response plans developed under RCRA can be used to meet the emergency response requirements of this rule. In addition, certain training and other release prevention activities required under RCRA may satisfy certain of the prevention program requirements for Program 2 processes.

4. Other Federal Regulations. A number of commenters stated that EPA should not cover outer continental shelf (OCS) sources because they are adequately regulated under the Marine Mineral Service, Pipeline Safety Act, and OPA–90. The mining industry said that they should not be covered because their handling of explosives is regulated in great detail by the Mine Safety and Health Administration and the Bureau of Alcohol, Tobacco, and Firearms. In its proposed rule (61 FR 16598, April 15, 1996), EPA has proposed to delist explosives and proposed a stay of the affected list provisions; elsewhere in today's Federal Register, EPA has stayed implementation of the affected provisions until these changes are finalized. OCS sources are not subject to part 68 because the connection between this part and protection of ambient air quality is too remote; therefore, CAA section 328 proscribes EPA's jurisdiction.

5. State and Local Regulations. Commenters sought clarification of how risk management programs implemented under state laws in Delaware, New Jersey, California, and Nevada would be treated. Some commenters said sources complying with these state rules should be grandfathered into EPA's rule for at least five years. California commenters asked that risk management prevention programs (RMPPs) developed and submitted under California's rule be considered in lieu of the required RMP. Some commenters asked that documentation created to meet the state requirements be considered adequate to meet EPA's program so that additional documentation need not be created just to meet slightly different rules. A few commenters suggested that EPA should explicitly preempt any state risk management program regulations that are not submitted to and approved by EPA. Other states said that EPA should defer to state rules on hydrogen sulfide and propane.

None of the four state risk management program rules is identical to EPA's or each other. The Delaware, New Jersey, and Nevada programs closely parallel the OSHA PSM rule; the California program is less specific. EPA expects that sources in compliance with these state programs will have completed most of the steps required under EPA's rule. EPA notes that these sources are generally also covered by OSHA PSM and, therefore, should be in compliance with a significant portion of EPA's rule.

In relation to the request for grandfathering, EPA does not have the authority to grandfather compliance with programs that the Agency has not reviewed and approved. EPA expects that these four states will seek delegation of the 112(r) program under CAA section 112(l). At that time, EPA will review the state programs and approve them if they are as stringent as EPA's rule and meet other section 112(l) requirements. If states are granted delegation, they will have the authority to grandfather previous compliance. Because the CAA specifically grants states the right to impose more stringent regulations, EPA cannot preempt state programs as one commenter requested.

EPA believes that substitution of the RMPP for the RMP for California sources is not feasible. The California RMPPs are voluminous documents, submitted per process, not per source. These documents could not be submitted electronically. Because EPA is concentrating on submission of data elements, EPA believes that its RMP requirements can be met quickly by any source that has completed an RMPP. Completion of the RMP will not impose a large burden on sources. If the RMPP has summary sections, these may be directly transferable for use as the executive summary.

In regard to other state laws, states may include them as part of their CAA section 112(l) submission for EPA's review and approval. These laws, however, must be as stringent as EPA's; that is, they must cover all elements of the rule with requirements that at least match EPA's. EPA notes that state propane laws are generally based on NFPA–58, which EPA is using to help develop its model risk management program for propane distributors and users. Therefore, sources in compliance with NFPA–58 requirements may meet many of the requirements of Program 2, as defined in the model.

Q. Industry-Specific Issues

A number of industries submitted comments on issues that were particular to them, in many cases seeking exemption from the rule.

1. Oil and Gas Facilities. Industry commenters argued that components of the oil and gas industries should be excluded from EPA's risk management program; in particular, that EPA should exempt the following operations and facilities from RMP requirements:

- Atmospheric storage and transfer of flammable liquids;
- Retail facilities;
- Marketing terminals and bulk plants;
- Remote, low-risk petroleum operations;
- Oil and gas exploration, production and processing facilities;
- Crude oil separation, handling, and storage operations;
- Subsurface hydrocarbon reservoirs;
- All transportation and facilities incident to transportation; and
- Outer continental shelf facilities.

Commenters noted that these industries and facilities pose a low risk to the public for a number of reasons. Significant accidental releases are highly unlikely because these facilities handle materials which, given site conditions, have limited potential for release to the air or offsite impacts. Existing regulations reduce the potential for significant accidental releases. Additionally, commenters argued that the RMP provisions extend beyond EPA's statutory authority and run counter to the Domestic Natural Gas and Oil Initiative established by President Clinton.

Commenters stated that most of the exploration and production facilities are remotely located and argued that even the tiering approach that EPA proposed in the SNPRM did not provide adequate relief for these sources, which pose minimal risks. They noted that OSHA specifically excludes remotely located sources, retail facilities, DOT-regulated sources, and atmospheric storage tanks. A number of commenters said that EPA had never included most of these sources in its economic analysis, implying that EPA did not intend to cover them in these regulations; they requested an explicit statement to that effect. One commenter opposed an exemption for oil and gas sources and pipeline and other transportation companies, arguing that these sources have some of the most common or worst accidents.

EPA does not agree that marketing terminals or bulk plants should be excluded if there are regulated substances present above their threshold quantities. Although EPA did not specifically exempt gasoline and naturally occurring hydrocarbons (e.g., crude oil), it did not intend to cover regulated flammables in these mixtures. In its proposed rule (61 FR 16598, April 15, 1996), EPA has proposed to revise the criteria for flammable mixtures and to exclude naturally occurring hydrocarbons prior to processing at a gas processing plant or refinery. Flammable mixtures would be covered only if they met all of the NFPA-4 criteria. Gasoline and crude oil are listed with NFPA 3 flammability ratings in NFPA 325 M, Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids, 1991. Elsewhere in today's Federal Register, EPA has stayed implementation of the risk management program rule for substances and processes that would be affected by the proposed changes. As EPA explained in the preamble to the final list rule, the Agency has not adopted OSHA's exemption for atmospheric storage of flammables because, unlike OSHA, EPA has listed only flammable gases and highly volatile flammable liquids. EPA considers these substances to be intrinsically hazardous, regardless of storage conditions and, therefore, does not believe it is appropriate to provide an exemption for such tanks.

2. Retail Facilities. The rule is expected to cover a substantial number of retail facilities, specifically those handling propane and ammonia as a fertilizer. Approximately 100 commenters requested that EPA exempt propane retailers from coverage under the risk management program, primarily due to the effectiveness of the existing regulatory structure for the industry (in particular, NFPA Standard 58). At the same time, more than 50 commenters requested that EPA exempt agricultural chemical retailers (with inventories of ammonia fertilizer) from coverage under the risk management program because of the existing state and Federal regulation of these operations.

a. Propane Retailers. Commenters argued that the primary thrust of the proposed regulations is to preclude unwarranted risk to the surrounding community from an accidental failure of a storage tank. They stated that the basic purpose of NFPA 58, the Storage and Handling of Liquefied Petroleum Gases, is to prevent such releases through design and engineering. This standard requires fire safety analyses, distance separation between the storage tank and surrounding exposures, and approval of plans for new or existing facilities by local authorities. They noted that NFPA 58 has been adopted as state law in 48 of the 50 states and that the two remaining states (California and Texas) have similar rules. They said that propane storage containers are manufactured strictly to the specifications of the American Society of Mechanical Engineers. According to commenters, emergency response planning is already covered by NFPA-58, OSHA, and DOT. Because of compliance with this standard and state law, commenters argued that the rule would not provide any improvement in safety. A number of commenters argued that propane was a heating fuel, not a chemical, and did not pose the same level of risk as larger quantities of propane held and used as a chemical feedstock. One commenter noted that OSHA had exempted retailers and propane when used as a fuel.

In contrast, one state, which also regulates propane under its state risk management program law, argued that propane is not sufficiently regulated. It stated:

Fire authorities inspect each new facility before propane is introduced. They concentrate on adequate fire water supply, electrical code compliance, and distance separation requirements. Some fire authorities are not technically capable of determining if the facility piping system complies with NFPA 58. There are no follow-up inspections to assure continuing compliance and no requirements under NFPA 58 for training distribution plant operators or mechanics, written maintenance programs, or procedures to control change. During our inspections, we have identified some facilities that were not in conformance with NFPA 58.

EPA does not agree with commenters who are seeking exemption of propane retailers and users. In a supplemental notice, EPA sought comment on whether flammable substances, when used as a fuel, posed a lesser intrinsic hazard than the same substances handled otherwise; no data were submitted to EPA to justify this position. Further, EPA has considerable accident data for propane that illustrates its potential to affect the public located nearby. As a result, EPA continues to believe that the hazard posed by propane is inherent and does not vary with its use. Because of a lack of data justifying a different level of hazard for flammables used as fuel, the Agency will not adopt a fuel use exemption similar to that provided by OSHA.

Furthermore, EPA notes that many propane retailers are relatively close to other commercial buildings and the community. Should a fire or explosion occur, the community could be substantially impacted. EPA believes the community and sources need to be aware of the potential risk and understand the steps the source is taking to limit the potential for a release. Because EPA recognizes that the full PSM standard is not appropriate for propane retailers, EPA has assigned propane retailers and users to Program 2. Compliance with most aspects of Program 2 should be simple. For example, use of tanks that meet relevant ASME standards and retention of the material safety data sheets required by OSHA will satisfy the safety information requirements of § 68.48. Furthermore, EPA is developing a model risk management program to help sources comply. This model is being based on NFPA-58 standards, where they apply, so that sources already in compliance with NFPA-58 will be in substantial compliance with Program 2. The model will help sources comply with other elements in a cost-effective manner.

b. Ammonia Retailers. Ammonia is sold as a fertilizer from agricultural retailers, primarily in the Middle West, Great Plains, and West. Commenters stated that the retail fertilizer industry is already governed by OSHA's Health and Safety Standards, which are specifically applicable to the storage and handling of anhydrous ammonia. They noted that this standard (29 CFR 1910.111) is based on ANSI K61.1 and sets forth extensive requirements applicable to the design, construction, location, installation, and operation of anhydrous ammonia facilities. Measures designed to adequately provide for the prevention of and response to accidental releases are an integral part of this standard. Some commenters said that if EPA did not exempt retail sources, ammonia retailers should be deemed to be in compliance with the prevention program. In addition, commenters said they are regulated under state laws and are subject to EPCRA reporting requirements. Many commenters argued that retail fertilizer sources have an excellent safety record. They stated that retail fertilizer facilities are limited in size, do not involve complex processing and manufacturing operations, and are located in rural areas; consequently, they present a low risk to the surrounding communities. Commenters objected to the regulations because they would impose a substantial burden on what are small operations. Some commenters argued that, because Congress had granted EPA the authority to exempt ammonia when held by a farmer for use as a fertilizer, EPA could grant retail ammonia sources the same exemption.

Although EPA recognizes that other regulatory programs address safety for agricultural retailers and that such operations do not involve complex processing or manufacturing, EPA disagrees with the conclusions of these commenters. According to the industry, the typical ammonia retailer has 200 tons of ammonia on site at times. Even in rural areas, release of even a fraction of this quantity could affect the community. Sources constructed and operated consistent with the relevant ANSI standard will meet the EPA rule for subjects addressed by both. EPA recognizes the OSHA standard for anhydrous ammonia handling and hopes to work with the ammonia industry to develop a model risk management program for ammonia retailers. This model would be based on the OSHA standard, where applicable. The standard, however, does not include some elements mandated by the CAA as part of the prevention program, specifically training and maintenance programs. In addition, EPA believes that there is a further need to convey information on hazards and risk management practices of these operations to the public and local entities. The model will provide guidance to help sources comply with these elements in a cost-effective manner. Finally, EPA does not agree that the Congressionally allowed exemption of farmers can be extended to non-farmers. See 136 Cong. Rec. S2284 (March 7, 1990) (colloquy between Sens. Kerrey and Chafee).

3. Refrigeration Systems. A number of commenters stated that ammonia used in a refrigeration system should be exempted from this rule because these systems pose little risk to the public. One commenter said that EPA should exempt roof-mounted air handlers, pipes, and components. Some commenters said that the industry was already overregulated and the imposition of this rule would be a burden.

The CAA requires EPA to impose this rule on any source with more than a threshold quantity of a regulated substance. Therefore, EPA cannot exempt ammonia refrigeration systems that contain more than 10,000 pounds of ammonia. In addition, ammonia refrigeration plants have had a substantial number of accidents where the ammonia has migrated offsite, indicating that these systems do pose a risk to the public. At the same time, it should be noted that all of these refrigeration systems are already covered by the OSHA PSM standard. Consequently, the only additional steps sources will have to take are to conduct the hazard assessment, comply with the emergency response requirements, and file the RMP. EPA worked with the International Institute of Ammonia Refrigeration to develop a model risk management program that will facilitate compliance and reduce the burden on sources (Model Risk Management Program for Ammonia Refrigeration). For most of these sources, which have only one chemical, the RMP will be a very brief document.

4. Other Operations. Comments were submitted on a range of other industries.

The warehouse industry said that it should be exempted where material is received and shipped in packages that are not opened; commenters noted that they are covered by DOT packaging regulations. EPA believes that warehouses must be covered if they have more than a threshold quantity of a regulated substance. Under the OSHA definition of process, which EPA has adopted, packages of a substance stored in the same room may be counted toward the threshold quantity if the packages could release their contents in the same event. EPA notes that warehouse fires have created major incidents in the past 10 years, and the Agency believes that warehouses should take the steps necessary to prevent and mitigate such incidents. EPA is interested in working with the industry to create a model risk management program that would help sources develop a hazard assessment process that can account for potentially changing contents of a warehouse.

Batch processors face related problems with changing chemicals on site. EPA is willing to work with industry to develop a generic approach to risk management programs. EPA believes, however, that most batch processors will already be covered by OSHA PSM. The RMP Offsite Consequence Analyses Guidance will reduce the burden of developing multiple release scenario analyses. To minimize the need for continual revision of their worst-case scenario to accommodate periodic inventory changes, sources such as warehouses and batch processors may want to analyze their expected chemical inventory in developing a scenario that represents the worst case for the foreseeable future, even if the substance is not currently in use at the source.

A number of commenters raised questions about coverage of POTWs. A specific concern was EPA's statement in the NPRM that substances in waste streams would not be covered by the rule. This statement is based on the belief that the regulated toxic substances will not constitute more than one percent of any waste stream received by a POTW. Consequently, they will not be considered in calculations of threshold quantities. No waste stream is likely to meet EPA's flammability criteria. POTWs are likely, however, to be covered because of regulated substances they use to treat wastes.

R. Implementing Agency Delegation

EPA received a number of comments to the NPRM regarding the role and potential burden on LEPCs, SERCs, and other local agencies that may result from implementation of the risk management program. In the SNPRM preamble, EPA indicated that EPA and the states share the responsibility for protecting public health and the environment and encouraged state and local agencies to seek delegation for this program because their participation is essential to successful chemical accident prevention, preparedness and response and recognized by the legislative history and the CAA section 112(r) requirements by requiring that RMPs be submitted to states and local planning entities. States are already involved in chemical emergency preparedness and planning through the requirements of EPCRA.

Commenters on the SNPRM requested that the final rule clearly state that EPA is the implementing agency unless a state or local agency is granted a delegation of authority under section 112(l). Several commenters indicated that EPA should allow states the flexibility to designate the most appropriate implementing agency, such as OSHA or the state agency that administers and enforces the OSHA PSM standard, rather than mandating the air permitting authority or a SERC agency in the final rule. A number of commenters on the SNPRM and NPRM suggested that existing local emergency planning agencies (e.g., LEPCs, fire departments) would be best suited to serve as implementing agencies, in part because they are closest to the communities at risk. However, many commenters (including LEPCs that commented) argued that LEPCs would be unprepared to take on such a burden and that even a minimal role in implementing section 112(r), including mere storage of RMPs, would overwhelm their limited resources and technical expertise. In addition, commenters indicated that LEPCs, as mostly volunteer agencies, would not and could not have the authority necessary to implement and enforce the RMP rule.

The implementing agency is the state or local agency that obtains delegation of the section 112(r) program under section 112(l). As stated in the definition of Implementing Agency in today's rule, until a state or local agency is granted delegation of the risk management program under CAA section 112(l), EPA will serve as the implementing agency. States may select any state or local agency to implement this program, including an air permitting authority or a state OSHA program, provided the agency has the expertise, legal authority and resources to implement the program; the state must also have the authority to enforce the program. EPA realizes that, in most cases, LEPCs will not have the authority to be implementing agencies, but they should be involved as much as possible in the program.

Commenters on the SNPRM suggested that EPA should avoid adding specific implementation details to the final rule so that states would have the flexibility to develop or continue programs that meet local needs. Other commenters, however, suggested that EPA should issue delegation guidance and to define the elements of an adequate state program to avoid inconsistent interpretations and implementation of the rule. Commenters representing companies that operate in several states were particularly concerned about maintaining uniform implementation.

EPA has not added specific state or local implementation requirements to today's rule because the Agency already promulgated sufficient provisions for delegation of accident prevention programs under section 112(r) to states and local authorities under 40 CFR part 63, subpart E, which implements CAA § 112(l). As EPA discussed in the SNPRM, implementing agencies will be responsible for such tasks as reviewing RMP information, auditing and inspecting a percentage of sources annually, requiring revisions to the RMP as necessary, and assisting the permitting authority in ensuring compliance. States have the flexibility to implement their own programs, however the CAA requires that state or local program requirements must be as stringent as EPA's and must include EPA regulated substances and processes. This means that California, Delaware, Nevada, and New Jersey will need to revise their existing program requirements, substance lists, and in some cases, thresholds, to meet EPA's requirements and to obtain section 112(r) delegation. EPA intends to issue additional guidance that will help state and local agencies obtain program delegation. EPA must review delegation requests submitted under 40 CFR part 63, subpart E to ensure that state and local programs requirements are as stringent as EPA's. With respect to nationwide uniform implementation, EPA notes that the CAA specifically grants states the right to develop more stringent requirements; consequently, there may be state-to-state variations. Many states, however, are prohibited under their state laws from adopting regulations that are more stringent than Federal rules.

One commenter on the NPRM indicated that EPA's estimation of the costs of implementing the section 112(r) program is extremely low, representing demands that are 65 to 75 percent lower than those experienced by states implementing similar programs. LEPCs and state governments were concerned about the imposition of section 112(r) requirements on state and local governments as an unfunded mandate. Several state agencies indicated that the considerable financial burden imposed by section 112(r) implementation would prohibit them from seeking section 112(l) delegation. Commenters encouraged EPA to develop guidance on potential funding mechanisms, including descriptions of the fee systems used by existing state programs for accidental release prevention. Several commenters indicated that the political climate at the state and local level would make it impossible to levy new, or raise existing, fees.

Since states are not required to seek delegation of this program, it does not constitute an unfunded mandate (see also section V.C). Before EPA grants delegation, state or local agencies must show that they have the resources to implement and enforce the risk management program rules. EPA recognizes that there is no Federal funding associated with implementation of section 112(r) but believes that the tiered program levels and centralized electronic submission of RMPs in today's rule substantially reduces the cost and resource demand for state and local entities seeking delegation. State and local agencies that fully implement section 112(r) will be able to develop and operate a program that best fits their individual needs, resources, and structures. As part of consideration of the costs to implement section 112(r), state and local agencies should also weigh the benefits of integrating accident prevention with pollution prevention, environmental protection, and worker and public health and safety at the state level, and the benefits to local industry associated with state, rather than Federal, implementation of this program. Many states and local agencies have established a close working relationship with the sources in their jurisdiction. In addition, a number of state and local publicly owned sources are covered by this rule; state implementation can serve to enhance compliance that may otherwise require increased coordination with EPA. Although other states have successfully "self-funded" their accident prevention programs with various state authorized fees, EPA recognizes that it may be difficult for state or local agencies to generate the resources necessary to fund full section 112(r) implementation.

Several commenters on the SNPRM requested guidance and training for sources, local entities, and implementing agencies on understanding hazard assessments, and conducting program inspections, reviews, and audits. EPA recognizes the need for guidance and training for implementing agencies and sources. EPA plans to modify and to continue offering its four-day Chemical Safety Audit workshop to other federal agency representatives, state and local government officials, and industry representatives as an introduction to chemical process safety, current industry chemical accident prevention practices and understanding the elements of the risk management program. EPA is ready to assist state and local agencies through its regional offices to coordinate state and local programs and to help in obtaining program delegation and development of resources to fund state or local programs. Region 4 in Atlanta, Georgia, for example, has developed an integrated section 112(r) work group of state and local air pollution control, SERC, and LEPC representatives who participate in workshops, seminars, and pilot studies designed to foster local program implementation and to build a support network. EPA also continues to work with NOAA to enhance modeling and information management tools contained in the Computer Aided Management of Emergency Operations (CAMEO) and Areal Locations of Hazardous Atmospheres (ALOHA) software for local emergency planners and responders.

Two commenters on the NPRM requested that EPA address the issue of tort liability in the event that an accidental release occurs after an RMP has been submitted to the implementing agency. One other commenter believed that the implementing agency must be held accountable for RMP content while another believed that EPA must ensure that adequate limits to implementing agency liability exist.

The primary responsibility for accident prevention rests with the owners or operators of sources. Section 112(r) does not create a basis for implementing agency tort liability under federal law. CAA § 112(r)(1). When EPA is the implementing agency, it is immune from tort liability under state law. States that are implementing agencies generally will have protection from liability under their state laws. If a state has waived its sovereign immunity, EPA cannot take steps to alter that situation. EPA encourages states concerned about this issue to discuss the matter with their attorneys general to determine whether state law protects them from liability.

S. Accident Information Reporting

In the SNPRM, EPA discussed the possibility of additional accident reporting to support a variety of future accident prevention activities. EPA proposed that sources either submit an OSHA PSM or Program 3 investigation report for certain accidental releases or a survey form that collects certain accident data. Otherwise EPA could use existing authorities to collect additional accident data from existing information, as needed.

Most commenters opposed EPA's proposal for additional accident reporting requirements, especially the collection of accident investigations prepared under Program 3 or OSHA PSM, because it increases costs, it would have no benefit, it generates significant liability issues, and it would divert limited resources away from activities with greater public health benefit. Commenters supported the use of existing reports since this approach should not generate an additional burden, such reports are available through EPA and OSHA under other regulations and they should be adequate for the objectives outlined by EPA.

EPA agrees with commenters and has decided not to adopt any additional accident reporting requirements. EPA will rely on the five-year accident history for the immediate future and, based on that information, determine whether additional information and requirements are needed. EPA has the authority under CAA section 114 to investigate releases and seek additional information as needed.

T. Other Issues

1. OSHA VPP. In the SNPRM, EPA asked whether the OSHA Voluntary Protection Program (VPP) protects public health and the environment and suggested that one approach to third party review (discussed below) would be to assign sources that participate in VPP to Program 2. Many commenters supported VPP participation as a criterion for assigning a source to Program 2. Several of these commenters noted, however, that because VPP sources are probably already covered by OSHA PSM, assigning them to Program 2 would provide no reduction in burden or regulatory relief. One commenter suggested that EPA could allow VPP sources the flexibility to determine, with the LEPC, what the offsite consequence analysis would cover. Seven commenters opposed VPP participation as a Program 2 criterion because VPP does not address offsite consequences, no evidence was presented that PSM is being carried out adequately at VPP sources, and this approach would discriminate against other voluntary programs.

After consideration of the comments, EPA has decided not to use VPP participation as a Program 2 criterion, but has adopted language in the final rule to exempt sources with a Star or Merit ranking under OSHA's VPP from selection for audits based on the criteria in § 68.220 (b)(2) and (b)(7); such a source may be audited if it has an accidental release that requires an accident investigation under these regulations. This decision recognizes that such sources have active accident prevention programs and should not be regarded in the same way as other sources within the same industry or as other sources in general. In addition, it thus provides a similar degree of benefit with respect to EPA auditing as it does with respect to OSHA auditing. EPA agrees that VPP sources would gain no benefit by assignment to Program 2. EPA does not believe it is appropriate to adjust the hazard assessment requirements for VPP sources; this information is essential to local emergency preparedness and response and for public dialogue.

2. Qualified Third Party. In the SNPRM, EPA sought comments on whether sources should be allowed to have qualified third parties assist them in achieving and maintaining compliance. Eight commenters supported third party reviews as a way to reduce implementing agency efforts. One commenter stated that sources should be required to hire a qualified third party to assess their activities. Most commenters, however, expressed some reservations including greater cost if sources were required to hire third parties, when many sources already have staff qualified to implement the risk management program. Commenters said that a third party review would be particularly costly for retailers who will have model programs and stated that use of third parties would add another layer of bureaucracy to the process. A number of commenters said that EPA should fund third parties. Commenters also stated that use of third parties might confuse the issue of who was responsible for safety and for enforcement; they said that EPA must make it clear that the owner or operator of the source remains responsible for accidents and that the implementing agency retains enforcement authority. Finally, several commenters asked who would determine the qualifications of a qualified third party.

EPA is not requiring use of qualified third parties in this rule. EPA, however, endorses the concept of offering sources the option of using third parties to assist owner/operators in meeting their obligations under the rule. Based on the comments, EPA recognizes that any third party proposal must:

- Not weaken the compliance responsibilities of source owner/operators;
- Offer cost savings and benefits to the industry, community, and implementing agencies that significantly exceed the cost of implementing the qualified third party approach;
- Lead to a net increase in process safety, particularly for smaller, less technically sophisticated sources; and
- Promote cost-effective agency prioritization of implementing agency oversight resources.

Several key issues need further discussion before the use of a qualified third party may be offered as an option. These include qualification criteria, certification procedures, liability, and other critical issues associated with the use of a qualified third party. Therefore, following promulgation of this rule, EPA proposes to call a meeting to solicit input from trade associations, professional and technical societies, states, and other interested parties to address these issues and investigate the need for developing a process and a national exam to qualify third parties.

3. Documentation. Commenters expressed a number of concerns about the level of recordkeeping and the availability of information. Some commenters stated that records need to be maintained for longer than five years; commenters suggested 10 years, 20 years, and the life of the source. One commenter suggested that records should be kept for the life of the process and then seven years thereafter to ensure that records would be available if a lawsuit was initiated. Industry commenters said that only current documents and data should be maintained to prevent confusion from having multiple versions of the same document. One commenter stated that policies and procedures should be kept until they are superseded, then they should be destroyed; retaining old, superseded information is unsafe and unacceptable and can result in accidents.

One commenter said that sources should be required to develop and maintain a master index or catalogue of documents relevant to the proposed rule to support public access. Another commenter stated that, in addition to maintaining records supporting the implementation of the risk management program, the owner or operator should submit the records to the implementing agency. A third commenter said that the rule should require that all records supporting compliance with the rule be organized and readily available through the designated contact person at the source to the implementing agency for inspection.

Other commenters said the proposed recordkeeping was excessive. One stated that EPA is forcing industries towards "defensive universal recordkeeping," retaining mountains of documents because EPA has not specified what records need to be kept. Another commenter said that an examination of the proposal indicated that no fewer than about 22 separate written documents are required to be maintained on site or submitted to the responsible regulatory agency and other parties. One commenter noted that more resources will be spent on filling out paperwork than on actual spill prevention.

In the final rule, EPA has adopted the OSHA PSM language for Program 3 processes; therefore, documentation for PSM elements is dictated by that rule. For other elements of the risk management program and for processes in other tiers, EPA has set a period of five years for the maintenance of supporting documentation. EPA agrees with commenters that only current versions of documents and procedures should be retained. On the issue of records submitted to the implementing agency, EPA believes that the provisions outlined in the final rule (as described in Subpart G to part 68) will limit the volume of such documentation. The implementing agency and EPA will have access to all on-site documentation when needed. Much of the on-site documentation will be confidential and protected under Section 114(c) of the CAA. The burden on the implementing agency will be substantially reduced because it will not have to establish protected trade secret files and procedures.

Finally, EPA agrees with commenters that level of recordkeeping should be kept as low as possible consistent with EPA's statutory mandate. EPA has reduced the documentation requirements for Program 2 processes (particularly with respect to the prevention program) because it believes that for these sources, the benefit of the records does not offset the cost of creating and maintaining files.

IV. Section-by-Section Analysis of the Rule

This section discusses specific changes to the rule that are not otherwise described in this preamble. The rule has been renumbered to include new sections and subparts. The hazard assessment requirements have been divided into separate sections in subpart B. The Program 2 prevention program requirements are in subpart C; Program 3 prevention program elements are in Subpart D. Emergency response requirements are in subpart E, RMP requirements in subpart G. The registration requirement, proposed § 68.12, has been moved to the RMP subpart. Tables 3 and 4 present the distribution of NPRM and SNPRM sections and derivation of final rule sections.

TABLE 3.—DISTRIBUTION TABLE

NPRM and SNPRM citations	Final rule citations
68.3 Definitions	68.3 Definitions.
68.10 Applicability	68.10 Applicability.
68.12 Registration	68.160 Registration.
68.13 No Impact Sources (Tier 1)	68.10(b) Applicability. 68.12(b) General Requirements.
68.14 Streamlined Risk Management Program (Tier 2)	Subpart C Program 2 Prevention Program (68.48–68.60).
68.15 Hazard Assessment	Subpart B Hazard Assessment (68.20–68.42).
68.20 Prevention Program—Purpose	Deleted.
68.22 Prevention Program—Management System	68.15 Management.
68.24 Prevention Program—Process Hazard Analysis	68.67 Process Hazard Analysis.
68.26 Prevention Program—Process Safety	68.65 Process Safety Information.
68.28 Prevention Program—Standard Operating Procedures	68.69 Operating Procedures.
68.30 Prevention Program—Training	68.71 Training.
68.32 Prevention Program—Maintenance (mechanical integrity)	68.73 Mechanical Integrity.
68.34 Prevention Program—Pre-Startup Review	68.77 Pre-Startup Review.
68.36 Prevention Program—Management of Change	68.75 Management of Change.
68.38 Prevention Program—Safety Audits	68.58 Compliance Audits. 68.79 Compliance Audits.
68.40 Prevention Program—Accident Investigation	68.60 Incident Investigation. 68.81 Incident Investigation.
68.45 Emergency Response Program	68.95 Emergency Response Program.

TABLE 3.—DISTRIBUTION TABLE—Continued

NPRM and SNPRM citations	Final rule citations
68.50 Risk Management Plan	Subpart G Risk Management Plan (68.150–68.190).
68.55 Recordkeeping Requirements	68.200 Recordkeeping.
68.58 Permit Content and Air Permitting Authority Requirements	68.215 Permit Content and Air Permitting Authority or Designated Agency Requirements.
68.60 Audits	68.220 Audits.

TABLE 4.—DERIVATION TABLE

Final rule citations	NPRM and SNPRM citations
68.3 Definitions	68.3 Definitions.
68.10 Applicability	68.10 Applicability, SNPRM 68.13.
68.12 General Requirements	SNPRM 68.13, 68.14.
68.15 Management	68.22 Prevention Program—Management.
68.20 Applicability (Hazard Assessment)	68.10 Applicability.
68.22 Offsite Consequence Analysis Parameters (Hazard Assessment).	68.15(e) Hazard Assessment.
68.25 Worst-Case Release Analysis (Hazard Assessment)	68.15(c) Hazard Assessment.
68.28 Alternative Release Analysis (Hazard Assessment)	68.15(d) Hazard Assessment.
68.30 Defining Offsite Impacts—Population (Hazard Assessment)	68.15(e)(3) Hazard Assessment.
68.33 Defining Offsite Impacts—Environment (Hazard Assessment)	68.15(e)(4) Hazard Assessment.
68.36 Review and Update (Hazard Assessment)	68.15(g) Hazard Assessment.
68.39 Documentation (Hazard Assessment)	68.15(h) Hazard Assessment.
68.42 Five-year Accident History (Hazard Assessment)	68.15(f) Hazard Assessment.
68.48 Safety Information (Program 2)	68.14(b) Streamlined Risk Management Program (Tier 2); 68.26 Process Safety Information.
68.50 Hazard Review (Program 2)	68.14(b) Streamlined Risk Management Program (Tier 2); 68.24 PHA.
68.52 Operating Procedures (Program 2)	68.14(b) Streamlined Risk Management Program (Tier 2); 68.28 SOPs.
68.54 Training (Program 2)	68.14(b) Streamlined Risk Management Program (Tier 2); 68.30 Training.
68.56 Maintenance (Program 2)	68.14(b) Streamlined Risk Management Program (Tier 2); 68.32 Maintenance.
68.58 Compliance Audits (Program 2)	68.38 Prevention Program—Safety Audits.
68.60 Incident Investigation (Program 2)	68.40 Prevention Program—Incident Investigation.
68.65 Process Safety Information (Program 3)	68.26 Prevention Program—Process Safety.
68.67 Process Hazard Analysis (Program 3)	68.24 Prevention Program—Process Hazard Analysis.
68.69 Operating Procedures (Program 3)	68.28 Prevention Program—Standard Operating Procedures.
68.71 Training (Program 3)	68.30 Prevention Program—Training.
68.73 Mechanical Integrity (Program 3)	68.32 Prevention Program—Maintenance (mechanical integrity).
68.75 Management of Change (Program 3)	68.36 Prevention Program—Management of Change.
68.77 Pre-Startup Review (Program 3)	68.34 Prevention Program—Pre-Startup Review.
68.79 Compliance Audits (Program 3)	68.38 Prevention Program—Safety Audits.
68.81 Accident Investigation (Program 3)	68.40 Prevention Program—Accident Investigation.
68.83 Employee Participation (Program 3)	68.24(f) Process Hazard Analysis.
68.85 Hot Work Permit (Program 3)	NPRM Preamble (58 FR 54205).
68.87 Contractors (Program 3)	NPRM Preamble (58 FR 54205).
68.90 Applicability (Emergency Response)	68.45(a) Emergency Response Program.
68.95 Emergency Response Program	68.45(b)–(f) Emergency Response Program.
68.150 Submission (Risk Management Plan)	68.50(a) Risk Management Plan.
68.155 Executive Summary (Risk Management Plan)	68.50(a) Risk Management Plan.
68.160 Registration (Risk Management Plan)	68.12 Registration.
68.165 Offsite Consequence Analysis (Risk Management Plan)	68.50(c) Risk Management Plan.
68.168 Five-Year Accident History (Risk Management Plan)	68.15(f) Hazard Assessment.
68.170 Prevention Program/Program 2 (Risk Management Plan)	68.14(b) Streamlined Risk Management Program (Tier 2); 68.50(g).
68.175 Prevention Program/Program 3 (Risk Management Plan)	68.50(g) Risk Management Plan.
68.180 Emergency Response Program (Risk Management Plan)	68.50(e) Risk Management Plan.
68.185 Certification (Risk Management Plan)	68.50(g) Risk Management Plan. 68.13(a) No Impact Sources.
68.190 Updates (Risk Management Plan)	68.50(h) Risk Management Plan.
68.200 Recordkeeping	68.55 Recordkeeping Requirements.
68.210 Availability of Information to the Public	42 U.S.C. 7412.
68.215 Permit Content and Air Permitting Authority or Designated Agency Requirements.	68.58 Permit Content and Air Permitting Authority Requirements.
68.220 Audits	68.60 Audits.
Appendix A—Table of Toxic Endpoints	68.15(h)(3)(iii) Hazard Assessment.

Section 68.3, Definitions, has been revised to add or delete a number of definitions. A definition of administrative controls has been added that is derived from the definition used

by the Center for Chemical Process Safety (CCPS).

The definition of analysis of offsite consequences has been deleted.

A definition of catastrophic release has been added that is adapted from OSHA's definition of catastrophic release (29 CFR 1910.119); OSHA's language on danger to employees in the workplace has been changed to imminent and substantial endangerment to public health and the environment.

A definition of classified information has been added. The definition is adopted from the Classified Information Procedures Act.

The proposed definition of covered process is unchanged.

The proposed definition of designated agency has been revised to indicate that the state, not the state air permitting authority, shall select an agency to conduct activities required by § 68.215.

As discussed above, a definition of environmental receptor has been added to list the receptors of concern.

The definition of full-time employee has been deleted.

A definition of hot work has been adopted verbatim from the OSHA PSM standard.

The definition of implementing agency is adopted as proposed in the SNPRM.

A definition of injury has been added.

A definition of major change has been added to clarify the types of changes that necessitate actions to manage change. The definition will help sources understand when they are required to take steps to review their activities for new hazards.

A definition of mechanical integrity has been added to clarify the requirements of maintenance sections.

A definition of medical treatment has been added to clarify what constitutes an injury. The definition is adapted from an OSHA definition used by sources in logging occupational injuries and illnesses.

The proposed definition of mitigation has been changed by adding a definition of active mitigation.

A definition of offsite has been changed to clarify that areas within the source would be considered offsite if the public has routine and unrestricted access during or outside of business hours. Areas within a source's boundaries that may be considered offsite are public roads that pass through sections of the site and natural areas owned by the source to which the public has unrestricted access. For some sites, parking lots within the boundary may be offsite if the source cannot restrict access.

A definition of population has been added. Population is defined as the public.

A definition of public has been added to state that all persons except employees and contractors at the stationary source are members of the public. A number of commenters stated that employees at other facilities should not be considered part of the public. EPA disagrees because these employees may not be trained in protective actions or have protective equipment appropriate for releases from covered processes.

A definition of public receptor has been added. Some commenters stated that EPA should include public roads within this definition. EPA decided that inclusion of public roads was unwarranted. EPA recognizes that people on public roads may be exposed during a release. In most cases, however, vehicles on public roads will be able to leave the area quickly and further access can be blocked, especially in isolated areas. If public roads were included, almost no sources would be eligible for Program 1 because there will be public roads leading to the source. In those cases where public roads are heavily traveled, there will be other public receptors near the source and, therefore, the source's processes will not qualify for Program 1.

OSHA's definition of replacement in kind has been adopted.

The definition of significant accidental release has been deleted.

A definition of typical meteorological conditions has been added which means the temperature, wind speed, cloud cover, and atmospheric stability class prevailing at the source. Data on the first three of these are available from local meteorological stations (e.g., airports). Atmospheric stability class can be derived from cloud cover data.

The definition of worst-case release has been revised to clarify that the release is the one that leads to the greatest distance to the applicable endpoint.

Section 68.10, Applicability, has been revised to change the term "tier" to "Program." The section now details the eligibility criteria for all three programs. Paragraph (a) has been revised to be consistent with statutory language on compliance dates. Sources must comply with the requirements by June 21, 1999, three years after EPA first lists a substance, or the date on which a source first becomes subject to this part, whichever is latest. After June 21, 1999, sources that begin using a regulated substance that has been listed for at least three years must be in compliance with the requirements of part 68 on the day they bring the substance on site above a threshold quantity.

The Program 1 eligibility requirements have been revised to clarify that the criteria are applied to a process, not the source as a whole, as discussed above. EPA has deleted requirements for explosives because the Agency is proposing to delist explosives. The types of accidents that will disqualify a process from Program 1 are now specified in the rule as those accidental releases of a regulated substance that led to offsite exposure to the substance, its reaction products, overpressure generated by an explosion involving the substance, or radiant heat generated by a fire involving the substance which resulted in offsite death or injury (as defined by the rule), or response or restoration activities at an environmental receptor. These accidental release criteria eliminate the need for a definition of significant accidental release, which has been deleted. Offsite environmental response or restoration would include such activities as collection, treatment and disposal of soil, shutoff of drinking water, replacement of damaged vegetation, or isolation of a natural areas due to contamination associated with an accidental release. The distance calculation equation for flammables has been dropped, and the worst-case release endpoint for flammables is specified which allows the source to use the reference tables or their own methodology to determine the distance to the endpoint. The requirement that the community have an EPCRA emergency response plan has been replaced by a requirement that the source coordinate emergency response procedures with local community responders.

As discussed above, the eligibility criteria for Program 2 and 3 have been changed. Both apply to processes, not sources.

Paragraph (e) states that if a process no longer meets the eligibility criteria of its Program level, the source must comply with the requirements of the new Program level and the update the RMP according to § 68.190. This paragraph clarifies the responsibility of the source when a process becomes ineligible for a Program level (e.g., public receptors move within the distance to an endpoint for a Program 1 process or OSHA changes the applicability of its PSM standard).

Proposed § 68.12, Registration, has been dropped. Registration requirements are now part of the RMP requirements in subpart G, § 68.160.

New § 68.12, General Requirements, has been added to provide a roadmap for sources to use to identify the requirements that apply to processes in each of the three tiers. The Program 1 requirements, in proposed § 68.13, have been included in this section. Owners or operators of Program 1 processes are required to analyze and document in the RMP the worst-case release to ensure that they meet the eligibility criteria of no public receptors within the distance to the endpoint. As discussed above, the requirement to post signs has been dropped. The certification statement has been revised to be consistent with the eligibility requirements. If a source has more than one Program 1 process, a single certification may be submitted to cover all such processes.

The Program 2 requirements specify the sections of the rule that apply to these processes.

The Program 3 requirements specify the sections of the rule that apply to these processes.

Proposed § 68.22, Management, has been moved from the prevention program to § 68.15 in subpart A-General. The section has been adopted as proposed except that the purpose sentence in paragraph (a) has been dropped and a phrase at the beginning of paragraph (b) has been deleted as unnecessary.

A new subpart B has been created to cover the hazard assessment requirements. The proposed § 68.15 has been divided into separate sections to cover the parameters, the different types of analyses, the identification of offsite populations and environments, documentation and updates, and the five-year accident history. EPA believes that limiting each section to a single topic will make the rule easier to understand.

Section 68.20 has been added to specify which hazard assessment requirements apply to Program 1, 2, and 3 processes. All sources are required to complete a worst-case release analysis for regulated substances in covered processes, based on the requirements of § 68.25. Program 2 and 3 processes must also perform alternative release analyses required by § 68.28. All sources must complete the five-year accident history for all covered processes.

A new § 68.22 has been added to list the parameters to be used in the offsite consequence analyses. Owners or operators who choose to use their own air dispersion modeling tools must use the parameters specified in paragraphs (a), (e), (f), and (g) of this section; they must use the meteorological parameters specified in paragraph (b) of this section unless they can demonstrate that the conditions do not exist at their site. Paragraph (c) specifies the ambient temperature and humidity for worst case (highest daily maximum over the previous three years and average humidity); if a source uses the guidance, it may use average temperature and humidity (25° C and 50 percent) as default values. EPA recognizes that these values are less conservative than the worst-case meteorological conditions, but determined that they represent a reasonable average to be used for developing tables. Providing tables for a variety of temperatures and humidity would have made the guidance much more voluminous and difficult to use. EPA is requiring sources that use dispersion models instead of the guidance to use actual temperature and humidity data applicable to the site. EPA believes this approach represents a reasonable tradeoff. The guidance generates conservative results even with the less conservative assumptions about temperature and humidity; air dispersion modeling will generally produce less conservative results and, therefore, should be based on actual data for these variables. Average data applicable to the source may be used for alternative scenarios. Paragraph (d) requires that the release height for worst-case be at ground level (zero feet). Paragraph (e) specifies that urban or rural topography be used as appropriate in modeling. Paragraph (f) requires sources to use models or tables appropriate for the density of the substance being released (e.g., dense gases must be modeled using tables or models that account for the behavior of dense gases). Dense gases are typically those that are heavier than air as well as those that form aerosols and behave as if they are heavier than air upon release. For worst-case releases, liquids (other than gases liquefied by refrigeration only) shall be considered to be released at the highest daily maximum temperature or at process temperature, whichever is higher. For alternative scenarios, substances may be considered to be released at ambient or process temperatures as appropriate. Owners or operators may choose to use EPA's RMP Offsite Consequence Analysis Guidance for their offsite consequence analyses. All of the parameters specified here are reflected in this guidance.

A new § 68.25 has been added on the worst-case release analysis. As discussed above, the section requires one worst-case release for toxics and one for flammables. If additional scenarios, for either class of substances, would potentially expose receptors not exposed by the worst-case release, the additional scenario shall be analyzed and reported. This provision is to take into account the possibility that at large sources, vessels at opposite ends of the source may expose different populations.

The section specifies how maximum quantity in a vessel or pipe is to be determined, the scenarios to be considered for toxic gases, toxic gases liquefied by refrigeration only, toxic liquids, and flammables, the parameters to be used, consideration of passive mitigation, and factors to be considered in selecting the worst-case scenario. The section also specifies that sources may use proprietary models if the source provides the implementing agency access to the model and explains differences between the model and publicly available models, if requested. This approach will allow sources to use the most appropriate models available, while preserving the transparency of the results.

A new § 68.28 has been added on alternative release scenario analysis. As discussed above, the section requires one alternative release analysis for all flammables held above the threshold in processes at the source and one alternative release analysis for each toxic held above the threshold in processes. For each scenario, the owner or operator shall select a scenario that is more likely to occur than the worst case; and that will reach an endpoint offsite, unless no such scenario exists. The section includes a list of scenarios that owners/operators may want to consider, but does not dictate a particular scenario. EPA has provided additional direction and suggestions for defining these scenarios in the RMP Offsite Consequence Analysis Guidance. As noted above, the section references the parameters to be used and allows consideration of both passive and active mitigation systems. The section specifies factors to be considered in selecting alternative scenarios; specifically, sources shall consider releases that have been documented in the five-year accident history; or failure scenarios identified through the PHA or hazard review.

A new § 68.30 has been added on defining offsite impacts—population. The section specifies that populations are to be defined for a circle with a radius that is the distance to the endpoint. Owners or operators are required only to estimate the residential population within the circle to two significant digits and may use Census data to make these estimates. Owners or operators are also required to note, in the RMP, the presence of any major institutions, such as schools, hospitals, prisons, public recreational areas, arenas, and major commercial and industrial developments, but they are not required to estimate the number of people present at such sites. These additional locations are those that would normally be shown on area street maps.

A new § 68.33 has been added on defining offsite impacts to the environment. As discussed above, the owners or operators are required only to identify any environmental receptors within the circle with a radius determined by the distance to the endpoint. The owners or operators are not required to assess the potential types or degree of damage that might occur from a release of the substance. The environmental receptors are those that can be identified on U.S. Geological Survey local topographical maps or maps based on U.S.G.S. data.

A new § 68.36 has been added to list the requirements for reviewing and updating the offsite consequence analysis. As proposed, if no changes occur at the site, the analyses must be reviewed and updated at least once every five years. If changes at the site occur that would reasonably be expected either to increase or decrease the distance to the endpoint by a factor of two or more, owners/operators are required to update the offsite consequence analysis within six months. The time for the reanalysis has been changed to six months to make it consistent with the update requirements for the RMP. The proposed requirement for reviewing the analyses based on offsite changes has been deleted. A number of commenters objected to the requirement because it would have compelled them to track changes over very large areas. Because the distance to the endpoints, especially for toxics, may be as much as 40 km, the area affected could easily exceed 1,000 square miles. EPA agreed with commenters that there was little benefit from requiring sources to track offsite changes and redo analyses because the public is aware of the changes.

A new § 68.39 has been added to list the documentation related to the offsite consequence analyses that must be retained on site. For both types of scenarios, the documentation shall include a description of the scenarios identified, assumptions and parameters used, the rationale for the selection of specific scenarios; assumptions shall include use of mitigation and any administrative controls that were assumed to limit the quantity that could be released. Documentation shall include the effect of the mitigation and controls on the release quantity. The documentation shall also include the estimated quantities released, release rates, and durations of release. The owners or operators shall also identify the methodology used to determine distance to endpoints (i.e., EPA's guidance or an air dispersion model) and the data used to estimate population and environmental receptors potentially affected. EPA has deleted the proposed requirement for documentation of endpoints because these are now dictated by the rule. EPA has also dropped the requirement for documentation of distance calculations; distances will either be determined from EPA's reference tables or by an air dispersion model.

A new § 68.42 has been added to detail the requirements for the five-year accident history. As discussed above, the accident history is limited to accidental releases of listed substances from covered processes only. The only accidental releases that must be included in the history are those that resulted in deaths, injuries, or significant property damage on site, or known offsite deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage. Although language related to the types of environmental damage listed in the proposed rule has been dropped, EPA intends that environmental damage not be limited to environmental receptors; events where any known environmental impact of any kind (e.g., fish or animal kills, lawn, shrub, or crop damage), should be included in the history.

The data required on each accident include date, time, and approximate duration of the release; chemical(s) released; estimated quantity in pounds; the type of release event and its source; weather conditions (if known); on-site impacts and known offsite impacts; the initiating event and contributing factors (if known); whether offsite responders were notified (if known); and operational or process changes that resulted from the release. Estimates may be provided to two significant digits. EPA expects that for accidents that occur after the publication of this rule, sources will be able to document weather conditions, initiating events and contributing factors, and notification of offsite responders as these items would be part of the incident investigation. The Agency recognizes, however, that for incidents that occur before the rule is final, sources may not have this information unless OSHA PSM already would require the source to gather such information (e.g., initiating event and contributing factors). EPA has dropped the requirement that the concentration of the released substance be reported. Concentration at the point of release is assumed to be 100 percent except for substances in solution, where the concentration at the point of release is assumed to be the percentage of the solution as held or processed. The data provided will allow the source or the public to estimate the concentration offsite.

Because the five-year accident history will initially cover releases that occurred before this rule is promulgated, EPA is requiring reports on weather conditions only if the source has a record. For future releases, EPA encourages the owners or operators keep a record of wind speed and temperature if possible as these conditions have a significant impact on the migration of a release offsite. The rule specifies that the source must document known offsite impacts. The source is not required to conduct research on this subject, but must report impacts of which it is aware through direct reporting to the source or claims filed, or reasonably should have been aware of from publicly available information. The source is not required to verify the accuracy of public or media reports.

A new subpart C has been created to include the requirements of the prevention program for Program 2 processes.

New § 68.48 details the safety information that sources will be required to develop. The information is a subset of the information required under the OSHA rule and is limited to those items that are likely to apply to Program 2 processes: MSDSs, maximum intended inventory, safe upper and lower process parameters, equipment specifications, and the codes and standards used to design, build, and operate the process. Because Program 2 processes are generally simple, EPA determined that items such as process chemistry, process flow diagrams, detailed drawings on equipment, and material and energy balances are not necessary for these processes. Evaluation of consequences of deviations will be handled under the process review and the offsite consequence analysis.

Paragraph (b) of § 68.48 requires owners or operators to ensure that the process is designed in compliance with good engineering practices. The paragraph states that compliance with Federal or state regulations that address industry-specific safe design or with industry-specific design codes may be used to demonstrate compliance. NFPA–58 for propane handlers and OSHA's rule for ammonia handling (29 CFR 1910.111) are examples of such design codes.

The final paragraph of § 68.48 requires owners or operators to update the safety information if a major change makes it inaccurate.

New § 68.50 sets the requirements for a hazard review. The section lists the hazards and safeguards that the owners or operators must identify and review. The section states that owners or operators may use checklists, such as those provided in model risk management programs, to conduct the review. For processes that are designed to industry standards (e.g., NFPA–58) or Federal/state design rules, owners or operators need only check their equipment closely to ensure that it has been fabricated and installed according to the standards or rules and is being operated appropriately. In this case, the standard or rule-setting body has, in essence, conducted the hazard review and designed the equipment to reduce hazards. Like the PHA required under PSM, the hazard review must be documented and the findings resolved. The review must be updated at least once every five years or when a major change occurs. A streamlined version of the PHA requirement, the review recognizes that for simple processes some of the OSHA requirements, such as the requirement for a team and a person trained in the technique, may not be necessary. Most Program 2 processes will have model risk management programs that will assist owners or operators in conducting the review.

New § 68.52 covers operating procedures. The section allows owners or operators to use standardized procedures developed by industry groups or provided in model risk management programs as a basis for the SOPs. Owners or operators will need to review standardized SOPs to ensure that they are appropriate for their operations; some may need to be tailored. The steps covered in the SOP are adapted from the OSHA PSM standard. Certain elements of the PSM requirement (e.g., safety and health consideration) were dropped because they are generally covered in training provided under the OSHA hazard communication standard. Other elements were not included because they are covered by other OSHA rules or may not apply to the kinds of sources in Program 2. The section requires that the SOPs be updated whenever necessary.

New § 68.54 covers training and is a streamlined version of the OSHA PSM requirement. The primary difference with the OSHA PSM training element is that the documentation requirements have been dropped. EPA believes that for Program 2 sources, which generally will have simple processes and few employees involved in the process, the level of documentation required by OSHA PSM is not needed. The section specifically states that training conducted to comply with other Federal or state rules or industry codes may be used to demonstrate compliance with the section if the training covers the SOPs for the process. Workers must be retrained when SOPs change as a result of a major change.

New § 68.56 covers maintenance and requires owners or operators to prepare and implement procedures for maintenance and train workers in these procedures. The owners or operators are also required to inspect and test process equipment consistent with good engineering practices. The OSHA list of equipment has been dropped because it seemed too detailed for the simpler Program 2 processes. Similarly, the OSHA PSM requirements for documentation, equipment deficiencies, and quality assurance seem too burdensome given the type of processes in Program 2. EPA emphasizes that sources should address equipment deficiencies when they arise.

New §§ 68.58 and 68.60 on compliance audits and accident investigation are adopted directly from the OSHA PSM standard. EPA believes that these two elements are critical to good prevention practices and that no changes are needed from the OSHA requirements. EPA has added a provision to clearly indicate that audit reports more than five-years old need not be retained.

The Program 3 prevention program is codified in new subpart D. As explained above, the subpart adopts the OSHA PSM standard with only minor editorial changes necessitated by the different statutory authorities of the two agencies. Throughout the subpart, "employer" has been changed to "owner or operator," "facility" to "stationary source," and "highly hazardous chemical" to "regulated substance." EPA has reordered the elements somewhat so that the order reflects the progression in which sources will generally implement the program. For example, process safety information, which is needed for the PHA, now precedes that section. Pre-startup review, which is the last step of management of change procedures, now follows management of change. The reordering does not reflect any change in the content.

Section 68.65, process safety information, is adopted directly from OSHA. The only changes are the following: references to other requirements have been changed to reflect the appropriate EPA section numbers; the phrase "highly hazardous chemical" has been changed to "regulated substance"; the word "standard" has been changed to "rule" in paragraph (a); and the date when material and energy balances are needed for new processes has been changed to June 21, 1999. The words "including those affecting the safety and health of employees" has been deleted from the requirement for the evaluation of the consequences of deviations (paragraph (c)(1)(v)) because EPA has no authority to regulate the workplace. Further, EPA believes this change reflects EPA's desire that sources implement one prevention program that protects the safety and health of workers, the public and the environment and should have no effect on sources already complying with the OSHA PSM rule.

Section 68.67, process hazard analysis, has been adopted from the OSHA rule with a few changes. The OSHA schedule for completion of PHAs has been replaced with the compliance date of this rule; a new sentence has been added to state that PHAs conducted to comply with OSHA PSM are acceptable as the initial PHA under this rule. These PHAs shall be updated and revalidated based on their OSHA completion date. This provision will ensure that sources do not need to duplicate PHAs already completed or change their update schedule.

In paragraph (c)(2), the phrase "in the workplace" has been deleted from the requirement to identify previous incidents with the potential for catastrophic consequences because EPA does not have the authority to regulate the work place. EPA believes that this change will have no effect on the rule; any incident with the potential for catastrophic consequences in the workplace will also have had the potential for catastrophic consequences offsite. Similarly, the phrase "on employees in the workplace" has been deleted from paragraph (c)(7), which requires a qualitative evaluation of a range of the possible safety and health effects of failure of controls. By deleting the language, rather than changing it, EPA is consistent with its authority without imposing any new requirements on sources. A new sentence has been added to paragraph (f) to state that PHAs updated and revalidated under the OSHA rule are acceptable for EPA's purposes. Throughout this section, internal references have been changed.

To maintain consistency with OSHA PSM, proposed paragraph (j), which would have required the evaluation of mitigation and detection systems, has been dropped, as have proposed references to offsite consequences and public health and the environment. Evaluation of mitigation and detection systems is normally part of the PHA process and of management's decisions on implementing recommendations and, therefore, EPA decided that a separate requirement was not needed. EPA will collect information on monitoring, detection, and mitigation systems used in each Program 2 and 3 process as part of the RMP. Proposed paragraph (a), which was advisory, has been dropped.

Section 68.69, Operating Procedures, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator." Proposed paragraph (a) has been deleted to ensure consistency with OSHA.

Section 68.71, Training, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator" and changes in referenced sections. Proposed paragraph (a) has been deleted to ensure consistency with OSHA, as has proposed paragraph (e).

Section 68.73, Mechanical Integrity proposed as Maintenance, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator." Proposed paragraph (a) has been deleted to ensure consistency with OSHA. The proposed requirements to develop a critical equipment list, document training, and "maintain" as well as inspect and test under paragraph (d) have been dropped to ensure consistency with OSHA.

Section 68.75, Management of Change, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator" and changes to referenced sections. Proposed paragraph (a) has been deleted to ensure consistency with OSHA. EPA's proposed paragraph (b), which defined changes not covered by the section, has also been dropped in favor of OSHA's definition of "replacement in kind."

Section 68.77, Pre-Startup Review, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator" and changes to referenced sections. Proposed paragraph (a) and the reference to emergency response training in proposed paragraph (c)(4) have been deleted to ensure consistency with OSHA.

Section 68.79, Compliance Audits, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator" and changes to referenced sections. Proposed paragraph (a) has been deleted to ensure consistency with OSHA.

Section 68.81, Accident Investigation, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator" and "highly hazardous chemical" to "regulated substance" and changes to referenced sections. Proposed paragraphs (a) and (b), the latter of which would have required written procedures, have been deleted to ensure consistency with OSHA. References to significant accidental release have been dropped because the phrase is no longer used. Although EPA has adopted OSHA's language, EPA has changed the definition of catastrophic release. Consequently, this section requires owners or operators to investigate accidents that resulted in or could reasonably have resulted in a release that presented serious danger to public health or the environment. EPA does not believe that, except in isolated cases, the modification to this provision will require sources to investigate accidents that they would not investigate under the OSHA rule.

Section 68.83, Employee Participation, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator." Although EPA did not propose adopting this section, the Agency solicited comments on this issue, and commenters convinced the Agency that employee participation is an important component of a complete prevention program.

Section 68.85, Hot Work Permit, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator." Although EPA did not propose adopting this section, the Agency solicited comments on this provision and decided that it was valuable to maintain consistency with the OSHA PSM elements and that the hot work permit was important to good prevention practices.

Section 68.87, Contractors, has been adopted verbatim from OSHA except for changing "employer" to "owner or operator," changing to referenced sections, and deleting OSHA's paragraph 29 CFR 1910.119(h)(2)(vi). Although EPA did not propose adopting this section, the Agency solicited comments on this issue. Commenters argued that contractor practices are an important component of a complete prevention program. A number of major accidents have resulted from contractor mistakes. EPA agrees with the commenters and has included the provision in the final rule. EPA has, however, deleted the requirement that employers maintain an occupational injury and illness log for contract employees because the Agency does not have the authority to impose this requirement.

EPA has placed the emergency response requirements in a new Subpart E and divided the proposed emergency response section into two separate sections, an applicability section and a section to cover the emergency response program.

A new § 68.90, Applicability, has been added. Because many sources covered by this rule may be too small to handle emergency response themselves, EPA has provided, in this new section, the actions they must take if they will not respond to releases. Specifically, for sources with regulated toxic substances, the source must be addressed in the community emergency response plan developed under EPCRA section 303. Sources with regulated flammable substances must coordinate response actions with the local fire department. These sources must also establish a mechanism to contact local emergency responders. Sources that do not meet these requirements must comply with EPA's emergency response program requirements.

Section 68.95, Emergency Response Program, is adopted from § 68.45 of the proposed rule. The program has four components: an emergency response plan, procedures for use of response equipment and its maintenance, training for employees, and procedures to update the plan after changes to the source. The required elements of the plan are those specified in CAA section 112(r)(7)(B)(ii): procedures for informing the public and local response agencies; documentation of emergency medical treatment; and procedures and measures for emergency response. As explained above, EPA decided that, to avoid inconsistency with other emergency response planning regulations, the rule would be limited to the statutory requirements. Consequently, EPA has deleted the following proposed requirements: documentation of evacuation routes (which should be covered under the emergency action plans required by OSHA under 29 CFR 1910.38); descriptions of all response and mitigation technologies available at the source; documentation of the maintenance and training programs; emergency response drills and exercises; revision of the plan based on the findings of the drills and exercises; and documentation of management's response to findings and a schedule for completion. EPA believes that these requirements are addressed in other Federal regulations and, therefore, sources are already doing them. By not including them, EPA, however, avoids the possibility that slightly different wording could lead to unnecessary additional effort on the part of sources.

EPA has added a paragraph (b) to this section to state that compliance with other Federal contingency plan regulations or use of the National Response Team's Integrated Contingency Plan Guidance ("One Plan") that results in a written plan that addresses the elements in paragraph (a) shall satisfy the requirements of the rule, provided that the owner or operator also complies with paragraph (c) of this section.

Paragraph (c) is adopted from proposed paragraph § 68.45(g) and requires coordination of the plan with the local community emergency response plan. References to the local emergency planning committee (LEPC) have been changed to 'local emergency response officials' to recognize and include other local groups that may be in charge of coordinating emergency planning. LEPCs would be included in this category.

A new Subpart G has been created to cover the Risk Management Plan. The Risk Management Plan includes three main sections, an executive summary, the registration, and data elements that provide information on the offsite consequence analyses, the five-year accident history, the prevention program, and the emergency response program. The subpart includes separate section to address each of these, plus sections on submission, certifications, and updates.

New § 68.150, Submission, has been added. As discussed above, an owner or operator shall submit a single RMP for the source, regardless of the number of covered processes or the tiers for which they are eligible. All RMPs will be submitted in a manner and method EPA will specify by the compliance date to a point designated by EPA; no other submission will be required because other agencies and the public will have access to the submissions on-line. As required by the CAA, the first RMP must be submitted by June 21, 1999, three years after EPA first lists a substance, or the date on which a source first becomes subject to this part, whichever is latest. As discussed above under applicability, after June 21, 1999, sources that begin using a substance that has been listed for at least three years will be required to submit their RMPs on the date the substance is first on site above the threshold quantity. Sources that begin using such a regulated substance prior to June 21, 1999 will need to be in compliance with the rule on June 21, 1999. The final paragraph states that, except for a classified annex that would not be publicly available, the RMP shall exclude classified information.

New § 68.155 details the requirements for the executive summary. The summary shall include brief descriptions of the following items: the source's prevention and emergency response approach; the stationary source and regulated substances; worst-case release scenario(s) and alternative release scenario(s), including any administrative controls applied to limit the release quantity; the general prevention program and chemical-specific prevention steps; the five-year accident history; the emergency response program; and planned changes to improve safety. EPA anticipates that none of these items should require more than a half page of text. Because this information may be filed electronically, EPA is not asking sources to submit maps of the worst-case or alternative release scenario circles. The data submitted under each of these sections will allow state or local agencies and the public to map the circles.

Section 68.160, Registration, replaces proposed § 68.12. The registration shall include the following data: stationary source name, street, city, county, state, zip code, latitude, and longitude; the stationary source and corporate Dun and Bradstreet numbers; the name, telephone number, and mailing address of the owner/operator; the name and title of the person responsible for implementation of the risk management program; the name, title, telephone number, and 24-hour telephone number of the emergency contact; the stationary source EPA identifier; the number of full-time employees at the stationary source; whether the stationary source is subject to 29 CFR 1910.119; whether the stationary source is subject to 40 CFR part 355; and the date on which the stationary source last had a safety inspection by a Federal, state, or local government agency.

For each covered process, the source must list the regulated substances present above a threshold quantity (name and CAS number), the maximum quantity of each substance in the process, the SIC code of the process, and the Program level that applies to the process. This process information provides a simple method for describing covered processes and identifying Program levels.

The reporting of the quantity has been changed; rather than have sources report in ranges, the rule requires that the quantity be reported to two significant digits. EPA has found that the reporting ranges are so broad (generally an order of magnitude) that data analysis is extremely difficult. By limiting the reporting to two significant digits, EPA will allow sources to estimate quantities, but still provide more precise data than are currently available. EPA has added a requirement for reporting full-time employees. These data are easy for sources to provide and will enhance the Agency's ability to assess the impact of its rule on businesses of various sizes. The EPA identifier will be the unique number EPA will assign to each source and will allow EPA to cross reference other reporting to the Agency. Use of the identifier also means that EPA may not need to collect certain data on this form because they will be available from the identifier database; EPA may revise the requirements when the identifier rule is promulgated.

EPA has deleted the certification statement proposed for the registration because the RMP as a whole will have a certification statement that will cover all elements, including registration. Corrections to the registration will be treated as corrections to the RMP and must be filed within six months of the change, rather than the 60 days proposed for registration changes.

The registration now requires the owners or operators to check off the agency that last conducted a safety inspection at the source and provide the date. The inspection does not need to have been related to prevention practices as defined in this rule, but may instead cover fire safety, workplace safety, etc.

New § 68.165 covers the requirements for reporting on the offsite consequence analysis. As discussed in Section III.B, the RMP shall include data on one worst case release scenario for each Program 1 process; and, for Program 2 and 3 processes, one worst case release scenario for toxics and one for flammables (for sources with substances in both hazard classes). If additional worst-case release scenarios are required under § 68.25 for either class, data on that scenario must also be reported. Sources with Program 2 and 3 processes will also provide data on one alternative release scenario to cover all flammables in covered processes and an alternative release scenario for each toxic substance held in covered processes.

For each reported scenario, the owners or operators shall provide the following data: chemical name; physical state (toxics only); basis of results and model (if used); scenario; quantity released in pounds; release rate; duration; wind speed and stability (toxics only); topography (toxics only); distance to endpoint; public and environmental receptors within the distance; passive mitigation considered; and active mitigation (alternative releases only) considered. A number of the data elements are not relevant to all flammable releases; for example, in the worst-case release flammables are assumed to be released and explode almost instantly so that release rate, duration, wind speed and stability, and topography are not factors in determining distances.

The purpose of requiring these data elements, rather than the proposed summary of the assessment, is to provide the public with the essential estimates of distance to the endpoints and provide enough data on the release scenario to allow agencies or the public to confirm the distance estimate. With the data provided, a public agency will be able to use EPA's guidance to determine the distance for a particular chemical release and compare that distance with the one reported by the source. This ability will be particularly important when a source has chosen to use an air dispersion model rather than the reference table. The proposed rule approach, which required a summary of the assessment, would have resulted in considerable variation in the information submitted, as happened in the Kanawha Valley exercise. In that case, each source decided on the level of information to provide; although each provided maps, it was not possible, in many cases, to determine how the distances were estimated because much of the underlying data was not reported. EPA believes that these requirements will impose a minimal burden on sources, because they will already have the data from completing the analyses, will ensure that the same data are reported by all sources, and will provide enough data to evaluate the results using publicly available documents and models.

New § 68.168 on the five-year accident history simply references the data elements listed in § 68.42(a). The data elements will be reported for each accidental release covered by the accident history requirement.

New § 68.170, Prevention Program/Program 2, requires owners or operators with Program 2 processes to list the name of chemical(s) in, and SIC code for, the Program 2 process; to provide the dates of the most recent revisions or reviews of the prevention program elements; to provide, based on the hazard review, information on the major hazards, process controls, mitigation systems, monitoring or detection systems, and changes since the last hazard review; to list any state or federal regulations of industry-specific design codes or standards being used to demonstrate compliance with prevention program elements; to list the type of training and competency testing used; to provide the date of the most recent change that triggered a review or revision of prevention elements; and to provide the date of the completion of any changes resulting from hazard reviews, audits, or incident investigations. EPA recognizes that not all recommendations resulting from hazard reviews, audits, or incident investigations result in changes; some or all may be resolved without changes. However, if any changes are made, the owners or operators shall report in the RMP the date when such changes are complete or expected to be complete.

New § 68.175, Prevention Program/Program 3, requires owners or operators with Program 3 processes to list the name of chemical(s) in, and SIC code for, the Program 3 process; to provide the dates of the most recent revisions or reviews of the prevention program elements; to provide, based on the PHA, information on the major hazards, process controls, mitigation systems, monitoring or detection systems, and changes since the last PHA; to list the type of training and competency testing used; to provide the date of the most recent change that triggered a review or revision of prevention elements; and to provide the date of the completion of any changes resulting from PHAs, audits, or incident investigations. As above, EPA recognizes that not all recommendations resulting from PHAs, audits, or incident investigations result in changes; some or all may be resolved without changes. However, if any changes are made, the owners or operators shall report in the RMP the date when such changes are complete or expected to be complete.

New § 68.180, Emergency Response Program, requires owners or operators to answer questions about the required content of the emergency response plan, providing the date of the most recent training of employees update of the plan, indicate whether the source emergency response plan has been coordinated with the LEPC plan, provide the name and telephone number of the local agency with which the plan has been coordinated, and list other Federal or state emergency planning requirements to which the source is subject.

New § 68.185, Certification, specifies the certification requirements that owners or operators must complete when the RMP is submitted.

New § 68.190 details the requirements for updating the RMP. The plan must be updated at least once every five years. If a new substance is added to an already covered process or a new covered process is added, the RMP must be updated on the date on which the regulated substance is first present above a threshold quantity. If EPA lists a new substance that the source has above a threshold quantity, the RMP must be updated within three years of the date of listing. If a change at the source leads to a revised offsite consequence analysis, process hazard analysis or review, or a process changes Program level, the RMP must be revised and resubmitted within six months of the change. Subsequent updates will be required within five years of the update.

A new Subpart H, Other Requirements, has been added.

New § 68.200, Recordkeeping, simply states that records will be maintained for five years unless otherwise specified in the Program 3 prevention program.

New § 68.210, Availability of information to the public, has been added and a paragraph included to provide that classified information is protected under applicable laws, regulations, and executive orders.

New § 68.215, Permit content and air permitting authority or designated agency requirements, has been added to define the requirements for including part 68 in Part 70 and 71 permits, as discussed above.

Section 68.220, Audits, has been revised to change references in paragraph (a). A new paragraph (c) has been added to specify the sources that have achieved a star or merit rating under OSHA's VPP program will be exempt from audits if the audit program is based on industry accident history or on neutral random oversight and if the source has not had an accidental release that requires investigation under the rule. Paragraph (h) has been revised to clarify that the source must revise the RMP 30 days after completion of the actions detailed in the implementation plan, not 30 days after the issuance of the final determination.

Appendix A has been added to provide the toxic endpoints.

V. Required Analyses

A. E.O. 12866

Under Executive Order (E.O.) 12866 (58 FR 51735; October 4, 1993), EPA must determine whether a regulatory action is "significant" and, therefore, subject to OMB review and the requirements of the E.O. The Order defines "significant regulatory action" as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or state, local, or tribal government or communities.

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the E.O.

Under terms of E.O. 12866, EPA has determined that today's final rulemaking is a "significant regulatory action." EPA, therefore, has developed an economic impact analysis for the final rule, (Economic Analysis in Support of Final Rule on Risk Management Program Regulations for Chemical Accidental Release Prevention), which is available in the docket.

In developing the final rule, EPA notes that it has taken actions to streamline requirements whenever possible and has tailored the requirements through the use of Programs. This approach differed from the proposed rule, which imposed what are now Program 3 requirements on all sources and processes. EPA has also changed substantially the requirements for two elements of the rule, the offsite consequence analysis and the RMP. For the offsite consequence analysis, EPA decided to develop methodologies and look-up tables so sources would not need to spend resources obtaining air dispersion models; EPA also reduced the requirements to define offsite populations by allowing sources to use Census data and to identify only those institutions and developments that appear on local maps (as opposed to identifying day care centers and nursing homes). For the RMP, EPA has limited the requirements for information to that which can be reported as data elements. In contrast, the rule as proposed would have required sources to document for each process all major hazards, the consequences of each of these hazards, the risk reduction steps taken to address each hazard, and the consequences of each risk reduction step. The result would have been, for large, complex sources, documents of a 1,000 pages or more.

To analyze the cost impacts of the various approaches, EPA considered three possible options in the final EIA: the final rule, an option that imposed final rule Program 3 requirements on all sources, and an option that imposed proposed rule requirements on all sources. The last of these options was considered to evaluate the impact of changing the requirements for the offsite consequence analysis and RMP.

Based on the final list and thresholds, EPA estimates that approximately 66,100 sources will be affected by the rule. EPA expects that about 360 sources and approximately 410 processes will be eligible for Program 1. These sources are primarily gas processors that, because they are remote and unstaffed, are not covered by OSHA PSM. EPA also estimated that approximately 50 processes using toluene di-isocyanate (TDI) may qualify for Program 1 based on the relatively low volatility of TDI. Program 2 is expected to include 40,200 sources and 47,700 processes; these sources include all retailers, propane users, public drinking water and wastewater systems and public electric utilities not subject to OSHA PSM, wholesalers, processes at Federal facility processes, and non-chemical manufacturers. Program 3 is expected to cover 25,500 sources and 43,800 processes. These sources include manufacturers, electric utilities, POTWs and drinking water sites covered by OSHA PSM, wholesalers, ammonia refrigeration systems, gas utilities, gas processors, and Federal facilities. All of these sources are already covered by OSHA PSM for at least one regulated substance; EPA estimates that about 370 non-OSHA Program 3 processes in the specified SIC codes will be covered.

Sources that already have a high quality PSM program would not need to take any additional actions to satisfy EPA's Program 3 prevention program, but the analysis assumed that many sources may still be in the process of improving their PSM programs after achieving initial compliance. The public scrutiny expected to follow submission of the RMP is likely to encourage sources to ensure that their prevention efforts are fully implemented and effective. To account for these efforts, the analysis assumed that sources covered by OSHA would improve training, maintenance, and management oversight and, in some cases, institute additional capital improvements.

The rule provides sources three years to come into compliance with the rule. The rule, however, will impose continuing costs as sources implement their risk management programs. Initial compliance, therefore, covers the cost of meeting the requirements of the rule by the three-year compliance date. These costs are presented as a single figure, but are assumed to be incurred over a three-year period. Total costs to industry were estimated by multiplying the estimated unit costs of compliance with the risk management program elements by the estimated number of affected sources. Because many sources already implement some of the risk management requirements (e.g., training), cost estimates were adjusted to account for the expected likelihood that a source is already human health (death or injury), responses to these threats (evacuations, sheltering in place) threats to the environment, and economic damages (lost production, property damages, and litigation). Additional benefits may be provided by making information available to the public in the RMP. These benefits, however, cannot be quantified.

B. Regulatory Flexibility Act

In accordance with the Regulatory Flexibility Act of 1980, Federal agencies must evaluate the impacts of rules on small entities and consider less burdensome regulatory alternatives. As originally proposed in 1993, EPA believes that the rule would have created a severe, adverse impact on small manufacturers. In February 1995, EPA published a supplemenatal proposal which introduced a tiering approach for this regulation. By using the tiering approach and streamlining the Program 2 requirements, this final rule significantly reduces the impact on small businesses. The tiering approach also significantly reduces the impact on small communities.

EPA has developed a Regulatory Flexibility Analysis for this final rule evaluating the effects on small entities, which is presented in Chapter 7 of the EIA. The number of small manufacturers was estimated to be 960 sources with fewer than 20 FTEs, and 2,000 sources with between 20 and 99 FTEs. The number of small non-manufacturers is more difficult to determine. Virtually all retailer and wholesalers have fewer than 100 FTEs. Industry estimates, however, indicate that about 80 percent of the affected retailers may be owned by larger companies; the analysis assumed that 3,700 retailers were small businesses. No information was available to estimate the percentage of wholesalers that might be owned by large corporations. The analysis assumed that all wholesalers were small. The total number of small businesses, therefore, was estimated to be 8,160.

Public drinking water and waste water systems affected by the rule generally serve a minimum of 10,000 people. Approximately 980 water systems are estimated to serve between 10,000 and 25,000 people. Approximately 500 water systems are estimated to serve between 25,000 and 50,000 people. Consequently, 1,480 drinking water systems would be considered small governmental entities. The number of small POTWs was estimated to include all systems treating less than 10 mgd and 59 percent of those treating between 10 and 25 mgd (based on the ratio of drinking water systems in this category that serve populations below 50,000). Approximately 2,600 POTWs were estimated to serve between 10,000 and 25,000 people and 180 to serve between 25,000 and 50,000, for a total of 2,800 POTWs. A total of approximately 4,300 small governmental entities would be affected by this rule.

The total number of small entities affected by this rule was estimated to be 12,500 or 19 percent of the affected universe. No detailed analysis of the impact on small entities was performed because of the relatively low cost of the rule for small entities. Initial costs are considerably less than one percent of sales for all small manufacturers. Subsequent year costs will be even lower. Costs for non-manufacturers are very low (less than $1,000 per year for initial compliance). These sums do not impose a serious adverse burden on these sources. Only chemical manufacturers with complex processes and 20 to 99 FTEs have initial costs that exceed $6,000 per year. The costs for these sources, $28,000 to $30,000 per year for the first three years, represent less than 0.5 percent of sales. It should be noted that all of the costs for small manufacturers assume that the sources will take additional efforts, above their actions to comply with the OSHA rule, to improve the quality of the risk management programs. If they do not take additional actions, their costs would be substantially lower.

C. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Public Law 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on state, local, and tribal governments and the private sector. Under section 202 of UMRA, EPA must generally prepare a written statement, including a cost-benefit analysis for proposed and final rules with "Federal mandates" that may result in expenditures to state, local, and tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, section 205 of UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternatives that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the Administrator publishes with the final rule an explanation of why the alternative was not adopted. Before EPA establishes any regulatory requirements that significantly or uniquely affect small governments, including tribal governments, it must have developed under section 203 of UMRA, a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input into the development of the regulatory proposals with significant Federal intergovernmental mandates, and informing, educating, and advising small governments on compliance with the regulatory requirements.

EPA has determined that this rule contains a Federal mandate that may result in expenditures of $100 million or more for state, local, and tribal governments, in the aggregate, or to the private sector, in any one year. Accordingly, EPA has prepared, under section 202 of the UMRA, a written statement which is summarized below.

EPA is required to promulgate this rule under CAA section 112(r). In the first and third year of initial compliance, the cost of the rule to the regulated community will exceed $100 million; in all subsequent years the costs will be below $100 million. EPA has developed an economic impact analysis, discussed above, that evaluates several regulatory alternatives. EPA has adopted the least costly of these alternatives. EPA estimates that annualized costs for state and local governments will be $13 million; annualized costs for the private sector are estimated to be $72 million.

Consistent with the intergovernmental consultation provisions of section 204 of the UMRA and Executive Order 12875 "Enhancing the Intergovernmental Partnership," EPA has involved state, local and business representatives in focus groups to develop the rule. EPA included representatives of state government in the rulemaking workgroup process, available to the public under CAA section 114(c) and 40 CFR part 2; EPA does not believe that any of the requested information will be considered confidential.

The public reporting burden will depend on the regulatory program into which the 66,100 sources are placed. The public reporting burden for rule familiarization is estimated to range from 4 to 68 hours per source for all three program tiers. The public reporting burden to prepare and submit the registration and other RMP elements is estimated to be 0.5 hours for sources with only Program 1 processes, between 6.0 and 11.25 hours for Program 2 sources, and between 6.25 and 30.5 hours for Program 3 sources. The RMP is submitted once, at the end of the three year compliance period. The public recordkeeping burden to maintain on-site documentation is estimated to range from 10 to 180 hours for Program 2 sources and from 52 to 1,200 hours for Program 3 sources. On-site documentation must be developed and maintained on an ongoing basis, which varies by rule element; based on the statute of limitation for this rule, documentation must generally be maintained for five years. The total annual public reporting burden for rule familiarization, to complete the RMP, and to maintain on-site documentation is estimated to be about 3.36 million hours over three years, or an annual burden of 1.119 million hours. No capital costs are expected to be incurred to maintain or submit this documentation.

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and use technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

E. Submission to Congress and the General Accounting Office

Under section 801(a)(1)(A) of the Administrative Procedures Act (APA) as amended by the Small Business Regulatory Enforcement Fairness Act of 1996, EPA submitted a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives and the Comptroller General of the General Accounting Office prior to publication of the rule in today's Federal Register. This rule is a "major rule" as defined by section 804(2) of the APA as amended.

List of Subjects in 40 CFR Part 68

Environmental protection, Chemicals, Hazardous substances, Intergovernmental relations.

Dated: May 24, 1996.

Carol M. Browner,

Administrator.

For the reasons set out in the preamble, 40 CFR Part 68 is amended as follows:

PART 68—[AMENDED]

1. The authority citation for part 68 is revised to read as follows:

Authority: 42 U.S.C. 7412(r), 7601(a)(1), 7661–7661f.

2. Part 68 is amended by redesignating Subpart C (§§ 68.100—68.130) as Subpart F.

Subpart A—[Amended]

4. Section 68.3 is amended to add the following definitions:

§ 68.3 Definitions.

Act means the Clean Air Act as amended (42 U.S.C. 7401 et seq.)

* * * * *

Administrative controls mean written procedural mechanisms used for hazard control.

AIChE/CCPS means the American Institute of Chemical Engineers/Center for Chemical Process Safety.

* * * * *

API means the American Petroleum Institute.

ASME means the American Society of Mechanical Engineers.

Catastrophic release means a major uncontrolled emission, fire, or explosion, involving one or more regulated substances that presents imminent and substantial endangerment to public health and the environment.

Classified information means "classified information" as defined in the Classified Information Procedures Act, 18 U.S.C. App. 3, section 1(a) as "any information or material that has been determined by the United States Government pursuant to an executive order, statute, or regulation, to require protection against unauthorized disclosure for reasons of national security."

Covered process means a process that has a regulated substance present in more than a threshold quantity as determined under § 68.115.

Designated agency means the state, local, or Federal agency designated by the state under the provisions of § 68.215(d).

* * * * *

Environmental receptor means natural areas such as national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, refuges, or areas; and Federal wilderness areas, that could be exposed at any time to toxic concentrations, radiant heat, or overpressure greater than or equal to the endpoints provided in § 68.22(a), as a result of an accidental release and that can be identified on local U. S. Geological Survey maps.

Hot work means work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations.

Implementing agency means the state or local agency that obtains delegation for an accidental release prevention program under subpart E, 40 CFR part 63. The implementing agency may, but is not required to, be the state or local air permitting agency. If no state or local agency is granted delegation, EPA will be the implementing agency for that state.

Injury means any effect on a human that results either from direct exposure to toxic concentrations; radiant heat; or overpressures from accidental releases or from the direct consequences of a vapor cloud explosion (such as flying glass, debris, and other projectiles) from an accidental release and that requires medical treatment or hospitalization.

Major change means introduction of a new process, process equipment, or regulated substance, an alteration of process chemistry that results in any change to safe operating limits, or other alteration that introduces a new hazard.

Mechanical integrity means the process of ensuring that process equipment is fabricated from the proper materials of construction and is properly installed, maintained, and replaced to prevent failures and accidental releases.

Medical treatment means treatment, other than first aid, administered by a physician or registered professional personnel under standing orders from a physician.

Mitigation or mitigation system means specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. Passive mitigation means equipment, devices, or technologies that function without human, mechanical, or other energy input. Active mitigation means equipment, devices, or technologies that need human, mechanical, or other energy input to function.

NFPA means the National Fire Protection Association.

Offsite means areas beyond the property boundary of the stationary source, and areas within the property boundary to which the public has routine and unrestricted access during or outside business hours.

OSHA means the U.S. Occupational Safety and Health Administration.

Owner or operator means any person who owns, leases, operates, controls, or supervises a stationary source.

Population means the public.

* * * * *

Public means any person except employees or contractors at the stationary source.

Public receptor means offsite residences, institutions (e.g., schools, hospitals), industrial, commercial, and office buildings, parks, or recreational areas inhabited or occupied by the public at any time without restriction by the stationary source where members of the public could be exposed to toxic concentrations, radiant heat, or overpressure, as a result of an accidental release.

* * * * *

Replacement in kind means a replacement that satisfies the design specifications.

RMP means the risk management plan required under subpart G of this part.

SIC means Standard Industrial Classification.

* * * * *

Typical meteorological conditions means the temperature, wind speed, cloud cover, and atmospheric stability class, prevailing at the site based on data gathered at or near the site or from a local meteorological station.

* * * * *

Worst-case release means the release of the largest quantity of a regulated substance from a vessel or process line failure that results in the greatest distance to an endpoint defined in § 68.22(a).

5. Section 68.10 is added to subpart A to read as follows:

§ 68.10 Applicability.

(a) An owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process, as determined under § 68.115, shall comply with the requirements of this part no later than the latest of the following dates:

(1) June 21, 1999;

(2) Three years after the date on which a regulated substance is first listed under § 68.130; or

(3) The date on which a regulated substance is first present above a threshold quantity in a process.

(b) Program 1 eligibility requirements. A covered process is eligible for

Program 1 requirements as provided in § 68.12(b) if it meets all of the following requirements:

(1) For the five years prior to the submission of an RMP, the process has not had an accidental release of a regulated substance where exposure to the substance, its reaction products, overpressure generated by an explosion involving the substance, or radiant heat generated by a fire involving the substance led to any of the following offsite:

(i) Death;

(ii) Injury; or

(iii) Response or restoration activities for an exposure of an environmental receptor;

(2) The distance to a toxic or flammable endpoint for a worst-case release assessment conducted under Subpart B and § 68.25 is less than the distance to any public receptor, as defined in § 68.30; and

(3) Emergency response procedures have been coordinated between the stationary source and local emergency planning and response organizations.

(c) Program 2 eligibility requirements. A covered process is subject to Program 2 requirements if it does not meet the eligibility requirements of either paragraph (b) or paragraph (d) of this section.

(d) Program 3 eligibility requirements. A covered process is subject to Program 3 if the process does not meet the requirements of paragraph (b) of this section, and if either of the following conditions is met:

(1) The process is in SIC code 2611, 2812, 2819, 2821, 2865, 2869, 2873, 2879, or 2911; or

(2) The process is subject to the OSHA process safety management standard, 29 CFR 1910.119.

(e) If at any time a covered process no longer meets the eligibility criteria of its Program level, the owner or operator shall comply with the requirements of the new Program level that applies to the process and update the RMP as provided in § 68.190.

6. Section 68.12 is added to subpart A to read as follows:

§ 68.12 General requirements.

(a) General requirements. The owner or operator of a stationary source subject to this part shall submit a single RMP, as provided in §§ 68.150 to 68.185. The RMP shall include a registration that reflects all covered processes.

(b) Program 1 requirements. In addition to meeting the requirements of paragraph (a) of this section, the owner or operator of a stationary source with a process eligible for Program 1, as provided in § 68.10(b), shall:

(1) Analyze the worst-case release scenario for the process(es), as provided in § 68.25; document that the nearest public receptor is beyond the distance to a toxic or flammable endpoint defined in § 68.22(a); and submit in the RMP the worst-case release scenario as provided in § 68.165;

(2) Complete the five-year accident history for the process as provided in § 68.42 of this part and submit it in the RMP as provided in § 68.168;

(3) Ensure that response actions have been coordinated with local emergency planning and response agencies; and

(4) Certify in the RMP the following: "Based on the criteria in 40 CFR 68.10, the distance to the specified endpoint for the worst-case accidental release scenario for the following process(es) is less than the distance to the nearest public receptor: [list process(es)]. Within the past five years, the process(es) has (have) had no accidental release that caused offsite impacts provided in the risk management program rule (40 CFR 68.10(b)(1)). No additional measures are necessary to prevent offsite impacts from accidental releases. In the event of fire, explosion, or a release of a regulated substance from the process(es), entry within the distance to the specified endpoints may pose a danger to public emergency responders. Therefore, public emergency responders should not enter this area except as arranged with the emergency contact indicated in the RMP. The undersigned certifies that, to the best of my knowledge, information, and belief, formed after reasonable inquiry, the information submitted is true, accurate, and complete. [Signature, title, date signed]."

(c) Program 2 requirements. In addition to meeting the requirements of paragraph (a) of this section, the owner or operator of a stationary source with a process subject to Program 2, as provided in § 68.10(c), shall:

(1) Develop and implement a management system as provided in § 68.15;

(2) Conduct a hazard assessment as provided in §§ 68.20 through 68.42;

(3) Implement the Program 2 prevention steps provided in §§ 68.48 through 68.60 or implement the Program 3 prevention steps provided in §§ 68.65 through 68.87;

(4) Develop and implement an emergency response program as provided in §§ 68.90 to 68.95; and

(5) Submit as part of the RMP the data on prevention program elements for Program 2 processes as provided in § 68.170.

(d) Program 3 requirements. In addition to meeting the requirements of paragraph (a) of this section, the owner or operator of a stationary source with a process subject to Program 3, as provided in § 68.10(d) shall:

(1) Develop and implement a management system as provided in § 68.15;

(2) Conduct a hazard assessment as provided in §§ 68.20 through 68.42;

(3) Implement the prevention requirements of §§ 68.65 through 68.87;

(4) Develop and implement an emergency response program as provided in §§ 68.90 to 68.95 of this part; and

(5) Submit as part of the RMP the data on prevention program elements for Program 3 processes as provided in § 68.175.

7. Section 68.15 is added to subpart A to read as follows:

§ 68.15 Management.

(a) The owner or operator of a stationary source with processes subject to Program 2 or Program 3 shall develop a management system to oversee the implementation of the risk management program elements.

(b) The owner or operator shall assign a qualified person or position that has the overall responsibility for the development, implementation, and integration of the risk management program elements.

(c) When responsibility for implementing individual requirements of this part is assigned to persons other than the person identified under paragraph (b) of this section, the names or positions of these people shall be documented and the lines of authority defined through an organization chart or similar document.

8. Subpart B—is added to read as follows:

Subpart B—Hazard Assessment

Sec.

Subpart B—Hazard Assessment

§ 68.20 Applicability.

The owner or operator of a stationary source subject to this part shall prepare a worst-case release scenario analysis as provided in § 68.25 of this part and complete the five-year accident history as provided in § 68.42. The owner or operator of a Program 2 and 3 process must comply with all sections in this subpart for these processes.

§ 68.22 Offsite consequence analysis parameters.

(a) Endpoints. For analyses of offsite consequences, the following endpoints shall be used:

(1) Toxics. The toxic endpoints provided in Appendix A of this part.

(2) Flammables. The endpoints for flammables vary according to the scenarios studied:

(i) Explosion. An overpressure of 1 psi.

(ii) Radiant heat/exposure time. A radiant heat of 5 kw/m^2 for 40 seconds.

(iii) Lower flammability limit. A lower flammability limit as provided in NFPA documents or other generally recognized sources.

(b) Wind speed/atmospheric stability class. For the worst-case release analysis, the owner or operator shall use a wind speed of 1.5 meters per second and F atmospheric stability class. If the owner or operator can demonstrate that local meteorological data applicable to the stationary source show a higher minimum wind speed or less stable atmosphere at all times during the previous three years, these minimums may be used. For analysis of alternative scenarios, the owner or operator may use the typical meteorological conditions for the stationary source.

(c) Ambient temperature/humidity. For worst-case release analysis of a regulated toxic substance, the owner or operator shall use the highest daily maximum temperature in the previous three years and average humidity for the site, based on temperature/humidity data gathered at the stationary source or at a local meteorological station; an owner or operator using the RMP Offsite Consequence Analysis Guidance may use 25°C and 50 percent humidity as values for these variables. For analysis of alternative scenarios, the owner or operator may use typical temperature/humidity data gathered at the stationary source or at a local meteorological station.

(d) Height of release. The worst-case release of a regulated toxic substance shall be analyzed assuming a ground level (0 feet) release. For an alternative scenario analysis of a regulated toxic substance, release height may be determined by the release scenario.

(e) Surface roughness. The owner or operator shall use either urban or rural topography, as appropriate. Urban means that there are many obstacles in the immediate area; obstacles include buildings or trees. Rural means there are no buildings in the immediate area and the terrain is generally flat and unobstructed.

(f) Dense or neutrally buoyant gases. The owner or operator shall ensure that tables or models used for dispersion analysis of regulated toxic substances appropriately account for gas density.

(g) Temperature of released substance. For worst case, liquids other than gases liquified by refrigeration only shall be considered to be released at the highest daily maximum temperature, based on data for the previous three years appropriate for the stationary source, or at process temperature, whichever is higher. For alternative scenarios, substances may be considered to be released at a process or ambient temperature that is appropriate for the scenario.

§ 68.25 Worst-case release scenario analysis.

(a) The owner or operator shall analyze and report in the RMP:

(1) For Program 1 processes, one worst-case release scenario for each Program 1 process;

(2) For Program 2 and 3 processes:

(i) One worst-case release scenario that is estimated to create the greatest distance in any direction to an endpoint provided in Appendix A of this part resulting from an accidental release of regulated toxic substances from covered processes under worst-case conditions defined in § 68.22;

(ii) One worst-case release scenario that is estimated to create the greatest distance in any direction to an endpoint defined in § 68.22(a) resulting from an accidental release of regulated flammable substances from covered processes under worst-case conditions defined in § 68.22; and

(iii) Additional worst-case release scenarios for a hazard class if a worst-case release from another covered process at the stationary source potentially affects public receptors different from those potentially affected by the worst-case release scenario developed under paragraphs (a)(2)(i) or (a)(2)(ii) of this section.

(b) Determination of worst-case release quantity. The worst-case release quantity shall be the greater of the following:

(1) For substances in a vessel, the greatest amount held in a single vessel, taking into account administrative controls that limit the maximum quantity; or

(2) For substances in pipes, the greatest amount in a pipe, taking into account administrative controls that limit the maximum quantity.

(c) Worst-case release scenario—toxic gases.

(1) For regulated toxic substances that are normally gases at ambient temperature and handled as a gas or as a liquid under pressure, the owner or operator shall assume that the quantity in the vessel or pipe, as determined under paragraph (b) of this section, is released as a gas over 10 minutes. The release rate shall be assumed to be the total quantity divided by 10 unless passive mitigation systems are in place.

(2) For gases handled as refrigerated liquids at ambient pressure:

(i) If the released substance is not contained by passive mitigation systems or if the contained pool would have a depth of 1 cm or less, the owner or operator shall assume that the substance is released as a gas in 10 minutes;

(ii) If the released substance is contained by passive mitigation systems in a pool with a depth greater than 1 cm, the owner or operator may assume that the quantity in the vessel or pipe, as determined under paragraph (b) of this section, is spilled instantaneously to form a liquid pool. The volatilization rate (release rate) shall be calculated at the boiling point of the substance and at the conditions specified in paragraph (d) of this section.

(d) Worst-case release scenario—toxic liquids.

(1) For regulated toxic substances that are normally liquids at ambient temperature, the owner or operator shall assume that the quantity in the vessel or pipe, as determined under paragraph (b) of this section, is spilled instantaneously to form a liquid pool.

(i) The surface area of the pool shall be determined by assuming that the liquid spreads to 1 centimeter deep unless passive mitigation systems are in place that serve to contain the spill and limit the surface area. Where passive mitigation is in place, the surface area of the contained liquid shall be used to calculate the volatilization rate.

(ii) If the release would occur onto a surface that is not paved or smooth, the owner or operator may take into account the actual surface characteristics.

(2) The volatilization rate shall account for the highest daily maximum temperature occurring in the past three years, the temperature of the substance in the vessel, and the concentration of the substance if the liquid spilled is a mixture or solution.

(3) The rate of release to air shall be determined from the volatilization rate of the liquid pool. The owner or operator may use the methodology in the RMP Offsite Consequence Analysis Guidance or any other publicly available techniques that account for the modeling conditions and are recognized by industry as applicable as part of

current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

(e) Worst-case release scenario—flammables. The owner or operator shall assume that the quantity of the substance, as determined under paragraph (b) of this section, vaporizes resulting in a vapor cloud explosion. A yield factor of 10 percent of the available energy released in the explosion shall be used to determine the distance to the explosion endpoint if the model used is based on TNT-equivalent methods.

(f) Parameters to be applied. The owner or operator shall use the parameters defined in § 68.22 to determine distance to the endpoints. The owner or operator may use the methodology provided in the RMP Offsite Consequence Analysis Guidance or any commercially or publicly available air dispersion modeling techniques, provided the techniques account for the modeling conditions and are recognized by industry as applicable as part of current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

(g) Consideration of passive mitigation. Passive mitigation systems may be considered for the analysis of worst case provided that the mitigation system is capable of withstanding the release event triggering the scenario and would still function as intended.

(h) Factors in selecting a worst-case scenario. Notwithstanding the provisions of paragraph (b) of this section, the owner or operator shall select as the worst case for flammable regulated substances or the worst case for regulated toxic substances, a scenario based on the following factors if such a scenario would result in a greater distance to an endpoint defined in § 68.22(a) beyond the stationary source boundary than the scenario provided under paragraph (b) of this section:

(1) Smaller quantities handled at higher process temperature or pressure; and

(2) Proximity to the boundary of the stationary source.

§ 68.28 Alternative release scenario analysis.

(a) The number of scenarios. The owner or operator shall identify and analyze at least one alternative release scenario for each regulated toxic substance held in a covered process(es) and at least one alternative release scenario to represent all flammable substances held in covered processes.

(b) Scenarios to consider. (1) For each scenario required under paragraph (a) of this section, the owner or operator shall select a scenario:

(i) That is more likely to occur than the worst-case release scenario under § 68.25; and

(ii) That will reach an endpoint offsite, unless no such scenario exists.

(2) Release scenarios considered should include, but are not limited to, the following, where applicable:

(i) Transfer hose releases due to splits or sudden hose uncoupling;

(ii) Process piping releases from failures at flanges, joints, welds, valves and valve seals, and drains or bleeds;

(iii) Process vessel or pump releases due to cracks, seal failure, or drain, bleed, or plug failure;

(iv) Vessel overfilling and spill, or overpressurization and venting through relief valves or rupture disks; and

(v) Shipping container mishandling and breakage or puncturing leading to a spill.

(c) Parameters to be applied. The owner or operator shall use the appropriate parameters defined in § 68.22 to determine distance to the endpoints. The owner or operator may use either the methodology provided in the RMP Offsite Consequence Analysis Guidance or any commercially or publicly available air dispersion modeling techniques, provided the techniques account for the specified modeling conditions and are recognized by industry as applicable as part of current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

(d) Consideration of mitigation. Active and passive mitigation systems may be considered provided they are capable of withstanding the event that triggered the release and would still be functional.

(e) Factors in selecting scenarios. The owner or operator shall consider the following in selecting alternative release scenarios:

(1) The five-year accident history provided in § 68.42; and

(2) Failure scenarios identified under §§ 68.50 or 68.67.

§ 68.30 Defining offsite impacts—population.

(a) The owner or operator shall estimate in the RMP the population within a circle with its center at the point of the release and a radius determined by the distance to the endpoint defined in § 68.22(a).

(b) Population to be defined. Population shall include residential population. The presence of institutions (schools, hospitals, prisons), parks and recreational areas, and major commercial, office, and industrial buildings shall be noted in the RMP.

(c) Data sources acceptable. The owner or operator may use the most recent Census data, or other updated information, to estimate the population potentially affected.

(d) Level of accuracy. Population shall be estimated to two significant digits.

§ 68.33 Defining offsite impacts—environment.

(a) The owner or operator shall list in the RMP environmental receptors within a circle with its center at the point of the release and a radius determined by the distance to the endpoint defined in § 68.22(a) of this part.

(b) Data sources acceptable. The owner or operator may rely on information provided on local U.S. Geological Survey maps or on any data source containing U.S.G.S. data to identify environmental receptors.

68.36 Review and update.

(a) The owner or operator shall review and update the offsite consequence analyses at least once every five years.

(b) If changes in processes, quantities stored or handled, or any other aspect of the stationary source might reasonably be expected to increase or decrease the distance to the endpoint by a factor of two or more, the owner or operator shall complete a revised analysis within six months of the change and submit a revised risk management plan as provided in § 68.190.

§ 68.39 Documentation

The owner or operator shall maintain the following records on the offsite consequence analyses:

(a) For worst-case scenarios, a description of the vessel or pipeline and substance selected as worst case, assumptions and parameters used, and the rationale for selection; assumptions shall include use of any administrative controls and any passive mitigation that were assumed to limit the quantity that could be released. Documentation shall include the anticipated effect of the controls and mitigation on the release quantity and rate.

(b) For alternative release scenarios, a description of the scenarios identified, assumptions and parameters used, and the rationale for the selection of specific scenarios; assumptions shall include use of any administrative controls and any mitigation that were assumed to limit the quantity that could be released. Documentation shall include the effect of the controls and mitigation on the release quantity and rate.

(c) Documentation of estimated quantity released, release rate, and duration of release.

(d) Methodology used to determine distance to endpoints.

(e) Data used to estimate population and environmental receptors potentially affected.

§ 68.42 Five-year accident history.

(a) The owner or operator shall include in the five-year accident history all accidental releases from covered processes that resulted in deaths, injuries, or significant property damage on site, or known offsite deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage.

(b) Data required. For each accidental release included, the owner or operator shall report the following information:

(1) Date, time, and approximate duration of the release;

(2) Chemical(s) released;

(3) Estimated quantity released in pounds;

(4) The type of release event and its source;

(5) Weather conditions, if known;

(6) On-site impacts;

(7) Known offsite impacts;

(8) Initiating event and contributing factors if known;

(9) Whether offsite responders were notified if known; and

(10) Operational or process changes that resulted from investigation of the release.

(c) Level of accuracy. Numerical estimates may be provided to two significant digits.

9. Subpart C is added to read as follows:

Subpart C—Program 2 Prevention Program

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Subpart C—Program 2 Prevention Program

§ 68.48 Safety information.

(a) The owner or operator shall compile and maintain the following up-to-date safety information related to the regulated substances, processes, and equipment:

(1) Material Safety Data Sheets that meet the requirements of 29 CFR 1910.1200(g);

(2) Maximum intended inventory of equipment in which the regulated substances are stored or processed;

(3) Safe upper and lower temperatures, pressures, flows, and compositions;

(4) Equipment specifications; and

(5) Codes and standards used to design, build, and operate the process.

(b) The owner or operator shall ensure that the process is designed in compliance with recognized and generally accepted good engineering practices. Compliance with Federal or state regulations that address industry-specific safe design or with industry-specific design codes and standards may be used to demonstrate compliance with this paragraph.

(c) The owner or operator shall update the safety information if a major change occurs that makes the information inaccurate.

§ 68.50 Hazard review.

(a) The owner or operator shall conduct a review of the hazards associated with the regulated substances, process, and procedures. The review shall identify the following:

(1) The hazards associated with the process and regulated substances;

(2) Opportunities for equipment malfunctions or human errors that could cause an accidental release;

(3) The safeguards used or needed to control the hazards or prevent equipment malfunction or human error; and

(4) Any steps used or needed to detect or monitor releases.

(b) The owner or operator may use checklists developed by persons or organizations knowledgeable about the process and equipment as a guide to conducting the review. For processes designed to meet industry standards or Federal or state design rules, the hazard review shall, by inspecting all equipment, determine whether the process is designed, fabricated, and operated in accordance with the applicable standards or rules.

(c) The owner or operator shall document the results of the review and ensure that problems identified are resolved in a timely manner.

(d) The review shall be updated at least once every five years. The owner or operator shall also conduct reviews whenever a major change in the process occurs; all issues identified in the review shall be resolved before startup of the changed process.

§ 68.52 Operating procedures.

(a) The owner or operator shall prepare written operating procedures that provide clear instructions or steps for safely conducting activities associated with each covered process consistent with the safety information for that process. Operating procedures or instructions provided by equipment manufacturers or developed by persons or organizations knowledgeable about the process and equipment may be used as a basis for a stationary source's operating procedures.

(b) The procedures shall address the following:

(1) Initial startup;

(2) Normal operations;

(3) Temporary operations;

(4) Emergency shutdown and operations;

(5) Normal shutdown;

(6) Startup following a normal or emergency shutdown or a major change that requires a hazard review;

(7) Consequences of deviations and steps required to correct or avoid deviations; and

(8) Equipment inspections.

(c) The owner or operator shall ensure that the operating procedures are updated, if necessary, whenever a major change occurs and prior to startup of the changed process.

§ 68.54 Training.

(a) The owner or operator shall ensure that each employee presently operating a process, and each employee newly assigned to a covered process have been trained or tested competent in the operating procedures provided in § 68.52 that pertain to their duties. For those employees already operating a process on June 21, 1999, the owner or operator may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as provided in the operating procedures.

(b) Refresher training. Refresher training shall be provided at least every three years, and more often if necessary, to each employee operating a process to ensure that the employee understands and adheres to the current operating procedures of the process. The owner or operator, in consultation with the employees operating the process, shall determine the appropriate frequency of refresher training.

(c) The owner or operator may use training conducted under Federal or state regulations or under industry-specific standards or codes or training conducted by covered process equipment vendors to demonstrate compliance with this section to the extent that the training meets the requirements of this section.

(d) The owner or operator shall ensure that operators are trained in any updated or new procedures prior to startup of a process after a major change.

§ 68.56 Maintenance.

(a) The owner or operator shall prepare and implement procedures to maintain the on-going mechanical integrity of the process equipment. The owner or operator may use procedures or instructions provided by covered process equipment vendors or procedures in Federal or state regulations or industry codes as the basis for stationary source maintenance procedures.

(b) The owner or operator shall train or cause to be trained each employee involved in maintaining the on-going mechanical integrity of the process. To ensure that the employee can perform the job tasks in a safe manner, each such employee shall be trained in the hazards of the process, in how to avoid or correct unsafe conditions, and in the procedures applicable to the employee's job tasks.

(c) Any maintenance contractor shall ensure that each contract maintenance employee is trained to perform the maintenance procedures developed under paragraph (a) of this section.

(d) The owner or operator shall perform or cause to be performed inspections and tests on process equipment. Inspection and testing procedures shall follow recognized and generally accepted good engineering practices. The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations, industry standards or codes, good engineering practices, and prior operating experience.

§ 68.58 Compliance audits.

(a) The owner or operator shall certify that they have evaluated compliance with the provisions of this subpart at least every three years to verify that the procedures and practices developed under the rule are adequate and are being followed.

(b) The compliance audit shall be conducted by at least one person knowledgeable in the process.

(c) The owner or operator shall develop a report of the audit findings.

(d) The owner or operator shall promptly determine and document an appropriate response to each of the findings of the compliance audit and document that deficiencies have been corrected.

(e) The owner or operator shall retain the two (2) most recent compliance audit reports. This requirement does not apply to any compliance audit report that is more than five years old.

§ 68.60 Incident investigation.

(a) The owner or operator shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release.

(b) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

(c) A summary shall be prepared at the conclusion of the investigation which includes at a minimum:

(1) Date of incident;
(2) Date investigation began;
(3) A description of the incident;
(4) The factors that contributed to the incident; and,
(5) Any recommendations resulting from the investigation.

(d) The owner or operator shall promptly address and resolve the investigation findings and recommendations. Resolutions and corrective actions shall be documented.

(e) The findings shall be reviewed with all affected personnel whose job tasks are affected by the findings.

(f) Investigation summaries shall be retained for five years.

10. Subpart D is added to read as follows:

Subpart D—Program 3 Prevention Program

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Subpart D—Program 3 Prevention Program

§ 68.65 Process safety information.

(a) In accordance with the schedule set forth in § 68.67, the owner or operator shall complete a compilation of written process safety information before conducting any process hazard analysis required by the rule. The compilation of written process safety information is to enable the owner or operator and the employees involved in operating the process to identify and understand the hazards posed by those processes involving regulated substances. This process safety information shall include information pertaining to the hazards of the regulated substances used or produced by the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process.

(b) Information pertaining to the hazards of the regulated substances in the process. This information shall consist of at least the following:

(1) Toxicity information;
(2) Permissible exposure limits;
(3) Physical data;
(4) Reactivity data:
(5) Corrosivity data;
(6) Thermal and chemical stability data; and
(7) Hazardous effects of inadvertent mixing of different materials that could foreseeably occur.

Note to paragraph (b): Material Safety Data Sheets meeting the requirements of 29 CFR 1910.1200(g) may be used to comply with this requirement to the extent they contain the information required by this subparagraph.

(c) Information pertaining to the technology of the process.

(1) Information concerning the technology of the process shall include at least the following:

(i) A block flow diagram or simplified process flow diagram;
(ii) Process chemistry;
(iii) Maximum intended inventory;
(iv) Safe upper and lower limits for such items as temperatures, pressures, flows or compositions; and,
(v) An evaluation of the consequences of deviations.

(2) Where the original technical information no longer exists, such information may be developed in conjunction with the process hazard analysis in sufficient detail to support the analysis.

(d) Information pertaining to the equipment in the process.

(1) Information pertaining to the equipment in the process shall include:

(i) Materials of construction;
(ii) Piping and instrument diagrams (P&ID's);
(iii) Electrical classification;
(iv) Relief system design and design basis;
(v) Ventilation system design;
(vi) Design codes and standards employed;
(vii) Material and energy balances for processes built after June 21, 1999; and
(viii) Safety systems (e.g. interlocks, detection or suppression systems).

(2) The owner or operator shall document that equipment complies with recognized and generally accepted good engineering practices.

(3) For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the owner or operator shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.

§ 68.67 Process hazard analysis.

(a) The owner or operator shall perform an initial process hazard analysis (hazard evaluation) on processes covered by this part. The process hazard analysis shall be appropriate to the complexity of the process and shall identify, evaluate, and control the hazards involved in the process. The owner or operator shall determine and document the priority order for conducting process hazard analyses based on a rationale which includes such considerations as extent of the process hazards, number of potentially affected employees, age of the process, and operating history of the process. The process hazard analysis shall be conducted as soon as possible, but not later than June 21, 1999. Process hazards analyses completed to comply with 29 CFR 1910.119(e) are acceptable as initial process hazards analyses. These process hazard analyses shall be updated and revalidated, based on their completion date.

(b) The owner or operator shall use one or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed.

(1) What-If;

(2) Checklist;

(3) What-If/Checklist;

(4) Hazard and Operability Study (HAZOP);

(5) Failure Mode and Effects Analysis (FMEA);

(6) Fault Tree Analysis; or

(7) An appropriate equivalent methodology.

(c) The process hazard analysis shall address:

(1) The hazards of the process;

(2) The identification of any previous incident which had a likely potential for catastrophic consequences.

(3) Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors.);

(4) Consequences of failure of engineering and administrative controls;

(5) Stationary source siting;

(6) Human factors; and

(7) A qualitative evaluation of a range of the possible safety and health effects of failure of controls.

(d) The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.

(e) The owner or operator shall establish a system to promptly address the team's findings and recommendations; assure that the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.

(f) At least every five (5) years after the completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated by a team meeting the requirements in paragraph (d) of this section, to assure that the process hazard analysis is consistent with the current process. Updated and revalidated process hazard analyses completed to comply with 29 CFR 1910.119(e) are acceptable to meet the requirements of this paragraph.

(g) The owner or operator shall retain process hazards analyses and updates or revalidations for each process covered by this section, as well as the documented resolution of recommendations described in paragraph (e) of this section for the life of the process.

§ 68.69 Operating procedures.

(a) The owner or operator shall develop and implement written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information and shall address at least the following elements.

(1) Steps for each operating phase:

(i) Initial startup;

(ii) Normal operations;

(iii) Temporary operations;

(iv) Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.

(v) Emergency operations;

(vi) Normal shutdown; and,

(vii) Startup following a turnaround, or after an emergency shutdown.

(2) Operating limits:

(i) Consequences of deviation; and

(ii) Steps required to correct or avoid deviation.

(3) Safety and health considerations:

(i) Properties of, and hazards presented by, the chemicals used in the process;

(ii) Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;

(iii) Control measures to be taken if physical contact or airborne exposure occurs;

(iv) Quality control for raw materials and control of hazardous chemical inventory levels; and,

(v) Any special or unique hazards.

(4) Safety systems and their functions.

(b) Operating procedures shall be readily accessible to employees who work in or maintain a process.

(c) The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to stationary sources. The owner or operator shall certify annually that these operating procedures are current and accurate.

(d) The owner or operator shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a stationary source by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.

§ 68.71 Training.

(a) Initial training. (1) Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures as specified in § 68.69. The training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.

(2) In lieu of initial training for those employees already involved in operating a process on June 21, 1999 an owner or operator may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.

(b) Refresher training. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process. The owner or operator, in consultation with the employees involved in operating the process, shall determine the appropriate frequency of refresher training.

(c) Training documentation. The owner or operator shall ascertain that each employee involved in operating a process has received and understood the training required by this paragraph. The owner or operator shall prepare a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.

§ 68.73 Mechanical integrity.

(a) Application. Paragraphs (b) through (f) of this section apply to the following process equipment:

(1) Pressure vessels and storage tanks;

(2) Piping systems (including piping components such as valves);

(3) Relief and vent systems and devices;

(4) Emergency shutdown systems;

(5) Controls (including monitoring devices and sensors, alarms, and interlocks) and,

(6) Pumps.

(b) Written procedures. The owner or operator shall establish and implement written procedures to maintain the on-going integrity of process equipment.

(c) Training for process maintenance activities. The owner or operator shall train each employee involved in maintaining the on-going integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.

(d) Inspection and testing. (1) Inspections and tests shall be performed on process equipment.

(2) Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.

(3) The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.

(4) The owner or operator shall document each inspection and test that has been performed on process equipment. The documentation shall identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.

(e) Equipment deficiencies. The owner or operator shall correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in § 68.65) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.

(f) Quality assurance. (1) In the construction of new plants and equipment, the owner or operator shall assure that equipment as it is fabricated is suitable for the process application for which they will be used.

(2) Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.

(3) The owner or operator shall assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.

§ 68.75 Management of change.

(a) The owner or operator shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to stationary sources that affect a covered process.

(b) The procedures shall assure that the following considerations are addressed prior to any change:

(1) The technical basis for the proposed change;

(2) Impact of change on safety and health;

(3) Modifications to operating procedures;

(4) Necessary time period for the change; and,

(5) Authorization requirements for the proposed change.

(c) Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.

(d) If a change covered by this paragraph results in a change in the process safety information required by § 68.65 of this part, such information shall be updated accordingly.

(e) If a change covered by this paragraph results in a change in the operating procedures or practices required by § 68.69, such procedures or practices shall be updated accordingly.

§ 68.77 Pre-startup review.

(a) The owner or operator shall perform a pre-startup safety review for new stationary sources and for modified stationary sources when the modification is significant enough to require a change in the process safety information.

(b) The pre-startup safety review shall confirm that prior to the introduction of regulated substances to a process:

(1) Construction and equipment is in accordance with design specifications;

(2) Safety, operating, maintenance, and emergency procedures are in place and are adequate;

(3) For new stationary sources, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and modified stationary sources meet the requirements contained in management of change, § 68.75.

(4) Training of each employee involved in operating a process has been completed.

§ 68.79 Compliance audits.

(a) The owner or operator shall certify that they have evaluated compliance with the provisions of this section at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed.

(b) The compliance audit shall be conducted by at least one person knowledgeable in the process.

(c) A report of the findings of the audit shall be developed.

(d) The owner or operator shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.

(e) The owner or operator shall retain the two (2) most recent compliance audit reports.

§ 68.81 Incident investigation.

(a) The owner or operator shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of a regulated substance.

(b) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

(c) An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.

(d) A report shall be prepared at the conclusion of the investigation which includes at a minimum:

(1) Date of incident;

(2) Date investigation began;

(3) A description of the incident;

(4) The factors that contributed to the incident; and,

(5) Any recommendations resulting from the investigation.

(e) The owner or operator shall establish a system to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented.

(f) The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.

(g) Incident investigation reports shall be retained for five years.

§ 68.83 Employee participation.

(a) The owner or operator shall develop a written plan of action regarding the implementation of the employee participation required by this section.

(b) The owner or operator shall consult with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of process safety management in this rule.

(c) The owner or operator shall provide to employees and their representatives access to process hazard analyses and to all other information required to be developed under this rule.

§ 68.85 Hot work permit.

(a) The owner or operator shall issue a hot work permit for hot work operations conducted on or near a covered process.

(b) The permit shall document that the fire prevention and protection requirements in 29 CFR 1910.252(a) have been implemented prior to beginning the hot work operations; it shall indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed. The permit shall be kept on file until completion of the hot work operations.

§ 68.87 Contractors.

(a) Application. This section applies to contractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery or other supply services.

(b) Owner or operator responsibilities. (1) The owner or operator, when selecting a contractor, shall obtain and evaluate information regarding the contract owner or operator's safety performance and programs.

(2) The owner or operator shall inform contract owner or operator of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.

(3) The owner or operator shall explain to the contract owner or operator the applicable provisions of subpart E of this part.

(4) The owner or operator shall develop and implement safe work practices consistent with § 68.69(d), to control the entrance, presence, and exit of the contract owner or operator and contract employees in covered process areas.

(5) The owner or operator shall periodically evaluate the performance of the contract owner or operator in fulfilling their obligations as specified in paragraph (c) of this section.

(c) Contract owner or operator responsibilities. (1) The contract owner or operator shall assure that each contract employee is trained in the work practices necessary to safely perform his/her job.

(2) The contract owner or operator shall assure that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process, and the applicable provisions of the emergency action plan.

(3) The contract owner or operator shall document that each contract employee has received and understood the training required by this section. The contract owner or operator shall prepare a record which contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training.

(4) The contract owner or operator shall assure that each contract employee follows the safety rules of the stationary source including the safe work practices required by § 68.69(d).

(5) The contract owner or operator shall advise the owner or operator of any unique hazards presented by the contract owner or operator's work, or of any hazards found by the contract owner or operator's work.

11. Subpart E is added to read as follows:

Subpart E—Emergency Response

Subpart E—Emergency Response

§ 68.90 Applicability.

(a) Except as provided in paragraph (b) of this section, the owner or operator of a stationary source with Program 2 and Program 3 processes shall comply with the requirements of § 68.95.

(b) The owner or operator of stationary source whose employees will not respond to accidental releases of regulated substances need not comply with § 68.95 of this part provided that they meet the following:

(1) For stationary sources with any regulated toxic substance held in a process above the threshold quantity, the stationary source is included in the community emergency response plan developed under 42 U.S.C. 11003;

(2) For stationary sources with only regulated flammable substances held in a process above the threshold quantity, the owner or operator has coordinated response actions with the local fire department; and

(3) Appropriate mechanisms are in place to notify emergency responders when there is a need for a response.

§ 68.95 Emergency response program.

(a) The owner or operator shall develop and implement an emergency response program for the purpose of protecting public health and the environment. Such program shall include the following elements:

(1) An emergency response plan, which shall be maintained at the stationary source and contain at least the following elements:

(i) Procedures for informing the public and local emergency response agencies about accidental releases;

(ii) Documentation of proper first-aid and emergency medical treatment necessary to treat accidental human exposures; and

(iii) Procedures and measures for emergency response after an accidental release of a regulated substance;

(2) Procedures for the use of emergency response equipment and for its inspection, testing, and maintenance;

(3) Training for all employees in relevant procedures; and

(4) Procedures to review and update, as appropriate, the emergency response plan to reflect changes at the stationary source and ensure that employees are informed of changes.

(b) A written plan that complies with other Federal contingency plan regulations or is consistent with the approach in the National Response Team's Integrated Contingency Plan Guidance ("One Plan") and that, among other matters, includes the elements provided in paragraph (a) of this section, shall satisfy the requirements of this section if the owner or operator also complies with paragraph (c) of this section.

(c) The emergency response plan developed under paragraph (a)(1) of this section shall be coordinated with the community emergency response plan developed under 42 U.S.C. 11003. Upon request of the local emergency planning committee or emergency response officials, the owner or operator shall promptly provide to the local emergency response officials information necessary for developing and implementing the community emergency response plan.

12. Subpart G is added to read as follows:

Subpart G—Risk Management Plan

Sec.

Subpart G—Risk Management Plan

§ 68.150 Submission.

(a) The owner or operator shall submit a single RMP that includes the information required by §§ 68.155 through 68.185 for all covered processes. The RMP shall be submitted in a method and format to a central point as specified by EPA prior to June 21, 1999.

(b) The owner or operator shall submit the first RMP no later than the latest of the following dates:

(1) June 21, 1999;

(2) Three years after the date on which a regulated substance is first listed under § 68.130; or

(3) The date on which a regulated substance is first present above a threshold quantity in a process.

(c) Subsequent submissions of RMPs shall be in accordance with § 68.190.

(d) Notwithstanding the provisions of §§ 68.155 to 68.190, the RMP shall exclude classified information. Subject to appropriate procedures to protect such information from public disclosure, classified data or information excluded from the RMP may be made available in a classified annex to the RMP for review by Federal and state representatives who have received the appropriate security clearances.

§ 68.155 Executive summary.

The owner or operator shall provide in the RMP an executive summary that includes a brief description of the following elements:

(a) The accidental release prevention and emergency response policies at the stationary source;

(b) The stationary source and regulated substances handled;

(c) The worst-case release scenario(s) and the alternative release scenario(s), including administrative controls and mitigation measures to limit the distances for each reported scenario;

(d) The general accidental release prevention program and chemical-specific prevention steps;

(e) The five-year accident history;

(f) The emergency response program; and

(g) Planned changes to improve safety.

§ 68.160 Registration.

(a) The owner or operator shall complete a single registration form and include it in the RMP. The form shall cover all regulated substances handled in covered processes.

(b) The registration shall include the following data:

(1) Stationary source name, street, city, county, state, zip code, latitude, and longitude;

(2) The stationary source Dun and Bradstreet number;

(3) Name and Dun and Bradstreet number of the corporate parent company;

(4) The name, telephone number, and mailing address of the owner or operator;

(5) The name and title of the person or position with overall responsibility for RMP elements and implementation;

(6) The name, title, telephone number, and 24-hour telephone number of the emergency contact;

(7) For each covered process, the name and CAS number of each regulated substance held above the threshold quantity in the process, the maximum quantity of each regulated substance or mixture in the process (in pounds) to two significant digits, the SIC code, and the Program level of the process;

(8) The stationary source EPA identifier;

(9) The number of full-time employees at the stationary source;

(10) Whether the stationary source is subject to 29 CFR 1910.119;

(11) Whether the stationary source is subject to 40 CFR part 355;

(12) Whether the stationary source has a CAA Title V operating permit; and

(13) The date of the last safety inspection of the stationary source by a Federal, state, or local government agency and the identity of the inspecting entity.

§ 68.165 Offsite consequence analysis.

(a) The owner or operator shall submit in the RMP information:

(1) One worst-case release scenario for each Program 1 process; and

(2) For Program 2 and 3 processes, one worst-case release scenario to represent all regulated toxic substances held above the threshold quantity and one worst-case release scenario to represent all regulated flammable substances held above the threshold quantity. If additional worst-case scenarios for toxics or flammables are required by § 68.25(a)(2)(iii), the owner or operator shall submit the same information on the additional scenario(s). The owner or operator of Program 2 and 3 processes shall also submit information on one alternative release scenario for each regulated toxic substance held above the threshold quantity and one alternative release scenario to represent all regulated flammable substances held above the threshold quantity.

(b) The owner or operator shall submit the following data:

(1) Chemical name;

(2) Physical state (toxics only);

(3) Basis of results (give model name if used);

(4) Scenario (explosion, fire, toxic gas release, or liquid spill and vaporization);

(5) Quantity released in pounds;

(6) Release rate;

(7) Release duration;

(8) Wind speed and atmospheric stability class (toxics only);

(9) Topography (toxics only);

(10) Distance to endpoint;

(11) Public and environmental receptors within the distance;

(12) Passive mitigation considered; and

(13) Active mitigation considered (alternative releases only);

§ 68.168 Five-year accident history.

The owner or operator shall submit in the RMP the information provided in § 68.42(b) on each accident covered by § 68.42(a).

§ 68.170 Prevention program/Program 2.

(a) For each Program 2 process, the owner or operator shall provide in the RMP the information indicated in paragraphs (b) through (k) of this section. If the same information applies to more than one covered process, the owner or operator may provide the information only once, but shall indicate to which processes the information applies.

(b) The SIC code for the process.

(c) The name(s) of the chemical(s) covered.

(d) The date of the most recent review or revision of the safety information and a list of Federal or state regulations or industry-specific design codes and standards used to demonstrate compliance with the safety information requirement.

(e) The date of completion of the most recent hazard review or update.

(1) The expected date of completion of any changes resulting from the hazard review;

(2) Major hazards identified;

(3) Process controls in use;

(4) Mitigation systems in use;

(5) Monitoring and detection systems in use; and

(6) Changes since the last hazard review.

(f) The date of the most recent review or revision of operating procedures.

(g) The date of the most recent review or revision of training programs;

(1) The type of training provided—classroom, classroom plus on the job, on the job; and

(2) The type of competency testing used.

(h) The date of the most recent review or revision of maintenance procedures and the date of the most recent equipment inspection or test and the equipment inspected or tested.

(i) The date of the most recent compliance audit and the expected date of completion of any changes resulting from the compliance audit.

(j) The date of the most recent incident investigation and the expected date of completion of any changes resulting from the investigation.

(k) The date of the most recent change that triggered a review or revision of safety information, the hazard review, operating or maintenance procedures, or training.

§ 68.175 Prevention program/Program 3.

(a) For each Program 3 process, the owner or operator shall provide the information indicated in paragraphs (b) through (p) of this section. If the same information applies to more than one covered process, the owner or operator may provide the information only once, but shall indicate to which processes the information applies.

(b) The SIC code for the process.

(c) The name(s) of the substance(s) covered.

(d) The date on which the safety information was last reviewed or revised.

(e) The date of completion of the most recent PHA or update and the technique used.

(1) The expected date of completion of any changes resulting from the PHA;

(2) Major hazards identified;

(3) Process controls in use;

(4) Mitigation systems in use;

(5) Monitoring and detection systems in use; and

(6) Changes since the last PHA.

(f) The date of the most recent review or revision of operating procedures.

(g) The date of the most recent review or revision of training programs;

(1) The type of training provided—classroom, classroom plus on the job, on the job; and

(2) The type of competency testing used.

(h) The date of the most recent review or revision of maintenance procedures and the date of the most recent equipment inspection or test and the equipment inspected or tested.

(i) The date of the most recent change that triggered management of change procedures and the date of the most recent review or revision of management of change procedures.

(j) The date of the most recent pre-startup review.

(k) The date of the most recent compliance audit and the expected date of completion of any changes resulting from the compliance audit;

(l) The date of the most recent incident investigation and the expected date of completion of any changes resulting from the investigation;

(m) The date of the most recent review or revision of employee participation plans;

(n) The date of the most recent review or revision of hot work permit procedures;

(o) The date of the most recent review or revision of contractor safety procedures; and

(p) The date of the most recent evaluation of contractor safety performance.

§ 68.180 Emergency response program.

(a) The owner or operator shall provide in the RMP the following information:

(1) Do you have a written emergency response plan?

(2) Does the plan include specific actions to be taken in response to an accidental releases of a regulated substance?

(3) Does the plan include procedures for informing the public and local agencies responsible for responding to accidental releases?

(4) Does the plan include information on emergency health care?

(5) The date of the most recent review or update of the emergency response plan;

(6) The date of the most recent emergency response training for employees.

(b) The owner or operator shall provide the name and telephone number of the local agency with which the plan is coordinated.

(c) The owner or operator shall list other Federal or state emergency plan requirements to which the stationary source is subject.

§ 68.185 Certification.

(a) For Program 1 processes, the owner or operator shall submit in the RMP the certification statement provided in § 68.12(b)(4).

(b) For all other covered processes, the owner or operator shall submit in the RMP a single certification that, to the best of the signer's knowledge, information, and belief formed after reasonable inquiry, the information submitted is true, accurate, and complete.

§ 68.190 Updates.

(a) The owner or operator shall review and update the RMP as specified in paragraph (b) of this section and submit it in a method and format to a central point specified by EPA prior to June 21, 1999.

(b) The owner or operator of a stationary source shall revise and update the RMP submitted under § 68.150 as follows:

(1) Within five years of its initial submission or most recent update required by paragraphs (b)(2) through (b)(7) of this section, whichever is later.

(2) No later than three years after a newly regulated substance is first listed by EPA;

(3) No later than the date on which a new regulated substance is first present in an already covered process above a threshold quantity;

(4) No later than the date on which a regulated substance is first present above a threshold quantity in a new process;

(5) Within six months of a change that requires a revised PHA or hazard review;

(6) Within six months of a change that requires a revised offsite consequence analysis as provided in § 68.36; and

(7) Within six months of a change that alters the Program level that applied to any covered process.

(c) If a stationary source is no longer subject to this part, the owner or operator shall submit a revised registration to EPA within six months indicating that the stationary source is no longer covered.

13. Subpart H is added to read as follows:

Subpart H—Other Requirements

Subpart H—Other Requirements

§ 68.200 Recordkeeping.

The owner or operator shall maintain records supporting the implementation of this part for five years unless otherwise provided in Subpart D of this part.

§ 68.210 Availability of information to the public.

(a) The RMP required under subpart G of this part shall be available to the public under 42 U.S.C. 7414(c).

(b) The disclosure of classified information by the Department of Defense or other Federal agencies or contractors of such agencies shall be controlled by applicable laws, regulations, or executive orders concerning the release of classified information.

§ 68.215 Permit content and air permitting authority or designated agency requirements.

(a) These requirements apply to any stationary source subject to this part 68 and parts 70 or 71 of this Chapter. The 40 CFR part 70 or part 71 permit for the stationary source shall contain:

(1) A statement listing this part as an applicable requirement;

(2) Conditions that require the source owner or operator to submit:

(i) A compliance schedule for meeting the requirements of this part by the date provided in § 68.10(a) or;

(ii) As part of the compliance certification submitted under 40 CFR 70.6(c)(5), a certification statement that the source is in compliance with all requirements of this part, including the registration and submission of the RMP.

(b) The owner or operator shall submit any additional relevant information requested by the air permitting authority or designated agency.

(c) For 40 CFR part 70 or part 71 permits issued prior to the deadline for registering and submitting the RMP and which do not contain permit conditions described in paragraph (a) of this section, the owner or operator or air permitting authority shall initiate permit revision or reopening according to the procedures of 40 CFR 70.7 or 71.7 to incorporate the terms and conditions consistent with paragraph (a) of this section.

(d) The state may delegate the authority to implement and enforce the requirements of paragraph (e) of this section to a state or local agency or agencies other than the air permitting authority. An up-to-date copy of any delegation instrument shall be maintained by the air permitting authority. The state may enter a written agreement with the Administrator under which EPA will implement and enforce the requirements of paragraph (e) of this section.

(e) The air permitting authority or the agency designated by delegation or agreement under paragraph (d) of this section shall, at a minimum:

(1) Verify that the source owner or operator has registered and submitted an RMP or a revised plan when required by this part;

(2) Verify that the source owner or operator has submitted a source certification or in its absence has submitted a compliance schedule consistent with paragraph (a)(2) of this section;

(3) For some or all of the sources subject to this section, use one or more mechanisms such as, but not limited to, a completeness check, source audits, record reviews, or facility inspections to ensure that permitted sources are in compliance with the requirements of this part; and

(4) Initiate enforcement action based on paragraphs (e)(1) and (e)(2) of this section as appropriate.

§ 68.220 Audits.

(a) In addition to inspections for the purpose of regulatory development and enforcement of the Act, the implementing agency shall periodically audit RMPs submitted under subpart G of this part to review the adequacy of such RMPs and require revisions of RMPs when necessary to ensure compliance with subpart G of this part.

(b) The implementing agency shall select stationary sources for audits based on any of the following criteria:

(1) Accident history of the stationary source;

(2) Accident history of other stationary sources in the same industry;

(3) Quantity of regulated substances present at the stationary source;

(4) Location of the stationary source and its proximity to the public and environmental receptors;

(5) The presence of specific regulated substances;

(6) The hazards identified in the RMP; and

(7) A plan providing for neutral, random oversight.

(c) Exemption from audits. A stationary source with a Star or Merit ranking under OSHA's voluntary protection program shall be exempt from audits under paragraph (b)(2) and (b)(7) of this section.

(d) The implementing agency shall have access to the stationary source, supporting documentation, and any area where an accidental release could occur.

(e) Based on the audit, the implementing agency may issue the owner or operator of a stationary source a written preliminary determination of necessary revisions to the stationary source's RMP to ensure that the RMP meets the criteria of subpart G of this part. The preliminary determination shall include an explanation for the basis for the revisions, reflecting industry standards and guidelines (such as AIChE/CCPS guidelines and ASME and API standards) to the extent that such standards and guidelines are applicable, and shall include a timetable for their implementation.

(f) Written response to a preliminary determination.

(1) The owner or operator shall respond in writing to a preliminary determination made in accordance with paragraph (e) of this section. The response shall state the owner or operator will implement the revisions contained in the preliminary determination in accordance with the timetable included in the preliminary determination or shall state that the owner or operator rejects the revisions in whole or in part. For each rejected revision, the owner or operator shall explain the basis for rejecting such revision. Such explanation may include substitute revisions.

(2) The written response under paragraph (f)(1) of this section shall be received by the implementing agency within 90 days of the issue of the preliminary determination or a shorter period of time as the implementing agency specifies in the preliminary determination as necessary to protect public health and the environment. Prior to the written response being due and upon written request from the owner or operator, the implementing agency may provide in writing additional time for the response to be received.

(g) After providing the owner or operator an opportunity to respond under paragraph (f) of this section, the implementing agency may issue the owner or operator a written final determination of necessary revisions to the stationary source's RMP. The final determination may adopt or modify the revisions contained in the preliminary determination under paragraph (e) of this section or may adopt or modify the substitute revisions provided in the response under paragraph (f) of this section. A final determination that adopts a revision rejected by the owner or operator shall include an explanation of the basis for the revision. A final determination that fails to adopt a substitute revision provided under paragraph (f) of this section shall include an explanation of the basis for finding such substitute revision unreasonable.

(h) Thirty days after completion of the actions detailed in the implementation schedule set in the final determination under paragraph (g) of this section, the owner or operator shall be in violation of subpart G of this part and this section unless the owner or operator revises the RMP prepared under subpart G of this part as required by the final determination, and submits the revised RMP as required under § 68.150.

(i) The public shall have access to the preliminary determinations, responses, and final determinations under this section in a manner consistent with § 68.210.

(j) Nothing in this section shall preclude, limit, or interfere in any way with the authority of EPA or the state to exercise its enforcement, investigatory, and information gathering authorities concerning this part under the Act.

14. Part 68 Appendix A is added to read as follows:

Appendix A to Part 68—Table of Toxic Endpoints

[As defined in § 68.22 of this part]

CAS No.	Chemical name	Toxic endpoint (mg/L)
107–02–8	Acrolein [2-Propenal]	0.0011
107–13–1	Acrylonitrile [2-Propenenitrile]	0.076
814–68–6	Acrylyl chloride [2-Propenoyl chloride]	0.00090
107–18–6	Allyl alcohol [2-Propen-1-ol]	0.036
107–11–9	Allylamine [2-Propen-1-amine]	0.0032
7664–41–7	Ammonia (anhydrous)	0.14
7664–41–7	Ammonia (conc 20% or greater)	0.14
7784–34–1	Arsenous trichloride	0.010
7784–42–1	Arsine	0.0019
10294–34–5	Boron trichloride [Borane, trichloro-]	0.010
7637–07–2	Boron trifluoride [Borane, trifluoro-]	0.028
353–42–4	Boron trifluoride compound with methyl ether (1:1) [Boron, trifluoro[oxybis[methane]]-, T-4	0.023
7726–95–6	Bromine	0.0065
75–15–0	Carbon disulfide	0.16
7782–50–5	Chlorine	0.0087
10049–04–4	Chlorine dioxide [Chlorine oxide (ClO2)]	0.0028
67–66–3	Chloroform [Methane, trichloro-]	0.49
542–88–1	Chloromethyl ether [Methane, oxybis[chloro-]	0.00025
107–30–2	Chloromethyl methyl ether [Methane, chloromethoxy-]	0.0018
4170–30–3	Crotonaldehyde [2-Butenal]	0.029
123–73–9	Crotonaldehyde, (E)-, [2-Butenal, (E)-]	0.029
506–77–4	Cyanogen chloride	0.030
108–91–8	Cyclohexylamine [Cyclohexanamine]	0.16
19287–45–7	Diborane	0.0011
75–78–5	Dimethyldichlorosilane [Silane, dichlorodimethyl-]	0.026
57–14–7	1,1-Dimethylhydrazine [Hydrazine, 1,1-dimethyl-]	0.012
106–89–8	Epichlorohydrin [Oxirane, (chloromethyl)-]	0.076
107–15–3	Ethylenediamine [1,2-Ethanediamine]	0.49
151–56–4	Ethyleneimine [Aziridine]	0.018
75–21–8	Ethylene oxide [Oxirane]	0.090
7782–41–4	Fluorine	0.0039
50–00–0	Formaldehyde (solution)	0.012
110–00–9	Furan	0.0012
302–01–2	Hydrazine	0.011
7647–01–0	Hydrochloric acid (conc 30% or greater)	0.030
74–90–8	Hydrocyanic acid	0.011
7647–01–0	Hydrogen chloride (anhydrous) [Hydrochloric acid]	0.030
7664–39–3	Hydrogen fluoride/Hydrofluoric acid (conc 50% or greater) [Hydrofluoric acid]	0.016
7783–07–5	Hydrogen selenide	0.00066
7783–06–4	Hydrogen sulfide	0.042
13463–40–6	Iron, pentacarbonyl- [Iron carbonyl (Fe(CO)5), (TB–5–11)-]	0.00044
78–82–0	Isobutyronitrile [Propanenitrile, 2-methyl-]	0.14
108–23–6	Isopropyl chloroformate [Carbonochloride acid, 1-methylethyl ester]	0.10
126–98–7	Methacrylonitrile [2-Propenenitrile, 2-methyl-]	0.0027
74–87–3	Methyl chloride [Methane, chloro-]	0.82
79–22–1	Methyl chloroformate [Carbonochloridic acid, methylester]	0.0019
60–34–4	Methyl hydrazine [Hydrazine, methyl-]	0.0094
624–83–9	Methyl isocyanate [Methane, isocyanato-]	0.0012
74–93–1	Methyl mercaptan [Methanethiol]	0.049
556–64–9	Methyl thiocyanate [Thiocyanic acid, methyl ester]	0.085
75–79–6	Methyltrichlorosilane [Silane, trichloromethyl-]	0.018
13463–39–3	Nickel carbonyl	0.00067
7697–37–2	Nitric acid (conc 80% or greater)	0.026

APPENDIX A TO PART 68—TABLE OF TOXIC ENDPOINTS—Continued

[As defined in § 68.22 of this part]

CAS No.	Chemical name	Toxic endpoint (mg/L)
10102–43–9	Nitric oxide [Nitrogen oxide (NO)]	0.031
8014–95–7	Oleum (Fuming Sulfuric acid) [Sulfuric acid, mixture with sulfur trioxide]	0.010
79–21–0	Peracetic acid [Ethaneperoxoic acid]	0.0045
594–42–3	Perchloromethylmercaptan [Methanesulfenyl chloride, trichloro-]	0.0076
75–44–5	Phosgene [Carbonic dichloride]	0.00081
7803–51–2	Phosphine	0.0035
10025–87–3	Phosphorus oxychloride [Phosphoryl chloride]	0.0030
7719–12–2	Phosphorus trichloride [Phosphorous trichloride]	0.028
110–89–4	Piperidine	0.022
107–12–0	Propionitrile [Propanenitrile]	0.0037
109–61–5	Propyl chloroformate [Carbonochloridic acid, propylester]	0.010
75–55–8	Propyleneimine [Aziridine, 2-methyl-]	0.12
75–56–9	Propylene oxide [Oxirane, methyl-]	0.59
7446–09–5	Sulfur dioxide (anhydrous)	0.0078
7783–60–0	Sulfur tetrafluoride [Sulfur fluoride (SF4), (T-4)-]	0.0092
7446–11–9	Sulfur trioxide	0.010
75–74–1	Tetramethyllead [Plumbane, tetramethyl-]	0.0040
509–14–8	Tetranitromethane [Methane, tetranitro-]	0.0040
7750–45–0	Titanium tetrachloride [Titanium chloride (TiCl4) (T-4)-]	0.020
584–84–9	Toluene 2,4-diisocyanate [Benzene, 2,4-diisocyanato-1-methyl-]	0.0070
91–08–7	Toluene 2,6-diisocyanate [Benzene, 1,3-diisocyanato-2-methyl-]	0.0070
26471–62–5	Toluene diisocyanate (unspecified isomer) [Benzene, 1,3-diisocyanatomethyl-]	0.0070
75–77–4	Trimethylchlorosilane [Silane, chlorotrimethyl-]	0.050
108–05–4	Vinyl acetate monomer [Acetic acid ethenyl ester]	0.26

[FR Doc. 96–14597 Filed 6–19–96; 8:45 am]

BILLING CODE 6560–50–M

40 CFR Part 68

[FRL–5516–6]

List of Regulated Substances and Thresholds for Accidental Release Prevention; Final Rule—Stay of Effectiveness

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: On April 15, 1996, the Environmental Protection Agency (EPA) proposed several modifications to provisions of the rule listing regulated substances and establishing threshold quantities under section 112(r) of the Clean Air Act as amended (List Rule Amendments). The proposed List Rule Amendments, if promulgated in a final rule, would clarify or establish that part 68 does not apply to several types of processes and sources. In addition, EPA proposed, pursuant to Clean Air Act section 301(a)(1), 42 U.S.C. 7601(a)(1), to stay the effectiveness of provisions that would be affected by the proposed List Rule Amendments, for so long as necessary to take final action on the proposed List Rule Amendments. EPA received no adverse public comment on the short-term stay. Today EPA is amending part 68 to promulgate the stay, under which owners and operators of processes and sources that EPA has proposed not be subject to part 68 would not become subject to part 68 until EPA has determined whether to proceed with the List Rule Amendments. The effect of today's action will be to give owners and operators of sources affected by the proposed List Rule Amendments the same amount of time to achieve compliance with the requirements of part 68 as owners and operators of other sources in the event that EPA does not proceed with the List Rule Amendments as proposed.

EFFECTIVE DATE: June 20, 1996.

FOR FURTHER INFORMATION CONTACT: Vanessa Rodriguez, Chemical Engineer, Chemical Emergency Preparedness and Prevention Office, Environmental Protection Agency (5101), 401 M St. SW., Washington, DC 20460, (202) 260–7913.

SUPPLEMENTARY INFORMATION:

I. Background and Discussion

On April 15, 1996, EPA proposed amendments to regulations in 40 CFR part 68 that, inter alia, list regulated substances and establish threshold quantities for the accident prevention provisions under Clean Air Act section 112(r). 61 FR 16598. Readers should refer to that document for a complete discussion of the background of the rule affected. The amendments proposed in that document ("List Rule Amendments") would, if promulgated, delete explosives from the list of regulated substances, modify threshold provisions to exclude flammable substances in gasoline and in naturally occurring hydrocarbon mixtures prior to entry into a processing unit or plant, modify the threshold provisions for other flammable mixtures, and clarify the definition of stationary source with respect to transportation, storage incident to transportation, and naturally occurring hydrocarbon reservoirs.

On the same date, EPA proposed to stay provisions of part 68 that were affected by the proposed List Rule Amendments until such time as EPA takes final action on the proposed List Rule Amendments. 61 FR 16606. EPA proposed a stay of 18 months because it believed such a period would be sufficient to take final action on the List Rule Amendments and believed that owners and operators affected by the List Rule Amendments should have the same certainty about whether they are subject to part 68 as owners and operators of other sources have when they begin their regulatory compliance planning. In general, owners and operators of sources subject to the "Risk Management Program" final rule promulgated elsewhere in today's Federal Register, have three years from today to achieve compliance with part 68.

United States Environmental Protection Agency
Office of Solid Waste and Emergency Response (5101)
May 1996
550-F-96-003

EPA
CEPPO

LIST OF SUBSTANCES FOR ACCIDENTAL RELEASE PREVENTION

CLEAN AIR ACT section 112(r)

FACTSHEET

The purpose of the CAA provisions for accident prevention is to ensure that facilities reduce the likelihood and severity of accidental chemical releases that could harm the public and the environment. These provisions also ensure that the public and state and local governments can receive facility-specific information on potential hazards and the steps being taken to prevent accidents.

On 31January 1994, EPA promulgated a final rule under provisions of the Clean Air Act (CAA) Amendments s.112(r) for the prevention of accidental releases of hazardous substances. The rule establishes a list of chemicals and threshold quantities that identify facilities subject to subsequent accident prevention regulations. The listed substances have the potential to pose the greatest hazard to public health and the environment in the event of an accidental release. On 15 April 1996, EPA proposed several amendments to the final rule. The list constitutes the first of two necessary elements for the prevention of chemical accidents under EPA's CAA mandate. The second element is the requirement for risk management planning. A facility that handles more than a threshold quantity of a listed substance in a process is subject to the risk management planning requirements of CAA section 112(r).

REGULATORY BACKGROUND

In 1986 the Emergency Planning and Community Right-to-Know Act (EPCRA) became law. EPCRA improves the ability of communities to prepare for and respond to chemical accidents. Under EPCRA, communities must develop emergency response plans, based on information that facilities must provide on the hazardous chemicals they handle. In the 1990 amendments to the Clean Air Act, Congress included requirements for accidental release prevention regulations in section 112(r). Congress also mandated that the Occupational Safety and Health Administration (OSHA) adopt a process safety management standard to protect workers from the workplace effects of chemical accidents; the standard was issued on 24 February 1992.

CHARACTERISTICS OF THE FINAL RULE

Under the CAA, EPA must develop an initial list of at least 100 substances that, in the event of an accidental release, could cause death, injury, or serious adverse effects to human health or the environment.

If a facility has more than a threshold quantity of these substances in a process, then it must develop and implement a risk management program. That program must include a hazard assessment, prevention program, and an emergency response program. Summary risk management plans will be submitted to a central location and will be made electronically available to state and local authorities as well as the public. The final rule for risk management planning was promulgated on 20 June 1996.

The statutory criteria EPA considered in selecting substances for the list include severity of acute adverse health effects, likelihood of release, and potential magnitude of human exposure. EPA set threshold quantities for each regulated substance based on its toxicity, reactivity, volatility, dispersibility, and flammability, as well as the amount known or anticipated to cause effects of concern.

The list EPA promulgated in 1994 includes 77 acutely toxic chemicals, 63 flammable gases and volatile flammable liquids, and Division 1.1 high explosive substances as listed by DOT in 49 CFR 172.101. The final rule establishes threshold quantities for toxic substances ranging from 500 to 20,000 pounds. For all listed flammable substances, the threshold quantity is 10,000 pounds, while all explosive substances have a threshold quantity of 5,000 pounds. The rule sets forth the procedures for determining whether a threshold quantity of a regulated substance is present at a stationary source. Specific exemptions to the threshold determination are also included for mixtures, articles, and certain uses and activities. The rule also specifies the requirements for petitions to the Agency to add substances to, or delete substances from, the list.

Proposed Changes

Following EPA's promulgation of the final list rule, some members of the regulated community raised questions about certain provisions they felt were inconsistent with the intent EPA expressed in the preamble and other documents supporting the final rule. In response, EPA published proposed amendments to the final rule on 15 April 1996.

The first proposed modification would be to delete the category of Division 1.1 explosives. The Agency also proposes to exempt from threshold quantity determinations regulated flammable substances in gasoline used as fuel and in naturally occurring hydrocarbon mixtures prior to initial processing. Further, the Agency proposes clarification of the provision for threshold determination of flammable substances in a mixture. Modifications to the definition of "stationary source" are proposed to clarify the exemption of transportation and storage related to transportation and to clarify that naturally occurring hydrocarbon reservoirs are not stationary sources or parts of stationary sources. In addition, EPA proposes to clarify that 40 CFR part 68 does not apply to sources located on the Outer Continental Shelf. EPA believes these proposed changes will focus accident prevention more appropriately on stationary sources with high hazard operations and reduce duplication with other similar requirements.

For those provisions of the list rule that EPA is proposing to amend, the Agency has finalized a stay of effectiveness until it takes final action on the proposed modifications. Thus, owners and operators of processes and sources that EPA has proposed not be subject to risk management planning requirements would not have to comply with CAA section 112(r) until EPA has determined whether to finalize the proposed list rule amendments.

Affected Universe

EPA estimates that approximately 66,000 facilities will be affected by the list and risk management planning rules, if the proposed list amendments are adopted. The facilities include chemical and many other manufacturers, cold storage facilities with ammonia refrigeration systems, public water treatment systems, wholesalers and distributors of these chemicals, propane retailers, utilities, and federal facilities.

Conclusion

According to the risk management planning requirements of the Clean Air Act, facilities that handle certain hazardous substances must act to prevent chemical accidents. They must also share information about their prevention efforts with the public, workers, and government. EPA expects these new partnerships among stakeholders in prevention activity to prove a dynamic force in reducing the number and severity of chemical accidents.

For More Information...

Contact the Emergency Planning and Community Right-to-Know Hotline

(800) 424-9346 or (703) 412-9810
TDD (800) 553-7672

Monday-Friday, 9AM to 6PM, Eastern Time

Visit the CEPPO Home Page
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United States Environmental Protection Agency | Office of Solid Waste and Emergency Response (5101) | 550-F-96-002 May 1996

EPA CEPPO

RISK MANAGEMENT PLANNING: ACCIDENTAL RELEASE PREVENTION

Final Rule: Clean Air Act section 112(r)

FACTSHEET

Preventing accidental releases of hazardous chemicals is the shared responsibility of industry, government, and the public. The first steps toward accident prevention are identifying the hazards and assessing the risks. Once information about chemicals is openly shared, industry, government, and the community can work together toward reducing the risk to public health and the environment. Important new provisions in the Clean Air Act advance the process of risk management planning and public disclosure of risk. These requirements will affect facilities that produce, handle, process, distribute, or store certain chemicals. The final rule for risk management planning was promulgated on 20 June 1996.

MANAGING CHEMICALS SAFELY

Section 112(r) of the amended Clean Air Act (CAA), signed into law on 15 November 1990, mandates a new federal focus on the prevention of chemical accidents. The objective of section 112(r) is to prevent serious chemical accidents that have the potential to affect public health and the environment. Under these requirements, industry has the obligation to prevent accidents, operate safely, and manage hazardous chemicals in a safe and responsible way. Government, the public, and many other groups also have a stake in chemical safety and must be partners with industry for accident prevention to be successful.

The risk management planning requirements of CAA section 112(r) complement and support the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA). A milestone in federal actions, EPCRA helps local communities prepare for and respond to chemical accidents. It requires communities to develop emergency response plans, based on information from industry concerning hazardous chemicals. Under the new CAA requirements, stationary sources (facilities) must identify and assess their chemical hazards and carry out certain activities designed to reduce the likelihood and severity of accidental chemical releases. Information summarizing these activities will be available to state and local governments, the public, and all other stakeholders. Using this information, citizens will have the opportunity to work with industry to reduce risks to the community from chemical accidents.

In the broadest sense, risk management planning relates to local emergency preparedness and response, to pollution prevention at facilities, and to worker safety. In a more focussed sense, it forms one element of an integrated approach to safety and complements existing industry codes and standards. The risk management planning requirements build on OSHA's Process Safety Management Standard, the chemical safety guidelines of the Center for Chemical Process Safety of the American Institute of Chemical Engineers, and similar standards of the American Petroleum Institute and Chemical Manufacturers Association, as well as the practices of many other safety-conscious companies.

It's the Law...

CAA section 112(r) mandates that EPA publish rules and guidance for chemical accident prevention. These rules must include requirements for sources to develop and implement risk management programs that incorporate three elements: a hazard assessment, a prevention program, and an emergency response program. These programs are to be summarized in a risk management plan (RMP) that will be made available to state and local government agencies and the public.

Who's Covered

Any source with more than a threshold quantity of a listed "regulated substance" in a single process must comply with the regulation. "Process," in terms of the regulation, means manufacturing, storing, distributing, handling, or using a regulated substance in any other way. Transportation, including pipelines and vehicles under active shipping orders, is excluded. On 31 January 1994, EPA promulgated a final list of 139 regulated substances: 77 acutely toxic substances, 63 flammable gases and volatile liquids, and Division 1.1 high explosives as listed by DOT. The final list rule established threshold quantities for toxics ranging from 500 to 20,000 pounds. For all listed flammables, the threshold quantity is 10,000 pounds. EPA proposed modifications to the final list on 15 April 1996. These modifications would exclude facilities handling explosives, exploration/production facilities for oil and gas, and gasoline.

EPA estimates that approximately 66,000 sources will be covered by the rule, assuming the proposed list amendments are adopted. The universe includes chemical manufacturers, other manufacturers, certain wholesalers and retailers, drinking water systems, wastewater treatment works, ammonia refrigeration systems, utilities, and federal facilities. Sources with at least one covered process must comply with the rule by June 20, 1999.

Three Levels of Compliance

The final risk management planning regulation (40 CFR part 68) defines the activities sources must undertake to address the risks posed by regulated substances in covered processes. To ensure that individual processes are subject to appropriate requirements that match their size and the risks they may pose, EPA has classified them into three categories ("Programs").

Program 1 requirements apply to processes for which a worst-case release, as evaluated in the hazard assessment, would not affect the public. These are sources or processes that have not had an accidental release that caused serious offsite consequences. Remotely located sources and processes using listed flammables are primarily those eligible for this program.

Program 2 requirements apply to less complex operations that do not involve chemical processing (e.g., retailers, propane users, non-chemical manufacturers, and other processes not regulated under OSHA's PSM Standard).

Program 3 requirements apply to higher risk, complex chemical processing operations and to processes already subject to the OSHA PSM.

RMP Basics

Sources with processes with a regulated substance above a threshold quantity will be required to carry out the following elements of risk management planning:

◆ ***An offsite consequence analysis that evaluates specific potential release scenarios, including worst-case and alternative*** *scenarios*

- *A 5-year history of certain accidental releases of regulated substances from covered processes*

- *An integrated prevention program to manage risk*

- *An emergency response program*

- *An overall management system to supervise the implementation of these program elements*

- *A risk management plan (RMP), revised at least once every five years, that summarizes and documents these activities for all covered processes*

Based on their limited potential for serious offsite consequences, sources are not required to implement a prevention program, an emergency response program, or a management system for Program 1 processes. Sources with processes in Program 2 and Program 3 must address each of the above elements.

LINKS

The OSHA PSM Standard (29 CFR 1910.119) reflects the key elements that the petrochemical industry, trade associations, and engineering societies have deemed essential to safe management of hazardous substances for complex, chemical-processing operations. EPA has adopted OSHA's PSM requirements as the Program 3 prevention program, with only minor changes in terminology. With few exceptions, processes assigned to Program 3 are already subject to the OSHA PSM Standard; the remaining Program 3 processes are in industry sectors that have a significant accident history.

EPA has also worked closely with other regulatory programs that focus on risk management issues for hazardous chemicals in order to foster co-ordination and reduce burden. EPA and the National Response Team have prepared Integrated Contingency Plan Guidance to assist sources subject to multiple regulations in preparing a consolidated emergency response plan. Further, EPA believes that many of the prevention program requirements for Program 2 processes and the emergency response program requirements can be satisfied without additional effort because of existing compliance with other federal and state regulations, industry standards and codes, and good engineering practices.

MAKING IT WORK

To document compliance with the rule and provide risk information, all sources must submit to a central location a risk management plan that includes a registration, an executive summary, a 5-year accident history, and offsite consequence analysis information. Sources with Program 2 and 3 processes also must submit information in the RMP regarding compliance with requirements for the prevention program and the emergency response program.

EPA is developing a reporting mechanism and form to collect RMPs in a way that encourages electronic submission. This will make risk management planning information available far more widely to the public and at a far lower cost than would traditional reporting. To support electronic submission and reduce the reporting burden, EPA has standardized the RMP requirements. With the exception of the executive summary, data elements will be primarily check-off boxes, yes/no answers, or numerical entries.

An "implementing agency" will oversee these requirements and receive the RMPs. It will audit and inspect a percentage of sources each year and require whatever revisions to the RMPs are necessary. Under CAA section 112(l), states may request that EPA delegate the authority to serve as the implementing agency to a state or local agency with the appropriate expertise, resources, and authority. States may implement their own programs, although the law demands that program requirements must be as stringent as EPA's and must include all EPA-regulated substances and processes. Approximately 30 per cent of the sources subject to the risk management program requirements must also comply with Title V of the Clean Air Act, which requires permits for emissions of air pollutants. Section 112(r) is an applicable requirement for Title V permits.

Help for Small Business

Small and medium-sized enterprises may receive information about CAA section 112(r) through the Small Business Assistance Program in each state, through the Federal Small Business Assistance Program, through the network of Small Business Development Centers across the country, through the EPCRA Hotline, and through a range of electronic outlets.

To make compliance easier for small businesses, EPA is working with industry groups to develop model risk management programs. Initially, these model programs will be developed for ammonia refrigeration, propane handling, and water treatment operations. The RMP Offsite Consequence Analysis Guidance will eliminate the need for covered small operations to invest in computer modeling programs and to answer complex technical questions (e.g., how to model liquefied gases) related to this element of the hazard assessment.

Looking Ahead...

As this final rule is implemented, EPA plans to publish general technical guidance, guidance for states on implementation, guidance for Local Emergency Planning Committees on ways to use RMP information in the community, and additional model plans for certain industry sectors and regulated substances. In addition, the Agency will produce training packages and disseminate training through a variety of educational outlets. Workshops, in co-operation with industry and engineering societies, will also be presented around the country, as well as teleconferences to introduce the new risk management planning requirements to a diversity of stakeholders.

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With risk management planning as the basis for accident prevention, everybody wins. Industry has an opportunity to demonstrate excellence in safety. Government can show effective, efficient leadership in developing sensible requirements. And communities will have a powerful right-to-know tool, as citizens work together toward reducing chemical risks to public health and the environment.

For More Information...

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United States Environmental Protection Agency
Office of Solid Waste and Emergency Response (5101)
550-F-96-005
May 1996

EPA
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CLEAN AIR ACT SECTION 112(r)

Excerpts from Statute

FACTSHEET

CLEAN AIR ACT

SECTION 112(r) EXCERPTS

Section 112(r) of the amended Clean Air Act deals with the prevention and detection of accidental releases of hazardous chemicals. EPA has promulgated the two regulations that the Act calls for concerning risk management planning. As a reference document to accompany those rules, this fact sheet sets forth relevant portions excerpted from the statute.The Clean Air Act is codified in the U.S. Code at 42 U.S.C. 7401 et seq.; section 112(r) may be found at U.S.C. 7412.

(r) Prevention of Accidental Releases

(1) Purpose and General Duty

It shall be the objective of the regulations and programs authorized under this subsection to prevent the accidental release and to minimize the consequences of any such release of any substance listed pursuant to paragraph (3) or any other extremely hazardous substance. The owners and operators of stationary sources producing, processing, handling, or storing such substances have a general duty in the same manner and to the same extent as section 654 of Title 29 to identify hazards which may result from such releases using appropriate hazard assessment techniques, to design and maintain a safe facility taking such steps as are necessary to prevent releases, and to minimize the consequences of accidental releases which do occur. For purposes of this paragraph, the provisions of section 7604 of this title shall not be available to any person or otherwise be construed to be applicable to this paragraph. Nothing in this section shall be interpreted, construed, implied or applied to create any liability or basis for suit for compensation for bodily injury or any other injury or property damages to any person which may result from accidental releases of such substances.

(2) Definitions

(A) The term "accidental release" means an unanticipated emission of a regulated substance or other extremely hazardous substance into the ambient air from a stationary source.

(B) The term "regulated substance" means a substance listed under paragraph (3).

(C) The term "stationary source" means any buildings, structures, equipment, installations or substance emitting stationary activities (i) which belong to the same industrial group, (ii) which are located on one or more contiguous properties, (iii) which are under the control of the same person (or persons under common control), and (iv) from which an accidental release may occur.

(3) List of Substances

The Administrator shall promulgate not later than 24 months after enactment of the Clean Air Act Amendments of 1990 an initial list of 100 substances which, in the case of an accidental release, are known to cause or may reasonably be anticipated to cause death, injury, or serious adverse effects to human health or the environment. For purposes of promulgating such list, the Administrator shall use, but is not limited to, the list of extremely hazardous substances published under the Emergency Planning and Community Right-to-Know Act of 1986 [42 U.S.C. ß 11001 et seq.], with such modifications as the Administrator deems appropriate. The initial list shall include chlorine, anhydrous ammonia, methyl chloride, ethylene oxide, vinyl chloride, methyl isocyanate, hydrogen cyanide, ammonia, hydrogen sulfide, toluene diisocyanate, phosgene, bromine, anhydrous hydrogen chloride, hydrogen fluoride, anhydrous sulfur dioxide, and sulfur trioxide. The initial list shall include at least 100 substances which pose the greatest risk of causing death, injury, or serious adverse effects to human health or the environment from accidental releases. Regulations establishing the list shall include an explanation of the basis for establishing the list. The list may be revised from time to time by the Administrator on the Administrator's own motion or by petition and shall be reviewed at least every 5 years. No air pollutant for which a national primary ambient air quality standard has been established shall be included on any such list. No substance, practice, process, or activity regulated under subchapter VI of this chapter shall be subject to regulations under this subsection. The Administrator shall establish procedures for the addition and deletion of substances from the list established under this paragraph consistent with those applicable to the list in subsection (b) of this section.

(4) Factors to be Considered

In listing substances under paragraph (3), the Administrator shall consider each of the following criteria ,

(A) the severity of any acute adverse health effects associated with accidental releases of the substance;

(B) the likelihood of accidental releases of the substance; and

(C) the potential magnitude of human exposure to accidental releases of the substance.

(5) Threshold Quantity

At the time any substance is listed pursuant to paragraph (3), the Administrator shall establish by rule, a threshold quantity for the substance, taking into account the toxicity, reactivity, volatility, dispersibility, combustibility, or flammability of the substance and the amount of the substance which, as a result of an accidental release, is known to cause or may reasonably be anticipated to cause death, injury or serious adverse effects to human health for which the substance was listed. The Administrator is authorized to establish a greater threshold quantity for, or to exempt entirely, any substance that is a nutrient used in agriculture when held by a farmer.

(7) Accident Prevention

(A) In order to prevent accidental releases of regulated substances, the Administrator is authorized to promulgate release prevention, detection, and correction requirements which may include monitoring, recordkeeping, reporting, training, vapor recovery, secondary containment, and other design, equipment, work practice, and operational requirements. Regulations promulgated under this paragraph may make distinctions between various types, classes, and kinds of facilities, devices and systems taking into consideration factors including, but not limited to, the size, location, process, process controls, quantity of substances handled, potency of substances, and response capabilities present at any stationary source. Regulations promulgated pursuant to this subparagraph shall have an effective date, as determined by the Administrator, assuring compliance as expeditiously as practicable.

(B)(i) Within 3 years after November 15, 1990, the Administrator shall promulgate reasonable regulations and appropriate guidance to provide, to the greatest extent practicable, for the prevention and detection of accidental releases of regulated substances and for response to such releases by the owners or operators of the sources of such releases. The Administrator shall utilize the expertise of the Secretaries of Transportation and Labor in promulgating such regulations. As appropriate, such regulations shall cover the use, operation, repair, replacement, and maintenance of equipment to monitor, detect, inspect, and control such releases, including training of persons in the use and maintenance of such equipment and in the conduct of periodic inspections. The regulations shall include procedures and measures for emergency response after an accidental release of a regulated substance in order to protect human health and the environment. The regulations shall cover storage, as well as operations. The regulations shall, as appropriate, recognize differences in size, operations, processes, class and categories of sources and the voluntary actions of such sources to prevent such releases and respond to such releases. The regulations shall be applicable to a stationary source 3 years after the date of promulgation, or 3 years after the date on which a regulated substance present at the source in more than threshold amounts is first listed under paragraph (3), whichever is later.

(ii) The regulations under this subparagraph shall require the owner or operator of stationary sources at which a regulated substance is present in more than a threshold quantity to prepare and implement a risk management plan to detect and prevent or minimize accidental releases of such substances from the stationary source, and to provide a prompt emergency response to any such releases in order to protect human health and the environment. Such plan shall provide for compliance with the requirements of this subsection and shall also include each of the following:

(I) a hazard assessment to assess the potential effects of an accidental release of any regulated substance. This assessment shall include an estimate of potential release quantities and a determination of downwind effects, including potential exposures to affected populations. Such assessment shall include a previous release history of the past 5 years, including the size, concentration, and duration of releases, and shall include an evaluation of worst case accidental releases;

(II) a program for preventing accidental releases of regulated substances, including safety precautions and maintenance, monitoring and employee training measures to be used at the source; and

(III) a response program providing for specific actions to be taken in response to an accidental release of a regulated substance so as to protect human health and the environment, including procedures for informing the public and local agencies responsible for responding to accidental releases, emergency health care, and employee training measures.

At the time regulations are promulgated under this subparagraph, the Administrator shall promulgate guidelines to assist stationary sources in the preparation of risk management plans. The guidelines shall, to the extent practicable, include model risk management plans.

(iii) The owner or operator of each stationary source covered by clause (ii) shall register a risk management plan prepared under this subparagraph with the Administrator before the effective date of regulations under clause (i) in such form and manner as the Administrator shall, by rule, require. Plans prepared pursuant to this subparagraph shall also be submitted to the Chemical Safety and Hazard Investigation Board, to the State in which the stationary source is located, and to any local agency or entity having responsibility for planning for or responding to accidental releases which may occur at such source, and shall be available to the public under section 7414(c) of this title. The Administrator shall establish, by rule, an auditing system to regularly review and, if necessary, require revision in risk management plans to assure that the plans comply with this subparagraph. Each such plan shall be updated periodically as required by the Administrator, by rule.

(C) Any regulations promulgated pursuant to this subsection shall to the maximum extent practicable, consistent with the subsection, be consistent with the recommendations and standards established by the American Society of Mechanical Engineers (ASME), the American National Standards Institute (ANSI) or the American Society of Testing Materials (ASTM). The Administrator shall take into consideration the concerns of small business in promulgating regulations under this subsection.

(D) In carrying out the authority of this paragraph, the Administrator shall consult with the Secretary of Labor and the Secretary of Transportation and shall coordinate any requirements under this paragraph with any requirements established for com parable purposes by the Occupational Safety and Health Administration or the Department of Transportation. Nothing in this subsection shall be interpreted, construed or applied to impose requirements affecting, or to grant the Administrator, the Chemical Safety and Hazard Investigation Board, or any other agency any authority to regulate (including requirements for hazard assessment), the accidental release of radionuclides arising from the construction and operation of facilities licensed by the Nuclear Regulatory Commission.

(E) After the effective date of any regulation or requirement imposed under this subsection, it shall be unlawful for any person to operate any stationary source subject to such regulation or requirement in violation of such regulation or requirement. Each regulation or requirement under this subsection shall for purposes of sections 7413, 7414, 7416, 7420, 7604, and 7607 of this title and other enforcement provisions of this chapter, be treated as a standard in effect under subsection (d) of this section.

(F) Notwithstanding the provisions of subchapter V of this chapter or this section, no stationary source shall be required to apply for, or operate pursuant to, a permit issued under such subchapter solely because such source is subject to regulations or requirements under this subsection.

(G) In exercising any authority under this subsection, the Administrator shall not, for purposes of section 653(b)(1) of Title 29, be deemed to be exercising statutory authority to prescribe or enforce standards or regulations affecting occupational safety and health.

(9) Order Authority

(A) In addition to any other action taken, when the Administrator determines that there may be an imminent and substantial endangerment to the human health or welfare or the environment because of an actual or threatened accidental release of a regulated substance, the Administrator may secure such relief as may be necessary to abate such danger or threat, and the district court of the United States in the district in which the threat occurs shall have jurisdiction to grant such relief as the public interest and the equities of the case may require. The Administrator may also, after notice to the State in which the stationary source is located, take other action under this paragraph including, but not limited to, issuing such orders as may be necessary to protect human health. The Administrator shall take action under section 7603 of the title rather than this paragraph whenever the authority of such section is adequate to protect human health and the environment.

(B) Orders issued pursuant to this paragraph may be enforced in an action brought in the appropriate United States district court as if the order were issued under section 7603 of this title.

(C) Within 180 days after enactment of the Clean Air Act Amendments of 1990, the Administrator shall publish guidance for using the order authorities established by this paragraph. Such guidance shall provide for the coordinated use of the authorities of this paragraph with other emergency powers authorized by section 9606 of this title, sections 311(c), 308, 309 and 504(a) of the Federal Water Pollution Control Act, sections 3007, 3008, 3013, and 7003 of the Solid Waste Disposal Act, section 1445 and 1431 of the Safe Drinking Water Act, section 5 and 7 of the Toxic Substances Control Act, and section 7413, 7414, and 7603 of this title.

For More Information...

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TDD (800) 553-7672

Monday-Friday, 9 AM to 6 PM, eastern time

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United States Environmental Protection Agency

Office of Solid Waste and Emergency Response (5101)

550-F-96-004
May 1996

EPA CEPPO

CHEMICAL ACCIDENT PREVENTION AND THE CLEAN AIR ACT AMENDMENTS OF 1990

FACTSHEET

Preventing accidental releases of hazardous chemicals is the shared responsibility of industry, government, and the public. The first steps toward prevention are identifying the hazards and assessing the risks. Once information about chemicals is openly shared, stakeholders can work together toward reducing chemical risks to public health and the environment. Important new provisions in the Clean Air Act of 1990 advance the process of risk management planning and public disclosure of risk. The amendments, which cover a wide range of air pollution issues, include specific provisions addressing accidental releases of hazardous chemicals. These requirements will affect facilities that produce, handle, process, distribute, or store certain chemicals.

The Clean Air Act (CAA) makes it clear that facilities that handle hazardous substances bear the primary responsibility for ensuring their safe use. The CAA section 112(r)(1) general duty clause outlines the basic statutory principle that facilities are responsible for designing and maintaining a safe plant, identifying their hazards, and minimizing the consequences of accidental chemical releases. This clause applies to any facility that handles any hazardous substance, regardless of the quantity on site.

CAA Section 112(r): Basic Requirements

Under CAA s.112(r), EPA must:

- Publish a list of at least 100 substances and associated threshold quantities that determine who must comply with the new regulations
- Develop regulations and guidance for the response, prevention, and detection of accidental releases associated with these regulated substances.

Certain facilities must:

- Prepare risk management plans that include a hazard assessment, accident prevention program, and emergency response program
- Comply with other accidental release regulations that EPA may adopt.

One of the other key provisions of section 112(r) is a mandate for OSHA to establish a chemical process safety management standard for the workplace.

The CAA, under s.507, also requires that each state set up programs to provide small businesses with technical assistance on the CAA and to help them comply with the Act's regulations. By statute, these small business programs must include assistance related to accidental release prevention and detection. These programs provide information on alternative technologies, process changes, products, and methods of operation that help reduce air pollution.

Background: Chemical Accident Prevention Before 1990

Public awareness of the potential danger from accidental releases of hazardous substances has increased over the years as serious chemical accidents have occurred around the world. Public concern intensified following the 1984 release of methyl isocyanate in Bhopal, India, which killed more than 2,000 people. A subsequent chemical release in Institute, West Virginia, sent more than 100 people to the hospital and made Americans aware that such incidents can and do happen in the United States.

EPA's Response to Bhopal

In response to this public concern and the hazards that exist, EPA began its Chemical Emergency Preparedness Program (CEPP) in 1985. CEPP was a voluntary program to encourage state and local authorities to identify hazards in their areas and to plan for potential chemical emergencies. This local planning complemented emergency response planning carried out at the national and regional levels by the National Response Team and Regional Response Teams.

The following year, Congress enacted many of the elements of CEPP in the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), also known as Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This law requires states to establish State Emergency Response Commissions and Local Emergency Planning Committees to develop emergency response plans for each community. EPCRA also requires facilities to make information available to the public on the hazardous chemicals they have on site. EPCRA's reporting requirements foster a valuable dialogue between industry and local communities on hazards to help citizens become more informed about the presence of hazardous chemicals that might affect public health and the environment. According to OSHA requirements, workers on site also have a right to know about the hazardous chemicals to which they could be exposed.

Milestone Report on Systems for Prevention

EPCRA did not require facilities to establish accident prevention programs. However, under EPCRA section 305(b), EPA was required to conduct a review of emergency systems to monitor, detect, and prevent chemical accidents at facilities across the country. The final report to Congress, *Review of Emergency Systems* (EPA, 1988), concluded that the prevention of accidental releases requires an integrated approach that considers technologies, operations, and management practices, and it emphasized the importance of management commitment to safety.

EPA's Prevention Program Takes Shape

EPA recognized that prevention, preparedness, and response form a safety continuum. Therefore, in 1986, EPA established its Chemical Accident Prevention Program, integrating it with the Chemical Emergency Preparedness Program. The first initiative was to begin collecting information on chemical accidents. Then EPA began working with other stakeholder groups to increase knowledge of prevention practices and encourage industry to improve safety at facilities.

Under the Chemical Accident Prevention Program, EPA developed the Accidental Release

Information Program (ARIP) to collect data on the causes of accidents and the steps facilities take to prevent recurrences. EPA also developed its Chemical Safety Audit Program to gather and disseminate information on successful practices to mitigate and prevent chemical accidents. The audit program also points out problematic practices and ways to improve them. Through the program, EPA has trained its regional staff as well as state officials on process safety and auditing techniques. Another significant component of EPA's Chemical Accident Prevention Program involves outreach to small and medium-sized enterprises, which the section 305(b) study indicated are generally less aware of risks than larger facilities. EPA has worked with a broad spectrum of stakeholder groups to determine the best ways to reach these smaller operations.

All these efforts are based on the premise that while industry bears the primary responsibility for preventing and mitigating chemical accidents, many other groups also have a role to play. Workers, trade associations, environmental groups, professional organizations, public interest groups, the insurance and financial community, researchers and academia, the medical profession, and governments at all levels can help facilities that use hazardous chemicals identify their hazards and find safer ways to operate. A number of stakeholder groups have now developed programs and guidance to assist facilities in the management of chemical hazards. Many of these safety measures can make businesses more efficient and productive.

Clean Air Act Requirements: What Chemicals are Covered?

Under CAA 112(r)(3)(5), EPA must develop and publish an initial list of at least 100 substances that, in an accidental release, could cause death, injury, or serious adverse effect to human health or the environment.

To build its list, EPA considered the severity of any acute adverse health effects, the likelihood of an accidental release, and the potential magnitude of human exposure. The threshold quantities for each chemical (which determine the facilities subject to the RMP requirements) reflect toxicity, reactivity, volatility, flammability, explosivity, and dispersibility as well as the amount known or anticipated to cause effects of concern.

On January 31, 1994, EPA promulgated a final rule on the substances and thresholds: 77 acutely toxic chemicals, 63 flammable gases and volatile flammable liquids, and Division 1.1 high explosive substances as listed by DOT. On April 15, 1996, based on concerns raised by the regulated community, EPA proposed modifications to the final rule. The modifications would clarify "flammables" so that gasoline and crude oil would not be covered; clarify "stationary source"; and make clear the exclusion of facilities handling explosives, exploration and production facilities for oil and gas, and gasoline.

It is important to note that the threshold quantity is determined by the maximum amount of a substance in a proccess, not the maximum quantity on site. The list rule also sets forth the requirements for petitions to the Agency to add substances to, or delete substances from, the list.

Risk Management Planning

For industry, chemical accident prevention has become an important way of doing business. More and more plant managers, whether they are subject to regulation or not, recognize chemical safety management as an integral part of running an efficient operation. At the same time, new CAA regulations ensure that the public can be properly informed about chemical risks in their neighborhoods, and community organizations, states, and the federal government all have become active players in helping to lower these risks.

RMP Basics

EPA proposed its regulation on risk management planning on October 20, 1993. Its requirements apply to facilities that have more than a threshold quantity of a regulated substance in a process. As mandated by the CAA, the final rule requires facilities to develop and implement a risk management program that includes a hazard assessment of the off-site consequences of releases under worst case and alternate scenarios, a prevention program, and an emergency response program. Information about the program must be documented in a risk management plan that is submitted to a central location and made available electronically to states and local planning agencies as well as the public.

Building on Chemical Process Safety Management

These new risk management planning requirements are not unique. Rather, they form one element of an integrated approach to safety and complement closely related industry standards and practices. In the broadest sense, risk management planning relates to local emergency preparedness and response, to pollution prevention at facilities, and to worker safety. In a more focussed sense, these requirements build on OSHA's Process Safety Management Standard (issued on February 24, 1992). They also draw from the chemical safety guidelines of the Center for Chemical Process Safety of the American Institute of Chemical Engineers and similar standards of the American Petroleum Institute and Chemical Manufacturers Association, as well as the practices of safety-conscious chemical companies. In addition, four states--New Jersey, California, Nevada, and Delaware--also have regulations on accidental release prevention.

For facilities to comply with the new risk management planning rule, EPA is encouraging them to incorporate these existing industry standards and approaches that many already practice for chemical safety management.

Prevention Program Requirements

The elements of the prevention program include the following:

- **Review and documentation of the plant's chemicals, processes, and equipment**
- **Detailed process hazard analysis to identify hazards, assess the likelihood of accidental releases, and evaluate the consequences of such releases**
- **Development of standard operating procedures**
- **Training of employees on procedures**
- **Implementation of a preventive maintenance program**
- **Management of changes in operation that may impact the safety of the system**
- **Reviews before initial start-up of a process and before start-up following a modification of a process**
- **Investigation and documentation of accidents**
- **Periodic safety audits to ensure that procedures and practices are being followed**

Affected Universe

EPA estimates that approximately 66,000 facilities will be affected by the risk management planning requirements, if proposed amendments to the list rule are adopted. These facilities include manufacturers in the chemical and petrochemical and refining industries, other manufacturers in many manufacturing sectors (e.g., manufacturers of pulp and paper; organic and inorganic chemicals; manufacturers and handlers of chlor-alkalis, plastics and resins, nitrogen fertilizers, and agricultural chemicals), cold storage facilities that use ammonia as a refrigerant including food processors and distributors and refrigerated warehouses, public water treatment systems, chemical retailers, federal facilities, and some service industries.

Many other stakeholder groups will also be at least indirectly affected by the new 112(r) requirements. These include federal agencies and departments (especially OSHA, DOT, DOD, DOE, SBA, FEMA , and Coast Guard) and state and local representatives (particularly State Emergency Response Commissions and Local Emergency Planning Committees, state air offices, local fire departments, emergency management agencies, environmental protection and public health departments, land use planning officials, and natural resource planning and management offices).

Other interested stakeholders will be public interest groups and the environmental community, insurance companies, labor organizations, and international bodies such as the Organisation for Economic Co-operation and Development.

RMP Registration and Submittal

Facilities covered by the rule will comply by submitting to a central location a registration form along with a risk management plan that describes their risk management program. Facilities will submit their plans electronically, selecting options to be spelled out in guidance. The information will be available immediately to state and local authorities as well as to the general public and all other stakeholders who may be interested.

The final rule with the requirements for risk management planning was promulgated on June 20, 1996. Submittals of registration forms and risk management plans are due from facilities by June 20, 1999, with updates required every five years.

Should EPA add to the list of regulated substances, the regulations would take effect for newly covered facilities three years after the date on which a substance is first listed.

Other CAA Provisions

Presidential Review

The CAA requires the President to conduct a review of the current authority of various federal agencies regarding chemical release prevention, mitigation, and response and to report the findings to Congress. The purpose of the review is to clarify and co-ordinate responsibilities and to identify any gaps and/or overlaps that may exist. The President delegated this authority to the EPA Administrator in 1993.

Hydrofluoric Acid Study

As required by the CAA, EPA conducted a study on the potential hazards of hydrofluoric acid (HF). Transmitted to Congress in the fall of 1993, the study investigates the physical and chemical properties of HF, its hazards in commercial and industrial use, and the types and numbers of facilities in which HF is handled. The document also describes accidents that have resulted in the release of HF, as well as any public and environmental impacts that resulted from these releases. An analysis of scenarios using atmospheric dispersion models investigates potential impacts on the public from a range of worst-case accidental releases. The study also describes the current industry and government controls to prevent accidental releases of HF and to mitigate the potential consequences of accidents through emergency preparedness and response efforts.

Research Programs

Under the CAA, EPA must establish a program of long-term research on methods and techniques for conducting detailed hazard assessments. The CAA also requires EPA to test substances at the Liquefied Gaseous Fuels Spill Test Facility in Nevada. These tests would develop and validate improved predictive models for atmospheric dispersion, evaluate existing dispersion models, and evaluate technology for mitigation and emergency response.

New OSHA Standard

On February 24, 1992, OSHA adopted a standard for chemical process safety management in the workplace as required under the CAA 1990 amendments. Just as CAA s.112(r) protects public health and the environment, the OSHA standard is designed to protect workers from accidents involving hazardous chemicals. The OSHA standard applies to facilities that handle certain acutely toxic, highly flammable, and reactive substances.

Requirements of the standard cover safety information on chemicals and processes, a workplace process hazard analysis, periodic audits, standard operating procedures, training, maintenance, pre-startup safety reviews, management of change, emergency response, and accident investigation.

In formulating the regulatory requirements for risk management planning, EPA incorporated OSHA's Process Safety Management Standard nearly verbatim into the prevention program requirements of CAA s.112(r) for higher risk facilities.

NATURAL EVOLUTION

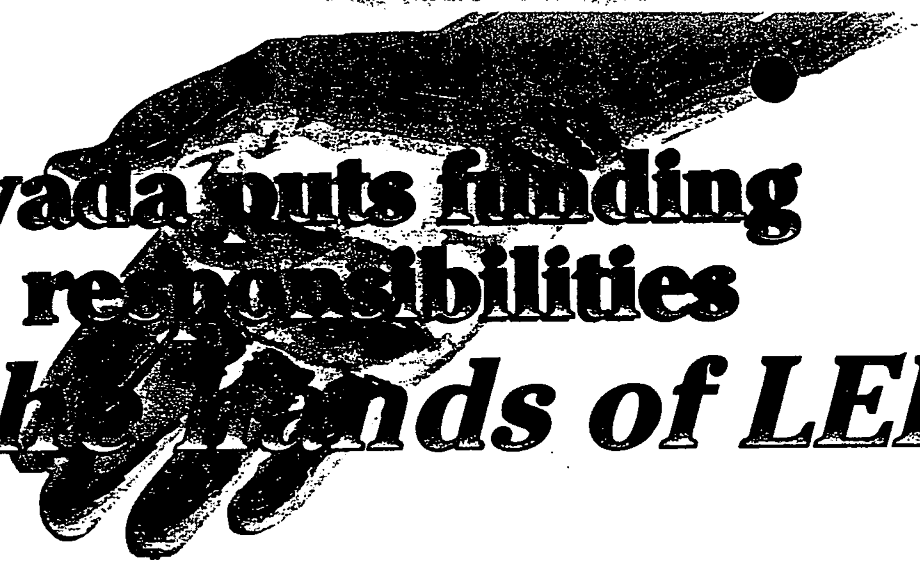
Since the mid-1980s, EPA has been working closely with the whole gamut of prevention stakeholders to help reduce the likelihood and severity of chemical accidents. Beginning with the voluntary Chemical Emergency Preparedness Program in 1985, extending to the SARA Title III regulations in 1986, and now culminating in the new Clean Air Act, these efforts address the entire safety continuum from emergency response to preparedness to prevention. In this way, a new partnership involving government, business, and the public is being forged. Working together, each of these groups is playing a key role in preventing accidental releases of hazardous chemicals.

FOR MORE INFORMATION...

CONTACT THE EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW HOTLINE
(800) 424-9346, OR (703) 412-9810, OR TDD (800) 553-7672
MONDAY THROUGH FRIDAY, 9:00 AM TO 6:00 PM, EASTERN TIME

ON THE WORLD WIDE WEB, VISIT THE HOME PAGE OF EPA'S CHEMICAL EMERGENCY PREPAREDNESS AND PREVENTION OFFICE AT:
http://www.epa.gov/swercepp/

Nevada puts funding and responsibilities in the hands of LEPCs



By Bob Andrews

Title III of the Superfund Amendments and Reauthorization Act of 1986 (Emergency Planning and Community Right-to-Know Act) caught Nevada largely unprepared. Sorting out precisely what it meant for Nevada and how it should be administered did not come easy.

The process began, as it undoubtedly did almost everywhere, with the development of a State Emergency Response Commission and Local Emergency Planning Committees. Beyond that fundamental first step were many unanswered questions on what needed to be done, who should do it, and how. It was the responsibility of the Nevada State Emergency Response Commission to answer questions such as:

- How would we define the SERC-LEPC relationship?
- What should the LEPC role be in Nevada?
- How would reporting requirements be handled? How would they be enforced?
- How could we best inform those that need to know about covered facilities and substances?
- What should be our relationship with regulated facilities?
- How would we define and implement training requirements?
- How would we best support the planning process? How would we handle the review process?
- Who would handle anticipated assistance requests from industry on compliance requirements and completing report forms?
- Should there be a central information repository? How should it be established?
- What was the extent of our responsibilities under community right-to-know provisions?
- How would we fund all of this?

After review of these and other related questions, two things became clear. First, successful implementation of SARA Title III is best handled at the local level. The Local Emergency Planning Committees would be the primary vehicles for much of SARA Title III implementation including planning, testing of plans, training, ongoing relationships with and assistance to facilities, and community right-to-know provisions. Second, it was imperative that funding be obtained to support LEPC activity.

Fee Structure

Nevada's Highway Patrol administers a permit fee for the transportation of hazardous materials within Nevada. It agreed to allocate a percentage of those fees to the State Emergency Response Commission for training and preparation efforts related to hazardous materials incident response. The decision was made to use most of the funds from the Highway Patrol to support Nevada's Local Emergency Planning Committees, retaining only what was necessary for SERC administration.

It was anticipated that the permit fees, which initially provided approximately $300,000 annually for SERC-LEPC operations, would be reduced significantly following the passage of the Hazardous Materials Transportation Uniform Safety Act, and that a separate SERC fee would be necessary to sustain operations. By the early 1990s, considerable work had been done to build a strong public/private sector relationship among the SERC, LEPCs, and the regulated facilities. This partnership was successful to the point where private-sector representatives unanimously supported the adoption of SERC fees at public hearings, thus making the separate SERC fee structure a reality in 1992.

The fees are a combination of reporting and storage quantity fees paid by regulated facilities with a cap of $5,000 per facility. Average revenue realized under this structure is about $230,000 annually.

With various fee adjustments (permit fees were indeed reduced), Nevada SERC revenues are averaging $450,000 annually. Approximately 75 percent is provided to LEPCs through grants, and the remainder is retained for SERC administration.

LEPC initiatives and grants projects

Nevada has three categories of LEPC grants:

1. *LEPC Operations Grants.* Automatic grants are provided to all active LEPCs for operations supportive of local SARA Title III implementation.

2. *Training/Equipment Grants.* Grant amounts are determined by the nature and merit of individual LEPC grant applications. Their purpose is to support SARA Title III-related training and equipment.

3. *Hazardous Materials Emergency Preparedness Grants.* Administered by the U.S. Department of Transportation, these are being used primarily to support hazardous materials training and planning.

A wide range of LEPC grants projects have been completed to date. Of special interest are the following:

Computerized Simulation Training. This is an interactive software application that develops emergency scenarios based upon decisions input at various stages of the scenario.

Hazardous Materials Categorization Training. This training has been sponsored by several LEPCs with SERC grants. It focuses on identification and analysis of hazardous materials and has special application in situations of spills or illegal dumping.

Tanker Truck Accident Training. Clark County LEPC hosted a tanker truck accident course that provided hands-on training with collision and rollover situations involving hazardous materials. This course also addressed tanker truck design and safe off-loading procedure.

LEPC-Industry Training Initiatives. Many of Nevada's LEPCs use grant funds to conduct on-site training for regulated facilities. This training has ranged from basic SARA Title III compliance issues to awareness and operations level hazmat training.

Hospital Decontamination Study. Clark County LEPC, in cooperation with its hospital community, initiated a grants project to evaluate hospitals' decontamination capabilities and make recommendations for further improvement of their capabilities.

Hazmat Incident Command Training. Several LEPCs have emphasized the response side of training. Highlights of Incident Command Training programs are the Incident Command System format, proper identification, and safe response procedures.

Community Right-to-Know. Several grants projects that have been supportive of community right-to-know initiatives are the design and printing of SARA Title III brochures for public distribution, information workshops for industry and the public, and a current proposal to provide software packages to libraries in order to make local chemical information readily available to the public.

Nevada's LEPCs have provided the mechanism necessary to not only implement SARA Title III provisions locally, but also to make it relevant and useful to concerned people—whether they are the general public, first responders, or industry representatives. A good working partnership between the public and private sectors (the SERC, LEPCs, and facilities) is the essential ingredient for successful implementation of SARA Title III.

Partnering begins with providing an adequate support base for the LEPCs to carry out their mission locally. LEPC members are in the best position to determine the SARA Title III priorities that will best serve their communities.

Bob Andrews was executive director for Nevada's State Emergency Response Commission and one of the people responsible for implementing SARA Title III in Nevada. He is currently the director of the Clark County Office of Emergency Management.

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UNIFIED COMMAND ORGANIZATION

INTRODUCTION

The purpose of this directive is to identify key individuals within the State Goverment to fill positions within the Incident Command System (or Unified Command System) during a major incident involving a hazardous substance including oil. The National Contingency Plan (NCP) has adopted the Incident Command System (ICS) as the management system for responding to oil and hazardous substance incidents.

This directive provides specific operational responsibilities in implementing the State of Hawaii Hawaii Oil Spill and Hazardous Substance Emergency Response Plan. This directive is developed to clarify roles and responsibilities under an Unified Command/Incident Command System for the State. This directive in no way supersedes the authority and responsibilities established in The State of Hawaii Oil Spill and Hazardous Substance Emergency Response Plan, Supplement to the State of Hawaii Plan for Emergency Preparedness Volume III.

Officers, section chiefs and unit leaders are considered supervisors for conducting the activities within their respective areas. These supervisors may recruit or identify additional resources needed, including personnel, necessary to accomplish identified responsibilities.

The Incident Command System (ICS) integrates all potential key players in a response (namely those with statutory or financial responsibility) at a multi-jurisdictional incident to contribute in the process of determining incident objectives, selecting response strategies, planning tactical activities, integrating tactical operations, maximizing use of all assigned resources, and integrating communication between responders.

NOTE: The term Incident Command System" and "Unified Command System" will be used in this directive. Although "Unified Command System" will differ slightly in the command level, where the main players in the response are represented (eg, USCG, State DOH, and a responsible party), both refer to the same organizational concept and will be used in the same context.

The following is a list of assumptions and limitations under which this directive was developed:

1. Unified Command System is a modular organization and the size of the structure is flexible to meet the needs according to the size of the

incident. Specific organizational structure will be established for any given incident based on the management requirements needs for that particular incident.

2. County emergency first responders will use an incident command system to coordinate their response efforts. This system can be integrated or become an extension of the unified system as the incident progresses or it is deemed necessary to "scale up" the response efforts.

3. County first responders are tasked with the initial mitigation of the incident. For hazardous substance incidents this may include but are not limited to diking, plugging, damming, or any action which would eliminate or restrict the imminent danger to the public health and welfare.

4. In Hawaii, the U.S. Coast Guard Captain of the Port (COTP) will be the Federal On-Scene Coordinator (FOSC) until such time the U.S. Environmental Protection Agency (EPA) assumes command, or the COTP determines federal involvement in the incident is no longer needed.

5. After hours, unified command system may be somewhat limited to the amount of DOH personnel that can be notified by telephone. Presently, only select personnel can be notified through digital pagers 24 hours a day, while the rest of the staff/personnel must be notified by telephone at work or their residence.

GENERAL PLAN

Notification

According to the Hawaii Administrative Rules (HAR) 11-451-7(b), the person in charge of a facility or vessel shall immediately notify the Department of Health and affected LEPC of any hazardous substance release from the facility or vessel.

Notification of a hazardous substance release:

Normal working hours:	586-4249
After working hours:	247-2191 (State Hospital)

Normal working hours are between Monday through Friday between the hours of 7:30 am to 4:30 pm, except State Holidays.

Call Out Procedure

This procedure is to be used if the duty SOSC determines the initial notification warrants activation of this directive.

1. Duty SOSC notifies HEER Office Manager.

2. Depending on the severity of the incident, the HEER Office manager may contact the Deputy Director of Health.

3. Duty SOSC should recall all available SOSCs.

4. A designated incident commander from the DOH should report to the incident command center or locate a suitable site for a command center.

5. The designated incident commander assigns an SOSC to initiate a call out of personnel needed to organize a incident command system.

Roles and General Responsibilities

I. COMMAND STAFF

Mobilize, implement, and manage the organization structure needed to anticipate and proactively accomplish response requirements.

A. Incident Commander - Develops strategic objectives, and directs the overall response operations.

B. Deputy Incident Commander - Assist the incident commander in the development and implementation of strategic and tactical objectives. Assumes responsibility of the incident commander in his/her absence.

C. Legal Officer - Assesses potential liability for incidents and actions associated with response, claims, and documentation of the response operations.

D. Safety Officer - Monitors the response operations to ensure that all personnel received appropriate training, necessary equipment, supervision, and procedures to safely and adequately respond.

E. Public Information Officer - Handles the gathering and releasing of information to all news media and other audiences on aspects of the incident and response efforts.

F. **Liaison Officer** - Communicates information to local, state, and federal agencies and ensures relevant regulations are being followed.

II. OPERATION SECTION

Conducts tactical operations to carry out the plan, develops the tactical objectives, organization, and directs all resources at the incident.

A. **Emergency Medical Services Unit** - Prioritize and respond to medical emergencies as directed by the operations section chief.

B. **Hazardous Material Unit** - Direct and manage hazardous material resources to accomplish tactical operational objectives as directed by the operations chief.

C. **Air Monitoring Unit** - Coordinate all missions to conduct air monitoring related to the incident.

D. **Surveillance Unit** - Coordinate all missions to conduct tracking, observation, and remote sensing of the incident.

E. **Wildlife Rehabilitation Unit** - Establish wildlife rehabilitation centers and conduct rehabilitation operations.

III. PLANNING SECTION

Develops the action plan to accomplish the objectives, collects and evaluates information, and maintains resource status.

A. **Resource Unit** - Collect, analyze, and disseminate information on the status of current and projected response resources.

B. **Situation Unit** - Collect, analyze, and disseminate information on the current incident or situation.

C. Technical Specialist Unit

1. **Response Technology** - Evaluate appropriate technologies to remove or remediate the hazards associated with the incident.

2. **Health Assessment** - Evaluate the possible and actual human health effects related to exposure to the hazardous substance.

3. **Environmental Assessment** - Evaluate the possible and actual

INCIDENT COMMANDER

Requirements under Hawaii Administrative Rules 12-99-18(d) "Hazardous Waste Operations and Emergency Response":

The individual in charge of the Incident Command System (ICS) shall:

a. Identify, to the extent possible all hazardous substances or conditions present and shall address as appropriate site analysis, use of engineering controls, maximum exposure limits, hazardous substance handling procedures, and use of any new technologies. [Chapter 12-99-18(d)(2), HAR]

b. Based on the hazardous substance or conditions present, shall implement appropriate emergency operations, and assure that the PPE worn is appropriate for the hazards encountered. [Chapter 12-99-18(d)(3), HAR]

c. Limit the number of emergency response personnel at the emergency site, in those areas of potential or actual exposure to incident or site hazards, to those who are actively performing emergency operations. [Chapter 12-99-18(d)(5), HAR]

d. Designate a safety official, who is knowledgeable in the operations being implemented at the emergency response site, with specific responsibility to identify and evaluate hazards and to provide direction with respect to the safety of operations for the emergency at hand. [Chapter 12-99-18(d)(7), HAR]

e. After the emergency operations have terminated, implement appropriate decontamination procedures. [Chapter 12-99-18(d)(9), HAR]

Responsibilities:

1. Supervise overall response operations and ensure that they are carried out in a manner consistent with State and DOH policy, appropriate regulations, and the needs and concerns of impacted areas.

2. Develop overall strategic objectives to guide response operations.

3. Develop or approve the General Plan, incident action plan, and other incident-specific plans.

4. Anticipate response needs and authorize the ordering, deploying, and demobilization of response resources.

5. Authorize information releases to the media and participate in scheduled press conferences.

DEPARTMENT OF HEALTH
INCIDENT COMMANDER LIST

The designated State representative to the Unified Command for marine oil spills in Hawaii under the FOSC Honolulu Area Contingency Plan is the Deputy Director of Health. Depending on the severity and magnitude of the incident, the Deputy Director may designate or delegate incident command authority to the following individuals in line of succession: Hazard Evaluation and Emergency Response Office Manager, Emergency Response and Preparedness Team Leader, State On-Scene Coordinator.

Chain of Command:

If the Deputy Director of Health is unavailable, the HEER Office manager will be designated the State representative in the Unified Command. If the HEER Office manager is also unavailable, then the Emergency Response and Preparedness Team Leader would become the State representative in the Unified Command. If the ERP Team Leader is unavailable, then a State On-Scene Coordinator would be the State representative in the Unified Command.

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
Deputy Director	Bruce Anderson	586-4424			
HEER Manager	Steve Armann	586-4248		577-4196	
ERP Team Leader				577-4192	
SOSC	Terry Corpus	586-4249		577-4193	
SOSC	Mike Cripps	586-4277		577-4195	
SOSC	Bill Perry	586-4650		577-4194	

environm..ntal effects related to exposure .. the hazardous substance.

4. Impact Assessment - Predict potential and analyze actual impact to population areas, natural resources, and other environmental concerns.

D. Disposal Unit - Provide a disposal plan for the recovered hazardous substance, contaminated material and equipment, and associated waste.

E. Documentation Unit - Provide documentation for all activities related to the incident response.

F. Demobilization Unit - Manage all demobilization of equipment, personnel, and staging areas.

IV. LOGISTICS SECTION

Provides support to meet incident meeds, provides resources and all other services needed to support the incident.

A. Communications Unit - Develop, implement, and coordinate the incident communications plan.

B. Service Unit

1. Medical Staff - Provide and coordinate medical care and services to response personnel.

2. Food Staff - Provide and coordinate meals and subsistence support to response personnel.

3. Lodging Staff - Provide and coordinate berthing facilities assigned to response personnel.

B. Support Unit

1. Supply Staff - Deliver and coordinate the delivery of response equipment, material, and supplies.

2. Facilities Staff - Provide and coordinate facilities for the personnel and response operations.

3. Transportation Staff - Provide, prioritize, schedule, and coordinate response transportation services.

4. Personnel Staff - Coordinate and document the assignment of personnel to meet response organization needs.

V. FINANCE SECTION

Monitors costs related to the incident, provides accounting, procurement, time recording and claims initiation.

A. Contract Unit - Negotiate, coordinate, document, and manage all contracts needed to support response operations.

B. Cost Unit - Manage, coordinate, and perform cost documentation to account for response costs.

C. Claims Unit - Receive, coordinate, document, and process claims.

DEPUTY INCIDENT COMMANDER

Responsibilities:

1. Monitor and direct the Command Staff and the Section Chiefs to accomplish the strategic goals and tactical strategies in the incident action plan.

2. Serve as the Incident Commander in his/her absence.

3. Identify and establish priorities related to the internal management and organization structure of the Unified Command System.

4. Authorize procurement of agreed upon equipment, material, supply and personnel needs.

5. Assist the Incident Commander in the development and implementation of strategic and tactical objectives.

DEPUTY INCIDENT COMMANDER LIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
HEER Manager	Steve Armann	586-4248		577-4196	
SOSC	Terry Corpus	586-4249		577-4193	
SOSC	Mike Cripps	586-4277		577-4195	
SOSC	Bill Perry	586-4650		577-4194	

SAFETY OFFICER

Requirements under Hawaii Administrative Rules 12-99-18(d) "Hazardous Waste Operations and Emergency Response":

a. When activities judged by the safety official to be an IDLH condition or to involve an imminent danger condition, the safety official shall have the authority to alter, suspend, or terminate those activities. [Chapter 12-99-18(d)(8), HAR]

Responsiblities:

1. Identify and evaluate safety and health hazards that may impact both response workers and the public, designate exclusion zone boundaries, and determine levels of personal protective equipment required.

2. Write and update the Site Safety Plan, safety bulletins, and permits in accordance with federal, state, and local regulations.

3. Implement and manage the safety staff needed to continuously monitor and evaluate safety and health conditions and to prevent unsafe conditions.

4. Insure that all responders have adequate skills to safety perform assigned tasks and that required levels of training are documented.

5. Provide or coordinate health and safety training and regular safety briefings required to perform response activities. Meet OSHA personnel training requirements.

6. Resolve and identify to the Unified Command significant safety and health issues.

7. Document and investigate occupational accidents related to the emergency response.

8. Identify locations for and establish first aid stations for the emergency response.

9. Review Incident Action Plan, work orders, or work/field assignment sheets to ensure all safety and health standards are met for the specific activity.

10. Work to ensure appropriate corrective actions will be taken when a hazard occupational is identified during the emergency response.

SAFETY OFFICER LIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SOSC	Terry Corpus	586-4249		577-4193	
SOSC	Mike Cripps	586-4277		577-4195	
SOSC	Bill Perry	586-4650		577-4194	

PUBLIC INFORMATION

Responsibilities:

1. Serve as the central clearing point for the dissemination of official information representing the Unified Command System (UCS) to the media.

2. Implement and manage the Joint Information Center (JIC) as the central location for disseminating official information.

3. Schedule, organize, and conduct UCS media briefings, interviews and tours.

4. Develop presentation documentation such as charts, maps, and graphics to support both response operations and media briefings.

5. Resolve conflicting information and identify media concerns to Unified Command.

6. Work with Planning Section Chief to maintain access to complete, accurate, and up-to-date information on the nature and status of emergency response operations.

7. Prepare press releases for approval by Incident Commander.

8. Establish lines of communication with: local press, radio, and TV outlets; national/international media representatives; concerned citizens' groups; and public organizations.

PUBLIC INFORMATION

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
DOH Communication	Frank Johnston	586-4442		576-8894	

LEGAL OFFICER

Responsibilities:

1. Advise Incident Commander, Deputy Incident Commander, and Section Chiefs on all legal matters related to emergency response operations.

2. Ensure that information and documentation for any violations, fines, or legal action are gathered and preserved.

3. Provide the Claims Unit Leader with legal advice on the handling of claims and assessment of external claims related to the incident.

4. Review forms, documentation, and press releases as requested by the Incident Commander.

LEGAL OFFICER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
Deputy AG	Kathy Ho	587-3076		577-4831	
Deputy AG					

LIAISON OFFICER

Responsibilities:

1. Serve as the initial point of contact for participating response agencies and groups, and identify assignments to appropriate UCS sections.

2. Receive and coordinate all calls from public and private entities offering assistance or requesting information.

3. Establish contact with government officials in threatened and/or affected areas and provide them with information on the incident and the status of emergency response operations.

4. Assist planning section personnel in obtaining government agency approvals/permits for the conduct of emergency response operations.

LIAISON OFFICER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SCD Plans & Ops	Blair Craig	733-4300			241-6303
OCDA Administrator	Joe Reed	523-4121			927-0735
HCD Administrator	Harry Kim	935-0031		935-3311	
MCD Administrator	Sel Menor	243-7721		244-6400	
KCD Administrator	Sonny Geraldo	245-4001		654-3933	

OPERATIONS SECTION CHIEF

Responsibilities:

1. Implement and manage the Operations Section branches and units needed to proactively accomplish strategic goals and objectives.

2. Assist the Planning Section in defining strategic response goals and tactical operational objectives detailed in the Incident Action Plan.

3. Develop detailed mission assignments, schedules, duty lists , and operational assignments to accomplish the strategic response goals and tactical operational objectives.

4. Identify additional response resources required or recommend the release of resources to the Incident Commander.

5. Evaluate and report on response counter measure efficiency.

6. Ensure field personnel have the equipment, materials, and supplies needed to carry out emergency response operations in safe, effective, and efficient fashion.

7. Work with Safety Officer to characterize the safety and health implications of the incident and the threat it poses to the health and welfare of people working or living in the vicinity of the incident.

8. Coordinate the overall emergency response operations carried out by DOH, third parties, or other contractors.

9. Provide the Incident Commander with briefings on the nature and status of emergency response operations.

OPERATIONS CHIEF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SOSC	Bill Perry	586-4650		577-4194	

EMERGENCY MEDICAL SERVICES UNIT LEADER

Responsibilities:

1. Prioritize emergency medical missions and coordinate mission assignments with the Operations Section Chief.

2. Manage dedicated emergency medical resources and coordinate mission resource requirements with platforms of opportunity.

3. Identify emergency medical resource and logistics needs.

4. Report on the status of emergency medical operations.

EMERGENCY MEDICAL SERVICES UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
EMS Manager	Donna Maiava				

HAZARDOUS MATERIAL UNIT LEADER

Responsibilities:

1. Direct and manage HAZMAT resources to accomplish tactical operational objectives as directed by the Operations Section Chief.

2. Conduct HAZMAT situation investigations, site surveys, and analyze HAZMAT problems.

3. Identify safety hazards that may be present and report observations to the Safety Officer.

4. Designate exclusion zones and report designations to the Safety Officer.

5. Identify HAZMAT resource and logistic support needs.

6. Report on the status of HAZMAT operations to the Operations Section Chief.

HAZARDOUS MATERIAL UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
ERP Team Leader					
SOSC	Terry Corpus	586-4699		577-4193	
SOSC	Mike Cripps	586-4277		577-4195	
SOSC	Bill Perry	586-4650		577-4194	

WILDLIFE REHABILITATION UNIT LEADER

Responsibilities:

1. Direct, coordinate, and conduct wildlife recovery and capture operations.

2. Maintain a central clearing point to direct recovered wildlife to appropriate rehabilitation facilities.

3. Maintain an evidence, tagging, and storage procedure for all wildlife recovered.

4. Manage the capture, triage, first aid, and transportation of recovered wildlife.

5. Provide training and briefing on actions and notifications required when response workers or members of the public encounter distressed wildlife.

6. Identify resources and logistics support requirements.

7. Establish wildlife rehabilitation centers and conduct rehabilitation operations.

8. Store, document, coordinate laboratory analysis and necropsies, and properly handle deceased wildlife.

9. Report on wildlife recovery and rehabilitation operations.

WILDLIFE REHABILITATION UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
DLNR Veternarian	Greg Massey				

AIR MONITORING UNIT LEADER

Responsibilities:

1. Coordinate and conduct air monitoring in areas where populations may be impacted.

2. Identify safety hazards that may be present and report observations to the Safety Officer.

3. Monitor exclusion zone and report any exposures above the limits set by the Safety Officer.

4. Identify resource and logistic support needs for air monitoring.

5. Report air monitoring results to Operations Section Chief.

AIR MONITORING UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SOSC	Mike Cripps	586-4277		577-4165	
CAB					
CAB					

AIR MONITORING TEAM LIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SOSC	Mike Cripps	586-4277		577-4165	
CAB					
CAB					
HEER RPM	Greg Olmstead				

SURVEILLANCE UNIT LEADER

Responsibilities:

1. Direct and coordinate air operations and monitoring to track, observe, and sense oil or hazardous substance.

2. Coordinate mission tasking with scientific and technical observers.

3. Report tracking, observation, and remote sensing results and coordinate observations to direct operational activities.

4. Work with Communications Unit Leader to address communication equipment needs.

5. Spot the current position and physical appearance of any released material to support:

   a. Assessments designed to evaluate the threat posed by any spilled material to environmentally, economically, and/or socially sensitive areas.

   b. Trajectory simulations.

   c. On water emergency response operations.

   d. On land emergency response operations.

   e. Wildlife capture operations.

SURVEILLANCE UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR

PLANNING SECTION CHIEF

Responsibilities:

1. Anticipate the need for information describing the status of the response and manage the system required to collect and disseminate response information.
2. Provide detailed General Plans and Incident Action Plans based on projected response needs to the Unified Command.
3. Support the Unified Command by evaluating alternative strategies and tactical operation plans that anticipate changing requirements.
4. Coordinate and develop Situation Status Reports and other incident specific plans.
5. Provide all scientific/technical support for response operations.
6. Coordinate documentation of all aspects of control and response operations.
7. Ensure all environmental requirements are complied with and communicated to the Incident Commander and staff.
8. Prepare a Demobilization Plan.
9. Develop a Disposal Plan.
10. Develop a Decontamination Plan.

PLANNING CHIEF LIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
Env. Planning Office				586-4337	

RESOURCES UNIT LEADER

Responsibilities:

1. Collect, analyze and disseminate information about the status of current and projected response resources, including: Personnel, equipment, vessels, aircraft, vehicles, facilities, materials, and supplies.

2. Establish procedures with Support Unit Leader to track equipment and personnel involved in emergency response operations.

3. Provide information about resource deployment for inclusion in Incident Action Plans.

4. Maintain the situation status reports and boards with the Situation Unit Leader to keep information current.

RESOURCES UNIT LEADER LIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR

SITUATION UNIT LEADER

Responsibilities:

1. Collect, analyze, and disseminate information about the situation as it progresses, including: Casualty information; discharge information, observations, and forecasts; environmental observations and forecasts; impacts to natural and economic resources; and the status of response operations.

2. Establish and maintain an information center and status boards that displays information about the emergency response.

3. Ensure that situation information corresponds with resource information.

SITUATION UNIT LEADER LIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
HEER RPM	Glenn Miyasaki	586-4249			
HEER RPM	Greg Olmstead	586-4249			

TECHNICAL SPECIALIST UNIT LEADER

Responsibilities:

1. Provide Planning Section Chief with technical information and assistance during an emergency response.

2. Inform Planning Section Chief about new ideas that have technical merit and about technical services that might improve the efficiency and/or effectiveness of emergency response operations.

3. Locate technical specialist or "experts" when requested by the Planning Section Chief.

TECHNICAL SPECIALIST UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
HEER RPM	Mike Miyasaka	586-4249			
HEER RPM	Bryce Hataoka	586-4249			

Responsibilities:

1. Evaluate appropriate opportunities to effectively use alternate response technology.

2. Conduct the planning and consultation required to apply a specific alternate response technology to the response.

3. Identify environmental trade offs associated with application of a specific alternative response technology.

4. Provide the Planning Section Chief with detailed recommendations and plans regarding the application of a specific technology.

The response technology specialist may be DOH personnel with knowledge of a specific technology or alternative response technology. Depending on the response or the nature of the incident, the Planning Section Chief or the Technical Specialist Unit Leader may draw on expertise form contractors or consultants.

RESPONSE TECHNOLOGY SPECIALIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
HEER RPM	Mike Miyasaka	586-4249			
HEER RPM	Greg Olmstead	586-4249			
SHWB UST	Eric Sadoyama	586-4231			

HEALTH ASSESSMENT SPECIALIST

Responsibilities:

1. Provide the Planning Section Chief with possible and actual human health effects related to the exposure of the hazardous substance.

2. Evaluate data to determine exposure levels for the general population.

3. Assist the Planning Section Chief on possible remedies or actions to protect the general public.

4. Assist the Air Monitoring Unit to gather data relevant to human health.

The health assessment specialist may be DOH personnel with knowledge of human health effects. Depending on the response or the nature of the incident, the Planning Section Chief or the Technical Specialist Unit Leader may draw on expertise form contractors or consultants.

HEALTH ASSESSMENT SPECIALIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
HEER Toxicologist	Leslie Au	586-7539			

IMPACT ASSESSMENT SPECIALIST

Responsibilities:

1. Provide the Planning Section Chief with projected impacts or plume movement through modeling or other means.

2. Provide the Planning Section Chief with forecasts and analysis of natural resource damages to directly support strategic response planning and assist in the prioritization of removal actions.

3. Gather necessary information to model or predict the movement of the plume or hazardous substance.

The impact assessment specialist may be DOH personnel with knowledge of plume modeling or prediction of hazardous substance movement. Depending on the response or the nature of the incident, the Planning Section Chief or the Technical Specialist Unit Leader may draw on expertise form contractors or consultants.

IMPACT ASSESSMENT SPECIALIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SHWB UST	Roger Brewer				
CAB Engineer	Nolan Hirai				

ENVIRONMENTAL ASSESSMENT SPECIALIST

Responsibilities:

1. Provide the Planning Section Chief with possible and actual environmental effects related to the exposure of the hazardous substance, to include wildlife, fauna, and aquatic biota.

2. Evaluate data to determine exposure levels for sensitive species.

3. Assist the Planning Section Chief on possible remedies or actions to protect the sensitive species, sensitive areas, and aquatic biota.

4. Provide information to the Situation Unit Leader on the status of impacts to wildlife for inclusion in the Situation Status Reports.

5. Collect and maintain baseline environmental data for potentially affected areas.

6. Identify experts to perform Natural Resource Damage Assessment operations.

7. Coordinate NRDA operations with Legal Officer.

The health assessment specialist may be DOH personnel with knowledge of human health effects. Depending on the response or the nature of the incident, the Planning Section Chief or the Technical Specialist Unit Leader may draw on expertise form contractors or consultants.

ENVRIRONMENTAL ASSESSMENT SPECIALIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SOSC	Bill Perry	586-4650		577-4194	
SOSC	Terry Corpus	586-4699		577-4193	
HEER Core	Tricia Nagatani	586-4654			
DLNR Biologist	Francis Oishi				
DLNR Biologist	Paul Conry				

DISPOSAL UNIT LEADER

Responsibilities:

1. Direct the collection, temporary storage, transportation, recycling, and disposal of recovered wastes.

2. Estimate the volume of waste that may be recovered and ensure adequate resources and logistical support are provided.

3. Manage temporary storage sites and prevent secondary discharges or cross contamination.

4. Confirm the laboratory results characterizing the waste as hazardous or non-hazardous and prepare required RCRA manifests as required.

5. Determine final disposal, recycling or storage for each waste stream resulting from the response.

DISPOSAL UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SOSC	Mike Cripps	586-4277		577-4195	
HEER RPM	Mike Miyasaka	586-4249			
OSWM	Ronda Randolph				

DOCUMENTATION UNIT LEADER

Responsibilities:

1. Collects and records information about the status of current and projected response resources, including: Personnel, equipment, vessels, aircraft, vehicles, facilities, materials, and supplies.

2. In association with the Legal Officer, develop documentation guidelines for all response personnel.

3. Establish procedures with Resource Unit Leader, Situation Unit Leader, Support Unit Leader to ensure proper documentation is maintained.

4. Organize, maintain, and store incident files in a convenient, secure location.

DOCUMENTATION UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
HEER Core	Tricia Nagatani	586-4654			

DEMOBILIZATION UNIT LEADER

Responsibilities:

1. Develop demobilization plan for the emergency response operations.

2. Establish a timetable for demobilization with Support Unit Leader, Situation Unit Leader, and Operations Section Chief.

3. Inspect the incident area and facilities to ensure proper demobilization has occurred.

DEMOBILIZATION UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SOSC	Terry Corpus	586-4699		577-4193	

LOGISTICS SECTION CHIEF

Responsibilities:

1. Implement and manage the Logistics Section branches and units needed to proactively accomplish Logistics Section actions.

2. Ensure the prompt delivery of resources to support response operations. Early emphasis on the delivery of heavy response equipment and personnel, providing communications resources, and the continuous need for support services are the highest priorities.

3. Manage, document, support, and anticipate the need for response resources, equipment, personnel, and services.

4. Anticipate, coordinate and proactively manage all request for additional resources and logistics support.

5. Develop logistics alternatives to support Planning and Operation Section missions.

6. Determine availability of equipment and personnel listed on draft field assignments or other operational assignment sheets.

7. Identify staging areas and warehouses for equipment.

8. Confirm support services are available and adequate to sustain operational activities.

9. Ensure that programs are in place to inspect and service equipment and services used, materials, and services provided, and contracts executed during emergency response operations.

LOGISTICS CHIEF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SCD					
OCDA					

COMMUNICATIONS UNIT LEADER

Responsibilities:

1. Develop, implement, and coordinate the Incident Communication Plan.

2. Deliver, issue, track, maintain, and recover communications resources telephones, radios, base stations, repeaters, and other communications facilities.

3. Identify additional communications capabilities and operations.

4. Establish and manage a message center, and a procedure for ensuring that messages are accurately received and routed to the appropriate emergency response personnel.

COMMUNICATIONS UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SCD					

SERVICE UNIT LEADER

Responsibilities:

1. Implement and manage the Service Unit Staff needed to provide services needed to maintain the emergency response operations.

2. Manage and coordinate the resources for the medical, feeding and lodging needs of the emergency response operations.

3. Report to the Logistics Section Chief on the status of services.

SERVICE UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
ARC					

MEDICAL STAFF

Responsibilities:

1. Provide and coordinate emergency and routine medical services to reponse personnel.

2. Manage dedicated resources and coordinate additional medical services.

3. Identify resources and logistics support needs.

4. Review draft field assignments or operational assisgnemnts to dermine location and nature of the field operations, and ensure that medical emergency services will be avialable to all personnel involved in the operations.

5. Notify Logistics Section Chief of all injuries/fatalities.

6. Assist Safety Officer to locate, set up, and man first aid stations in the field.

DOH MEDICAL STAFF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR

Responsibilities:

1. Provide and coordinate meals and subsistence to response personnel.

2. Plan, document, and account for the number and type of meals required.

3. Establish kitchens, galleys, canteens, and other food services support locations.

4. Establish and manage sources of supply to support meal and subsistence requirements.

5. Provide potable drinking water, coolers, and other beverages required to support response operations.

6. Identify additional resources and logistics support needs.

7. Report on the status of food and subsistence services.

FOOD STAFF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
DOH					

LODGING STAFF

Responsibilities:

1. Provide and coordinate berthing facilities assigned to response personnel.

2. Plan, document, and account for the number and type of berthing facilities required.

3. Maintain hotel contracts, berthing quarters, and remote location camps to provide living, sleeping, hygiene, and restroom facilities for response personnel.

4. Identify additional resources and logistic support needs.

5. Report on the status of Lodging Staff Services.

LODGING STAFF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR

Responsibilities:

1. Implement and manage the Support Unit Staff needed to provide support needed to maintain the emergency response operations.

2. Manage and coordinate the supplies, facilities, transportation, personnel and maintenance needs of the emergency response operations.

3. Report to the Logistics Section Chief on the status of support services.

SUPPORT UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
SCD					
OCDA					

SUPPLY STAFF

Responsibilities:

1. Deliver and coordinate the delivery of response equipment, material and supplies.

2. Maintain stocks of expendable supplies ready to be issued.

3. Plan, document, and account for response supplies and materials.

4. Issue personal protective equipment, ready gear bags, and expendable personal supplies to response personnel.

5. Report on response equipment delivery time tables, inventories of available supplies, and the status of Supply Unit services.

SUPPLY STAFF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
HEER Staff	Stan Deuz				

FACILITIES STAFF

Responsibilities:

1. Provide and coordinate response facility locations, including Command Posts, incident operations bases, staging sites, piers, warehouses, communications facilities, Joint Information Center, lodging, messing and sanitary facilities, and other response facilities.

2. Plan, document, and account for response facilities needed.

3. Manage and support facility, utility and maintenance services.

4. Provide portable hygiene and restroom facilities to support remote operation locations.

5. Identify additional facility resources and logistics support needs.

FACILITIES STAFF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR

TRANSPORTATION STAFF

Responsibilities:

1. Provide, prioritize, schedule, and coordinate reponse transportation services.
2. Plan, document, and account for response transportation services.
3. Manage and maintain dedicated transportation resources and coordinate trasnportation using resources of opportunity.
4. Operate and manage the "Motor Pool" of dedicated ground transportation vehicles, including cars, vans, busses, and trucks.
5. Assign and coordinate duty driver schedules.
6. Identify additional transportation resources and logistics support needed.
7. Miantain incident roads, as necessary.
8. Work with Epuipment Staff to keep track of transportation equipment purchased, leased, rented, or borrowed for emergency response operations.

DOH TRANSPORTATION STAFF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR

ERSONNEL STAFF

Responsibilities:

1. Coordinate and document the assignment of personnel to meet response organization needs.

2. Coordinate request for additional response personnel.

3. Coordinate the processing of arriving response personnel.

4. Plan, document, and account for response assignments made to individuals, agencies, groups, and commercial personnel.

5. Manage the personnel locator system to track the assignment and location of individual responders.

6. Identify additional resources and logistics support needed to support personnel processing and tracking.

PERSONNEL STAFF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
ERO					

MAINTENANCE STAFF

Responsibilities:

1. Establish and manage a field maintenance operation that is designed to maximize the efficiency and productivity of field operations.

2. Maintain an inventory of critical spare parts.

3. Work with Transportation Staff to establish a dispatch system for the rapid movement of maintenance services to and from field operations.

4. Establish a program for field equipment, and conduct preventive maintenance, as necessary.

MAINTENANCE STAFF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR

FINANCE SECTION CHIEF

Responsibilities:

1. Implement and manage the Finance Section branches and units needed to proactively accomplish Logistics Section actions.

2. Provide, manage, coordinate, document, and account for access to response funding sources, including the Oils Spill Liability Trust Fund, NRDA, and the Environmental Response Revolving Fund.

3. Coordinate and ensure the proper completion of response cost accounting documentation.

4. Coordinate and manage response ceilings, budgets and cost estimates.

5. Provide financial support for contracting services, purchases, and payments.

6. Facilitate the preparation and distribution of guidelines, procedures, forms and data management systems necessary to account for expenditures made during the emergency response operations.

7. Establish a procurement plan.

FINANCE SECTION CHIEF

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
ERO					

CONTRACT UNIT LEADER

Responsibilities:

1. Negotiate, coordinate, document, and mange all contracts needed to support response operations.

2. Manage, coordinate, document, and account for all procurement orders needed to support response operations.

3. Manage, coordinate, document, and account for all payments made to support response operations.

4. Identify additional resources and logistics support needed to accomplish contracting and procurement services.

5. Review all contacts, agreements, and other legally binding documents and understandings that detail performance standards, and audit emergency response operations to ensure compliance with the terms and conditions of the documents.

CONTRACT UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
ERO					

COST UNIT LEADER

Responsibilities:

1. Manage, coordinate, and perform cost documentation in accordance with OSTLF and State requirements to account for response costs.

2. Plan, coordinate, document, and account for response costs based on the time, personnel, equipment, and other resources are accountable to the response.

3. Identify additional resources and logistics support needed to perform cost documentation and time keeping services.

4. Provide Finance Section Chief with resource use estimates derived from cost data.

COST UNIT LEADER

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
ERO					

CLAIMS UNIT LEADER

Responsibilities:

1. Receive, coordinate, document, and process claims against the OSLTF, NRDA, or State funding sources. This may entail coordinating with the Wildlife Rehabilitation Unit Leader, Technical Specialist Unit Leader, Cost Unit Leader, and Legal Officer.

2. Coordinate evaluation of personal property damage claims.

3. Identify additional resources and logistics support needed to process claims.

4. If needed, seek advise of Legal Officer and Finance Section Chief on claims issues.

5. Coordinate and document claims on injuries/deaths caused by the release of hazardous substance or received by workers on the emergency response.

6. Provide Incident Commander and Public Information Officer with periodic reports on damage assessment/claims operations.

CLAIMS UNIT LEADER LIST

TITLE	NAME	OFFICE	HOME	PAGER	CELLULAR
ERO					

may be provided by contract out.

JOB TOTALS

MATERIAL INVENTORY SHEET

As of 12-3-96

Compiled by: PENCO

		11/23/96	11/24/96	11/25/96	11/26/96	11/27/96	11/29/96	11/30/96	12/2/96	12/3/96	TO DATE TOTALS
Batteries	ea	388	522	280	69	145	135	450	33	3	2025
Empty Drums	ea	72	319	228	207	6	88	55	3	0	978
Waste oils/petroleums	items	21	50	27	15	6	31	53	48	2	253
Paint Materials	items	221	82	41	21	249	234	214	559	0	1621
Grease	items	13	2	2	1	0	0	2	1	0	21
Petroleum sludges	items	0	6	0	0	0	0	7	0	0	13
Suspect pesticides	items	5	0	0	0	0	0	16	0	0	21
Small propane cylinders	ea	9	1	2	1	0	1	1	0	0	15
Other gas cylinder	ea	2	8	1	2	0	0	8	0	0	21
Assumed detergent	items	0	1	0	0	0	0	0	0	0	1
Pig grease*	items	0	0	0	15	0	0	0	0	0	15
Suspect asbestos	items	6	0	4	0	2	0	12	0	0	24
Flammable liquids	items	7	5	2	2	2	1	7	2	0	28
Antifreeze	items	4	2	3	0	0	1	2	0	0	12
Unknown	items	34	76	17	5	70	44	191	52	81	570
Petroleum sludges	items	0	0	3	0	0	0	0	0	0	3
Suspect peroxide	items	1	0	0	0	0	0	0	0	0	1
Assumed cleaners	items	0	0	1	0	0	0	0	3	0	4
Veg/min/cooking oils	items	0	0	0	0	0	65	0	0	0	65
Medical waste	items	0	0	0	0	0	0	3	0	0	3

* To be returned to site .

MODEL RISK MANAGEMENT PROGRAM AND PLAN FOR AMMONIA REFRIGERATION

May 1996

Prepared by

Science Applications International Corporation
Reston, VA

This document provides generic guidance on the Risk Management Program (RMP) for Ammonia Refrigeration Facilities on how EPA intends to exercise its discretion in implementing its regulations on Accidental Release Prevention: Risk Management Program Under the Clean Air Section 112(r)(7). The document does not substitute for EPA's regulations, nor is it a regulation itself. Thus, it cannot impose legally-binding requirements on EPA, States, or the regulated community, and may not apply to a particular situation based upon the circumstances. EPA may change this guidance in the future, as appropriate.

MODEL RISK MANAGEMENT PROGRAM AND PLAN FOR AMMONIA REFRIGERATION

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MODEL RISK MANAGEMENT PROGRAM AND PLAN FOR AMMONIA REFRIGERATION

1.0 INTRODUCTION

This guidance has been developed to help owners and operators of ammonia refrigeration facilities comply with the United States Environmental Protection Agency's (EPA) Risk Management Program (RMP) regulations, 40 CFR Part 68, and the Occupational Safety and Health Administration's (OSHA) Process Safety Management (PSM) Standard 29 CFR 1910.119 (both sets of regulations have a 10,000-pound threshold for anhydrous ammonia).

It is pertinent to begin by distinguishing between the Risk Management Program and the Risk Management Plan. The Plan is the information that the owner or operator will prepare and submit to a central point to be specified by EPA. This single submission will be deemed equivalent to a submission to the implementing agency, State and local planning and response agencies with jurisdiction for the area where the stationary source is located. The Program is the system that backs up the plan and ensures that the plant is being operated safely. This guidance is intended to explain the elements of the Program in such a way that owners or operators will understand what is needed to develop an adequate Program and will have all of the information needed to prepare a written Plan.

There are a large number of ammonia refrigeration facilities in the United States, which span a wide range of sophistication and knowledge about what it takes to operate safely. This guidance is primarily intended to help those owners or operators who may be looking for assistance on where to start in the development of an RMP and who may have few resources to devote to this objective. Although compliance with the RMP regulations is first and foremost a requirement of the law, a good RMP (particularly the Prevention Program) should also pay dividends in efficiency and profitability; that is, the resources devoted to developing the RMP ought to be more than recovered.

Although, as noted above, this guidance has been developed to help facilities get started on their programs, it is hoped that it will also prove useful to those facilities that already have excellent safety and prevention programs in place. However, the guidance is not meant to be prescriptive, and owners and operators will be free to develop their Programs in a different way if this fits better with their current management practices and procedures and available technical resources.

In summary, the guidance is intended to be in a simple form that is easy to use, while still covering all those elements that are necessary to comply with the regulations and to operate safely and efficiently.

This report is organized as follows:

Section 2 describes a simple way of performing the Hazard Assessment requirements of the regulations. It is intended to stand alone--that is, an owner or operator who reads and uses it will have completed a satisfactory Hazard Assessment. However, the development of Section 2 required consideration of a great deal of technical information on accidental releases of ammonia and how to handle their atmospheric dispersion. This information is extensively discussed in Appendices A, B and C.

Section 3 describes the Prevention Program and the Emergency Response Plan. There is an initial introduction that summarizes some of the history of prevention programs, and then goes on to discuss the applicability of the current guidance to the specific case of ammonia refrigeration facilities. Section 3 continues with a discussion of the requirement for a Management System, and then provides information and guidance on each of the elements of the Prevention Program. Section 3 concludes with a brief review of the elements of the Emergency Response Plan. Finally, Appendix D provides a brief review of past accidental releases of ammonia and their root causes from EPA's Accidental Release Information Program (ARIP) data base.

Please send comments to Dr. Lyse Helsing at EPA, (202) 260-6128, FAX (202) 260-0927 or e_mail helsing.lyse@epamail.epa.com. Technical questions about the Prevention Program and the emergency plan can be directed to Ray Brandes at (504) 761-4011, FAX (504) 769-9339, or e_mail RayBrandes@aol.com. Technical questions about the hazard assessment should be addressed to Dr. Geoff Kaiser at (703) 318-4626, FAX (703) 709-1042 or e_mailgeoffrey.d.kaiser@cpmx.saic.com.

2.0 HAZARD ASSESSMENT

The required elements of hazard assessment are as follows:

§68.25 Worst-case release scenario analysis
§68.28 Alternative release scenario analysis
§68.30 Defining offsite impacts - population
§68.33 Defining offsite impacts - environment
§68.36 Review and update
§68.39 Documentation
§68.42 Five-year accident history

The current chapter gives simple guidance on how to comply with each of the above requirements; it is intended to stand alone. Backup technical information is provided in Appendices A, B and C, including the reasons why the guidance has been developed in its current form.

2.1 Worst-Case Release Scenario Analysis

2.1.1 Mandatory Input

The following input is required by the Risk Management Program rule:

a) The worst-case release quantity M(lb) shall be the greater of the following:

 1) For substances in a vessel, the greatest amount held in a vessel, taking into account administrative controls that limit the maximum quantity; or

 2) For substances in pipes, the greatest amount in a pipe, taking into account administrative controls that limit the maximum quantity.

 Appendix A shows that, for ammonia refrigeration systems, a storage vessel or receiver is the place where the worst-case release quantity is expected to reside.

b) Per §68.25(c)(1), because ammonia is a vapor at ambient temperature and is handled as a liquid under pressure in most parts of a refrigeration system, the quantity M is completely released over a period of 10 minutes. Appendix A explains why this is actually a reasonable assumption for worst-case release scenarios in ammonia refrigeration systems.

c) Wind speed/atmospheric stability class: The owner or operator shall use a wind speed of 1.5 meters per second and F stability class. If the owner or operator can demonstrate that local meteorological data show a higher minimum windspeed or a less stable atmosphere at all times during the previous three years, these minimums may be used. For simplicity's sake, the guidance below is restricted to a wind speed of 1.5 meters per second and F stability class.

d) The toxic endpoint for ammonia is 200 ppm (0.14 mg/L). This airborne concentration has been published by the American Industrial Hygiene Association (AIHA) and is the maximum airborne concentration below which it is believed that nearly all individuals can be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.

2.1.2 Mass Released in the Worst-Case Release Scenario

Take the largest mass M(lb) of ammonia that is liquefied under pressure in any vessel in the ammonia refrigeration system. For many systems, this vessel will be the high pressure receiver with typical pressures in the range 100 to 200 psig. Other candidate vessels include: a) an outside vessel in which ammonia is stored as a liquid at ambient temperature (some, but not all, facilities have such a vessel); b) an intermediate receiver with typical pressures in the range 20 to 60 psig (typical of two-stage ammonia refrigeration systems); or c) a low-pressure receiver with pressures in the range 10-60 psig (typical of single-stage refrigeration systems).

The mass M should include any liquid ammonia in pipework connected to the vessel and in any other vessel that can discharge directly into pipework connected to the vessel. In addition, the maximum amount of ammonia that could be in the vessel at any one time, not just during normal operation, should be considered. For example, if the vessel is used to store some or all of the ammonia while the rest of the system is being serviced, then M should include the additional mass of ammonia that is in the vessel at such a time. However, if there are administrative controls that limit the amount of ammonia that is allowed in the vessel at any one time, this limit can also be taken into account when estimating M.

Appendix A gives more detail on the reasons for the above described way of estimating M.

2.1.3 Distance to the Toxic Endpoint

Take the mass M and go to Table 2-1. Find the entry in the "Mass Released" column that is closest to, but also higher than, M. Read off the corresponding distance from the urban or the rural column. This is the "distance to the endpoint" that must be submitted in the RMP information per §68.165(b)(10).

To decide whether the site is rural or urban, use the following guidance. If 50% of the landmass within a 1-mile radius can be described as indicated below, the area can be classified as urban:

Table 2-1
Predicted Distance to Toxic Endpoints - Worst-Case Release Scenario

Total Mass Released (lb)	Predicted Distance to Toxic Endpoint (ft)	
	Rural	Urban
1,000	3,100	2,100
1,500	3,700	2,500
2,000	4,300	2,900
3,000	5,200	3,500
4,000	6,000	4,000
5,000	6,600	4,500
6,000	7,300	4,900
7,000	7,800	5,200
8,000	8,400	5,600
9,000	8,900	5,900
10,000	9,500	6,200
15,000	11,500	7,500
20,000	13,300	8,600
25,000	15,000	9,500
30,000	16,400	10,400
35,000	17,800	11,200
40,000	19,100	11,900
45,000	20,300	12,600
50,000	21,400	13,200
60,000	23,600	14,400
70,000	25,600	15,500
80,000	27,400	16,600
90,000	29,100	17,500

a) Heavy industrial (large chemical, other manufacturing facilities, 3-5 story buildings, flat roofs, grass and trees extremely rare); or

b) Light-to-moderate industrial (rail yards, truck depots, warehouses, industrial parks, minor fabrication, 1-3 story buildings, flat roofs, limited grass and trees); or

c) Commercial (offices and apartments, hotels 10-story heights, flat roofs, limited grass or trees); or

d) Compact residential (single and some multiple family dwellings closely spaced, 2-story or less, alleys, pitched or flat roofs, limited lawns and few old established trees, no driveways).

If none of the above apply, the site should be classified as rural.

Figure 2-1 represents Table 2-1 in graphical form. The basis for Figure 2-1 is extensively discussed in Appendices A and B.

2.1.4 Passive Mitigation

The guidance on Table 2-1 has been prepared with the assumption that <u>no</u> passive mitigation is available. At first sight, it might appear that this is a highly pessimistic assumption because, in many ammonia refrigeration systems, the worst-case mass M will come from a vessel that is indoors in an area such as a compressor room. However, it is not easy to show that a typical building that houses compressors and vessels will effectively contain and mitigate a release of ammonia if the worst-case scenario occurs inside. Appendix C shows that, for many building configurations, the sudden loss of the contents of a high-pressure receiver (for example) would generate pressures that could not be withstood by a typical cinder block or unreinforced concrete structure. Therefore, it may be difficult to prove that the worst-case scenario can be mitigated by structures. However, if the owner or operator can demonstrate for a specific facility that structures can contain and mitigate the worst-case release scenario, then he/she can take credit for such mitigations.

2.2 <u>Alternative Release Scenario</u>

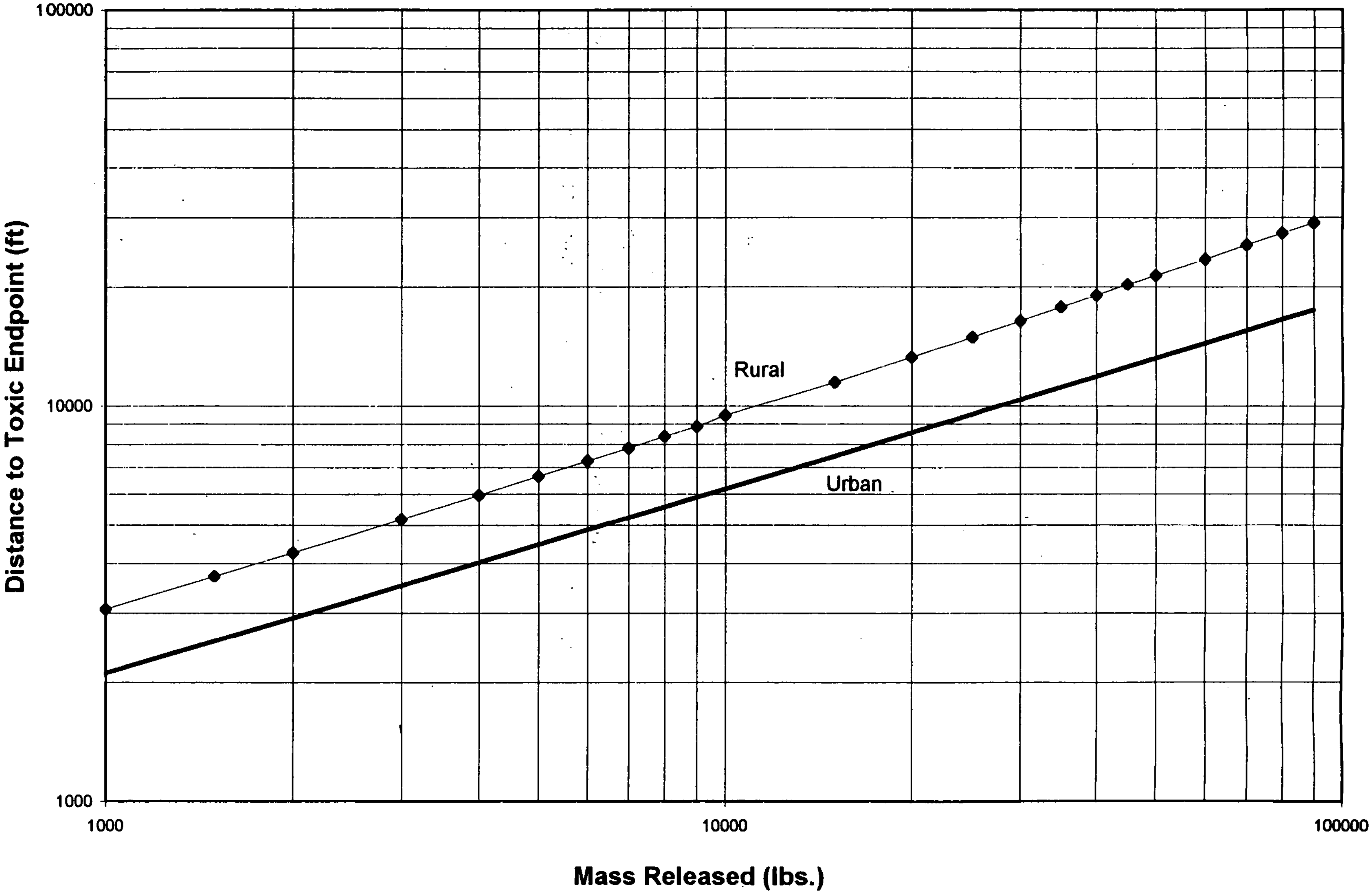
The owner or operator must identify and analyze at lease one "alternative" release scenario.

2.2.1 Mandatory Inputs

a) The alternative scenario should be more likely to occur than the worst-case scenario.

b) <u>It should reach an endpoint offsite</u>, unless no such scenario exists (note that this requirement means that the release rate for the alternative scenario must be fairly large, or it will generally not propagate offsite).

Figure 2-1 - Worst-Case Ammonia Release over 10 minutes
Generic Guidance on Distance to Toxic Endpoint



c) The owner or operator should use "typical meteorological conditions for the stationary source". For the guidance presented below, an "average" weather condition of wind speed 3 m/s and D stability class has been chosen. The owner or operator is free to use different conditions if he/she can show that these other conditions are typical of a specific site.

2.2.2 Choice of the Alternative Scenario

As is shown in Appendix A, there is a great variety of potential alternative scenarios. Many, probably most, of these will not be large enough to exceed the toxic endpoint offsite.

For the purposes of the present guidance, a very simple definition of an alternative scenario has been chosen (a 1/4" effective diameter orifice leading to an airborne release, representative of a pump seal leak or a gasket rupture). For typical conditions in a high-pressure receiver, the corresponding rate of release is 100 lb/min (see Appendix A). In average weather conditions, namely a wind speed of 3 m/s and Stability Class D, the predicted distance to the toxic endpoint is 450 feet at an urban site and 1,000 feet at a rural site (also see Appendix A).

The owner or operator may simply quote the results for this "canned" scenario. For different choices of alternative scenarios, or if the distances quoted above do not extend offsite, see Appendix A.

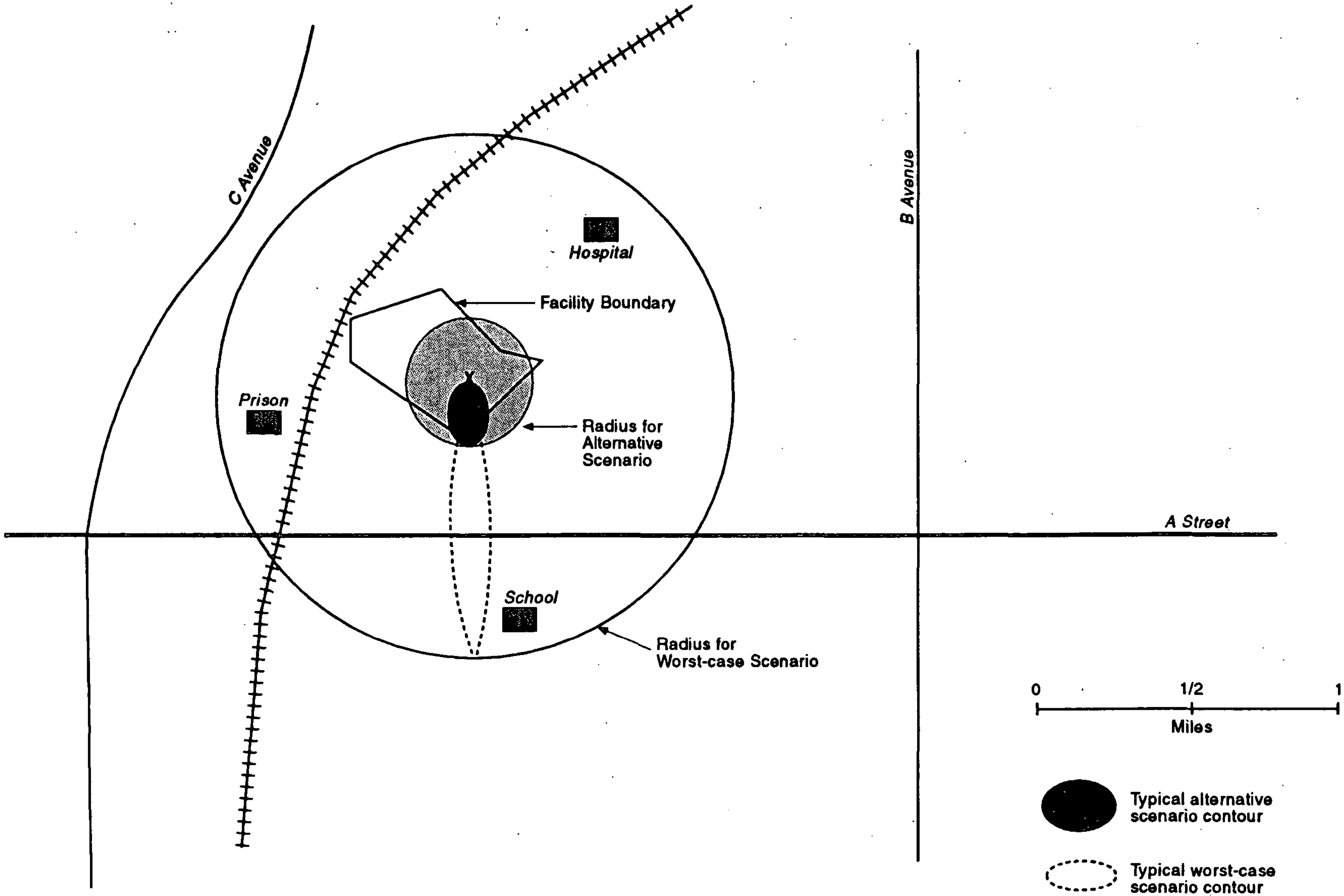
2.3 Presentation of Results

Figure 2-2 is one suggested example of how the consequences of worst-case and alternative scenarios might be presented. It is a simplified map that shows the radius to which the vapor cloud might extend, given the worst-case release in worst-case weather conditions (the owner or operator should use a real map of the area surrounding the site). Organizations that have already begun to prepare Risk Management Programs and Plans have used this form of presentation (for example, in the Kanawha Valley or in Tampa Bay).

2.4 Defining Offsite Impacts - Populations

For each worst-case and alternative scenario, the owner or operator must estimate, to two significant digits, the population within a circle, with its center at the point of release and a radius determined by the distance to the endpoint calculated as described in Sections 2.1 and 2.2 above (i.e., the circles shown on Figure 2-2). The population must include the residential population. The presence of schools, hospitals, prisons, public recreational areas, arenas and major commercial and industrial developments, must be noted in the Risk Management Plan. The owner or operator may use the most recent Census data to estimate the population potentially affected. Cognizant local authorities can give information on schools, prisons, etc.

Figure 2-2. Simplified Presentation of Worst-Case and Alternative Scenarios on a Local Map



2.5 Defining Offsite Impacts - Environment

In the Risk Management Plan, the owner or operator must list environmental receptors within the circles shown on Figure 2-2. Environmental receptor means natural areas, such as national or state parks; forests or monuments; officially-designated wildlife sanctuaries, preserves, refuges, or areas; and Federal wilderness areas. The owner or operator may rely on information provided on local U.S. Geological Survey maps or on any data source containing U.S.G.S. data to identify environmental receptors. All that is required is to note the existence of these receptors.

2.6 Documentation

The owner or operator needs to maintain onsite the following records on the offsite consequence analyses:

a) For the worst-case scenario, a description of the vessel or pipeline selected as worst-case, assumptions and parameters used and the rationale for selection; assumptions include use of any administrative controls and any passive mitigation that were assumed to limit the quantity that could be released. If the current guidance has been used, Section 2.1 can be referenced as the basis for the choice of the worst-case scenario.

b) For alternative release scenarios, a description of the scenarios identified, assumptions and parameters used and the rationale for the selection of specific scenarios; assumptions include use of any administrative controls and any mitigation that were assumed to limit the quantity that could be released. Documentation includes the effect of the controls and mitigation on the release quantity and rate. Section 2-2 can be referenced here if the "canned" scenario is used.

c) Documentation of estimated quantity released, release rate and duration of release.

d) Methodology used to determine distance to endpoints (it will be sufficient to reference this guidance).

e) Data used to identify potentially affected population and environmental receptors.

2.7 Review and Update

The owner or operator must review and update the offsite consequence analyses at least once every five years. If changes in processes, quantities stored or handled, or any other aspect of the stationary source might reasonably be expected to increase or decrease the worst-case distance to the endpoint by a factor of two or more, the owner or operator must complete a revised analysis within six months of the change and submit a revised Risk Management Plan.

2.8 Five-Year Accident History

The owner or operator must include in the five-year accident history all accidental releases of ammonia that resulted in deaths, injuries, or significant property damage on site, or known offsite deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage. For each accidental release included, the owner or operator is expected report the following information in the Risk Management Plan:

1) Date, time and approximate duration of the release
2) Chemical(s) released
3) Estimated quantity released in pounds
4) Type of release event and its source
5) Weather conditions if known
6) Onsite impacts
7) Known offsite impacts
8) Initiating event and contributing factors if known
9) Whether offsite responders were notified if known, and
10) Operational or process changes that resulted from investigation of the release

Numerical estimates should be provided to two significant digits. The above information should be available from the reports of a good incident investigation procedure.

3.0 PREVENTION PROGRAM AND EMERGENCY RESPONSE PLAN

3.1 Introduction

In June, 1988, in preparation for determining the role of the Federal Government in reducing the likelihood and severity of chemical accidents, EPA prepared the SARA 305(b) report, *Review of Emergency Systems*. In this report, it was concluded that:

> "Prevention of accidental releases requires a holistic approach that integrates technologies, procedures, and management practices".

The report went on to outline the elements of such a program. These were based on a compilation of industrial programs that had been shown to be successful in reducing both the likelihood and severity of chemical releases, fires and explosions. At the time, a review of practices revealed that no industry, nor any individual firm, practiced all of these elements. The compilation was of practices found throughout industry, bought into the EPA report as an overall program.

Both the OSHA regulation, 29 CFR 1910.119, and this EPA Part 68 - Accident Release Prevention Program, are founded on the program initially laid down in the SARA 305b report.

Thus, this prevention program is intended to assure that designs are reviewed so that new plant and equipment is in conformance to safe design principles. The remainder of the requirements assures that the operation, maintenance and control of hazards are well done. This will prevent inadvertent changes outside that safe design and operating envelope.

Readers will recognize that this prevention program is intended to provide for ongoing management of highly-hazardous substances. It in not a list of "once and done" actions. Rather, it provides a means for assuring safe operations throughout the life of the facility.

3.2 Applicability to Ammonia Refrigeration

A review of the ammonia releases from refrigeration plants found in the ARIP data base (see Appendix D) reveals that several of the individual elements of this rule would have been effective in preventing those releases. That is, the elements found useful in industry generally are fully applicable to ammonia refrigeration plants as a means of preventing accidents in its industry.

In that review, some elements were found to be especially applicable to accident prevention in the ammonia refrigeration industry. However, all elements are useful as part of the holistic approach to prevention. The detail involved in applying each element will vary between industries and between facilities in the same industry. This was foreseen in the performance orientation of this rule and in the OSHA regulation.

EPA recognizes that ammonia refrigeration plants are very different from complex chemical processing operations. Many of the operations in chemical processing are not found in refrigeration plants. There are no chemical reactions. Moreover, ammonia refrigeration is a mature industry. While there are new developments leading to more efficient operations, the design principles are fully available. A complete understanding of the safe design and operating envelope is available to design and operating practitioners in the industry.

This guidance takes the differences between chemical plants and ammonia refrigeration plants into account. It is based on the operating characteristics of ammonia refrigeration facilities. The International Institute of Ammonia Refrigeration (IIAR) has been most helpful in the formulation of this guidance. EPA wishes to thank the IIAR for their practical and valuable insight and advice about the industry.

In addition, the experience gained in applying process safety requirements to ammonia refrigeration plants in one state, Delaware, demonstrated the value of concentrating on specific elements of process safety. In particular, maintenance, or Mechanical Integrity, is vital. For that reason, this guidance puts that element first. Delaware's requirements come from their Extremely Hazardous Substances Regulation. This experience strongly parallels the results of the review of the ARIP data base, noted above. EPA wishes to thank the Delaware Department of Natural Resources and Environmental Control (DNREC) for their insight, assistance and advice. DNREC is responsible in Delaware for both enforcement and assisting in compliance.

This RMP rule and the OSHA PSM standard (29 CFR 1910.119) apply to ammonia refrigeration plants where the total quantity of ammonia is over 10,000 pounds. Because the PSM standard applies, ammonia refrigeration plants are considered to be Program 3 facilities, as provided in §68.10(d) of the rule. If the requirements of the OSHA regulation are met, the prevention provisions of the EPA RMP rule will also be essentially satisfied, because EPA has prepared the RMP rule so as to avoid duplication of effort in this regard by owners and operators. EPA however, has added that the owner or operator must be prepared to demonstrate that a management system is in place to assure continued fulfillment of prevention requirements. EPA also requires, beyond OSHA's requirements, an offsite consequence analysis, emergency response planning and registration of the facility.

3.3 Judgment of Facility Owners or Operators

The elements of process safety in both the EPA RMP rule and in the OSHA PSM standard express performance requirements. This allows for the individuality of each plant to be taken into account in determining the means of accomplishing that performance. Owners and operators must, therefore, determine exactly how they will accomplish it. They are expected to select the means that best suits both the effectiveness and efficiency with which the desired result is to be achieved at that plant.

Owners or operators, when taking the individuality of their plant into account, are free, indeed encouraged, to integrate their prevention program into routine business management. EPA is aware that, where this has been done, the burden of compliance is less than where compliance is considered an "add-on" to plant management. Many requirements of this rule are part of normal good operating practices; accomplishing them as an "add-on" can result in duplication of effort.

This guidance is, therefore, necessarily general in nature, with a few exceptions. EPA expects to find a wide variety in the means employed to meet the performance requirements. EPA regards the management system required by §68.15 as the source of the judgment needed as to how each element is to be accomplished. It is an integral part of the prevention program.

3.4 Management System

The RMP prevention program begins with a requirement for a Management system that assigns responsibility for implementation of the prevention program. This requirement for a Management System is intended to ensure that each element is fully and effectively carried out. The requirements are given in §68.15 of this rule. The elements of the prevention program are spelled out in Subpart D Program 3 Prevention Program, §68.65 through §68.87.

The elements of the prevention program are laid out to provide the actions needed in many different kinds of facilities that have hazardous materials subject to the rule. The application of each element will differ, depending on the industry and on the needs at individual facilities. For example, among ammonia refrigeration facilities, there are considerable differences between refrigerated warehouses and food processing plants. The age and design of individual facilities will have a large impact on the actions necessary to effectively carry out each element of the prevention program. For this reason, the Management System, in assigning responsibilities, must provide for the actions needed at each individual facility.

In evaluating whether their Management System has been implemented, owners or operators of covered sources will need to assess that the responsibilities have been fully and effectively assigned. Because the necessary actions differ amongst covered sources, what it is for which persons are made responsible must be spelled out. That is, the goals of accomplishment at the specific refrigeration facility against each element should be stated and understood by the person responsible for the outcome. As an example, a goal might be that *the operating procedures for the plant will be up to date and readily available to operators.*

Another measure that the responsibility has been effectively assigned is that there will be plans to carry out the goals. These plans will take into account the interrelationships between elements of the prevention program. For example, the plans might provide that *there will be updated and correct P&IDs before attempting to carry out a Process Hazard Analysis (PHA).* Owners or operators should ensure that plans to execute the assigned responsibilities are prepared and understood.

1) In addition to this section, there are related elements to be considered when evaluating compliance with the Management System requirements:

2) §68.79 provides for an audit that each element is fully carried out. This measures whether the assignment of responsibility was effective, and provides a mechanism to institute corrective action to improve the Management System, if needed.

In assigning responsibilities for executing

- Process Hazard Analyses (§68.67)
- Accident/incident investigations (§69.81)
- Compliance Audits (§68.79)

The Management System must assign responsibility to track the resolution or completion of recommendations and findings from these elements.

Owners or operators should ensure that the audits do measure that the several elements of the Prevention Program have been effectively accomplished, and that the resolution tracking responsibility has resulted in completion of these requirements.

3.5 <u>§68.175, Information Required</u>

As owners or operators provide the required information pursuant to this section, they may want to consider the guidance given below. Careful attention to the suggested practices is essential to assuring that the execution of the process safety element will be consistent with good industrial practices.

3.5.1 §68.175(h), Maintenance (see §68.73)

Experience in Delaware, corroborated by a review of accidents in the ARIP data base (see Appendix D) indicates that this element is of principal importance in preventing ammonia releases from refrigeration plants. EPA believes that a sound and well-run inspection, test and preventive maintenance program is essential to preventing equipment failure that could result in a hazardous release.

Written procedures should include all equipment that should be inspected, tested, or maintained. Good engineering practices and manufacturer's recommendations or experience should determine the means of inspection, test, or preventive maintenance. In older plants, operating experience in that plant should be taken into account when determining the appropriate level of preventive test, calibrations, or maintenance. Owners or operators are expected to judge the adequacy of the list of equipment to be maintained, the methods employed and the frequency of the preventive maintenance.

The rule requires that owners or operators report the date of review of procedures, and the date inspections and tests were done. Owners or operators should ensure that these tests and inspections are being done, and that deficiencies are corrected if any are found.

In ammonia refrigeration plants, experience suggests that it is especially important for these to be done:

- Periodic walk-throughs to find unusual or increasing vibration, incipient leaks, or other indications of potential upsets or failures that could lead to a release. In older plants, or in food processing units where frequent changes are made, this might be done daily. On more modern plants, weekly walk-throughs are likely to be sufficient.

- Inspection of pressure vessels. There may be need to consider whether stress corrosion cracking (SCC) is of concern. Industry guidance should be consulted; IIAR's Bulletin 110 provides information regarding this issue. However, attention to ammonia water and oxygen content throughout the life of the refrigeration system may preclude the need for internal inspections for SCC.

- Periodic replacement, or preventive inspection and maintenance, of pressure relief valves. ASME, ANSI/ASRAE 15, state and local codes should be consulted for guidance. Industry guidance from the IIAR, their Bulletin 10, recommends a five-yearly replacement of these valves.

- Periodic inspection and calibration of those liquid level, temperature and pressure instruments, switches and shutdown devices that have safety implications. Owners or operators will need to judge which of these devices have safety implications and which do not, e.g., a liquid level shutdown on a compressor suction is vital to safe operations.

- Periodic inspection of major powered equipment, including compressors, pumps and large fans, bearings, couplings, shaft seals, mountings, etc., for vibration, or incipient mechanical failure. Where expertise is needed, owners or operators are expected to secure it. Either employees or, if necessary, contractors, skilled in refrigeration equipment maintenance, can provide this expertise.

Experience also shows the importance of pre-startup safety reviews following extensive maintenance activity. See the guidance in Section 3.5.7.

If the plant relies on employees for maintenance activities, owners or operators should ensure that these employees are trained to perform that work. If contractors perform the work, the owner or operator will be expected to know that the contractor is qualified to work on refrigeration equipment.

Spare parts should be proper for refrigeration service. Where pertinent, spares should be purchased from refrigeration equipment vendors to be sure that the right materials are used.

New equipment design is vital. Owners or operators answering this question affirmatively will be expected to have assured that new equipment meets appropriate design codes or standards, including ASME pressure vessel code, ANSI safety and performance standards, ASHRAE and IIAR standards, and local mechanical and fire codes for refrigeration equipment. While larger firms may have competent engineering employees to do this, smaller firms may need to rely on contractors to provide this assurance. If the latter applies, owners or operators are expected to select contractors who are familiar with these codes and standards.

3.5.2 §68.175(d), Process Safety Information (see §68.65)

Owners or operators are to supply the date this information was last revised. In doing so, the owner or operator should verify that all of the information needed to safely operate the ammonia refrigeration system is on hand and up to date. In general, it should comprise of:

- information about the hazards of ammonia and other hazardous, materials, e.g., chlorine for water treatment if any are present
- information about the design basis for the plant
- information about the equipment in the plant

This general list should be considered in light of the simpler design basis for refrigeration plants, when compared to complex chemical operations. For ammonia refrigeration plants generally, process safety information is likely to consist of:

- Material safety data sheets for ammonia and any other hazardous materials present

- A block flow diagram for the plant

- Piping and instrument drawings (P&IDs)

- A complete list of safety relief valves, showing their location, design basis and capacity, set point, date of installation, and the design of discharge piping systems. The result and date of the most recent inspection, test, maintenance, or replacement should also be available.

- A complete list of high- and low-level, and high- and low-pressure, shutdown or alarm devices, their set point and location, and result and date of the most recent calibration of each.

- Equipment manufacturer's operating instructions, including safe operating limits, for vessels, piping, rotating equipment, heat exchangers, valves, controls and other equipment in the plant.

- Equipment drawings and specifications. Care should be taken to assure that these reflect as-built installed equipment.

3.5.3 §68.175(e), Process Hazards Analyses (see §86.67)

Process Hazard Analyses (PHAs) provide for understanding potential hazardous events, the means by which they can occur and what actions are likely to prevent them. Many methods to do these analyses have been developed by the engineering profession. For ammonia refrigeration plants, the industry, through the IIAR, has taken a strong lead in developing a simple and readily used checklist.

In giving the completion date of the last PHA, the owner or operator should ensure that a proper procedure was used. It may be the IIAR checklist, another checklist, or any of the methods outlined in §86.67 of this rule. Care should be taken to ensure that offsite consequences are evaluated.

PHAs usually result in findings or recommendations for improvements to prevent potential releases. The management system (see above) includes that these findings or recommendations are promptly brought to resolution. Owners or operators, when giving the dates of implementation or recommendations, should verify that this resolution is being done.

3.5.4 §68.175(f), Operating Procedures (SOPs) (see §68.69)

Owners or operators are asked to state when their operating procedures were prepared or last revised and updated. Operating procedures provide the basis for proper and safe operation of an ammonia refrigeration plant. These procedures should show a clear path to the safe operation of the plant. The procedures should:

- Be based on relevant process safety information and may take operating experience into account. (Note that in refrigeration plants, the equipment manufacturer's recommended operating procedures are often satisfactorily used as plant operating procedures. If this is done, owners or operators should ensure that these procedures are kept up to date, consulting with the equipment manufacturers if necessary.)

- Be up to date, reflecting all changes to the plant

- Include safe operating limits for temperature and pressure

- Describe the consequences of operating outside these safe operating limits

- Include procedures to correct maloperation outside these safe operating limits and to bring the plant into a safe state

- Provide a description of safety systems and how they operate. This should include pressure and liquid level trips and alarms, and pressure relief valves with their discharge locations.

- Include procedures for:

  Normal Operations

  Startup. Experience indicates that, in ammonia refrigeration plants, startup procedures after maintenance activity should include an inspection to ensure that the maintenance is complete, that drain valves, etc., are in the proper position, and piping is fully connected.

  Shutdown

Emergency operations for leaks or other foreseeable operating problems

Emergency shutdown, including when it is required

In ammonia service, attention to the quality of ammonia is important to preventing stress corrosion cracking of carbon steel. Operating procedures should provide that ammonia used to charge, or recharge, the system be of proper quality. The procedures should provide that operations are run in a way that maintains proper ammonia quality. Guidance on this issue is provided by the IIAR in their Bulletin 110. Testing of ammonia for water and oxygen is described in the IIAR Bulletin 108.

In addition to operating procedures, §68.69 calls for procedures for safe work practices. These generally address non-routine work, such as maintenance and construction, within an operating plant. The date these procedures were prepared or updated should also be reported. These safe work procedures are included:

- lockout/tagout
- confined space entry
- opening process equipment and piping
- control of access to the plant. This procedure is intended to ensure that plant management controls the activities and safety of workers other than those regularly assigned to work there.

Note that OSHA has described the requirements for lockout\tagout and confined space entry in separate standards that apply to any workplace. Also, note that a hot work procedure is called out separately in this rule.

3.5.5 §68.175(g), Training (see §68.71)

The rule's requirement for training is that each employee operating equipment in the plant shall have been trained to operate it safely and understands the training. Owners or operators should verify that this is the case. The training materials should be up to date; EPA requires that the date these were updated be specified.

Refresher training at least every three years is a requirement. Documentation should show that it has been done and when.

Verification of understanding of the training is an important aspect of the management of training. It may include observation of performance, written testing and/or oral testing. Training documentation should show how understanding was measured or verified.

3.5.6 §68.175(i), Management of Change (see §68.75)

When changes or expansions are done, it is necessary to assure that the change or expansion is at least as safe as the original design. Also, change can unexpectedly introduce new hazards. Owners or operators should ensure that the provisions of §68.75 are met whenever equipment is changed and not replaced in kind. Also, the provisions apply whenever operating conditions are changed beyond the limits given in process flow diagrams or in equipment specifications.

In particular, care should be taken that changes are identified. Small additions or rerouting of ammonia piping are changes that are often overlooked. Small, inadvertent change as a consequence of maintenance is also often overlooked. If these small changes are made, it is expected that they will have been identified and their impact on safety addressed.

Equipment replacements, when not exactly the same as the older versions, are changes to be evaluated: releases have occurred when equipment has been replaced, especially when the new equipment was not designed for refrigeration service.

In considering the technical basis for the change and its impact on safety and health (see §68.75[b][1] and [2]), EPA anticipates that a Safety and Health review, process hazard analysis, or similar review, will be used. A person qualified by experience or training should conduct the review. If the review shows the need to improve the design for safety reasons, the improvement should be completed before startup.

3.5.7 §68.175(j), Pre-Startup Review (see §68.79)

The owner or operator should ensure that the requirements of §68.79 are being met if there are changes in the plant.

This requirement is intended to be a redundant follow-up to Management of Change, discussed in the previous section. It provides for an independent recheck that changes are in condition to be operated prior to startup. In complex chemical plants and refineries, it is a vital redundancy; in ammonia refrigeration plants, a simple review by a manager that the provisions of Management of Change are complete should be sufficient.

3.5.8 §68.175(k), Compliance Audits (see §68.79)

Compliance audits provide a means by which the management of a plant assures itself that employees are properly carrying out their duties for preventing accidental releases. This element of the Prevention Program is essentially a follow-up to the requirement for the Management System delineated in §68.15 of this rule.

A vital activity is that any deficiency found in an audit be corrected.

3.5.9 §68.175(l), Accident Investigation (see §68.81)

Events that either might or did cause an accidental or unexpected release of ammonia are to be investigated. The objective is to correct deficiencies in such a way as to prevent repetition. EPA expects that corrective actions will be completed in a timely way. This is related to the Management System requirement (see above.)

3.5.10 §68.175(m), Employee Participation Plan (see §68.83)

This element of the Prevention Program requires that owners or operators consult with their workers about process safety. In particular, workers should participate in process hazards analyses and be consulted as to how the other elements of the Prevention Program are carried out. A written plan to do this is required. Owners or operators should ensure that their written plan is followed.

3.5.11 §68.175(n), Hotwork Permits (see §86.85)

Hot work is defined as spark or flame producing operations, such as welding, brazing, metal cutting and grinding, sandblasting, etc. A permit is required describing the hazards of the hot work to be done and the needed precautions to prevent fires. These permits should be used to communicate the hazards and precautions to the workers performing the hot work.

OSHA has described the necessary precautions in 29CFR 1910.52(a).

3.5.12 §68.175(o), Contractors (see §86.87)

Many ammonia refrigeration plants use mechanical and refrigeration contractors for construction, maintenance and repair and other work. Owners or operators should judge that these contractors are knowledgeable about ammonia refrigeration, understand the applicable codes and standards, and are capable of working safely in an ammonia refrigeration plant.

Refrigeration plant owners or operators often hire contractors for their expertise in maintenance or construction. However, it is expected that the owner or operator will ensure that the contractor understands the safety requirements of the plant, and ensure that contractors have trained their workers in them. Also, the rule requires that owners or operators will ensure that the field practices of the contractor's workers are in conformance to the safety requirements of the plant.

Related to both this contractor requirement and to Management of Change (see above), contractors often make additions and changes to plants. Owners or operators may call on the contractor to furnish safety information about the change or addition. Thus, a contractor's familiarity with the requirements of the RMP rule and ability to meet them can be important qualifications for their employment.

3.6 §68.180, Emergency Response Program

The emergency response program for ammonia refrigeration plants will be individually tailored to each plant and the emergency response services available in the community. §68.180(b) asks whether the plant has a plan and whether it is coordinated with the LEPC plan. In considering this question, owners or operators should consider these factors:

- Whether the details of the plan were worked out with local emergency responders through the Local Emergency Response Committee (LEPC)
- Whether the plan is based on the consequence assessment required by §68.165 of this rule
- Procedures for informing public and local authority about releases
- Site response procedures to protect workers and minimize the offsite consequences (note the requirements of 29 CFR 1910.38)
- Organization, responsibilities and training of responsible persons
- Internal alarms (note provisions of 29 CFR 1910.165)
- Evacuation, emergency response training and drills. Training should include hazardous materials training where pertinent (note provisions of 29 CFR 1910.120)
- Emergency valve closures and equipment shutdown; operator training in foreseeable emergencies
- Containment of releases
- Fixed fire protection equipment and its operation
- Protective gear; training in its use
- Coordination with local emergency responders
- Provisions for communication
- Shelter in place and/or offsite evacuation
- Drills and critiques
- Spill cleanup; Hazmat training if any (see 29 CFR 1910.120)

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GUIDANCE ON CHOICE AND MODELING OF WORST-CASE SCENARIO AND ALTERNATIVE SCENARIOS FOR AMMONIA REFRIGERATION FACILITIES

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GUIDANCE ON CHOICE AND MODELING OF WORST-CASE SCENARIO AND ALTERNATIVE SCENARIOS FOR AMMONIA REFRIGERATION FACILITIES

1.0 INTRODUCTION

1.1 Outline of Appendix

The purpose of this Appendix is to provide backup to the guidance in Chapter 3 on how to choose both "worst-case" scenarios and "more likely" or "alternative" scenarios, and how to perform the atmospheric dispersion modeling that is required by 40 CFR Part 68. The intention is to provide technical and scientific support for the key assumptions. In addition, earlier drafts of this guidance attracted certain questions, and the more important of those questions are provided with an answer.

Section 2 provides background in the form of a description of the various conditions under which ammonia exists in a typical refrigeration system. It also contains a qualitative discussion of how these conditions affect the predicted rate of release and other parameters that control the atmospheric dispersion analysis. Section 3 briefly reviews the atmospheric dispersion modeling for the worst-case release scenario. Section 4 discusses the choice and modeling of alternative release scenarios. Section 5 provides advice on where to go to obtain guidance if the owner or operator chooses to do his/her own modeling and not to use the material provided in this guidance.

Appendix B discusses how the atmospheric dispersion modeling was performed to support Sections 3 and 4. Appendix C contains a discussion of buildings and whether it is likely that, if the worst-case scenario takes place inside a typical compressor room, there will be effective containment and mitigation of the resulting ammonia vapor cloud (the conclusion is that this cannot be taken for granted). Finally, Appendix D is provided as additional guidance for owners or operators who wish to perform their own dispersion analysis.

1.2 Assumptions

There are certain assumptions in this Appendix that are mandated by the regulation:

- In the worst-case release scenario, the duration of release is 10 minutes at a constant rate.
- The toxic endpoint is the ERPG-2 of 200 ppm (0.14 mg/L) for an exposure time of one hour.
- The consequences of the worst-case scenario should be modeled in atmospheric stability category F weather conditions with a windspeed of 1.5 m/s.

- The alternative scenario should be large enough to cause offsite effects above the toxic endpoint.
- The consequences of the alternative scenario should be modeled in typical weather conditions.

2.0 BRIEF SUMMARY OF THE VARIOUS STATES IN WHICH AMMONIA EXISTS IN A TYPICAL REFRIGERATION FACILITY

A typical block diagram of a two-stage ammonia refrigeration facility is shown on Figure A-1. A similar diagram of a single-stage facility is shown on Figure A-2. It is pertinent to begin by discussing the state of the ammonia in various parts of the system because the potential rate of release through an accidentally-formed orifice and the subsequent atmospheric dispersion is strongly dependent upon this state.

2.1 <u>Ammonia Liquefied Under Pressure</u>

2.1.1 Background

In many parts of a typical refrigeration system, there is ammonia liquefied under pressure. If the pressure and temperature are sufficiently high, and if there is a sudden release of liquid ammonia, it will all become and remain airborne as a mixture of ammonia vapor and very fine liquid droplets that do not fall to the ground. Experimental results clearly show that this is a real physical phenomenon (Goldwire, et. al., 1985; Kaiser, 1989). The droplets evaporate quickly as air is entrained. The evaporation process cools the air so that a cold mixture of air and ammonia vapor is formed. The mixture is denser than air, and a heavy vapor dispersion model is required to adequately predict airborne concentrations downwind of the point of release.

In earlier drafts of this guidance, a number of people raised questions about how much of the liquid ammonia actually becomes and remains airborne, as a function of the temperature of ammonia in the vessel, and what is the temperature that is sufficiently high to ensure that all of the ammonia remains airborne as the mixture of vapor and fine liquid droplets referred to above.

Figure A-3 shows the results of some experiments that were carried out on liquid chlorine and reported by Johnson (1991). Similar experiments were not performed for ammonia, but it is to be expected that ammonia results would look similar because, for example, chlorine and ammonia have similar density ratios of liquid to vapor and have similar atmospheric boiling points. Figure A-3 shows the percentage of liquid chlorine that falls to the ground as a function of superheat, which is the difference between the temperature of the chlorine initially in the vessel and its boiling point. Figure A-3 also shows for comparison the results of the Dow Model (Dow, 1993), which predicts that the fraction of airborne liquid droplets is five times the vapor flash fraction (the fraction of chlorine that immediately vaporizes as it is released to the atmosphere). Earlier drafts of this guidance were criticized for not using the Dow model, but, as can be seen, the Dow Model appears to be conservative (i.e., it predicts that too much ammonia falls back to the ground).

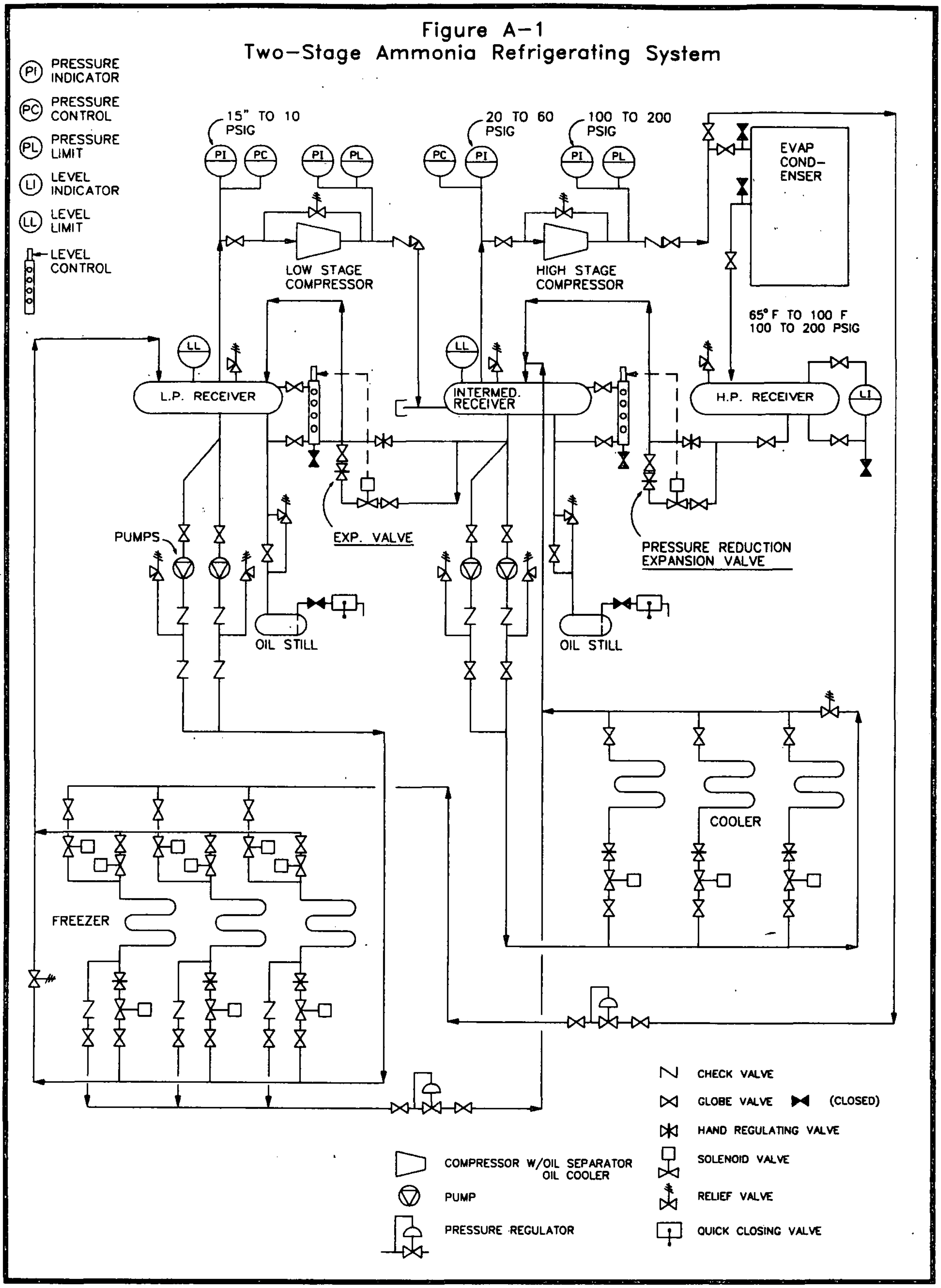


Figure A-1
Two-Stage Ammonia Refrigerating System
PI PRESSURE INDICATOR
PC PRESSURE CONTROL
PL PRESSURE LIMIT
LI LEVEL INDICATOR
LL LEVEL LIMIT
LEVEL CONTROL
15" TO 10 PSIG
20 TO 60 PSIG
100 TO 200 PSIG
EVAP COND-ENSER
LOW STAGE COMPRESSOR
HIGH STAGE COMPRESSOR
65° F TO 100 F
100 TO 200 PSIG
L.P. RECEIVER
INTERMED. RECEIVER
H.P. RECEIVER
PUMPS
EXP. VALVE
PRESSURE REDUCTION EXPANSION VALVE
OIL STILL
OIL STILL
COOLER
FREEZER
CHECK VALVE
GLOBE VALVE (CLOSED)
HAND REGULATING VALVE
SOLENOID VALVE
RELIEF VALVE
QUICK CLOSING VALVE
COMPRESSOR W/OIL SEPARATOR OIL COOLER
PUMP
PRESSURE REGULATOR

Figure A-2
Single-Stage with High-Side Float Regulator and Pump Circulation

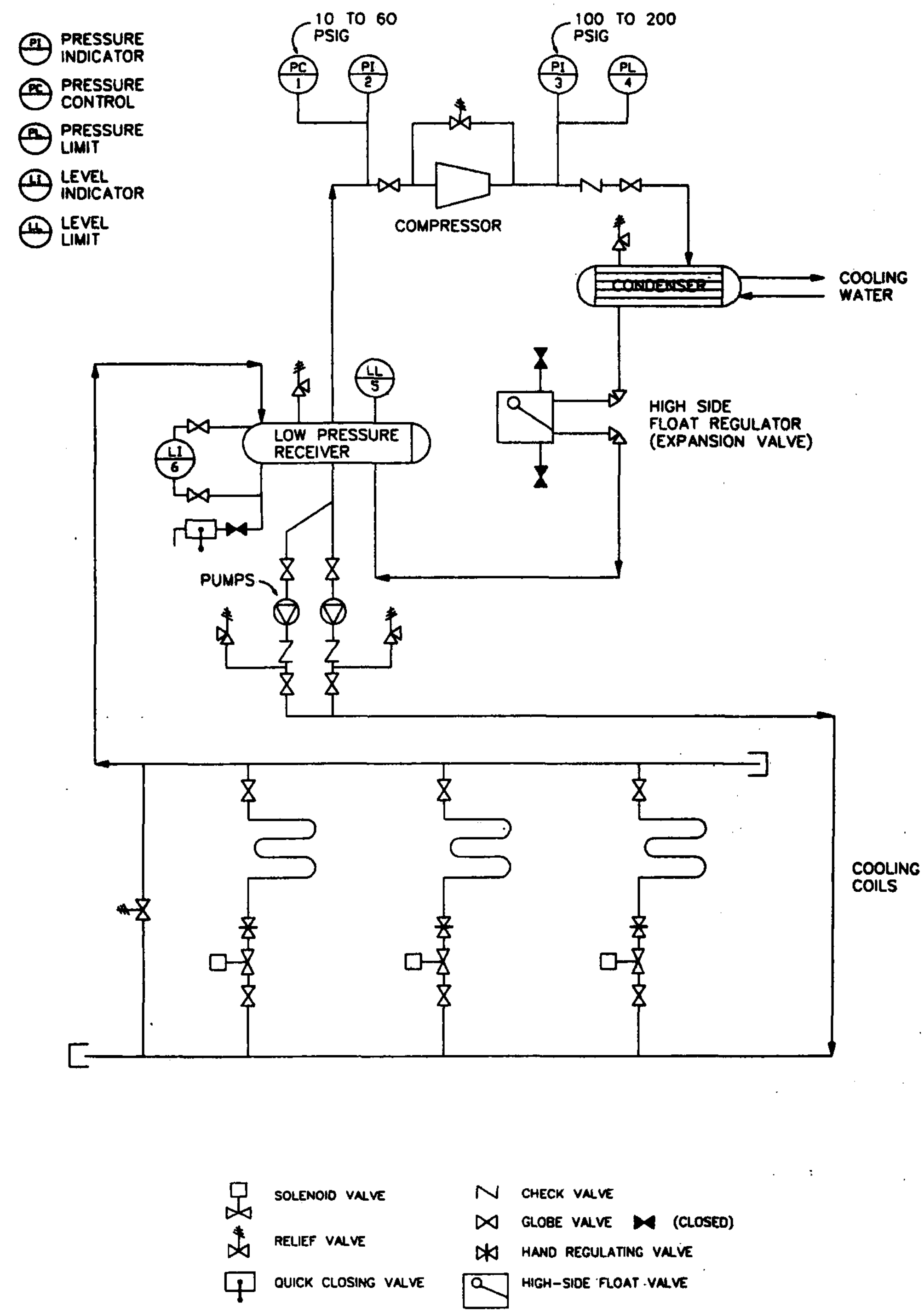


Figure A-3 also shows the results of a model (Ianello), known as the "RELEASE" model, that was used by Johnson (1991) to try to reproduce the experimental results. As can be seen, agreement is poor, possibly because the model neglects the evaporation from the airborne droplets as they fall towards the ground. Other models that take into account this evaporation lead to better agreement with experiments (e.g., Woodward and Papadourakis, 1991).

The principal conclusion, by analogy with the chlorine experimental results, is that, even at superheats of only 10°C (which would be a temperature of only about -23°C for ammonia), only a small fraction of released liquid ammonia would fall to the ground. Therefore, at most, a small degree of conservation is introduced if it is assumed that, for superheats exceeding 10°C, all of the released ammonia remains airborne.

2.1.2 Applicability to Ammonia Refrigeration Facilities

In many refrigeration facilities, the ammonia travels from the discharge of the compressors through the evaporative condensers to the high-pressure receiver, which will be at typical conditions of 35°C (95°F) and 180 psig. Figure A-1 shows a range of typical pressures in the high-pressure receiver from 100-200 psig (approximately 8-15 atmospheres). Figure A-4 shows ammonia vapor pressure as a function of temperature. 8-15 atmospheres corresponds to ammonia temperatures of approximately 10-40°C, or superheats of about 40-70°C. These conditions are definitely such as to ensure that all of any liquid ammonia release will become and remain airborne.

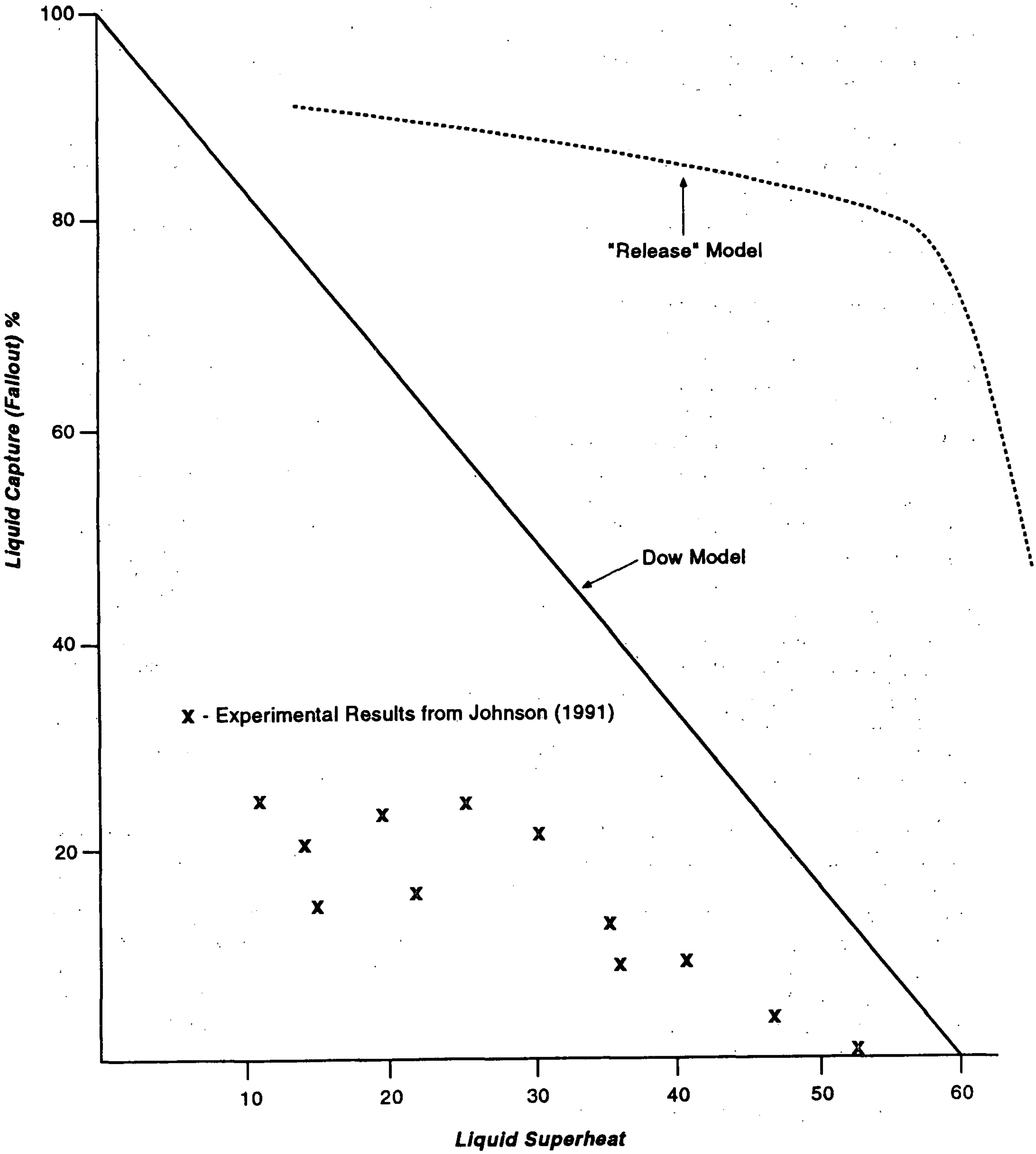
Some (but by no means all) refrigeration facilities have an ammonia storage vessel (not shown on Figure A-1) in addition to the high-pressure receiver. This vessel will, in all likelihood, be outside, and its pressure will fluctuate with the external temperature. However, at an ambient temperature of (say) 25°C, the superheat would be about 60°C so that the characteristics of any release from such a vessel are expected to be similar to those of a release from the high-pressure receiver. If the capacity of the outside storage vessel exceeds that of the high-pressure receiver, a release from this vessel should be considered as a candidate for the worst case.

Some refrigeration facilities (such as that shown on Figure A-2) may not have a high-pressure receiver. In such facilities, ammonia at pressures as high as 180 psig is confined to pipework, and there may be a low-pressure receiver with a typical pressure in the range 10-60 psig (~ 2-5 atmospheres), also containing ammonia liquefied under pressure. From Figure A-4, the corresponding temperatures are -20-0°C, or superheats of 10-30°C. Referring to the discussion of Figure A-3 in Section 2.1 of this Appendix, it is only slightly conservative to assume that all of the ammonia released from such a vessel becomes airborne. Note that two-stage systems have an intermediate receiver, which has a range of operating pressures similar to those for low-pressure receivers in a single-stage system.

2.2 <u>Ammonia at Subatmospheric Pressures</u>

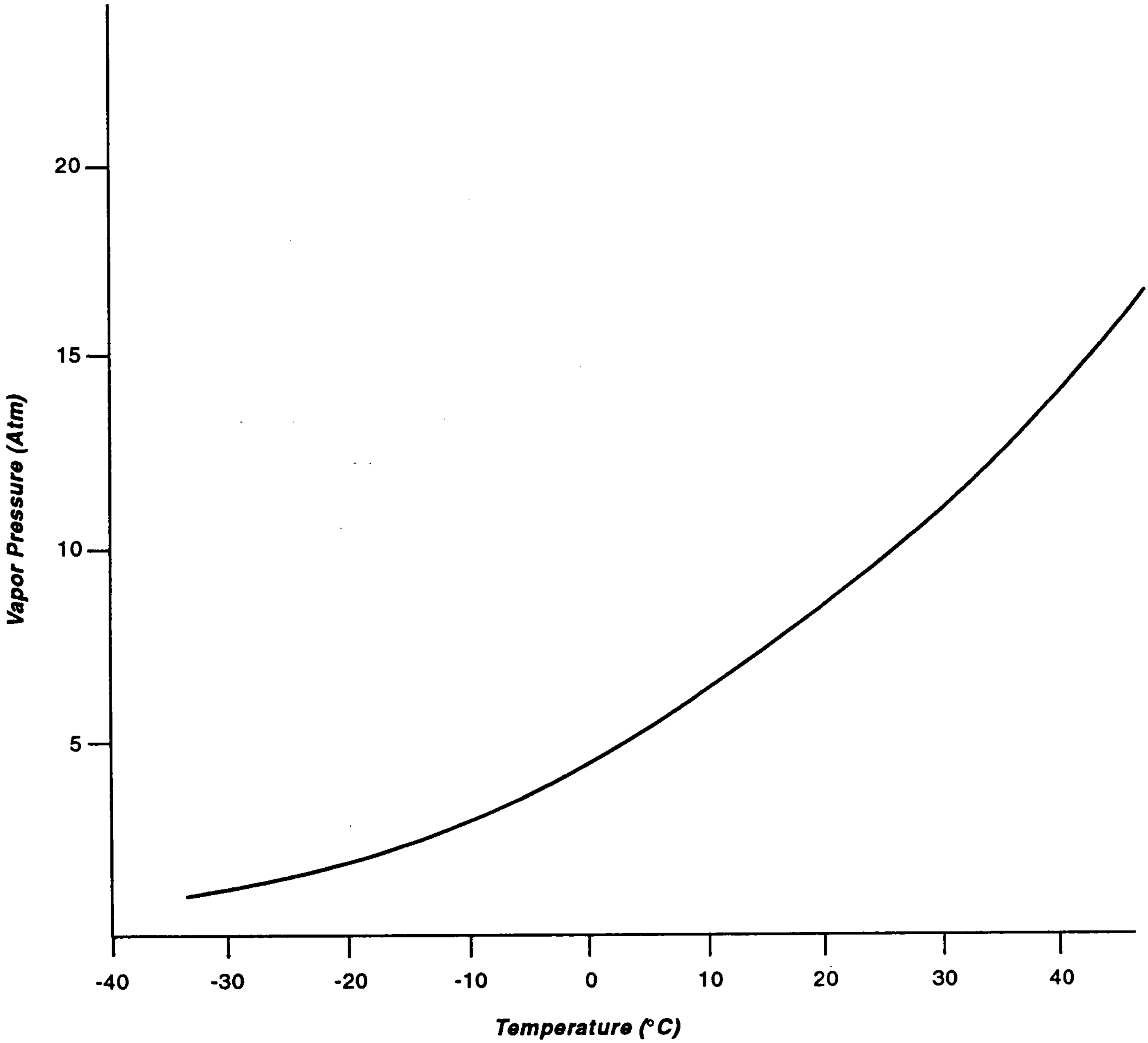
In some facilities (e.g., food processing plants), even colder ammonia may be needed (when, for example, very rapid freezing of food is necessary). Figure A-3 shows a low-pressure receiver

Figure A-3. Fraction of Liquid Chlorine Falling to the Ground as a Function of Superheat



(Liquid Superheat is Temperature Above the Chlorine Atmospheric Boiling Point of -34.6°C)

Figure A-4. Vapor Pressure of Ammonia as a Function of Temperature



with subatmospheric pressures as low as 15 inches of water, which corresponds to a temperature well below the atmospheric boiling point. If released, the ammonia will spill onto the ground and, over an average period of 10 minutes or more, will evaporate at a much lower rate than a release from a worst-case rupture in such a vessel as the high-pressure receiver. In addition, these low temperature vessels are generally inside buildings, and it is likely that this would further reduce the effective rate of release to the atmosphere external to the refrigeration plant.

2.3 Ammonia Gas

Finally, there is ammonia gas (vapor) in the system under a range of temperatures and pressures. If there is a rupture in the vapor space of the high-pressure receiver (say), there will be a buoyant ammonia jet (i.e., the ammonia vapor is less dense than air). However, for a given hole size and a given pressure, the rate of release of ammonia gas is very much less than that of liquid ammonia, so that it is unlikely that a vapor release would be the worst-case.

2.4 Buildings

In many refrigeration facilities, the high-pressure receiver and other vessels will be indoors (e.g., in the compressor room). It is pertinent to ask what effect the building will have if there is a sudden release of the contents of the high-pressure receiver inside it. It might be assumed that mixing in the air in the building and subsequent relatively slow leakage through cracks or through the ventilation system will considerably mitigate the consequences of the release. However, there are several reasons why this assumption should be carefully investigated:

1) In many cases, pipework connected to the liquid space of the-high pressure receiver leads outside so that, if there is a severe leak in this pipework, the contents of the vessel will discharge through it and bypass the building.

2) In many cases, a compressor room has doors or windows on external walls of the refrigeration facility. In the worst case, it cannot be assumed that these are closed.

3) Sensitivity studies have been performed that show that, in the event of a sudden release of several tons of ammonia into a compressor room, the pressure in the room could easily rise to well in excess of 1 psig. A typical cinder block or unreinforced concrete structure will not withstand this pressure, and any windows will certainly be broken. (Note that cinder block buildings will withstand shock or blast waves that generate overpressures of 2-3 psi [FEMA, 1989]. However, the duration of the excess pressure will be much greater than for a shock wave in the case of the ammonia expansion considered here, so it is prudent to somewhat reduce the expected pressure that the building will withstand.) After the initial pressure rise, the released ammonia will mix with the air in the room. The resulting air/ammonia mixture can be very cold and cause subatmospheric pressures that would again damage the building. The foregoing observations are dependent on the amount of ammonia released and on the size of the room. However, they are true for typical ratios of room volume to released

ammonia mass. Similar results have been shown to be true for chlorine (Brighton, 1989). This issue is discussed further in Appendix C.

4) In modern systems, compressor rooms are sometimes designed with panels that blow out at overpressures of about 1 psi, to protect against explosive overpressures.

5) Notwithstanding the foregoing, the owner or operator can perform his/her own analyses if he/she can show that the building will indeed withstand the worst-case release.

3.0 MODELING THE WORST-CASE RELEASE SCENARIO

Section 2.1 of the main body of this guidance gives advice on how to choose the mass M that is released in the worst-case scenario and to estimate the distance to the toxic endpoint. That advice is consistent with the discussion in Section 2 of this Appendix.

It is pertinent to discuss the rule's requirement that all of the ammonia should be modeled as becoming and remaining airborne over a period of 10 minutes. Sections 2.1 and 2.2 of this Appendix show that the assumption that all of the ammonia becomes and remains airborne is a reasonable one for a worst-case scenario. To understand whether a release duration of 10 minutes is reasonable, consider Bernoulli's formula (CCPS, 1989) for predicting the rate of release Q(kg/s) of liquid from a vessel:

$$Q = c\rho_L A(2p_g/\rho_L+2gh)^{0.5} \qquad (3\text{-}1)$$

where:

c	=	a constant (typical value 0.6)
ρ_L	=	the density of the liquid in the vessel (639 kg/m^3 for ammonia)
A	=	the area of the orifice (m^2 - for example, the area of a hole of diameter 1" is 5.16×10^{-4} m^2)
p_g	=	the gauge pressure in the vessel (Pa - for example, 180 psig = 1.2×10^6 Pa)
g	=	the acceleration due to gravity (9.82 m/s^2)
h	=	the static head (m - negligible when the vapor pressure is as high as 180 psig)

Note that this is the formula for the release of a pure liquid and would apply to a breach in the wall of a vessel or to the rupture of a very short pipe. For long pipes, there is a pressure drop between the vessel and the orifice that leads to flashing in the pipe and a reduce rate of release (Fauske, 1985; Fauske and Epstein, 1987).

The rate of release from a ruptured pipe from a high-pressure receiver as a pressure of 180 psig is predicted to be ~ 12 kg/s ~ 1600 lb/min out of a 1" hole. Therefore, a typical mass M of 20,000 lb would be expelled in about 12 minutes. For a 2" hole, the duration of release would be 3 minutes. For an intermediate-pressure receiver at 30 psig, the predicted rates of release would be

~ 660 lb/min (1" orifice) or 2650 lb/min (2" hole), with corresponding durations of release for 20,000 lb of ammonia of 30 minutes and 7 minutes, respectively. Thus, as a "typical" release duration, 10 minutes is not unreasonable.

4.0 ALTERNATIVE RELEASE SCENARIOS

It is possible to envisage a whole host of alternative scenarios. Some of those identified from a review of past incidents in refrigeration facilities (see Appendix D) include:

- plant upsets leading to the lifting of relief valves
- leaks in rotating seals
- pipeline failures
- a blocked-in, liquid-full pipeline rupturing as it heats up
- failures during ammonia delivery, such as a hose leak

The rule suggests that the following scenarios should be considered:

1) Transfer hose releases due to splits or sudden hose uncoupling;
2) Process piping releases from failures at flanges, joints, welds, valves and valve seas, and drains or bleeds;
3) Process vessel or pump releases due to cracks, seal failure, or drain, bleed, or plug failure
4) Vessel overfilling and spill, or overpressurization and venting through relief valves or rupture disks; and
5) Shipping container mishandling and breakage or puncturing leading to a spill

In addition, active and passive mitigation systems may be considered, provided that they can be shown to withstand the cause of the release.

It is apparent that there is a great variety of more likely scenarios. However, the EPA requires that only one such scenario be identified and modeled. Many scenarios are effectively equivalent to a small orifice of diameter 1/4 - 1/2" (e.g., a gasket rupture or a pump seal leak). Therefore, one more likely scenario could be the release of ammonia at high-pressure receiver conditions through a 1/4" orifice. A typical rate of release would then be 0.75 kg/sec (100 lb/min) according to Bernoulli's formula (see Equation 3-1).

The scenario needs to be modeled in typical weather conditions. For many sites, Atmospheric Stability Category D with a moderate windspeed (e.g., 3 m/s) is close to average. Figure A-5 shows the predicted distance to the toxic endpoint as a function of release rate in these "average" weather conditions. For the 100 lb/min scenario, the distance to the toxic endpoint is ~ 1,000' on a rural site and ~ 450' on an urban site. If an owner or operator wishes to consider an orifice of a different size or a different pressure in the vessel, Equation (3-1) can be used to calculate the rate of release; Q is kg/s. Q can then be converted to lb/min by multiplying it first by 2.2 (kg → minutes). The distance to the toxic endpoint can then be estimated from Figure A-5 or from

Figure A-5 - Alternative Release in Typical Weather Conditions
Generic Guidance on Distance to Toxic Endpoint

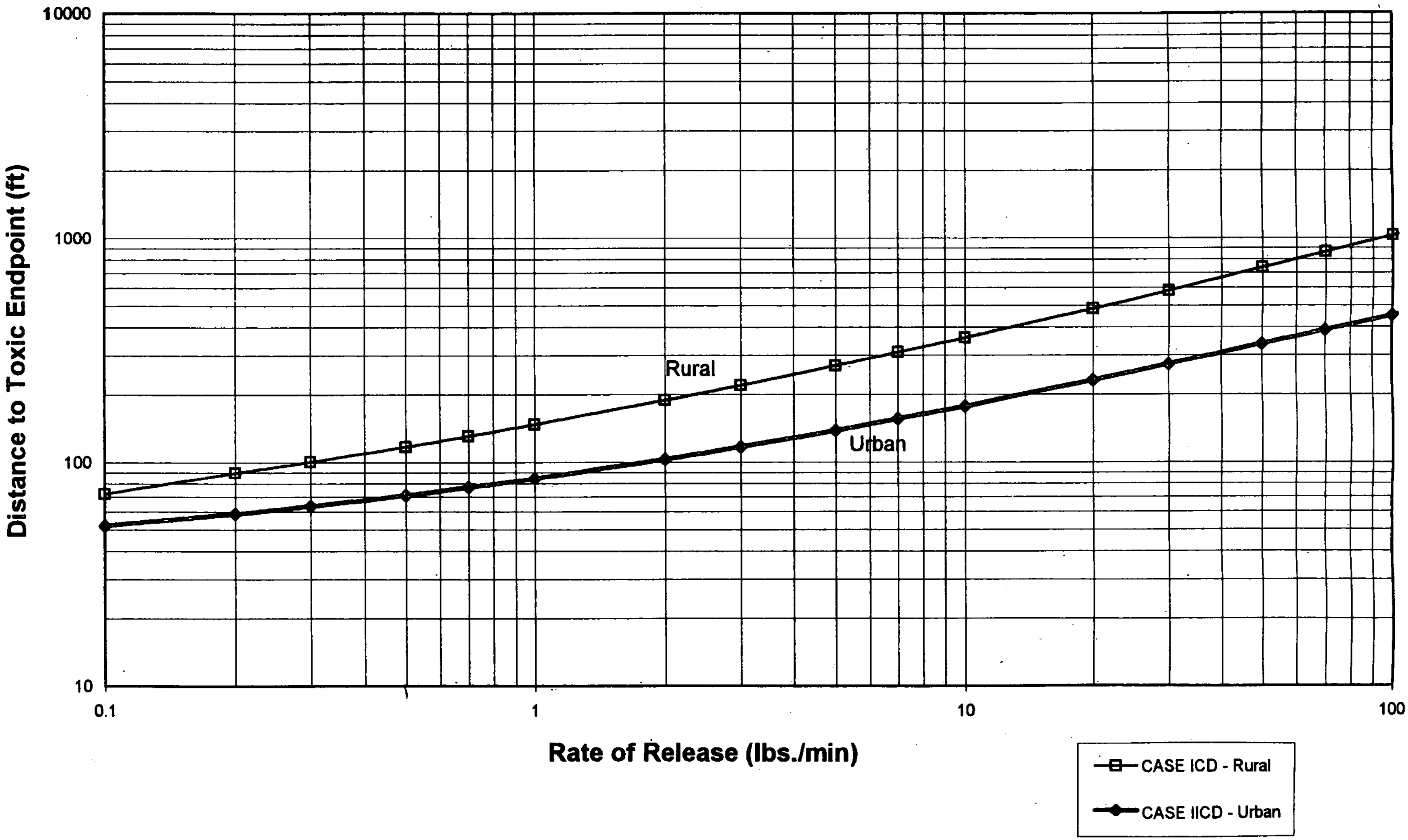


Table A-1, which is a tabulation of Figure A-5. These results could simply be quoted in the Risk Management Plan.

Notwithstanding the foregoing, the owner or operator can identify his/her own alternative scenario(s). However, remember that the regulation requires that releases that are large enough to have the potential to exceed the toxic endpoint offsite shall be considered.

5.0 GENERAL GUIDANCE ON MODELING

If the owner or operator decides to perform his/her own modeling, there are two major items that are not trivial. These are:

a) Correct characterization of the source term (e.g., rate of release, temperature, density, momentum, aerosol content, etc.)

b) Choice of a suitable dispersion model

Unfortunately, it is not possible to cover in detail all of the issues that need to be addressed, although there are sources of useful advice. The quadrennial conferences on vapor cloud dispersion modeling that are organized by the Center for Chemical Process Safety (CCPS) are a good source of information on the latest developments in source term and dispersion modeling (CCPS, 1987, 1991, 1995). There are also CCPS Guidebooks: "Guidelines for Use of Vapor Cloud Dispersion Models" (about to be issued in a revised version); "Workbook of Test Cases for Vapor Cloud Dispersion Models"; and "Guidelines for Chemical Process Quantitative Risk Analysis".

The EPA has also published useful guidance. There is one document that looks carefully at the definition of source terms (USEPA, 1993). There is another that describes the EPA's own screening model for accidental releases of accidental chemicals TSCREEN (USEPA, 1992). The EPA has also performed an evaluation of dense gas dispersion models (USEPA, 1991). Another review of available models has been given by Hanna, et. al. (1991).

Table A-1
Alternative Release in Typical Weather Conditions

Release Rate (lb/min)	Predicted Distance to Toxic Endpoint (ft.)	
	Rural	Urban
0.1	70	50
0.2	90	60
0.3	100	65
0.5	120	70
0.7	130	80
1.0	150	85
2.0	190	100
3.0	220	120
5.0	270	140
7.0	310	160
10.0	360	180
20.0	490	230
30.0	580	270
50.0	740	340
70.0	850	400
100.0	1,020	450
150.0	1,260	540
200.0	1,970	940
300.0	2,450	1,160
500.0	3,240	1,510

6.0 REFERENCES

Brighton, P.W.M. (1989). "Pressures Produced by Instantaneous Releases of Chlorine Inside Buildings," United Kingdom Health and Safety Executive Report SRD/HSE/R467, Her Majesty's Stationery Office, London.

Center for Chemical Process Safety (CCPS, 1987). "Proceedings of the International Symposium on Vapor Cloud Modeling," Boston, MA; American Institute of Chemical Engineers, New York, NY.

Center for Chemical Process Safety (CCPS, 1989). "Guidelines for Chemical Process Quantitative Risk Analysis," American Institute of Chemical Engineers, New York, NY.

Center for Chemical Process Safety (CCPS, 1991). "International Conference and Workshop on Modeling and Mitigating the Consequences of Accidental Releases of Hazardous Materials," New Orleans, LA, American Institute of Chemical Engineers, New York, NY.

Center for Chemical Process Safety (CCPS, 1995). "International Conference and Workshop on Modeling and Mitigating the Consequences of Accidental releases of Hazardous Materials," New Orleans, LA; American Institute of Chemical Engineers, New York, NY.

Dow Chemical Exposure Index, 1993.

Fauske, H.K. (1985). "Flashing Flows or Some Practical Guidelines on Emergency Releases," Plant/Operations Progress 4 (3 July), 132-134.

Fauske, H.K. and M. Epstein (1987). "Source Term Considerations in Connection with Chemical Accidents and Vapor Cloud Modeling," in CCPS (1987).

Federal Emergency Management Agency (FEMA, 1989). "Handbook of Chemical Analysis Procedures," Washington, DC

Goldwire, Jr., H.C., T.G. McRae, G.W. Johnson, D.L. Hipple, R.P. Koopman, J.W. McLure, L.K. Morris and R.T. Cederwall (1985). "Desert Tortoise Series Data Report - 1983 Pressurized Ammonia Spills," Lawrence Livermore National Laboratories Report UCID-20562, Livermore, CA.

Hanna, S.R., D.G. Strimatis and Joseph C. Chang (1991). "Uncertainties in Hazardous Model Gas Predictions," in CCPS (1991), pp. 345-368.

Ianello, V., P.H. Rothe, G.B. Wallis, R. Diener and S. Schreiber (1989). "Aerosol Research Program: Improved Source Term Definition for Modeling the Ambient Impact of Accidental Release of Hazardous Liquids," 6th International Symposium on Loss Prevention and Safety Promotion in the Process Industries, June, 1989, Oslo, Norway.

Johnson, D.J. (1991). "Prediction of Aerosol Formation from the Release of Pressurized, Superheated Liquids to the Atmosphere," in CCPS (1991).

Kaiser, G.D. (1989). "A Review of Models for Predicting the Dispersion of Ammonia in the Atmosphere," Plant/Operations Progress, January, 1989, pp. 58-64.

United States Environmental Protection Agency (USEPA, 1991). "Evaluation of Dense Gas Simulation Models," EPA-450/R-89-018, Research Triangle Park, NC.

United States Environmental Protection Agency (USEPA, 1992). "Workbook on Screening Techniques for Assessing Impacts of Toxic Air Pollutants (Revised)," EPA-454/R-92-004, Research Triangle Park, NC.

United States Environmental Protection Agency (USEPA, 1993). "Contingency Analysis for Superfund Sites and Other Industrial Sources," EPA-454/R-93-001, Research Triangle Park, NC.

Woodward, J.L and A. Papadourakis (1991). "Modeling of Droplet Entrainment and Evaporation in a Dispersing Jet," in CCPS (1991), pp. 147-167.

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BACKGROUND INFORMATION AND DISCUSSION PAPER DEVELOPMENT OF GUIDANCE ON ATMOSPHERIC DISPERSION MODELING FOR ANHYDROUS AMMONIA REFRIGERATION FACILITIES

1.0 INTRODUCTION

Sensitivity studies were performed for developing guidance on atmospheric dispersion modeling for anhydrous refrigeration ammonia facilities, such as that given on Figure 2-1.

A plausible worst-case release for many facilities was assumed to be the accidental release of the liquid contents of a high-pressure receiver, or of pipework connected to the liquid space of the high-pressure receiver, or of a similar vessel such as an ambient temperature storage vessel. Further, it was assumed that the release takes place over 10 minutes per the requirements of §68.22 of the rule. For this scenario, SAIC's SACRUNCH model has been used. It was decided to use SACRUNCH because it does a reasonable job of making predictions that are in agreement with experimental data (e.g., the large-scale ammonia experiments known as "Desert Tortoise") and can easily be used to perform the required sensitivity studies. Further information on SACRUNCH and associated models is available upon request (SAIC, 1994). The fact that SACRUNCH was used is in no way intended to imply that EPA endorses or favors it. On the contrary, the guidance provided on, for example, Figure 2-1 and Table 2-1 of the main body of this report, can be used without reference to any atmospheric dispersion model.

However, note that the results of SACRUNCH and associated computer models have been accepted in a number of regulatory applications. These include acceptance by some Administering Agencies in California in the context of that State's Risk Management and Prevention Program. In addition, the New Jersey Department of Environmental Protection has accepted the models as suitable for use in satisfying the requirements of the New Jersey Toxic Catastrophe Prevention Act.

Distances to the 200 ppm (the ERPG-2[1]) toxic endpoint for various conditions were calculated, again as required by §68.22. The results are discussed below and are illustrated with figures. The text in the legends lists the assumption for each curve. Table B-1 gives the description of each sensitivity study.

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[1] *ERPGs are defined by the American Industrial Hygiene Association. ERPG-2 is the maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms which could impair an individual's ability to take protective action.*

Table B-1: Description of Sensitivity Studies[2]

CASE	DESCRIPTION
I	Continuous, flashing rural release, constant toxic endpoint, F Stability, 1 m/s windspeed, no deposition
ICD	Continuous, rural release over 1 hour, constant toxic endpoint, D Stability, 4 m/s windspeed, no deposition
IP	Instantaneous, flashing rural release, constant toxic endpoint, F Stability, 1 m/s windspeed, no deposition
II	Continuous, flashing urban release, constant toxic endpoint, F Stability, 1 m/s windspeed, no deposition
IICD	Continuous, flashing urban release over 1 hour, constant toxic endpoint, F Stability, 1 m/s windspeed, no deposition
IIP	Instantaneous, flashing urban release, constant toxic endpoint, F Stability, 1 m/s windspeed, no deposition
III	Continuous, flashing rural release, constant toxic endpoint, F Stability, 1 m/s windspeed, deposition
IIIP	Instantaneous, flashing rural, release, constant toxic endpoint, F Stability, 1 m/s windspeed, deposition
IV	Continuous, flashing rural release, time-varying toxic endpoint, F Stability, 1 m/s windspeed, no deposition
IVP	Instantaneous, flashing rural release, time-varying toxic endpoint, F Stability, 1 m/s windspeed, no deposition
V	Continuous, flashing rural release, time-varying toxic endpoint, F Stability, 1 m/s windspeed, deposition
VP	Instantaneous, flashing rural release, time-varying toxic endpoint, F Stability, 1 m/s windspeed, deposition
VI	Continuous, flashing urban release, time-varying toxic endpoint, F Stability, 1 m/s windspeed, No deposition
VIP	Instantaneous, flashing urban release, time-varying toxic endpoint, F Stability, 1 m/s windspeed, no deposition
VII	Continuous, initially passive rural release, constant toxic endpoint, F Stability, 1 m/s windspeed, no deposition
VIII	Continuous, initially passive rural release, constant toxic endpoint, F Stability, 1 m/s windspeed, deposition
IX	Continuous, initially passive rural release, time-varying toxic endpoint, F Stability, 1 m/s windspeed, deposition
X	Continuous, initially passive urban release, constant toxic endpoint, F Stability, 1 m/s windspeed, no deposition
XI	Continuous, initially passive urban release, time-varying toxic endpoint, F Stability, 1 m/s windspeed, no deposition

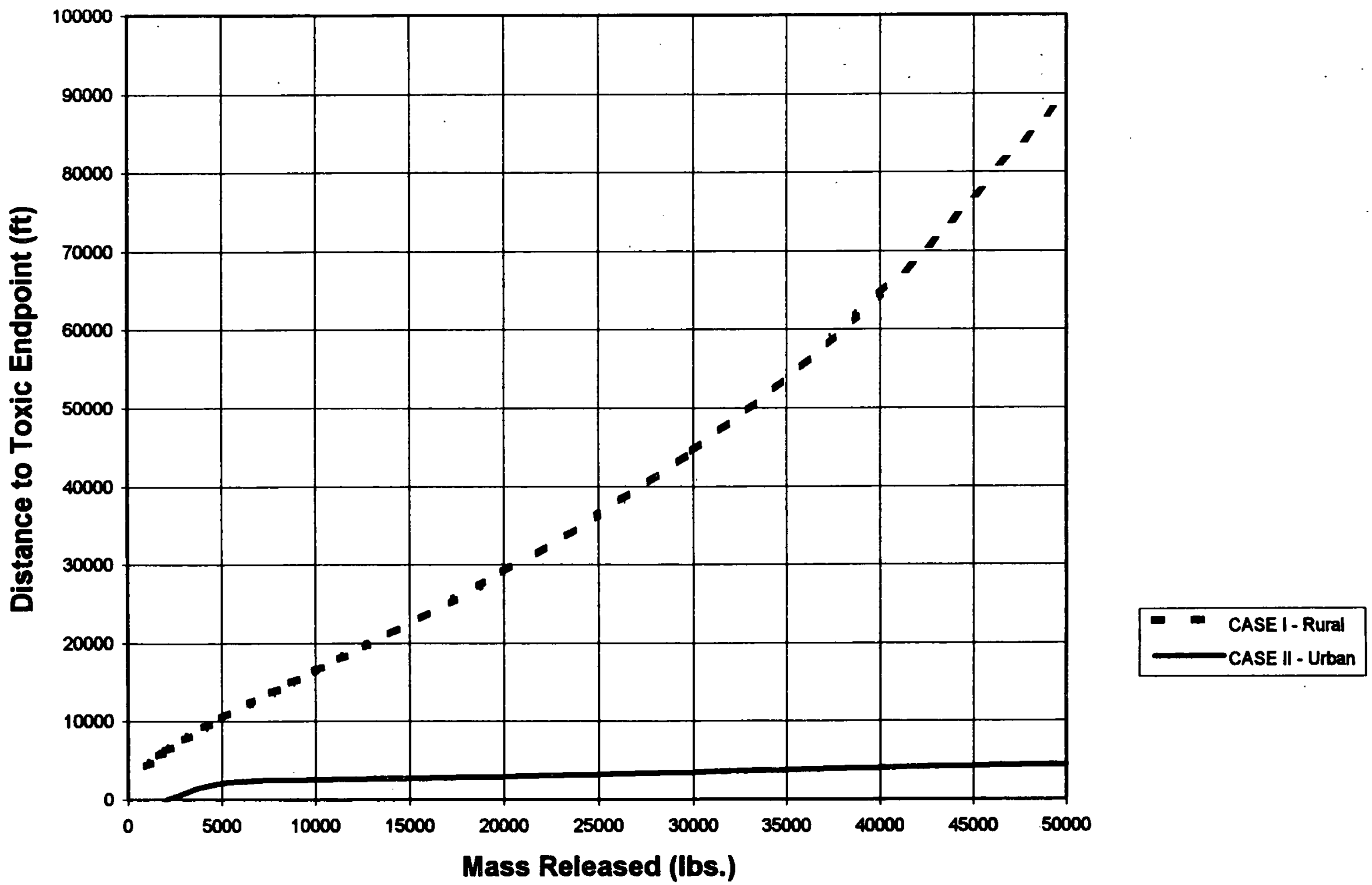
2.0 RESULTS AND SENSITIVITY STUDIES - WORST-CASE RELEASE

Figure B-1 shows the results of modeling a flashing liquid ammonia release over 10 minutes in the Category F Stability Class with a wind speed of 1.5 meter/second and an ambient temperature of 25°C (77°F). The distance to the 200 ppm toxic endpoint is plotted for different release masses.

Figure B-1 shows curves for both urban and rural areas. Note that, in SACRUNCH, in the far field, the urban and rural models asymptotically become identical to the Gaussian models in the

[2] *Release duration is 10 minutes, unless otherwise stated.*

Figure B-1 - Worst-Case Ammonia Release over 10 minutes, Constant Toxic Endpoint, No Deposition



Green Book (USEPA, 1987). In an urban area, where there is additional turbulence due to buildings and heat sources, the rate of dilution of the cloud is higher than in a rural one. Thus, a given release in an urban area results in lower concentrations than in a rural area. The differences in the concentrations at a given distance downwind can be quite dramatic and span a range of an order of magnitude, as Figure B-1 demonstrates. Figure B-1 has been prepared because it is a potential candidate for use in the generic RMP as guidance for finding distances of toxic endpoints for worst-case scenarios. However, the rural case on Figure B-1 is potentially too conservative to use, as is explained in the following.

Sensitivity studies were performed by perturbing factors, such as dry deposition[3] and a time-varying toxic endpoint [4]. The results are shown on Figure B-2. For convenience in comparing, the results on Figure B-1 are superimposed on Figure B-2. The assumption of deposition and/or time varying concentration in a *rural* area produces results that are similar to the results assuming an *urban* area (i.e., distances within a factor of two). Since it is quite likely that deposition will occur and that a time-varying toxic endpoint is realistic, the rural case assumption is likely too conservative for most situations.

On Figures B-1 and B-2, an assumption was made that the cloud is initially dense, as is expected for ammonia that is released as a liquid from vessels in which it is stored under pressure (Kaiser, 1989: see Appendix A). Figure B-3 shows the sensitivity to the assumptions of the same factors, but for an initially passive cloud. The pattern observed on Figures B-1 and B-2, that a rural area

---

[3] ***Deposition*** *- Deposition refers to the process by which material is removed from the cloud at the ground by means of chemical reactions, gravitational settling, etc. Deposition is often expressed in terms of an empirical deposition velocity (Hanna and Hosker, 1980).* 10^{-2} *meters/second is within the range that is usually accepted for reactive vapors and is the value that has been used in the present work for illustrative purposes.*

[4] ***Constant concentration versus time-dependent concentration exposure profile*** *- The hazard level for a given chemical is sometimes given as a constant exposure value with no regard to the duration of exposure. For instance, a 200 ppm constant endpoint value has been adopted by EPA for ammonia for the purposes of the RMP. A constant time-independent exposure value is easy to use to estimate the vulnerability zone. However, this approach may be too simplistic because it is erroneous to believe that a constant exposure concentration will have the same effect on exposed individuals regardless of exposure duration. In other words, if the exposure time is reduced (in a puff, for instance), then the concentration endpoint ought to be appropriately scaled up so as to produce the same health response. Needless to say, constant exposure values can be highly conservative, as they give no credit for short exposure duration. The discussion herein elaborates on this issue by assuming Haber's law for time-varying concentration (modified by a factor of two for short durations; details can be supplied upon request). Haber's law states that a given health effect is caused by a constant dose (USEPA, 1987).*

Figure B-2 - Worst-Case Ammonia Release over 10 minutes Sensitivity Studies

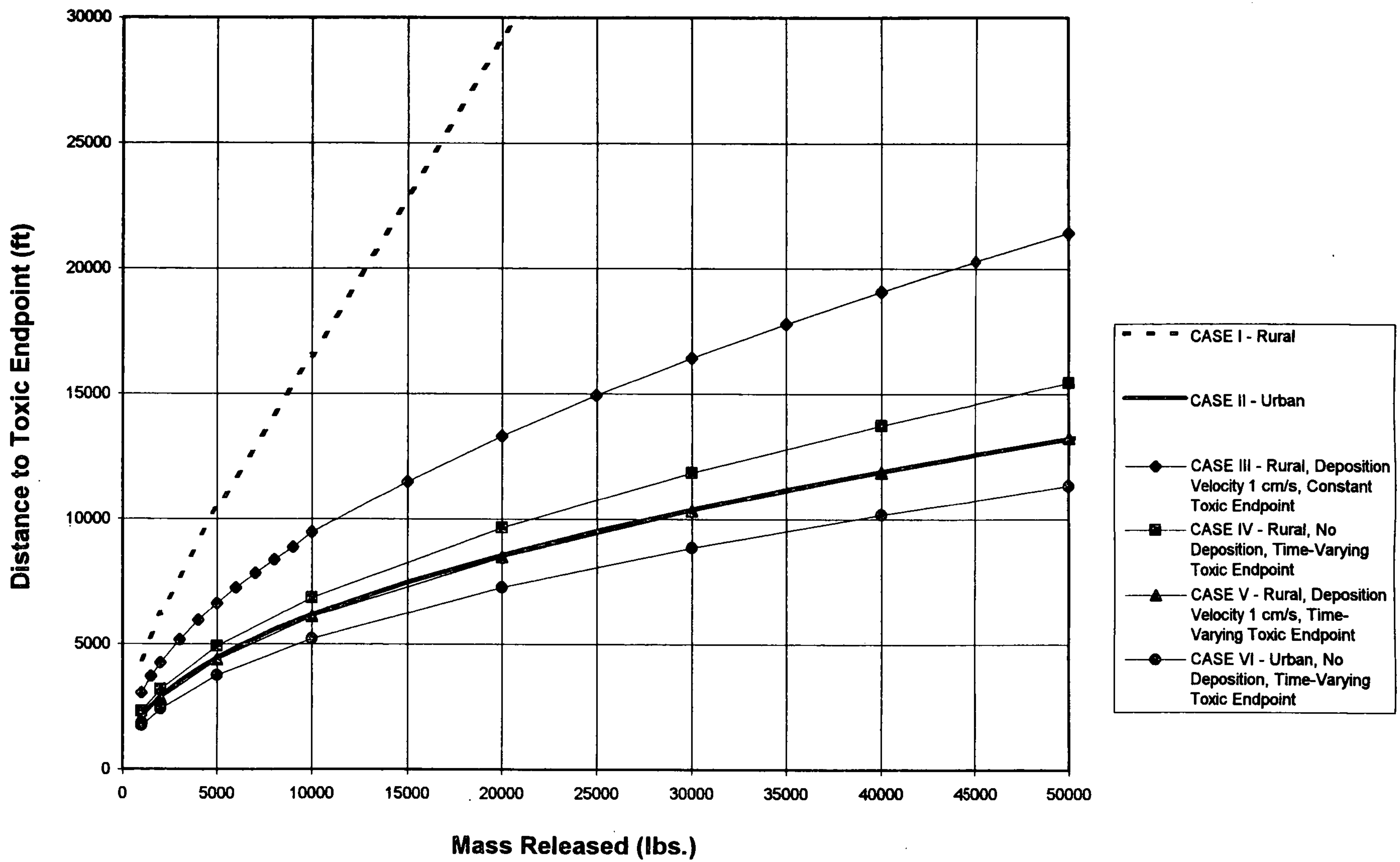
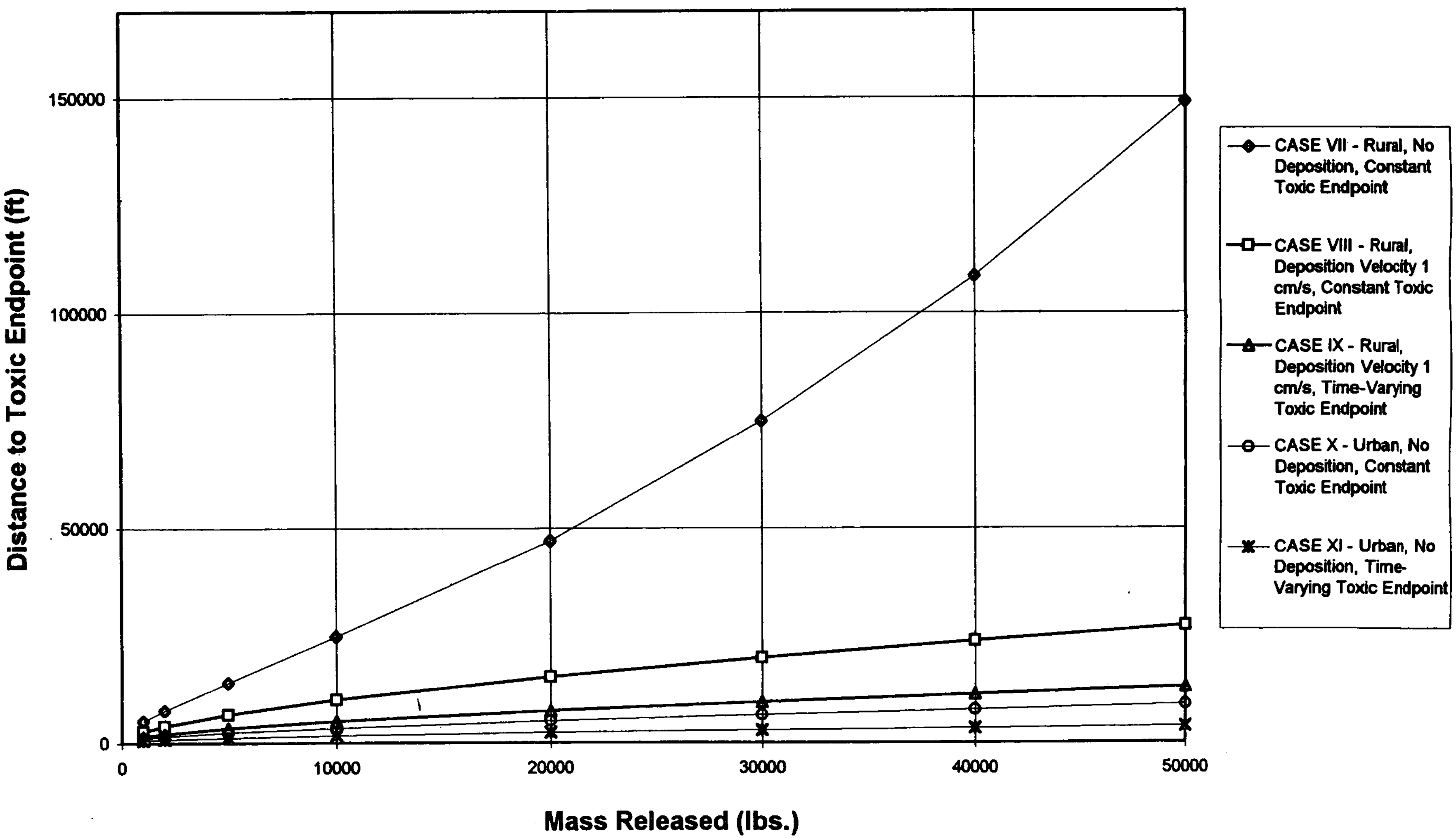


Figure B-3 - Worst-Case Ammonia Release over 10 minutes, Initially Passive Case, Sensitivity Studies



assumption with no dry deposition and constant concentration is far too conservative, is evident in this case also.

Figures B-1, B-2 and B-3 show results of continuous releases. Figure B-4, on the other hand, shows results for an instantaneous puff release. Figures B-1 and B-2 were for continuous releases of 10 minutes duration because that is what is required by the regulations. However, a puff release could be equally plausible as a worst-case release, and, in any event, a release of 10 minutes duration will evolve into a puff in the far field. Figure B-4 also makes it evident that the rural continuous model case, without any mitigating assumptions such as deposition, may be far too conservative. SAIC's SADENZ model was used for modeling instantaneous releases.

Figure B-5 gives a comparison between the continuous and instantaneous release cases for urban and rural areas. Figure B-5 confirms two points: (1) the rural case is the most conservative, and (2) the rural continuous release case is more conservative than the rural instantaneous "puff" case. The reason for the latter observation is that the puff is allowed to elongate along the wind direction in SADENZ, whereas the continuous release model is treated as a fixed-length "slug".

The overall conclusion is that, for worst-case release modeling, "unmitigated" rural modeling is far too conservative. With reasonable assumptions, the rural plots collapse until they are not too far away from urban ones. Figure B-6 has been chosen for the generic guidance (Case II and Case III from Figure B-2). It is identical to Figure 2-1 in Section 2 of the main body of this report. These cases envelope the sensitivity studies on Figure B-1 through B-5. Note that, in choosing the cases that are presented on Figure B-6, the use of judgment was required (i.e., that it is reasonable to choose guidance that envelopes reasonable sensitivity studies). Given the uncertainties in source term and atmospheric dispersion modeling, there is no means of arriving at a unique choice for the guidance. The above extensive discussion is intended to demonstrate that care and thought has been given to the preparation of Figure B-6.

3.0 ALTERNATIVE RELEASES

Smaller orifices in pipework or vessels are more likely. In such scenarios, the *rate* of release is important rather than the total *mass* released.

The "more likely" scenarios should also be modeled in "average" weather conditions. As an example, Figure B-7 shows the distance to the 200 ppm level as a function of release rate in Category D stability class and a wind speed of 3 meters/second. If deposition were included, it would not be a significant factor because in Category D, the predicted ground-level concentration is smaller than that in Category F, thus, deposition in Category D is smaller. Figure B-7 is identical to Figure A-4 in Appendix A.

4.0 CONCLUSIONS

The main observation from the above sensitivity studies is that the rural area assumption for the worst-case release is likely too conservative. An understanding of the modeling assumptions with regard to (1) rural versus urban dispersion, (2) deposition, (3) constant versus time-dependent

Figure B-4 - Worst-Case Instantaneous Ammonia Release Sensitivity Studies

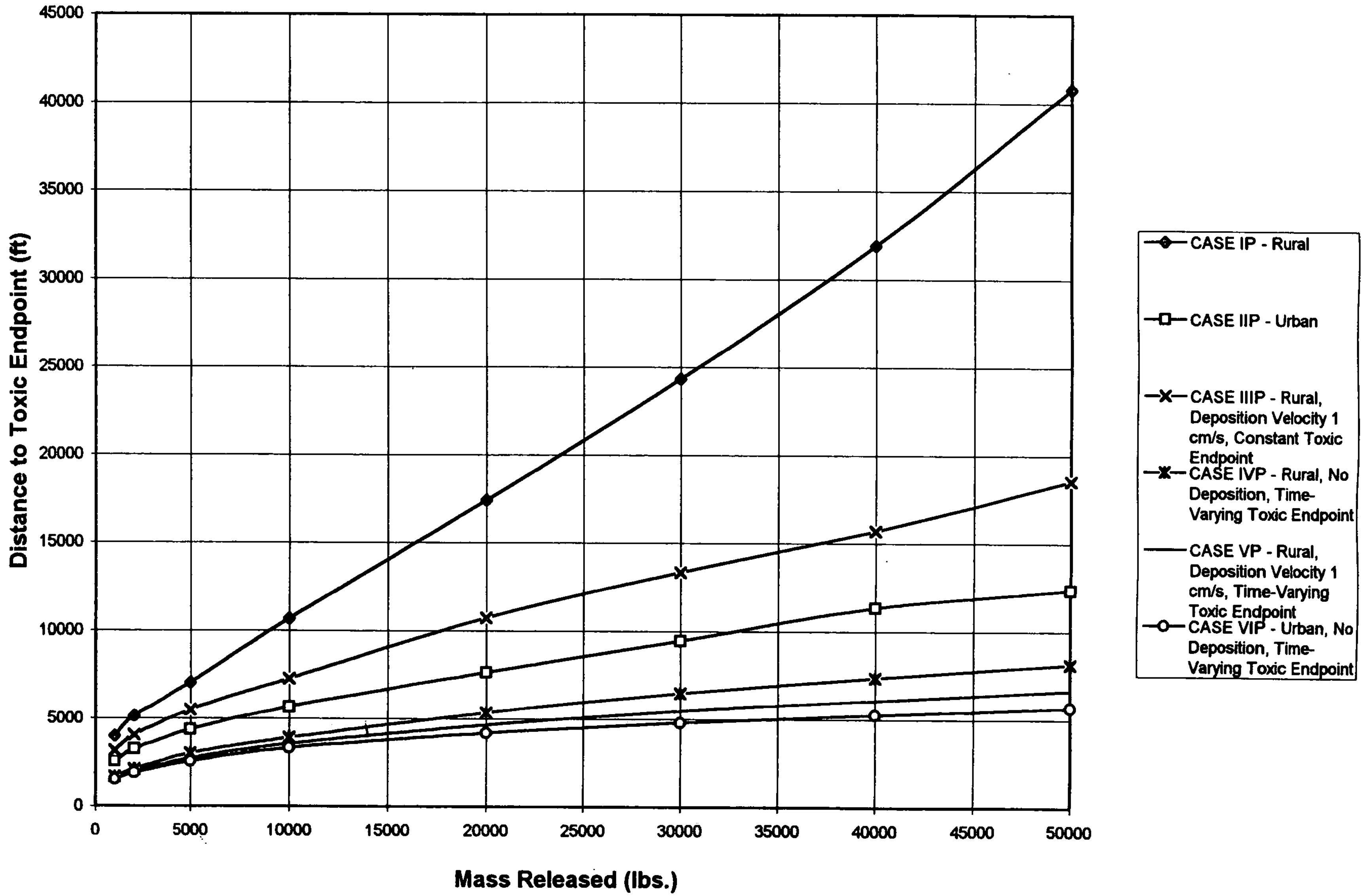


Figure B-5 - Worst-Case Ammonia Release
Comparison of Instantaneous and 10-minute Cases

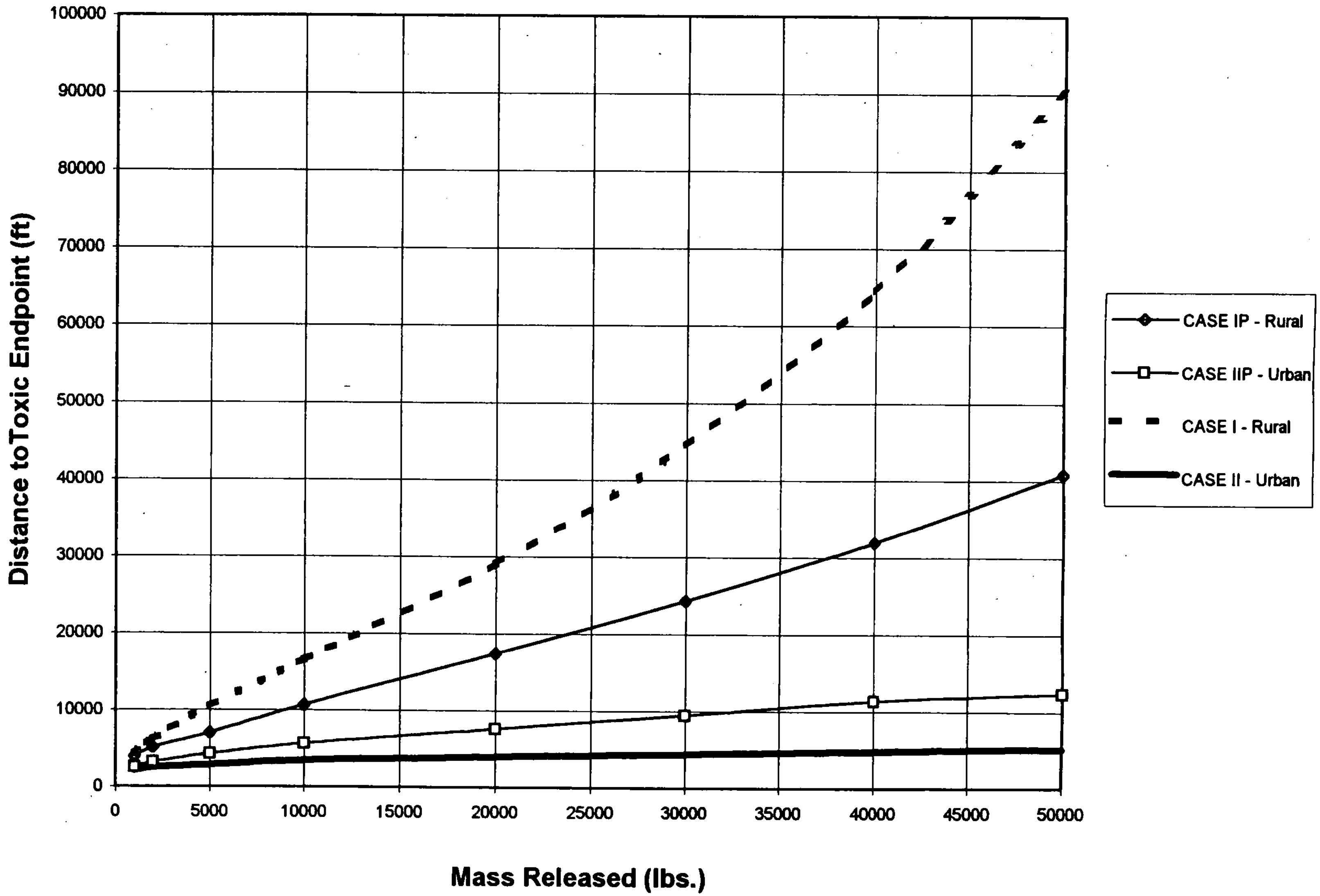


Figure B-6 - Worst-Case Ammonia Release over 10 minutes
Generic Guidance on Distance to Toxic Endpoint

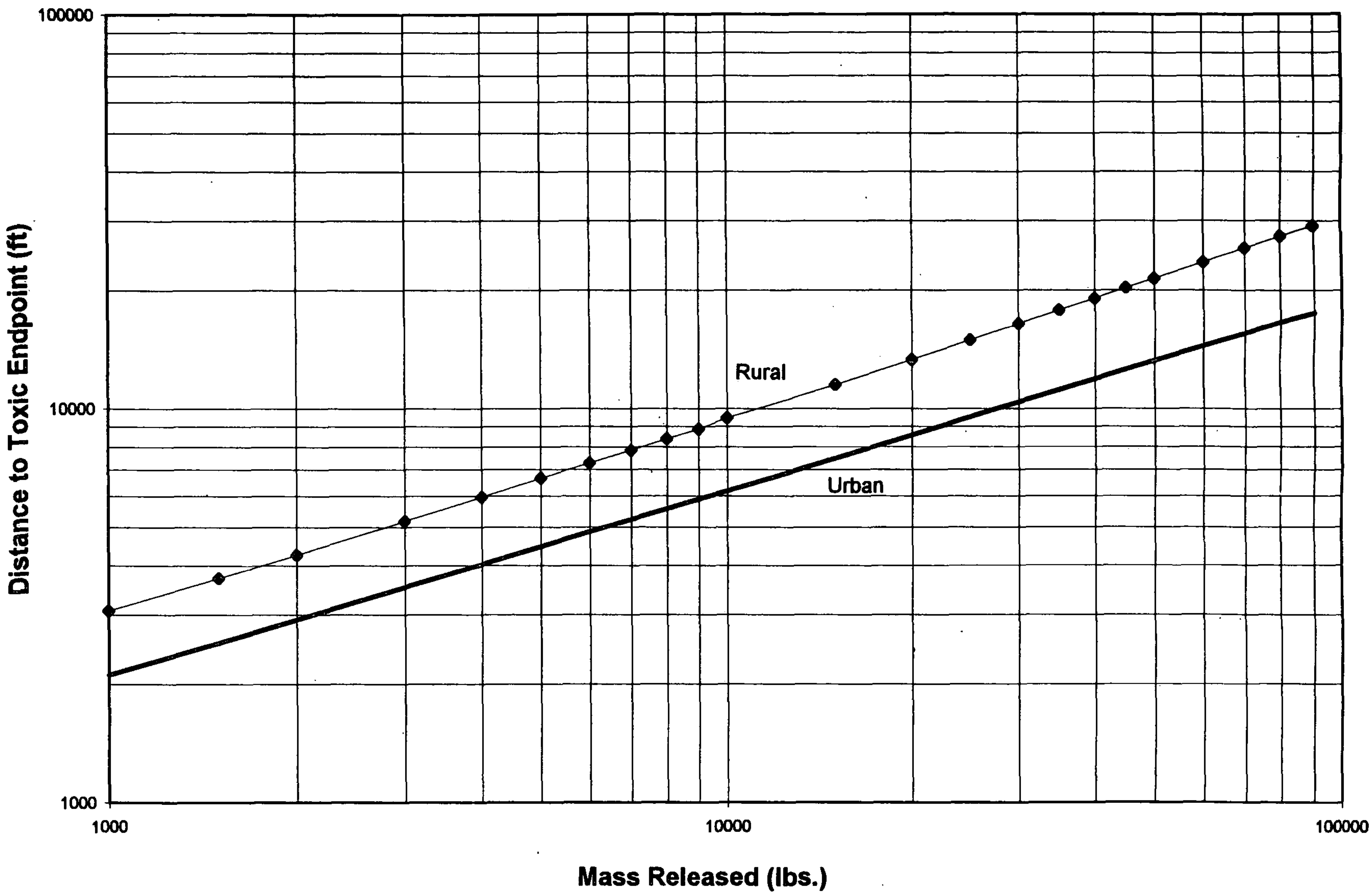
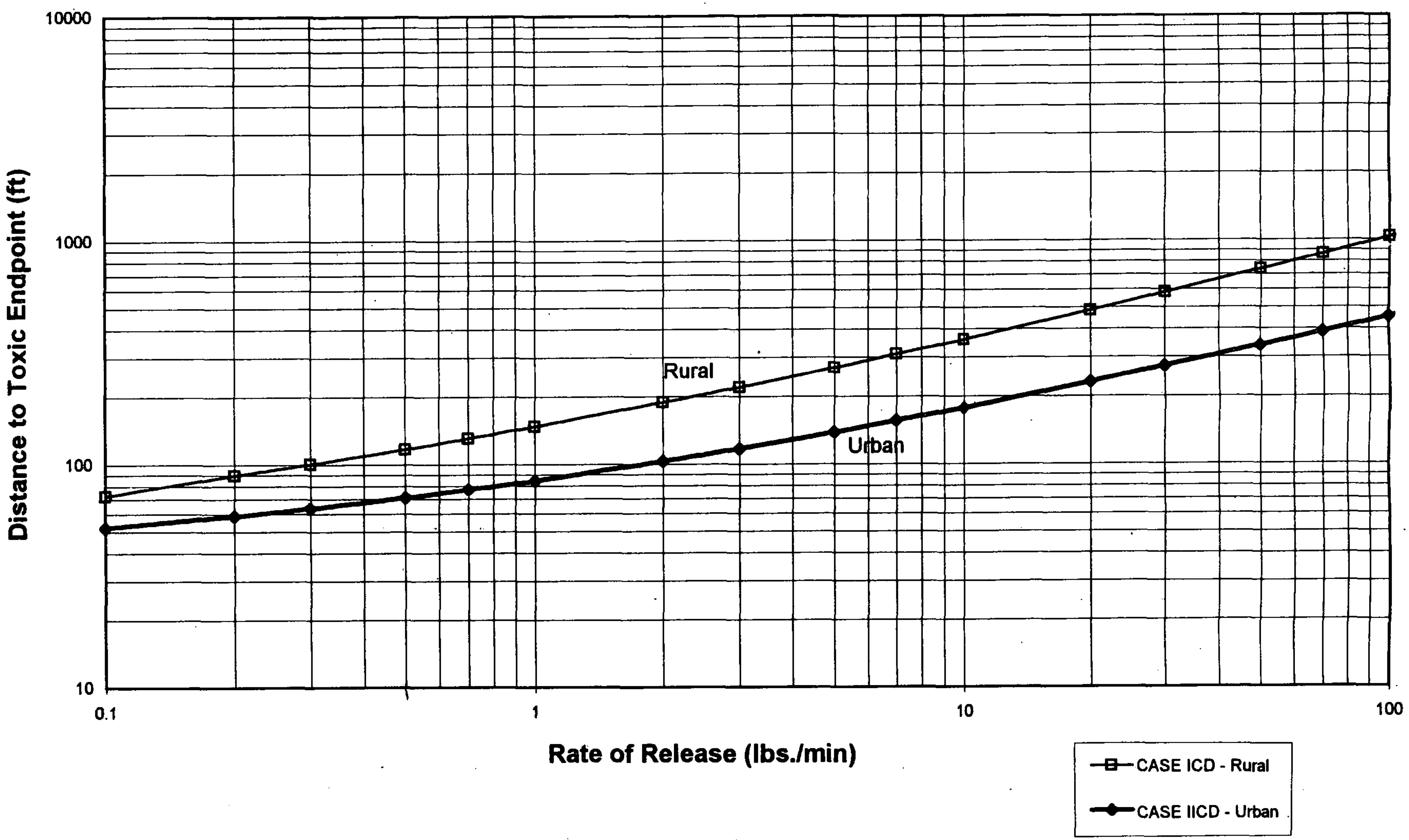


Figure B-7 - Alternative Release in Typical Weather Conditions
Generic Guidance on Distance to Toxic Endpoint



toxic endpoint, and (4) continuous vs. puff releases, is necessary for realistic modeling. There are other conservatisms that have been neglected, e.g., mixing in the building wake of a typical refrigeration facility and the fact that the worst-case weather condition will likely not persist while the vapor cloud travels large distances. An attempt has been made to take these issues into account in providing guidance for the atmospheric dispersion modeling for anhydrous ammonia facilities (see Figure B-6).

5.0 RESPONSES TO COMMENTS

5.1 Use of SACRUNCH and Associated Models

Some reviewers expressed concern that the hazard assessment guidance has been developed using proprietary models (SAIC, 1994). As noted above, these were adopted for ease and convenience in the performance of sensitivity studies; the final product (the guidance in Chapter 2 of the main body of the report) can and should be used without reference to any model. In addition, the "General Guidance on Modeling" in Section 5.0 of Appendix A gives reference to a whole host of other models that can be used. Therefore, this guidance does not imply any bias towards any particular model.

In order to further address this concern, the International Institute of Ammonia Refrigeration (IIAR) sponsored independent analyses, one with DEGADIS and one with ALOHA.

5.1.1 DEGADIS

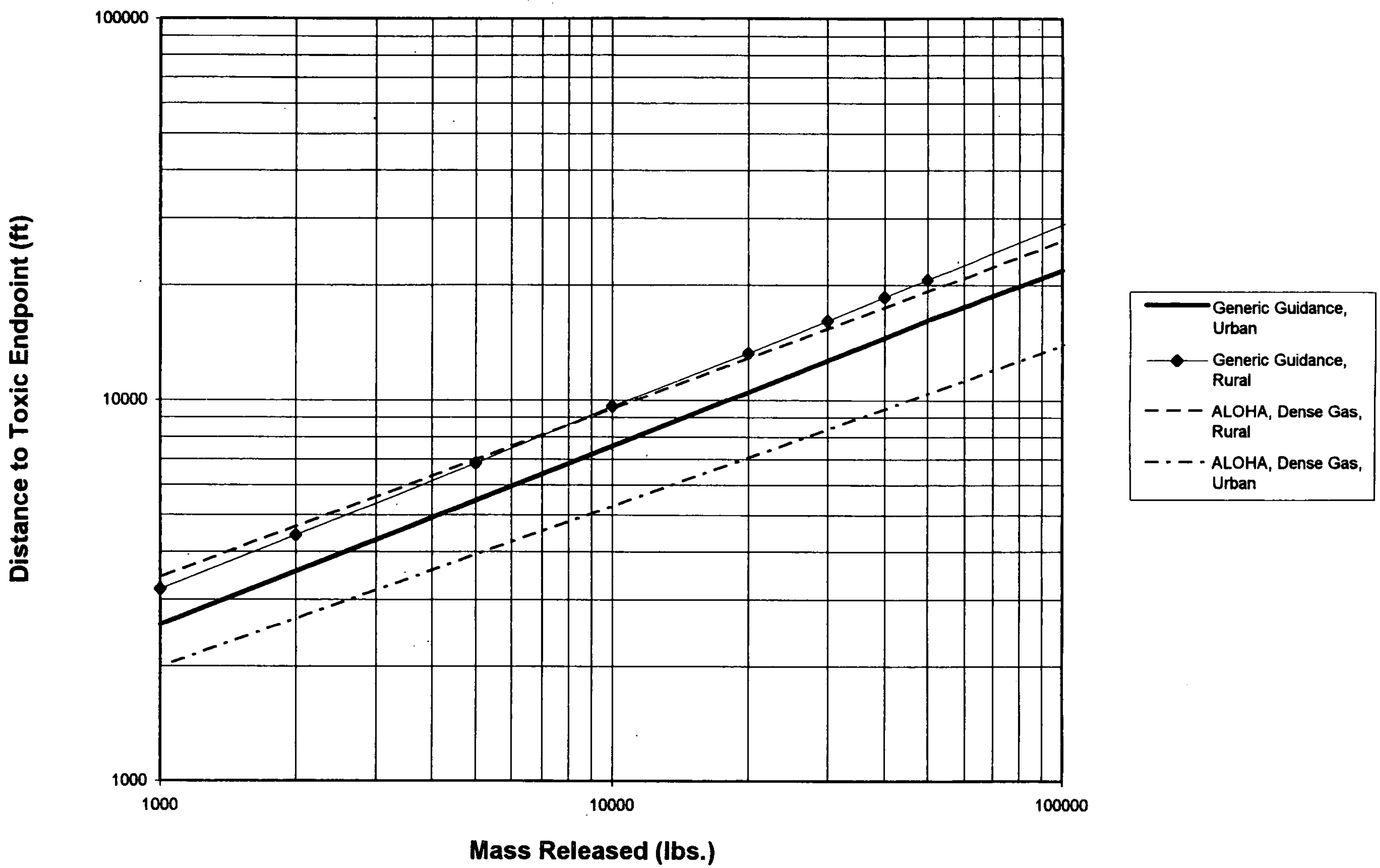
IIAR's consultant performed a number of DEGADIS (USEPA, 1989) analyses of the consequences of the release of 5,000 pounds of anhydrous ammonia over a period of 10 minutes in worst-case weather conditions. The results of these studies, and the input assumptions, were carefully reviewed with IIAR's consultant, who eventually concluded that he could reproduce the generic guidance to within 5 to 10%, and that the assumptions made in developing the guidance are reasonable.

5.1.2 ALOHA

Another of IIAR's consultants used ALOHA (NOAA, 1995). A comparison between the generic guidance and ALOHA is shown on Figure B-8 for the worst-case scenarios. For the rural case, ALOHA is almost identical to the generic guidance. This good agreement is purely fortuitous. For the urban case, the ALOHA results lie about 30% below the generic guidance. Within the uncertainties expected in atmospheric dispersion modeling, these results are quite close.

IIAR's consultant also looked at the guidance for alternative scenarios (see Figure B-8). His ALOHA predictions are higher than the generic guidance for both the urban and rural cases.

Figure B-8 - Worst-Case Ammonia Release over 10 minutes
Comparison of Generic Guidance with ALOHA Model



5.1.3 Conclusion

Limited comparisons with other models do not reveal either great conservations or concerns about underprediction.

5.2 Comparison with Lookup Tables

In other documentation, EPA has produced generic lookup tables (USEPA, 1996). Figure B-9 compares the generic worst-case release scenario guidance with the lookup table guidance for dense gases. As can be seen (and as several reviewers have pointed out), the lookup table guidance gives greater distances (by factors of 1.5 to about 2 at a given mass). The computer model SLAB was used for the lookup tables. There are some reasons why the lookup tables might be expected to differ from the generic ammonia guidance:

> The generic ammonia guidance was developed using a model that is specifically able to take account of the initial aerosolization of ammonia as it is released from a pressurized vessel. For the lookup tables, SLAB was run as a generic heavy vapor model.
>
> Ammonia is highly reactive. Therefore, relatively high dry deposition velocities and relatively rapid depletion of the plume it travels downwind is to be expected. On this basis, lower predicted distances to the toxic endpoint are plausible for ammonia.
>
> The structure of the lookup tables is such that toxic endpoints cannot be exactly matched. The toxic endpoint for ammonia is 0.14 mg/L; the closest available value in the lookup tables is 0.1 mg/L, leading to some overprediction in the lookup tables.

Figure B-10 compares the generic guidance for altnerative scearios with that from the lookup tables. As for the worst-case, the lookup table guidance is somewhat higher.

6.0 REFERENCES

Briggs, G. A. (1973), "Diffusion Estimation for Small Emissions," ATDL Contribution File No. 79, Atmospheric Turbulence and Diffusion Laboratory.

Goldwire, Jr., H.C., T.G. McRae, G.W. Johnson, D.L. Hipple, R.P. Koopman, J.W. McClure, L.K. Morris and R.T. Cederwall (1985), "Desert Tortoise Series Data Report - 1983 Pressurized Ammonia Spills," Lawrence Livermore National Laboratories Report UCID-20562, Livermore, CA.

Hannah, S. R. and R. P. Hosker, (1980), "Atmospheric Removal Processes for Toxic Chemicals," ATDL Contribution File No. 80/25, Air Resources, Atmospheric Turbulence and Diffusion Laboratory, National Oceanographic and Atmospheric Administration, Oak Ridge, TN.

Kaiser, G. D. (1989), "A Review of Models for Predicting the Dispersion of Ammonia in the Atmosphere," Plant/Operations Progress, vol. 8, no. 1, pp. 58-64.

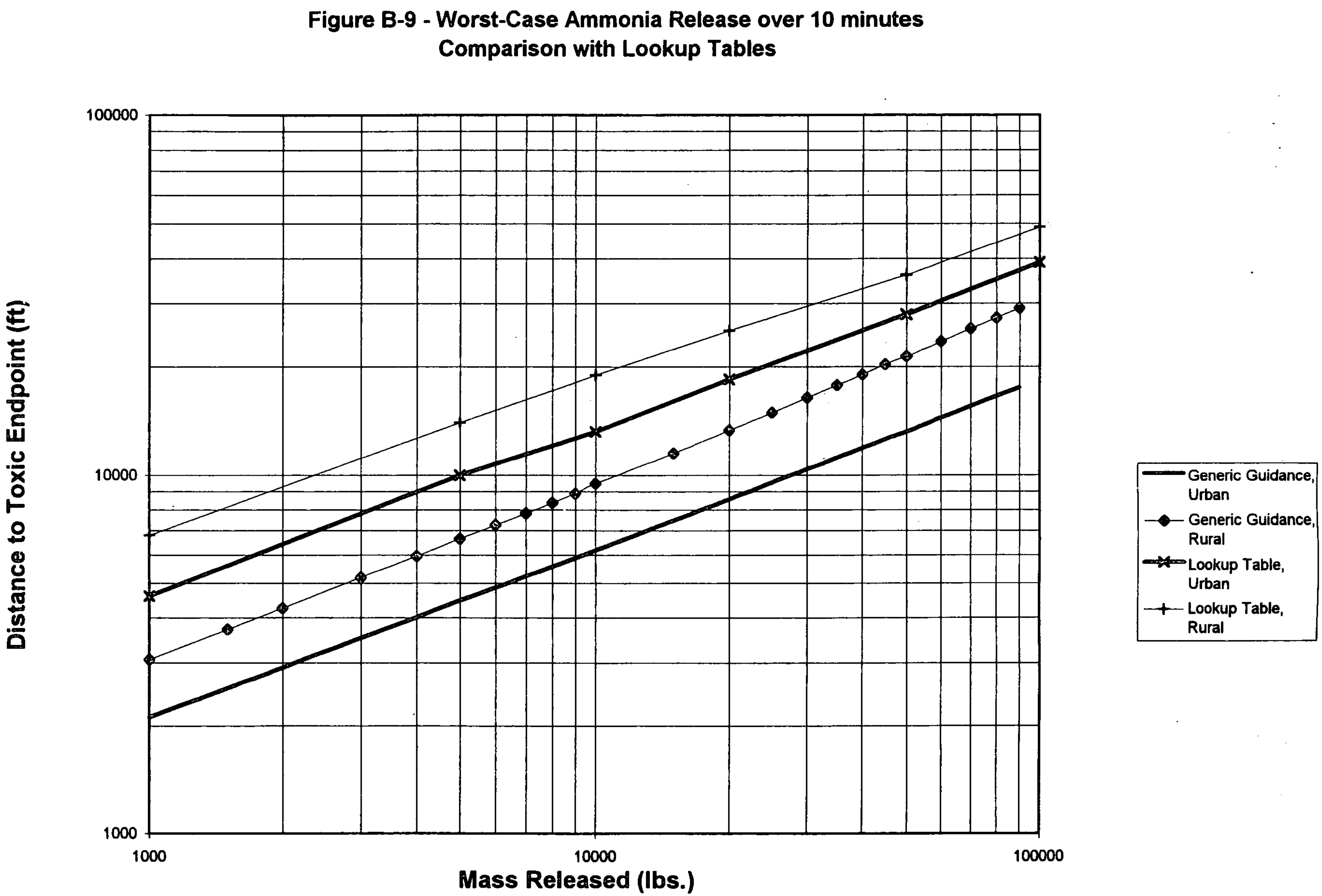


Figure B-9 - Worst-Case Ammonia Release over 10 minutes
Comparison with Lookup Tables
100000
10000
1000
1000
10000
100000
Mass Released (lbs.)
Distance to Toxic Endpoint (ft)
Generic Guidance, Urban
Generic Guidance, Rural
Lookup Table, Urban
Lookup Table, Rural

Figure B-10 - Alternative Release in Typical Weather Conditions
Comparison with Lookup Tables

National Oceanic and Atmospheric Administration (NOAA, 1995) and U.S. Environmental Protection Agency, "User's Manual for the ALOHA Model, ALOHA 5.0; Areal Locations of Hazardous Atmospheres".

SAIC (1994), "SAIC's Computer Programs for Modeling the Atmospheric Dispersion of Large Scale Accidental Releases of Hazardous Vapors in Industrial Environments - Volume I - Overview," SAIC, 11251 Roger Bacon Drive, Reston, VA 22090.

U.S. Environmental Protection Agency (USEPA, 1989), "User's Guide for the DEGADIS 2.1 Dense Gas Dispersion Model," EPA-450/4-89-019 (NTIS PB 90-213893), Research Triangle Park, NC.

U.S. Environmental Protection Agency (USEPA, 1996). "RMP Offsite Consequence Analysis Guidance," Washington, D.C.

U. S. EPA, FEMA, U. S. DOT (1987), "Technical Guidance for Hazards Analysis - Emergency Planning for Extremely Hazardous Substances".

APPENDIX C

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APPENDIX C

EFFECT OF AMMONIA RELEASES ON STRUCTURES

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APPENDIX C

LIST OF TABLES

APPENDIX C

EFFECT OF AMMONIA RELEASES ON STRUCTURES

The purpose of this appendix is to discuss the consequences of releases inside rooms, such as the compressor room. In Appendix A, Section 2.4, it was stated that "it is not easy to show that a typical building that houses compressors and vessels will effectively contain and mitigate a release of ammonia if the worst-case scenario occurs inside. Appendix C shows that, for many building configurations, the sudden loss of the contents of a high-pressure receiver (for example) would generate pressures that could not be withstood by a typical cinder block or unreinforced concrete structure".

This Appendix provides technical justification for the above statement. In addition, methods for prediction of pressures inside buildings and the rate of release to the atmosphere for prolonged releases are discussed. Important parameters include the quantity of ammonia available for release, the volume of the room, the presence of airborne liquid droplets, leakpaths in the structure and the characteristics of the ventilation system.

1.0 SUDDEN RELEASES

Worst-case scenarios for ammonia releases include catastrophic failure of storage tanks or receivers containing liquid ammonia under pressure. The presence of containment buildings will play a role in defining the conditions under which a release occurs and in controlling the rate at which ammonia is released to the atmosphere. In the case of sudden releases, forced ventilation or leakpath flow are likely to be ineffective in mitigating the initial pressure pulse, and the structure serves to enforce a constant volume constraint on the conditions of the initial release. Sudden releases occurring indoors may involve expansion of pure ammonia to pressures above atmospheric pressure and/or reduction of pressure following the mixing of ammonia and air and the subsequent evaporation cooling process. If the estimated pressure differential exceeds the design capacity of the confining structure, the structure could fail and release ammonia directly to the atmosphere.

In order to develop a conservative representation of potential conditions, sudden releases inside buildings are represented as occurring in two steps--an expansion of pure ammonia and compression of room air in the first step and mixing of ammonia with room air in the second step. This conceptual approach is similar to that applied for investigation of the release of chlorine into building containments (Brighton 1989). In the present analysis, the quantity of ammonia evaporated in the first step and the temperatures and pressures of both the ammonia and air at the end of the first step can be calculated as follows. The fraction of ammonia evaporated in the first step is estimated from an energy balance:

$$Y_1 = [C_{pl,nh3}(T_{0,nh3} - T_{1,nh3})]/\lambda_{nh3} \quad (1\text{-}1)$$

where:

Y_1	=	mass fraction of ammonia vapor at the end of the first step
$C_{pl,nh3}$	=	heat capacity of liquid ammonia, kJ/kg/K
$T_{0,nh3}$	=	temperature of stored ammonia, K
$T_{1,nh3}$	=	ammonia temperature at the end of the first step, K
λ_{nh3}	=	heat of vaporization of ammonia, kJ/kg

The temperature, pressure, and density of ammonia at the end of the first step are related by the vapor/liquid equilibrium constraint:

$$P_{1,nh3} = F_{sat}(T_{1,nh3}) \tag{1-2}$$

where:

$P_{1,nh3}$	=	equilibrium partial pressure of ammonia at temperature $T_{1,nh3}$, Pa
F_{sat}	=	equilibrium relation between pressure and temperature for ammonia

$T_{1,nh3}$ is defined as above, and the vapor/liquid equilibrium relationship is available in tabular form (ASHRAE 1981).

The volume occupied by the ammonia at the end of the first step is estimated from the mass fraction evaporated and the ammonia vapor and liquid densities at equilibrium conditions. The volume occupied by air at the end of the first step is estimated by the difference between the specified total room volume and the calculated ammonia volume. The pressure and temperature of the air at the end of the first step may then be estimated assuming isentropic compression:

$$P_{1,air} = P_{0,air}(\phi/V_{1,air})^{\gamma} \tag{1-3}$$

$$T_{1,air} = T_{0,air}(101{,}325/P_{1,air})^{(\gamma-1)/\gamma} \tag{1-4}$$

where:

$P_{1,air}$	=	absolute air pressure at the end of the first step, Pa
$P_{0,air}$	=	absolute air pressure prior to vessel failure, Pa
ϕ	=	room volume per unit mass of stored ammonia, m^3/kg
$V_{1,air}$	=	air volume at end of first step per unit mass of stored ammonia, m^3/kg
γ	=	ratio of constant pressure to constant volume heat capacities for air, dim
$T_{1,air}$	=	air temperature at the end of the first step, K
$T_{0,air}$	=	air temperature prior to vessel failure, K

The unknown mass fraction of ammonia evaporated and the ammonia and air temperatures and pressures are calculated from the above four equations and the constraint of equal ammonia and air pressures at the end of the first step.

Following the initial ammonia expansion/air compression, the gases mix at constant pressure and additional evaporation and associated reduction in temperature occurs. An energy balance for this process may be expressed as:

$$\begin{aligned}&\{Y_2[C_{pv,nh3}(T_2-T_r)+\lambda_{nh3}] + (1-Y_2)C_{pl,nh3}(T_2-T_r) + \\ &\phi C_{p,air}(T_2-T_r)\} - \{Y_1[C_{pv,nh3}(T_1-T_r)+\lambda_{nh3}] + \\ &(1-Y_1)C_{pl,nh3}(T_1-T_r) + \phi C_{p,air}(T_1-T_r)\} = \phi(P_2-P_1)\end{aligned} \tag{1-5}$$

where:

Y_2	=	mass ratio of ammonia vapor to total ammonia at end of step 2, dim
$C_{pv,nh3}$	=	heat capacity of ammonia vapor at constant pressure, kJ/kg/K
$C_{p,air}$	=	heat capacity of air at constant pressure, kJ/kg/K
T_2	=	mixture temperature at end of step 2, K
P_2	=	mixture absolute pressure at end of step 2, Pa
T_r	=	reference temperature, K

and all other variables are as defined above. The pressures appearing in this equation can be eliminated in favor of temperatures using the ideal gas law applied to both ammonia and air. In this form the equation can be solved directly for final temperature (T_2) if all the ammonia is evaporated in the mixing process. If some ammonia remains in the liquid state, the energy balance is solved simultaneously with the vapor/liquid equilibrium relation to determine the conditions at the end of the mixing process.

Potential conditions which could be encountered were established for sudden failure of a tank of liquid ammonia for the expected range of the ratio of room volume to stored ammonia mass (ϕ). Initial ammonia conditions were a temperature of 310 K (98°F) and a pressure of 1.4 MPa (206 psia). Final conditions predicted for the expansion/compression (Y_1, T_1 and P_1 for step 1) and mixing processes (Y_2, T_2, and P_2 for step 2) are presented on Table C-1. For rooms at the lower end of the range of expected volumes (i.e., 500 m^3), ammonia inventories analyzed ranged from 10 to 1,000 kg. For rooms at the upper end of the expected range (i.e., 10,000 m^3), ammonia inventories analyzed ranged from 200 to 20,000 kg. The results indicate that under many circumstances, either the step 1 overpressure or the step 2 underpressure would cause significant damage or failure of most structures. Only at the largest room volume to ammonia mass ratios are predicted pressure deviations small enough to support the position that the building would contain the release. This conclusion is based on adoption of an over/underpressure failure criterion of 6,895 Pa (1 psia). Shattering of concrete or cinder block walls is reported for explosion overpressures on the order of 13,900 Pa (2 psia) (Lees, 1980, p. 594). Because resistance of structures to forces decreases with an increase of duration of application, the failure threshold for the predicted ammonia release over/underpressures is approximately a factor of 2 less than that expected for explosion effects (Lees 1980, p. 579). Effects of explosions, such as shattering of small windows at overpressured 700 Pa (0.1 psia) and large windows at overpressured 3,500 Pa (0.5 psia) (Lees, 1980, p. 579) are also expected for ammonia release events.

Table C-1

Predicted Conditions for Sudden Releases of Ammonia Inside Buildings

	Step 1: Expansion/Compression			Step 2: Mixing		
ϕ (m^3/kg)	T_1 (K)	P_1* (Mpa) [psig]	Y_1 (dim.)	T_1 (K)	P_1* (Mpa) [psig]	Y_1 (dim.)
0.5	250	0.165 [9.24]	0.205	232	0.145 [7.34]	0.304
1.0	246	0.137 [5.17]	0.218	223	0.113 [1.69]	0.364
2.0	244	0.124 [3.29]	0.225	215	0.094 [-1.06]	0.456
5.0	241	0.109 [1.11]	.0234	208	0.082 [-2.80]	0.687
10.0	241	0.105 [0.53]	0.237	203	0.076 [-3.67]	1.0
20.0	240	0.103 [0.24]	0.238	252	0.088 [-1.93]	1.0
50.0	240	0.102 [0.10]	0.239	285	0.096 [-0.77]	1.0

* Negative values of gauge pressure indicate subatmospheric or vacuum pressure condition.

2.0 PROLONGED RELEASES

Gradual releases of ammonia may not be capable of producing the pressure differentials predicted for instantaneous releases. Over periods on the order of 10 minutes, ammonia may escape through leakpath and ventilation system flowpaths at rates large enough to relieve the initial pressure disturbance. The potential magnitude of this behavior was investigated for a leakpath flow which would produce a room change-over rate of one-half volumes per hour at undisturbed flow conditions. This assumption does not preclude the possibility that there may be significantly different change-over rates to be investigated on a case-by-case basis. The approach applied was to estimate leakpath resistance factors for representative conditions and use these resistance factor estimates to evaluate the building pressure response to a specified rate of ammonia release from a vessel inside the building.

Wind flowing directly towards the long side of a building produces an over-pressure on the upwind face and under-pressures on the side- and down-wind faces. For a given windspeed, the pressure differential may be estimated using correlations based on experimental data (Blevins, 1984). The pressure differential may then be used in conjunction with the assumed normal condition leakage rate to estimate resistances for the in- and out-leakage paths. This leakage resistance calibration procedure also assumed that the cross-sectional area of each leakpath was proportional to the length of the building, and that building length was twice building width. Leakpath resistance factors estimated in this manner were used in a ventilation system accident analysis computer model to evaluate room temperature, pressure and leakage flows for given mass injection rates. The computer code used for this analysis, FIRAC (Gregory and Nichols, 1986), is a node/branch network model in which nodes represent rooms and branches represent ducts, blowers and filters. In this case, leakpaths were modeled as ducts of small size, and the ammonia release was represented as mass injection with associated evaporative energy loss.

Potential conditions which could be established were investigated for a 10-minute release of liquid ammonia stored at 310 K (98°F) and 1.4 MPa (206 psia). The simulation estimated the ammonia injection rate required to produce an overpressure large enough to threaten structural integrity. An overpressure value of 6,895 Pa (1 psia) was adopted for this criterion. Release modeling predicted immediate evaporation of approximately 20% of the ammonia flow with subsequent evaporation of the remaining mass. High-accident condition leakpath flows were predicted for room volumes from 500 to 10,000 m^3 with 6,710 kg/10 min (14,790 lb/10 min) required to produce the 6,895 Pa (1 psia) overpressure for the 500 m^3 room. Very large release rates were required to approach the overpressure criterion for rooms in the 1,000 to 10,000 m^3 range.

3.0 SUMMARY OF CONCLUSIONS

Worst-case releases of ammonia inside buildings could occur as sudden releases in which case analysis of the expected range of building volumes (500 to 10,000 m^3) and ammonia inventories (10 to 20,000 kg) indicated that failure of the confining structure would be likely.

For prolonged releases, such as might be typical of an alternative scenario, analysis indicated that leakpaths that could produce a room air change-over of one-half volume per hour would effectively vent ammonia releases for rooms with volumes greater than 1,000 m^3. Thus, prolonged releases from the building would be modeled as transient releases at rates less than or equal to the estimated equipment release rate. That is, it is reasonable to take credit for the mitigating effects of the structure for "more likely" scenarios.

4.0 COMMENTS

Some comments were received on earlier drafts of this Appendix. There seems to be general concurrence that one cannot automatically assume that a building would effectively mitigate the consequences of a worst-case scenario. Some of the comments that are representative of the concerns raised are reviewed below.

Comment

Release of an entire storage inventory with complete vaporization and heating to 77°F within 10 minutes is an impossible case.

Response

Here, the 77°F (25°C) arises because, in the generic lookup table guidance, the ambient temperature is assumed to be 25°C. This concern appears to arise because the commenter is thinking of the spillage of large quantities of ammonia refrigerated at its atmospheric boiling point. If such spillages were to occur into a diked area, the rate of evaporation would be slow. It is important to realize that the scenarios considered in the present case are quite different, consisting as they do of instantaneous tank failures and breakage of pipes of diameter 1" or more connected to tanks at pressures of up to 200 psig. In either case, standard momentum/energy release analysis indicates that the major portion of the contents of a tank as large as 10 tons could be released within 10 minutes (see also Section 3 of Appendix A). The physical state of the released material is established by energy balance supported by experimental data. For both the instantaneous and pipe releases, the vapor fraction was estimated for isenthalpic expansion conditions. As indicated by the results presented in Appendix C and the discussion of Appendix A, the initial ammonia vapor fraction ranges from 20 to 25 weight percent. As also described in Appendix A, experimental observations indicate conclusively that the liquid fraction remains entrained in the cloud as small droplets. Subsequent entrainment of air into the cloud results in vaporization of the liquid ammonia with an associated decrease in temperature. Experimental observations indicate that substantial amounts of air may be entrained into the cloud near the point of release, but, independent of the location and rate of entrainment, expected conditions are, for the major portion of the initial release, to remain airborne in the form of a dense cloud with temperature significantly less than 77°F (e.g., at or near the atmospheric boiling point of ammonia). Note that there are several instances of instantaneous or nearly instantaneous releases of several tens of tons of ammonia from vessels that failed catastrophically, with the whole contents becoming/remaining airborne virtually at once (Kaiser, 1979; McMullen, 1976; Lousdale, 1975; NTSB, 1971; NTSB, 1978).

Comment

The confined space ammonia release estimates need to reconsider the role of blast, confined space pressurization and potential for retention. The use of the work of Goldwire is inappropriate to justify a blast effect. The EPA has assumed that blast will occur for all pressurized conditions in this guidance document. Liquid depressurization is unlikely to drive isentropic compression of the room air.

Response

The evaluations and conclusions presented in Appendix C for instantaneous and 10-minute releases do not assume and are not dependent upon occurrence of superheated liquid or boiling liquid expanding vapor explosions. Shock waves occurring as a result of the sudden failure of an ammonia vessel would be in addition to the phenomena described in this Appendix, namely overpressurization due to the initial rapid expansion of ammonia. Section 2.4 of Appendix A states that the duration of the excess pressure in such a case will be much greater than that of a shock wave. Visualization of the initial vaporization and expansion as slower than a blast does not imply that it would be no faster than the mixing and secondary vaporization processes. Experimental observations indicate that an initial concentrated cloud is formed on sudden releases. Some overpressurization due to the constant volume constraint of the room is likely to occur prior to vaporization of the entrained liquid ammonia. The reference to the work of Goldwire in Appendix A supports the initial entrainment aspect of cloud formation and does not refer to blast effects.

Even if the intermediate state overpressurization were not to occur, over and underpressurization predicted for the final state (i.e., Step 2) indicate that failure of windows, openings, or panels would likely occur for all room volume-to-ammonia mass ratios, with the exception of a narrow band near room volume-to-ammonia mass ratio of 1.4. This statement is based on constant volume isenthalpic flash and isenthalpic mixing and vaporization modeling as described here in Appendix C.

5.0 REFERENCES

American Society of Heating, Refrigeration, and Air Conditioning Engineers, Inc. (ASHRAE 1981), ASHRAE Handbook, 1981 Fundamentals, ASHRAE, Atlanta, GA.

Blevins, R.D. (Blevins 1984). Applied Fluid Dynamics Handbook, Van Nostrand Rhienhold, New York, NY.

Brighton, P.W.M. (1989). "Continuous Chlorine Releases Inside Buildings: Concentrations on Emissions to Atmosphere," SRD R 468, United Kingdom Atomic Energy Authority Health and Safety Directorate, Culcheth, UK.

Gregory, W.S. and B.D. Nichols (1986). "FIRAC User's Manual: A Computer Code to Simulate Fire Accidents in Nuclear Facilities," NUREG/CR-4561, Los Alamos National Laboratory, Los Alamos, NM.

Kaiser, G.D. (1979). "Examples of the Successful Application of a Simple Model for the Atmospheric Dispersion of Dense, Cold Vapors to the Accidental Release of Anhydrous Ammonia from Pressurized Containers," United Kingdom Atomic Energy Authority Safety and Reliability Directorate Report SRD R150, Culcheth, UK.

Lansdale, H. (1975). "Ammonia Task Failure - South Africa," Ammonia Plant Safety 17 (1975), 126-131.

Lees, F.P. (1980). "Loss Prevention in the Process Industries," Butterworths, London, UK.

McMullen, G. (1976). "A Review of the 11th May Ammonia Truck Accident," City of Houston Health Department Report (unnumbered), Houston, TX.

National Transportation Safety Board (NTSB, 1971). "Railroad Accident Report; Chicago, Burlington and Quincy Railroad Company Train 64 and Train 824 Derailment and Collision with Tank Car Explosion, Crete, Nebraska, February 18, 1969," Report Number NTSB-RAR-71-2, Washington, DC.

National Transportation Safety Board (NTSB, 1978). "Railroad Accident Report; Louisville and Nashville Railroad Company Freight Train Derailment and Puncture of Anhydrous Ammonia Truck Cars at Pensacola, Florida, November 9, 1977," Report Number NTSB-RAR-78-4, Washington, DC.

APPENDIX D

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APPENDIX D

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APPENDIX D
INFORMATION ABOUT ACCIDENTAL RELEASES OF AMMONIA

For a number of years, EPA has been keeping a record of accidental releases in their Accidental Release Information Program (ARIP). Considerable information is requested of those who have reportable releases.

The data base has numerous entries recorded since its inception, many of which involve ammonia. A list of all events involving ammonia refrigeration plants, which resulted in an offsite release was obtained. The original reports of each of these events was examined for root cause, as described by the reporting firm. Other information on the reports was also considered. In some cases, there were multiple applicable root causes.

In the examination of the data, a comparison of the event to the elements of the Prevention Program was made. The elements of the Program, which, had they been properly carried out, would have prevented the release, were judged to be the root causes.

The data garnered from this examination reveal that several sub-elements of Mechanical Integrity are vital to preventing releases from ammonia refrigeration plants. In particular, a majority of the accidents had omissions in inspections or tests as a root cause of the releases.

These data are presented in the spreadsheet that follows.

ARIP No.	Event	Operation	Root Cause	Process	Remarks
4153	Valve disassembled	Maintenance	Contractor selection	Public CS	Error in installing a new accumulator
1770			E/R training	Ice cream	Equipment upgrade stated
2579			E/R training	Food production	Sched 40 thd pipe used instead of welded sch 80
2825			E/R training	Poultry processing	Procedure produced untenable thermal shock
1281	Flange blew out	In operation	M.I. fit for purpose	Citrus concentrate	Cast iron flange
2850	Condenser leak	Maintenance	M.I. inspection	Milk	Corrosion; new unit on order at the time
1078	Heat exch. leak	In operation	M.I. Inspection	Ice Mfg	Ice machine tube failure
1080	Valve failure	In operation	M.I. Inspection	Meat Process	No explanation
1338	Pipe joint failure	In operation	M.I. inspection	Milk & ice cream	Fatigue failure on vibration
1901	Valve separation	In operation	M.I. inspection	Food processing	Corrective actions inspection and maintenance
4140	Gasket leak	In operation	M.I. inspection	Ice	Gasket leak on compressor; shut off valve failed to close
4209	Recip shaft seal	In operation	M.I. inspection	Frozen fish	Main brg failure - broken crank
3320	PRV opens	Maintenance	M.I. inspection	Ice	In pressure test to less than stated relief pressure; opened at lower pressure
1394	Pipe break	Sched shutdown	M.I. inspection	Ice cream	Equipment upgrade stated
834	Pipe broke	Temp inactive	M.I. Inspection	Turkey Prod	None given; Corr Actions were Inspections; RC inferred
2320	Tube rupture	Temp inactive	M.I. inspection	Frozen juices	Condenser replaced with new design
4269	PRV opens	Temp shutdown	M.I. inspection	Ground beef	Data missing
2456			M.I. inspection	Public CS	Solenoid valve fails to close
1770	Tube rupture	In operation	M.I. inspection (Inf)	Ice	Inspection called out
2202	Valve leak	Sched shutdown	M.I. inspection (Inf)	Frozen desserts	Corrective actions PM, inspection and test
2825	Valve came apart	In operation	M.I. procedures	Poultry processing	Procedure produced untenable thermal shock
2227	PRV opens	Maintenance	M.I. procedures	Poultry	Equipment not tied into central controller; restarted improperly after maintenance
424	Sight glass leak	Weekend shutdown	M.I. procedures	Sausage Mfg	Contractor left compressor water off
2456	Pipe break	In operation	M.I. QC	Food production	Sched 40 thd pipe used instead of welded sch 80
4252	Pump casing worn	Maintenance	M.I. QC	Distribution whse	Pumps replaced with a "more reliable design"
1879	Strainer casting	In operation	M.I. QC (Inf)	Meat processing	Strainer casting failure; changed design
799	PRV opens	In operation	M.I. test	Public C.S.	Ice buildup; fan destroyed; high-pressure cutout fails
2332	PRV failure	In operation	M.I. test	Citrus juices	RV neither tested nor replaced
2340	PRV opens	In operation	M.I. test	Public CS	Solenoid valve fails to close
1098	PRV opens	In operation	M.I. test	Cheese	R.V. set pressure less than high-pressure trip; would not reseat
1878			M.I. test	Ice	Inspection called out
1878	Unit failure	In operation	PHA	Meat processing	Improved control at PLC called out
2579	Pipe cap blown off	In operation	PHA	Poultry processing	Procedure produced untenable thermal shock
2907	PRV opens	In operation	PHA	Public CS	Not stated; vent re-routed to accumulator
3218	PRV opens	Normal startup	PHA	Cheese	Failed to start water pump on startup
453			PHA	Sausage Mfg	Contractor left compressor water off
1098			PHA	Cheese	R.V. set pressure less than high-pressure trip; would not reseat
2227			PHA	Poultry	Equipment not tied in to central controller; restarted improperly after maintenance
3263	Pipe break, forklift	In operation	PHA (siting)	Meat packing	Exposed piping - to be re-routed
3539	Piping damage	In operation	PHA (siting)	Beer	Damaged ammonia piping; PHA called out as corrective action
453			Procedures	Sausage Mfg	Contractor left compressor water off.
1106			Procedures	Cheese	R.V. set pressure less than high-pressure trip; would not reseat
3218			Procedures	Cheese	Failed to start water pump on startup
1106	Open line	construction	PSSR	Public C.S.	New construction; valve left uncapped at startup
3090	Valve left open	Startup new equip	PSSR	Meat products	No check for proper installation prior to startup
4170	Not legible	Startup new equip	PSSR	Not legible	Details illegible
3538	Valve left open	Maintenance	SWP	Beer	Valve left open during maintenance
453	Flex Joint break	Temp inactive	Training	Veg mfg	Trapped liquid; operator error; design fault

RISK MANAGEMENT PLAN DATA ELEMENTS

1. REGISTRATION

1.1 Source identification
a. Name
b. Street
c. City		d. County		e. State		f. Zip
g. Latitude		h. Longitude

1.2 Source Dun and Bradstreet number

1.3 a. Name of corporate parent company (if applicable)
b. Dun and Bradstreet number of corporate parent company (if applicable)

1.4 Owner/operator
a. Name		b. Phone
c. Mailing address

1.5 Name and title of person responsible for part 68 implementation

1.6 Emergency contact
a. Name		b. Title
c. Phone		d. 24-hour phone

1.7 For each covered process:

a.	1. Chemical name	2. CAS number	3. Quantity	4. SIC code	5. Program level
b.	1. Chemical name	2. CAS number	3. Quantity	4. SIC code	5. Program level
c.	1. Chemical name	2. CAS number	3. Quantity	4. SIC code	5. Program level

1.8 EPA Identifier

1.9 Number of full-time employees

1.10 Covered by
a. OSHA PSM 1. ___ Yes 2. ___ No
b. EPCRA section 302 1. ___ Yes 2. ___ No
c. CAA Title V operating permit 1. ___ Yes 2. ___ No

1.11 Last safety inspection

Date		By
a.______________ b. ___ OSHA
c. ___ State OSHA
d. ___ EPA
e. ___ State EPA
f. ___ Fire department

g. ___ Other (specify)
h. ___ Not applicable

2. TOXICS: WORST CASE (complete at least one)

2.1 Chemical name

2.2 Physical state

a. ___ Gas b. ___ Liquid

2.3 Results based on

a. ___ Reference table b. ___ Modeling
c. Model used ______________________

2.4 Scenario

a. ___ Explosion c. ___ Toxic gas release
b. ___ Fire d. ___ Liquid spill and vaporization

2.5 Quantity released ________ lbs 2.6 Release rate ______ lbs/min.

2.7 Release duration (if modeled) ______ min.

2.8 Wind speed ________ m/sec 2.9 Stability class ______

2.10 Topography (check one) a. ___ Urban b. ___ Rural

2.11 Distance to endpoint _____ miles

2.12 Residential population within distance (number) __________

2.13 Public receptors (check all that apply)

a. ___ Schools d. ___ Prisons
b. ___ Residences e. ___ Public recreational areas or arenas
c. ___ Hospitals f. ___ Major commercial, office, or industrial areas

2.14 Environmental receptors within distance (check all that apply)

a. ___ National or state parks, forests, or monuments
b. ___ Officially designated wildlife sanctuaries, preserves, or refuges
c. ___ Federal wilderness areas

2.15 Passive mitigation considered (check all that apply)

a. ___ Dikes d. ___ Drains
b. ___ Enclosures e. ___ Sumps
c. ___ Berms f. ___ Other (specify)

3. TOXICS: ALTERNATIVE RELEASES (complete for each toxic)

3.1 Chemical

3.2 Physical state

a. ___ Gas b. ___ Liquid

3.3 Results based on

a. ___ Reference table b. ___ Modeling
c. Model used ____________________________

3.4 Scenario (check one)

a. ___ Transfer hose failure
b. ___ Pipe leak
c. ___ Vessel leak
d. ___ Overfilling
e. ___ Rupture disk/relief valve
f. ___ Excess flow valve failure
g. ___ Other (specify) ____________________________

3.5 Quantity released ________ lbs 3.6 Release rate ______ lbs/min.

3.7 Release duration ______ min.

3.8 Wind speed ________ m/sec 3.9 Stability class ______

3.10 Topography (check one) a. __ Urban b. __ Rural

3.11 Distance to endpoint _____ miles

3.12 Residential population within distance (number) ___________

3.13 Public receptors (check all that apply)

a. ___ Schools
b. ___ Residences
c. ___ Hospitals
d. ___ Prisons
e. ___ Public recreational areas or arenas
f. ___ Major commercial, office, or industrial areas

3.14 Environmental receptors within distance (check all that apply)

a. ___ National or state parks, forests, or monuments
b. ___ Officially designated wildlife sanctuaries, preserves, or refuges
c. ___ Federal wilderness areas

3.15 Passive mitigation considered (check all that apply)

a. ___ Dikes
b. ___ Enclosures
c. ___ Berms
d. ___ Drains
e. ___ Sumps
f. ___ Other (specify)

3.16 Active mitigation considered (check all that apply)

a. ___ Sprinkler systems
b. ___ Deluge system
c. ___ Water curtain
d. ___ Neutralization
e. ___ Excess flow valve
f. ___ Flares
g. ___ Scrubbers
h. ___ Emergency shutdown systems
i. ___ Other (specify)

4. FLAMMABLES WORST CASE (complete one)

4.1 Chemical

4.2 Results based on (check one)

a. ___ Reference table   b. ___ Modeling
c. Model used ______________________________

4.3 Scenario (check one)

a. ___ Vapor cloud explosion   b. ___ Fireball

4.4 Quantity released ________ lbs

4.5 Endpoint used _________

4.6 Distance to endpoint _____ miles

4.7 Residential population within distance (number) ___________

4.8 Public receptors (check all that apply)

a. ___ Schools
b. ___ Residences
c. ___ Hospitals
d. ___ Prisons
e. ___ Public recreational areas or arenas
f. ___ Major commercial, office, or industrial areas

4.9 Environmental receptors within distance (check all that apply)

a. ___ National or state parks, forests, or monuments
b. ___ Officially designated wildlife sanctuaries, preserves, or refuges
c. ___ Federal wilderness areas

4.10 Passive mitigation considered (check all that apply)

a. ___ Dikes
b. ___ Fire walls
c. ___ Blast walls
d. ___ Enclosures
e. ___ Other (specify)

5. FLAMMABLES ALTERNATIVE RELEASES (complete one)

5.1 Chemical

5.2 Results based on (check one)

a. ___ Reference table
b. ___ Modeling
c. Model used ______________________________

5.3 Scenario (check one)

a. ___ Vapor cloud explosion
b. ___ Fireball
c. ___ BLEVE
d. ___ Pool fire
e. ___ Jet fire
f. ___ Vapor cloud fire

5.4 Quantity released ________ lbs

5.5 Endpoint used _________

5.6 Distance to endpoint _____ miles

5.7 Residential population within distance (number) ___________

5.8 Public receptors (check all that apply)

a. ___ Schools
b. ___ Residences
c. ___ Hospitals
d. ___ Prisons
e. ___ Public recreational areas or arenas
f. ___ Major commercial, office, or industrial areas

5.9 Environmental receptors within distance (check all that apply)

a. ___ National or state parks, forests, or monuments
b. ___ Officially designated wildlife sanctuaries, preserves, or refuges
c. ___ Federal wilderness areas

5.10 Passive mitigation considered (check all that apply)

a. ___ Dikes
b. ___ Fire walls
c. ___ Blast walls

5.11 Active mitigation considered (check all that apply)

a. ___ Sprinkler systems
b. ___ Deluge system
c. ___ Water curtain
d. ___ Excess flow valve

6. FIVE-YEAR ACCIDENT HISTORY (complete the following for each release)

6.1 Date ____________ 6.2 Time ______

6.3 Release duration ____________

6.4 Chemical(s)

6.5 Quantity released (lbs) ____________

6.6 Release event

a. ___ Gas release
b. ___ Liquid spill/evaporation
c. ___ Fire
d. ___ Explosion

6.7 Release source

a. ___ Storage vessel
b. ___ Piping
c. ___ Process vessel
d. ___ Transfer hose
e. ___ Valve
f. ___ Pump

6.8 Weather conditions at time of event (if known)

a. Wind speed/direction ______
b. Temperature ______
c. Stability class ______
d. Precipitation present _____
e. Unknown ____

6.9 On-site impacts

a. Deaths _______ (number)
b. Injuries ______ (number)
c. Property damage ($) _______

6.10 Known offsite impacts

a. Deaths _______ (number)
b. Hospitalizations ______ (number)
c. Other medical treatment ______ (number)
d. Evacuated _________ (number)
e. Sheltered _________ (number)
f. Property damage ($) ________
g. Environmental damage _______ (specify type)

6.11 Initiating event

a. ___ Equipment failure
b. ___ Human error
c. ___ Weather condition

6.12 Contributing factors (check all that apply)

a. ___ Equipment failure
b. ___ Human error
c. ___ Improper procedures
d. ___ Overpressurization
e. ___ Upset condition

f. ___ By-pass condition
g. ___ Maintenance activity/Inactivity
h. ___ Process design
i. ___ Unsuitable equipment
j. ___ Unusual weather condition
k. ___ Management error

6.13 Offsite responders notified a. ___Yes b. ___ No

6.14 Changes introduced as a result of the accident

a. ___ Improved/upgrade equipment
b. ___ Revised maintenance
c. ___ Revised training
d. ___ Revised operating procedures
e. ___ New process controls
f. ___ New mitigation systems
g. ___ Revised emergency response plan
h. ___ Changed process
i. ___ Reduced inventory
j. ___ Other
k. ___ None

7. PREVENTION PROGRAM PROGRAM 3 (For Each Program 3 Process)

7.1 SIC code for process ________

7.2 Name of substance(s) covered

a. b. c.

7.3 Date on which the safety information was last reviewed or revised

7.4 PHA

a. The date of completion of the most recent PHA or update

b. The technique used

1. ___ What If
2. ___ Checklist
3. ___ What If/Checklist
4. ___ HAZOP
5. ___ Failure Mode and Effects Analysis
6. ___ Fault Tree Analysis
7. ___ Other

c. The expected date of completion of any changes resulting from the PHA

d. Major hazards identified (check all that apply)

1. _____ Toxic release
2. _____ Fire
3. _____ Explosion
4. _____ Runaway reaction
5. _____ Polymerization
6. _____ Overpressurization
7. _____ Corrosion
8. _____ Overfilling
9. _____ Contamination
10. _____ Equipment failure
11. _____ Loss of cooling, heating, electricity, instrument air
12. _____ Earthquake
13. _____ Floods (flood plain)
14. _____ Tornado
15. _____ Hurricanes
16. _____ Other

e. Process controls in use (check all that apply)

1. _____ Vents
2. _____ Relief valves

3. _____ Check valves
4. _____ Scrubbers
5. _____ Flares
6. _____ Manual shutoffs
7. _____ Automatic shutoffs
8. _____ Interlocks
9. _____ Alarms and procedures
10. _____ Keyed bypass
11. _____ Emergency air supply
12. _____ Emergency power
13. _____ Backup pump
14. _____ Grounding equipment
15. _____ Inhibitor addition
16. _____ Rupture disks
17. _____ Excess flow device
18. _____ Quench system
19. _____ Purge system
20. _____ Other

f. Mitigation systems in use (check all that apply)

1. _____ Sprinkler system
2. _____ Dikes
3. _____ Fire walls
4. _____ Blast walls
5. _____ Deluge system
6. _____ Water curtain
7. _____ Enclosure
8. _____ Neutralization
9. _____ Other

g. Monitoring/detection systems in use (check all the apply)

1. _____ Process area detectors
2. _____ Perimeter monitors
3. _____ Other

h. Changes since last PHA update (check all that apply)

1. _____ Reduction in chemical inventory
2. _____ Increase in chemical inventory
3. _____ Change in process parameters
4. _____ Installation of process controls
5. _____ Installation of process detection systems
6. _____ Installation of perimeter monitoring systems
7. _____ Installation of mitigation systems
8. _____ Other
9. _____ None required/recommended

7.5 The date of the most recent review or revision of operating procedures

7.6 Training

a. The date of the most recent review or revision of training programs

b. The type of training provided
1. ___ Classroom
2. ___ Classroom plus on the job
3. ___ On the job
4. ___ Other

c. The type of competency testing used
1. ___ Written tests
2. ___ Oral tests
3. ___ Demonstration
4. ___ Observation
5. ___ Other

7.7 Maintenance

a. The date of the most recent review or revision of maintenance procedures
b. The date of the most recent equipment inspection or test
c. The equipment inspected or tested

7.8 Management of Change

a. The date of the most recent change that triggered management of change procedures
b. The date of the most recent review or revision of management of change procedures

7.8 The date of the most recent pre-startup review

7.9 Compliance audits

a. The date of the most recent compliance audit
b. The expected date of completion of any changes resulting from the compliance audit

7.10 Incident investigation

a. The date of the most recent incident investigation
b. The expected date of completion of any changes resulting from the investigation

7.11 The date of the most recent review or revision of employee participation plans

7.12 The date of the most recent review or revision of hot work permit procedures

7.13 The date of the most recent review or revision of contractor safety procedures

7.14 The date of the most recent evaluation of contractor safety performance

8. PREVENTION PROGRAM PROGRAM 2 (For Each Program 2 Process)

8.1 SIC code for process _________

8.2. Chemicals

a.
b.

8.3 Safety information

a. The date of the most recent review or revision of the safety information
b. A list of Federal or state regulations or industry-specific design codes and standards used to demonstrate compliance with the safety information requirement.

1. ___ NFPA 58 (or state law based on NFPA 58)
2. ___ OSHA 1910.111
3. ___ ASTM
4. ___ ANSI standards
5. ___ ASME standards
6. ___ Other (specify)
7. ___ None

8.4 Hazard review

a. The date of completion of the most recent hazard review or update

b. The expected date of completion of any changes resulting from the hazard review

c. Major hazards identified (check all that apply)

1. _____ Toxic release
2. _____ Fire
3. _____ Explosion
4. _____ Runaway reaction
5. _____ Polymerization
6. _____ Overpressurization
7. _____ Corrosion
8. _____ Overfilling
9. _____ Contamination
10. _____ Equipment failure
11. _____ Loss of cooling, heating, electricity, instrument air
12. _____ Earthquake
13. _____ Floods (flood plain)
14. _____ Tornado
15. _____ Hurricanes
16. _____ Other

d. Process controls in use (check all that apply)

1. _____ Vents
2. _____ Relief valves
3. _____ Check valves
4. _____ Scrubbers
5. _____ Flares
6. _____ Manual shutoffs
7. _____ Automatic shutoffs
8. _____ Interlocks
9. _____ Alarms and procedures
10. _____ Keyed bypass
11. _____ Emergency air supply
12. _____ Emergency power
13. _____ Backup pump
14. _____ Grounding equipment
15. _____ Inhibitor addition
16. _____ Rupture disks
17. _____ Excess flow device
18. _____ Quench system
19. _____ Purge system
20. _____ Other

e. Mitigation systems in use (check all that apply)

1. _____ Sprinkler system
2. _____ Dikes
3. _____ Fire walls
4. _____ Blast walls
5. _____ Deluge system
6. _____ Water curtain
7. _____ Enclosure
8. _____ Neutralization
9. _____ Other

f. Monitoring/detection systems in use

1. _____ Process area detectors
2. _____ Perimeter monitors
3. _____ Other

g. Changes since last hazard review update (check all that apply)

1. _____ Reduction in chemical inventory
2. _____ Increase in chemical inventory
3. _____ Change in process parameters
4. _____ Installation of process controls
5. _____ Installation of process detection systems
6. _____ Installation of perimeter monitoring systems
7. _____ Installation of mitigation systems

8. _____ Other
9. _____ None required/recommended

8.5 The date of the most recent review or revision of operating procedures

8.6 Training

a. The date of the most recent review or revision of training programs

b. The type of training provided
1. ___ Classroom
2. ___ Classroom plus on the job
3. ___ On the job
4. ___ Other

c. The type of competency testing used
1. ___ Written tests
2. ___ Oral tests
3. ___ Demonstration
4. ___ Observation
5. ___ Other

8.7 Maintenance

a. The date of the most recent review or revision of maintenance procedures
b. The date of the most recent equipment inspection or test
c. The equipment inspected or tested

8.8 Compliance audits

a. The date of the most recent compliance audit
b. The expected date of completion of any changes resulting from the compliance audit

8.9 Incident investigation

a. The date of the most recent incident investigation
b. The expected date of completion of any changes resulting from the investigation

8.10 The date of the most recent change that triggered a review or revision of safety information, the hazard review, operating or maintenance procedures, or training

9. EMERGENCY RESPONSE

9.1 Do you have a written emergency response plan? a. ___ Yes b. ___ No

9.2 Does the plan include specific actions to be taken in response to an accidental releases of a regulated substance? a. ___ Yes b. ___ No

9.3 Does the plan include procedures for informing the public and local agencies responsible for responding to accidental releases? a. ___ Yes b. ___ No

9.4 Does the plan include information on emergency health care? a. ___ Yes b. ___ No

9.5 The date of the most recent review or update of the emergency response plan

9.6 The date of the most recent emergency response training for employees

9.7 The name and telephone number of the local agency with which the plan is coordinated

a. Name b. Telephone number

9.8 Subject to (check all that apply)

a. ___ OSHA 1910.38 (Emergency Action Plan)
b. ___ OSHA 1910.120 (HAZWOPER)
c. ___ Clean Water Act/SPCC
d. ___ RCRA
e. ___ OPA-90
f. ___ State EPCRA Rules/Law
g. ___ Other (specify)

RISK MANAGEMENT PLAN DATA ELEMENTS

The owner or operator of a stationary source subject to the risk management program rule shall submit a single Risk Management Plan (RMP) that includes the information required in §§ 68.155 through 68.185 for all covered processes. A covered process is defined as a process that has a regulated substance present in more than a threshold quantity as determined under § 68.115 of the rule. The following elements should be submitted to EPA as specified in § 68.150.

EXECUTIVE SUMMARY: As specified in §68.155, the owner or operator must provide an executive summary in the RMP. The executive summary should be brief and concise, no more than four pages in length for sources with one or two regulated substances. Your executive summary should include descriptions of:

1. The accidental release prevention and emergency response policies at the stationary source.

2. The stationary source and regulated substances handled. This information may be presented in a paragraph or as bullets. The information should include the following:

    - Primary activities (e.g., manufacturer of polyethylene, pulp mill, chlorine wholesaler);

    - Use of regulated substances (e.g., chlorine used to produce bleach, treat wastewater, repackage for sale);

    - Quantities handled or stored.

3. The worst-case release scenario(s) and the alternative release scenario(s), including administrative controls and mitigation measures to limit the distances for each reported scenario. The information should include the following:

    - The scenario (e.g., failure of the storage tank containing 40,000 pounds of chlorine, storage quantity limited to 60 percent of tank's capacity by company procedures; 10 minute release);

    - Distance to endpoint (e.g., under worst-case weather, the substance could travel x miles before dispersing enough to no longer pose a hazard to the public).

4. The general accidental release prevention program and chemical-specific prevention steps. For example, you may state that you are in compliance with the OSHA PSM rule and this rule. You may want to highlight general or specific steps that you believe are key to your prevention program. These steps may be either technological (e.g., backup systems) or procedural/managerial (e.g., improved maintenance or training).

5. The five-year accident history. This should be a summary (e.g., we have had five accidental releases of chlorine in the past five years; the largest release was 1500 pounds. No one offsite was injured, but several houses were evacuated as a precautionary measure during the 10/25/95 and 5/1/96 releases). Do not present the information in a table format.

6. The emergency response program (e.g., source has an emergency response plan, which has been coordinated with the community plan. The source hazmat team has conducted joint training and drills with the local fire department. Mention any public notification and alert systems).

7. Planned changes to improve safety.

1. REGISTRATION: The owner or operator should complete a single registration for the entire source. The registration should cover all regulated substances handled in covered processes.

1.1 Source identification: These fields indicate the location of the source and should be completed using street or local road designation. Do NOT use post office box numbers or rural box numbers.

- **a. Name:** This is the name of the source, which may include the name of any parent company. The name should be specific to the site.

- **b-f. Address (Street, City, County, State, Zip):** This is the location of the source using local street and road designations. Do not use post office box numbers or rural box numbers. This is **not** a mailing address.

- **g-h. Latitude and Longitude:** Latitude is the distance north or south of the equator. Longitude is the distance east or west of the prime meridian. Latitude and longitude are measured in degrees, minutes, and seconds. The best tool for determining your latitude and longitude measurements are U.S. Geological Survey (USGS) topographic quadrangle maps.

1.2 Source Dun and Bradstreet number: This is an identification number that allows your business to be cross referenced to various business information. Dun & Bradstreet is a service mark for an agency furnishing subscribers with information as to the financial standing and credit rating of a business. You may be able to obtain this number from your finance department. Not all sources will have a Dun & Bradstreet number.

1.3 Name and Dun and Bradstreet Number of corporate parent company (if applicable): These fields provide information about the source's parent company.

- **a. Name of corporate parent company (if applicable):** The parent company is the corporation or other business entity that owns at least 50 percent of the voting stock of another company.

- **b. Dun and Bradstreet number of corporate parent company (if applicable):** This is an identification number that allows the parent company to be cross referenced to various business information. Not all sources will have a Dun & Bradstreet number.

1.4 **Owner/operator:** This section contains information about the person who owns or operates the source. The owner or operator means any person who owns, leases, operates, controls, or supervises a stationary source.

a. **Name:** This is the name of the person who owns or operates the source. This owner/operator is the highest ranking company executive on-site. Unmanned sources should supply the name of the executive responsible for the source.

b. **Phone:** This is the business phone number for the owner or operator.

c. **Mail Address:** This is the business mailing address for the owner or operator of the source. Please use post office box numbers or rural box numbers, as appropriate, and the proper zip code to correctly identify the owner's or operator's mailing address.

1.5 **Name and title of person responsible for part 68 implementation:** This is the person designated under § 68.15. This item is not applicable to a source with only Program 1 processes.

1.6 **Emergency contact:**

a. **Name:** This is the name of the person who has been designated as the emergency contact for the source. This person should be knowledgeable about the site and any emergency plans and be able to mitigate a release, fight a fire, or direct response personnel conducting such tasks. This person should be an employee (or a contract employee) of the source. The emergency contact may be the owner or operator of the source.

b. **Title:** The title or job classification of the emergency contact..

c. **Phone:** This is the phone number where the emergency contact can be reached during normal working hours. It is probably the phone number of the source. If the source does not have a phone number, you may either use the business phone number of the emergency contact, the phone number of the dispatcher, or the phone number of customer service.

d. **24-hour Phone:** This is the phone number where the emergency contact can be reached during non-working hours. It is probably the home phone number of the emergency contact or a 24-hour emergency notification "beeper" service.

1.7 **For each covered process:** Provide the chemical name, CAS number, quantity, SIC code, and program level for each covered process at the source.

1. **Chemical Name:** The name of the regulated chemical. Space is provided to list all regulated chemicals present about the threshold quantity in a process at the source. *Note: See 40 CFR Part 68 "List of Regulated Substances and Thresholds for Accidental Release Prevention and Risk Management Programs."*

2. **CAS number:** The Chemical Abstract Service registry number for the chemical.

3. **Quantity:** The maximum inventory quantity of each regulated substance or mixture in the process in pounds to two significant digits.

4. **SIC Code:** The four-digit Standard Industrial Classification (SIC) Code is the federal government category of business activity. See Standard Industrial Classification Manual, Office of Management and Budget, U.S. Government Printing Office, Washington, D.C. The four-digit SIC code should be applicable to the process, not the source as a whole.

5. **Program level:** Enter either Program 1, 2, or 3 to identify with which program the process complies.

1.8 **EPA Identifier:** This will be the key identifier number [reserved pending key identifier rule]

1.9 **Number of full-time employees:** This is the number of full-time equivalent workers. Part-time or seasonal workers can be added together to approximate an equivalent full-time worker. Part-time and seasonal workers should be weighted against a full-time work schedule. For example, a part-time worker who works 30 hours per week is 3/4 of a full-time worker, and a seasonal worker who works 3 months per year is 1/4 of a full-time worker.

1.10 **Covered by:** Indicate with a check mark whether the source is covered by the following regulatory programs.

a. **OSHA PSM:** The OSHA Process Safety Management Standard, codified at 29 CFR 1910.119, is similar to the Program 3 prevention program, and is designed to protect workers from the effects of accidental releases of hazardous substances. Note that this question covers all processes at your source; if any process at your source is subject to OSHA PSM, you must answer yes even if the PSM process is not covered by this rule.

b. **EPCRA section 302:** This question refers to the Emergency Planning and Community Right-to-Know-Act, which requires notification of local authorities of the presence of certain Extremely Hazardous Substances listed in 40 CFR 302. If you have a toxic regulated substance about the threshold quantity in a process, you are subject to EPCRA section 302. If you are covered for only flammable regulated substances, you are not subject to 40 CFR 355 for those substances, although you may be for toxic substances not affected by this rule.

c. **CAA Title V operating permit:** State and local operating permit programs are required under Title V of the Clean Air Act (40 CFR Part 70). Title V requires major sources of air pollution to receive permits, pay fees to cover costs of administering the program, and sign a binding certification of compliance on all permit applications and documents.

1.11 **Last safety inspection:** Record the date of the last safety inspection of your source and check the appropriate agency (OSHA, State OSHA, EPA, State EPA, Fire department, Other, or not applicable) that performed the inspection.

2. **TOXICS: WORST CASE:** Complete once for each Program 1 process containing a regulated toxic, and once to represent all regulated toxic substances held above the threshold quantity in Program 2 and Program 3 processes. In addition, you may need to complete additional worst-case release scenario(s) for a hazard class if a worst case release from another process within the source potentially affects public receptors different from those potentially affected by the worst-case release reported. See the RMP Offsite Consequence Analysis (OCA) Guidance for more information on determining your worst-case release scenarios.

2.1 **Chemical name:** The name of the regulated chemical evaluated in the worst-case scenario.

2.2 **Physical state:** Indicate with a check mark the physical state of the chemical as it is released in the scenario.

- **a.** **Gas:** Indicate with a check if the chemical is a gas.
- **b.** **Liquid:** Indicate with a check if the chemical is a liquid.

2.3 **Results based on:** Indicate with a check mark whether you used the reference tables provided in the RMP OCA guidance or conducted modelling to calculate your worst-case release. If you performed modelling, you must also indicate which model was used.

2.4 **Scenario:** Indicate with a check mark which of the following release scenarios describes your worst-case release scenario.

- **a.** **Explosion:** A rapid chemical reaction with the production of noise, heat, and violent expansion of gasses.
- **b.** **Fire:** A product (e.g., fuel) in a state of combustion.
- **c.** **Toxic gas release:** A release of the substance in a vapor state.
- **d.** **Liquid spill and vaporization:** A release of the substance in a liquid state with subsequent vaporization.

2.5 **Quantity released:** Indicate the quantity of the chemical released during the worst-case release in pounds.

2.6 **Release rate:** Indicate the rate of release in pounds per minute.

2.7 Release duration (if modeled): Indicate the length of time in minutes for the vessel, pipeline, or other location of the regulated substance to release all of its contents. For gasses, the duration is 10 minutes.

2.8 Wind speed: This is 1.5 meters per second unless you can demonstrate that local meteorological data applicable to the source show a higher minimum wind speed at all times during the last three years. If you can demonstrate higher minimums existed at all times, these minimums may be used. Provide wind speed in meters per second.

2.9 Stability class: This is an "F" stability class unless you can demonstrate that local meteorological data applicable to the source show a less stable atmosphere at all times. If you can demonstrate less stable conditions existed at all times, these minimums may be used.

2.10 Topography (check one): Indicate with a check mark whether the local topography is urban or rural. Urban means that there are many obstacles in the immediate area; obstacles include buildings or trees. Rural means that there are few buildings or other obstacles in the immediate area.

2.11 Distance to endpoint: Indicate the distance to the endpoint in miles for the chemical, using the endpoint specified for the chemical in Appendix A of the risk management program rule.

2.12 Residential population within distance: Indicate the population within the distance to the endpoint as specified in question 11 of this section. Populations should be estimated within a circle with a center at the point of the release and a radius determined by the distance to the endpoint. Populations estimated need only include residential populations and may be rounded to two significant digits (e.g., 5,500, 11,000).

2.13 Public receptors: These are the public receptors within the distance to the endpoint specified in the worst-case release. Public receptor means locations offsite where members of the public may be exposed to toxic concentrations, radiant heat, or overpressure as a result of an accidental release. Residences, institutions, industrial, office, and commercial buildings, parks, or recreational areas inhabited or occupied by the public at any time without restriction by the source are public receptors. You do not need to list specific locations or estimate populations at these locations. The presence of these receptors may be determined by using local street maps. Check all that apply.

a. **Schools:** Public and private elementary, secondary, or higher education schools.

b. **Residences**

c. **Hospitals**

d. **Prisons**

e. **Public recreational areas or arenas:** These include stadiums, parks, and public pools.

f. **Major commercial, office or industrial areas:** Industrial parks, office buildings, shopping malls, commercial areas.

2.14 **Environmental receptors within distance:** Environmental receptors should be identified within a circle with a center at the point of the release and a radius determined by the distance to the endpoint. Environmental receptor means natural areas, such as national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, refuges, or areas; and federal wilderness areas that could be exposed at any time to toxic concentrations, radiant hear, or overpressure as a result of an accidental release and that can be identified on local U.S. Geological Survey maps. Check all that apply.

a. **National or state parks, forests, or monuments**

b. **Officially designated wildlife sanctuaries, preserves, or refuges**

c. **Federal wilderness areas**

2.15 **Passive mitigation considered:** Mitigation means specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. Passive mitigation means equipment, devices, or technologies that function without human, mechanical, or other energy input. Check all that were considered in defining the release quantity or rate to the worst-case scenario.

a. **Dikes:** A low wall that acts as a barrier to prevent a spill from spreading.

b. **Enclosures:** Physical containment of the release within a structure (e.g., a building).

c. **Berms:** A mound or wall of earth at the top or bottom of a slope that prevents a spill from spreading.

d. **Drains:** A channel that carries off surface water.

e. **Sumps:** A pit or tank that catches liquid runoff for drainage or disposal.

f. **Other (specify)**

3. **TOXICS: ALTERNATIVE RELEASES:** Complete for each toxic regulated substance held above the threshold quantity in a Program 2 or Program 3 process.

3.1 **Chemical:** The name of the regulated chemical evaluated in the alternative release scenario.

3.2 **Physical state:** Indicate with a check mark the physical state of the chemical as it is released in the scenario. See question 2.2 of this guidance for an explanation of each physical state.

3.3 **Results based on:** Indicate with a check mark whether you used the reference tables provided in the OCA guidance or conducted modelling to calculate your worst-case release. If you performed modelling, you must also indicate which model was used.

3.4 **Scenario (check one):** Indicate with a check mark which of the following scenarios describes your alternative release scenario.

a. **Transfer Hose Failure:** Failure of the connection between two or more vessels.

b. **Pipe Leak:** Release through a rupture in a pipe.

c. **Vessel Leak:** Release through a rupture in a vessel.

d. **Overfilling:** Release due to filling a pipe, vessel, or other container past its capacity.

e. **Rupture Disk/Relief Valve:** Release due to failure of a rupture disk/relief valve to function properly. A rupture disk/relieve valve is a valve that relieves pressure beyond a specified limit and recloses upon return to normal operating conditions.

f. **Excess Flow Valve Failure:** Release caused by the failure of excess flow device to function properly and prevent surges from reaching downstream equipment.

g. **Other (specify)**

3.5 **Quantity released:** Indicate the quantity of the chemical released during the alternative release scenario in pounds.

3.6 **Release rate:** Indicate the rate of release in pounds per minute.

3.7 **Release duration:** Indicate the length of time in minutes for the vessel, pipeline, or other location of the regulated substance to release the quantity indicated in question 3.5.

3.8 **Wind speed:** If you use the RMP OCA guidance, list 3 m/s. If you modeled your scenario indicate the wind speed used. This wind speed should be the average daily wind speed based on annual data collected at your site or at a local meteorological station.

3.9 **Stability class:** If you use the RMP OCA guidance, list "D" stability. If you modeled your scenario indicate the stability used. The stability should be the average daily stability based on annual data collected at your site or at a local meteorological station.

3.10 **Topography (check one):** Indicate with a check mark whether the local topography is urban or rural. Urban means that there are many obstacles in the immediate area; obstacles include buildings or trees. Rural means that there are few buildings or other obstacles in the immediate area.

3.11 **Distance to endpoint:** Indicate the distance to the endpoint in miles for the chemical, using the endpoint specified for the chemical in Appendix A of the risk management program rule.

3.12 **Residential population within distance:** Indicate the population within the distance to the endpoint as specified in question 11 of this section. Populations should be estimated within a circle with a center at the point of the release and a radius determined by the distance to the endpoint. Populations estimated need only include residential populations and may be rounded to two significant digits (e.g., 5,500, 11,000).

3.13 **Public receptors:** These are the public receptors within the distance to the endpoint specified in the alternative release. Check all that apply. See question 2.13 of this guidance.

3.14 **Environmental receptors within distance:** Environmental receptors should be identified within a circle with a center at the point of the release and a radius determined by the distance to the endpoint. Check all that apply. See question 2.14 of this guidance.

3.15 **Passive mitigation considered:** Mitigation means specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. Passive mitigation means equipment, devices, or technologies that function without human, mechanical, or other energy input. Check all that were considered in defining the release quantity or rate of the alternative release scenario. See question 2.15 of this guidance.

3.16 **Active mitigation considered:** Mitigation means specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. Active mitigation means equipment, devices, or technologies that need human, mechanical, or other energy input to function. Check all that were considered in defining the release quantity or rate of the alternative release scenario.

a. **Sprinkler Systems:** A system for protecting a building against fire by means of overhead pipes which convey an extinguishing fluid through heat activated outlets.

b. **Deluge Systems:** A system to overflow an area of a release with water or other extinguishing fluid.

c. **Water Curtain:** A spray of water from a horizontal pipe through nozzles, the curtain may be activated manually or automatically.

d. **Neutralization:** Making a toxic chemical harmless through chemical reaction.

e. **Excess Flow Valve:** A system for diverting overflow.

f. **Flares:** A device for disposing of combustible gases from a chemical process by burning them in the open.

g. **Scrubbers:** A pre-release protection measure that uses water or aqueous mixtures containing scrubbing reagents to remove discharging liquids and possibly also treating the discharging chemical.

h. **Emergency Shutdown Systems:** Controls that are triggered when process limits are exceeded and that shut down that process.

i. **Other (specify)**

4. **FLAMMABLES: WORST CASE:** Complete once for each Program 1 process, and once to cover all flammables held above the threshold quantity in Program 2 or Program 3 processes. See the RMP Offsite Consequence Analysis (OCA) Guidance for more information on determining your worst-case release scenarios.

4.1 **Chemical:** The name of the regulated chemical evaluated in the worst-case scenario.

4.2 **Results based on (check one):** Indicate with a check mark whether you used the reference tables provided in the OCA guidance or conducted modelling to calculate your worst-case release. If you performed modelling, you must also indicate which model was used.

4.3 **Scenario (check one):** Indicate with a check mark which of the following release scenarios is appropriate to describe your worst-case release scenario. Generally the worst-case release scenario is a vapor cloud explosion.

a. **Vapor Cloud Explosion:** An explosion of a cloud made of a mixture of a flammable vapor or gas with air.

b. **Fireball:** The atmospheric burning of a fuel-air cloud in which the energy is mostly emitted in the form of radiant heat. As buoyancy forces of the hot gases begin to dominate, the burning cloud rises and becomes spherical in shape. Often caused by the ignition of a vapor cloud of a flammable substance.

4.4 **Quantity released:** Indicate the quantity of the chemical released during the worst-case release in pounds.

4.5 **Endpoint used:** For vapor cloud explosions, the endpoint is 1 PSI overpressure; for a fireball the endpoint is 5 kw/m^2 for 40 seconds.

4.6 **Distance to endpoint:** Indicate the distance in miles to the endpoint for the chemical specified.

4.7 **Residential population within distance:** Indicate the population within the distance to the endpoint as specified in question 6 of this section. Populations should be estimated within a circle with a center at the point of the release and a radius determined by the distance to the endpoint. Populations estimated need only include residential populations and may be rounded to two significant digits (e.g., 5,500, 11,000).

4.8 **Public receptors:** These are the public receptors within the distance to the endpoint specified in the worst-case release. Check all that apply. See question 2.13 of this guidance.

4.9 **Environmental receptors within distance:** Environmental receptors should be identified within a circle with a center at the point of the release and a radius determined by the distance to the endpoint. Check all that apply. See question 2.14 of this guidance.

4.10 **Passive mitigation considered:** Mitigation means specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. Passive mitigation means equipment, devices, or technologies that function without human, mechanical, or other energy input. Check all that were considered in defining the release quantity or rate to the worst-case scenario.

a. **Dikes:** A low wall that acts as a barrier to prevent a spill from spreading.

b. **Fire Walls:** A wall constructed to prevent the spread of fire.

c. **Blast Walls:** A heavy wall used to isolate buildings or areas that contain highly combustible or explosive materials.

d. **Enclosures:** Physical containment of the release within a structure (e.g., a building).

e. **Other (specify)**

5. FLAMMABLES: ALTERNATIVE RELEASES: Complete once for all flammable regulated substances held above the threshold quantity in a Program 2 or Program 3 process.

5.1 **Chemical:** The name of the regulated chemical evaluated in the alternative release scenario.

5.2 **Results based on (check one):** Indicate with a check mark whether you used the reference tables provided in the OCA guidance or conducted modelling to calculate your alternative release scenario. If you performed modelling, you must also indicate which model was used.

5.3 **Scenario (check one):** Indicate with a check mark which of the following release scenarios describes your alternative release scenario.

a. **Vapor Cloud Explosion:** An explosion of a cloud made of a mixture of a flammable vapor or gas with air.

b. **Fireball:** The atmospheric burning of a fuel-air cloud in which the energy is mostly emitted in the form of radiant heat. As buoyancy forces of the hot gases begin to dominate, the burning cloud rises and becomes spherical in shape. Often caused by the ignition of a vapor cloud of a flammable substance.

c. **BLEVE:** Boiling Liquid Expanding Vapor Explosion: used to describe the sudden rupture of a vessel/system containing liquefied flammable gas under pressure due to radiant heat flux. The pressure burst and the flashing of the liquid to vapor creates a blast wall and potential missile damage, and immediate ignition of the expanding fuel-air mixture leads to an intense combustion creating a fireball.

d. **Pool Fire:** The combustion of material evaporating from a layer of liquid at the base of the fire.

e. **Jet Fire:** Gas discharging or venting from a rupture will form a gas jet that "blows" into the atmosphere in the direction the whole is facing, all the while entraining and mixing with air. If the gas is flammable and encounters an ignition source, a flame jet may form.

f. **Vapor Cloud Fire:** A flash fire results from the ignition of a released flammable cloud in which there is essentially no increase in the combustion rate.

5.4 **Quantity released:** Indicate the quantity of the chemical released during the release in pounds.

5.5 **Endpoint used:** For vapor cloud explosions, the endpoint is 1 PSI overpressure; for a fireball the endpoint is 5 kw/m^2 for 40 seconds. A lower flammability limit may be listed as specified in NFPA documents or other generally recognized sources.

5.6 **Distance to endpoint:** This is the distance in miles to the endpoint in miles for the chemical.

5.7 **Residential population within distance:** Indicate the population within the distance to the endpoint as specified in question 6 of this section. Populations should be estimated within a circle with a center at the point of the release and a radius determined by the distance to the endpoint. Populations estimated need only include residential populations and may be rounded to two significant digits (e.g., 5,500, 11,000).

5.8 **Public receptors:** These are the public receptors within the distance to the endpoint specified in the alternative release. Check all that apply. See question 2.13 of this guidance.

5.9 **Environmental receptors within distance:** Environmental receptors should be identified within a circle with a center at the point of the release and a radius determined by the distance to the endpoint. Check all that apply. See question 2.14 of this guidance.

5.10 **Passive mitigation considered:** Mitigation means specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. Passive mitigation means equipment, devices, or technologies that function without human, mechanical, or other energy input. Check all that were considered in defining the release quantity or rate to the worst-case scenario. See question 4.10 of this guidance.

5.11 **Active mitigation considered:** Mitigation means specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. Active mitigation means equipment, devices, or technologies that need human, mechanical, or other energy input to function.

Check all that were considered in defining the release quantity or rate of the alternative release scenario. See question 3.16 of this guidance.

6. **FIVE-YEAR ACCIDENT HISTORY:** Complete a separate record for each accidental release from covered processes that occurred within the last five years and that resulted in deaths, injuries, or significant property damage on site, or known offsite deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage.

6.1 **Date:** Indicate the date on which the accident occurred.

6.2 **Time:** Indicate the time the release began.

6.3 **Release duration:** Indicate the approximate length of time of the release in minutes.

6.4 **Chemical(s):** Indicate the regulated substance(s) released.

6.5 **Quantity released:** Indicate the amount of each substance released in pounds.

6.6 **Release event:** Indicate with a check mark which of the following release events best describes your accident.

a. **Gas Release:** A release of the substance in a vapor state.

b. **Liquid Spill/Evaporation:** A release of the substance in a liquid state with subsequent vaporization.

c. **Fire:** A product (e.g., fuel) in a state of combustion.

d. **Explosion:** A rapid chemical reaction with the production of noise, heat, and violent expansion of gasses.

6.7 **Release source:** Indicate which best describes the source of the release. Check all that apply.

a. **Storage Vessel:** A container for storing, holding, or transporting a liquid.

b. **Piping:** A system of pipes used to carry a fluid.

c. **Process Vessel:** A container in which regulated substances are blended to form a mixture or reacted to convert them into some other final product or form.

d. **Transfer Hose:** A connection between two or more vessels.

e. **Valve:** A structure that closes temporarily a passage or permits movement of fluid in one direction only.

f. **Pump:** A device that raises, transfers, or compresses fluids or that attenuates gases by suction or pressure or both.

6.8 **Weather conditions at time of event (if known):** This information is important to those concerned with predicting the effects of accidents. Reliable information from those involved in the incident is better information than can be obtained from a meteorological weather station located miles from the incident site. Complete as much of the following as possible.

a. **Wind Speed/Direction:** Wind speed is an estimate of how fast the wind is traveling. Indicate the speed in miles per hour, meters per second, or knots. Be sure to identify the units of measure. Wind direction is the direction from which the wind comes. For example, a wind that blows from west to east comes from the west. You may describe the direction that the wind blows from as a standard compass reading such as "*Northeast*" or "*South-southwest.*" You may also describe the direction in degrees with North as zero degrees and East as 90 degrees. Thus northeast would represent 45 degrees, and south-southwest would represent 202.5 degrees. Abbreviations for the wind direction such as NE (for northeast) and SSW (for south-southwest) are also acceptable.

b. **Temperature:** The ambient temperature at the scene of the accident in degrees Fahrenheit.

c. **Stability Class:** This is a general indication of the degree of mixing present in the atmosphere accounting for windspeed and sunlight. The designation ranges from "A to F," where "A" represents extremely unstable conditions (high mixing) and "F" represents extremely stable or clam (little mixing) conditions. "F" conditions occur on overcast nights with low wind speeds and "A" conditions occur on clear days at high wind speeds. See the RMP OCA guidance for more information.

d. **Precipitation Present:** Check yes or no based on whether there was precipitation at the time of the accident.

e. **Unknown:** If you have no record of weather conditions check this.

6.9 **On site impacts:** Complete as much of the following as possible about on-site effects.

a. **Deaths:** Indicate the number of on-site deaths that are attributed to the accident or mitigation activities. On-site deaths means the number of employees or contract employees who were killed during the accident of performing any mitigation activities. What about offsite response contractors?

b. **Injuries:** Indicate the number of employees or contract personnel who were injured as a result of the accident or mitigation activities. An injury may or may not involve lost work time. An injury means any effect that results either from direct exposure to toxic concentrations, radiant heat, or overpressures from accidental releases or from the direct consequences of a vapor cloud explosion from an accidental release that requires medical treatment or hospitalization. Medical treatment means treatment, other than first aid, administered by a physician or registered professional personnel under standing orders from a physician.

c. **Property Damage:** Estimate the value of the equipment or business structures (for your business alone) that were damaged by the accident or mitigation activities. Record the value in American dollars. Do not include any losses that you may have incurred by business interruption.

6.10 **Known offsite impacts:** These are impacts that you are aware of or that were reported to the source. You are not required to conduct additional investigation to determine offsite impacts. Offsite means areas beyond the property boundary of the source or areas within the property boundary to which the public has routine and unrestricted access during or outside business hours.

a. **Deaths:** Indicate the number of offsite deaths that are attributable to the accident or mitigation activities. Offsite deaths means the number of community members and members of public response agencies who were killed during the accident or performing any mitigation activities.

b. **Hospitalizations:** Indicate the number of injuries that are attributable to the accident or mitigation activities where community members or members of response agencies required hospitalization due to the injury.

c. **Other Medical Treatment:** Indicate the number of injuries that are attributable to the accident or mitigation activities where community members or members of response agencies required medical treatment, not including first aid, due to the injury.

d. **Evacuated:** Indicate the number of members of the community who were evacuated as a result of the accident. A total count of the number of people evacuated is preferable to the number of houses evacuated.

e. **Sheltered:** Indicate the number of members of the community who were sheltered-in-place during the accident. Sheltering-in-place is the official designation when the incident commander orders community members to remain inside their residence or place of work until the emergency is over to prevent exposure to the substance. Usually these are associated with an emergency broadcast or similar method of mass notification by response agencies.

f. **Property Damage:** Estimate the value of any property (not belonging to the source) that may have been damaged as a result of the accident. Record the value in American dollars. Include the value of damages to any response equipment.

g. **Environmental Damage:** Indicate whether any environmental damage occurred and specify the type. The damage is not limited to environmental receptors listed in the rule. Any damage to the environment (e.g., defoliation, water contamination) should be considered. You are not, however, required to conduct surveys to determine whether such impact occurred.

6.11 **Initiating event:** Indicate with a check mark the initiating event that best describes the cause of the accident, if known.

a. **Equipment Failure:** A device or piece of equipment did not function as designed.

b. **Human Error:** An operator performs an operation improperly.

c. **Weather Condition:** Weather conditions, such as lightning, hail, ice storms, tornados, hurricanes, floods, or high winds caused the accident.

6.12 **Contributing factors:** These are factors that contributed to the accident occurring but were not the initiating event, if known. Check all that apply.

a. **Equipment Failure:** A device or piece of equipment did not function as designed thereby allowing a substance to be released.

b. **Human Error:** An operator performs an operation improperly or makes a mistake resulting in a release.

c. **Improper Procedures:** The procedure did not reflect the current method of operation, the procedure omitted steps that affected the accident, or the procedure was written in a manner that allowed for mis-interpretation of the instructions.

d. **Overpressurization:** The process was operated at pressures exceeding the design working pressure.

e. **Upset Condition:** Release caused by incorrect process conditions (e.g., increased temperature or pressure).

f. **By-pass Condition:** A pipe or channel that provides an alternate pathway that detours the main pathway fails releasing a substance.

g. **Maintenance Activity/Inactivity:** This is any failure that occurs because of maintenance activity or inactivity. For example, the pipes remain unpainted for so long that corrosion caused the pipe to fail, or the maintenance mechanic began to repair the wrong pump.

h. **Process Design:** Any failure that may be design related.

i. **Unsuitable Equipment:** The equipment used was incorrect for the process.

j. **Unusual Weather Condition:** Weather conditions, such as lightning, hail, ice storms, tornados, hurricanes, floods, or high winds caused the accident.

k. **Management Error:** This may be used to describe failures that occur because management did not exercise its managerial control to prevent the situation from occurring. This is usually used to describe faulty procedures, inadequate training, or failure to follow existing administrative procedures.

6.13 **Offsite responders notified:** Indicate with a check mark whether agencies were contacted.

6.14 **Changes introduced as a result of the accident:** Indicate with a check mark any measures that you have taken at the source to prevent recurrence of the accident.

a. **Improved/Upgraded Equipment:** A device or piece of equipment that did not function as designed was repaired or replaced.

b. **Revised Maintenance:** Maintenance processes were clarified or changed to ensure safe operation and timely maintenance.

c. **Revised Training:** Training programs were clarified or changed to ensure that employees and contract employees are aware of and are practicing correct safety, process, and administrative procedures.

d. **Revised Operating Procedures:** Operating procedures were clarified or changed to ensure that employees and contract employees are trained on process operating procedures.

e. **New Process Controls:** New process designs and controls were installed to correct problems and prevent recurrence of an accidental release.

f. **New Mitigation Systems:** New mitigation systems were initiated to limit accidental releases.

g. **Revised Emergency Response Plan:** The emergency response plan was revised.

h. **Changed process**

i. **Reduced Inventory:** Inventory was reduced at the source to prevent accidental release.

j. **Other**

k. **None**

7. **PREVENTION PROGRAM — PROGRAM 3:** Complete the following information about each Program 3 process at your source. If the same information applies to more than once covered process, the owner or operator may provide the information only once, but shall indicate to which process the information applies.

7.1 **SIC code for process:** The four-digit Standard Industrial Classification (SIC) Code is the federal government category of business activity. See Standard Industrial Classification

Manual, Office of Management and Budget, U.S. Government Printing Office, Washington, D.C. The four-digit SIC code should be applicable to the process, not the source as a whole.

7.2 **Name of substance(s) covered:** The name of the regulated substance(s) in the process.

7.3 **Date on which the safety information was last reviewed or revised:**

7.4 **PHA:** Answer the following questions about the status of your Process Hazard Analysis (PHA). The owner or operator must perform a PHA on processes covered by the risk management program rule.

a. **The date of completion of the most recent PHA or update**

b. **The technique used:** Indicate which of the following methodologies were used to evaluate the hazards of the process. Check all that apply.

1. **What If:** A What If analysis considers the consequences associated with events that occur as a result of failures involving equipment, design, or procedures. All possible system failures may be collected in checklist form and evaluated. Compiling a list of failures requires a basic understanding of what is intended and the ability to combine or synthesize possible deviations and reject incredible situations.

2. **Checklist:** This system involves developing a checklist of failure areas and reviewing each area to determine the possible effects of failure.

3. **What If/Checklist:** This methodology combines the what if and checklist analysis methodologies to identify and evaluate process hazards.

4. **HAZOP:** Hazard and Operability Studies (HAZOPs) are conducted by teams that brainstorm to systematically identify hazards or operability problems throughout a source through the use of certain guidewords such as "no flow" and "no cooling". The consequences of the deviation associated with the guidewords are assessed and credible deviations are identified and addressed.

5. **Failure Mode and Effects Analysis:** This is a methodology of tabulating the source's equipment, failure modes (how equipment fails), each failure mode's effect on the source, and a ranking of each failure mode.

6. **Fault Tree Analysis:** This is a deductive technique that focuses on one particular accident event and provides a method for determining causes of the event. The fault tree is a graphic model that displays the various combinations of equipment faults and failures that can result in a release.

7. **Other (specify)**

c. **The expected date of completion of any changes resulting from the PHA:** Not all recommendations will have resulted in changes. Record the date of expected final implementation of any changes that are made as a result of PHA recommendations.

d. **Major hazards:** Indicate with a check mark all major hazards that were identified for the Program 3 process at your source as a result of the PHA. Major hazards are defined as the potential for:

1. **Toxic Release:** If an accidental release occurred a regulated toxic substance could be released.

2. **Fire:** Process upsets, leaks, equipment failure, etc., could result in a fire. For listed flammables, fire will always be a major hazard. Fire, however, may also be a hazard in other processes and could lead to a toxic release.

3. **Explosion:** Confined or unconfined vapor cloud explosions, BLEVES; explosion will be a major hazard for listed flammables. It may also be a hazard for toxics, especially those handled at extreme conditions.

4. **Runaway Reaction:** An uncontrolled reaction that proceeds at an increasing rate.

5. **Polymerization:** A chemical reaction that produces the bonding of two or more monomers.

6. **Overpressurization:** Instantaneous energy release or detonation.

7. **Corrosion:** The presence of the regulated substance could lead to destruction of equipment and a release. Corrosion may be a major hazard for substances identified as corrosives on MSDSs unless the equipment used limits the hazard.

8. **Overfilling:** Filling a tank or vessel beyond its maximum safe capacity.

9. **Contamination:** A release could occur if inappropriate substances are introduced into storage or process vessels. Contamination may be a major hazard if controlling inappropriate substances (e.g., H_2O) is difficult.

10. **Equipment Failure:** Equipment failure is likely to be a major hazard for most processes because such failure could lead to a release. Equipment failure includes cracks, weld failures, disk failures, ruptures, pump/gauge/control system failures, etc.

11. **Loss of Cooling, Heating, Electricity, Instrument Air:** These losses could be major hazards if they would lead to releases. For example, loss of cooling could lead to an increase in pressure and failure of a vessel or pipe; a loss of heating or power could lead to unstable processes. These conditions are less

likely to be major hazards for substances handles at atmospheric temperatures and pressures.

12. **Earthquake:** Report these only if they are frequent enough or likely enough to occur at your site so that you design and plan for them.

13. **Floods (Flood Plain):** Report these only if they are frequent enough or likely enough to occur at your site so that you design and plan for them.

14. **Tornado:** Report these only if they are frequent enough or likely enough to occur at your site so that you design and plan for them.

15. **Hurricanes:** Report these only if they are frequent enough or likely enough to occur at your site so that you design and plan for them.

16. **Other (specify)**

e. **Process controls:** Indicate all of the process controls used on this Program 3 process. Process controls are equipment and associated procedures used to prevent or limit releases. Check all that apply.

1. **Vents:** An opening provided for the discharge of pressure or release of pressure form tanks, vessels, processing equipment, etc.

2. **Relief Valves:** A relief valve is a valve that relieves pressure beyond a specified limit and recloses upon return to normal operating conditions.

3. **Check Valves:** A device for automatically limiting flow in a piping system to a single direction,

4. **Scrubbers:** A pre-release protection measure that uses water or aqueous mixtures containing scrubbing reagents to remove discharging liquids and possibly also treating the discharging chemical.

5. **Flares:** A pre-release protection measure used for flammable gases and vapors to remove and possibly treat discharged liquids.

6. **Manual Shutoffs:** Controls the shutoff flow to a pipe or vessel and that must be operated manually.

7. **Automatic Shutoffs:** Controls the shutoff flow to a pipe or vessel and that are triggered automatically when process conditions are exceeded.

8. **Interlocks:** A switch or other device that prevents activation of a piece of equipment when a protective door is open or some other hazard exists.

9. **Alarms and Procedures:** Systems that operate a warning device after the occurrence of a hazardous condition and procedures to activate the alarm system.

10. **Keyed Bypass:** A bypass system that is activated by a control signal.

11. **Emergency Air Supply:** A backup system to provide air to a process when the regular air supply fails.

12. **Emergency Power:** Backup power systems.

13. **Backup Pump:** A secondary pump intended to serve the same function as the primary pump if the primary pump fails.

14. **Grounding Equipment:** Devices that ground electrical equipment to avoid explosions.

15. **Inhibitor Addition:** A substance that is added to a reaction that is capable of stopping or retarding a chemical reaction.

16. **Rupture Disks:** A rupture disk is a device that relieves pressure beyond a specified limit and recloses upon return to normal operating conditions.

17. **Excess Flow Device:** Flow-limiting equipment that protects downstream equipment from surges.

18. **Quench System:** A system that cools by removing excess heat or immersing liquid into a cooling medium.

19. **Purge System:** A system that replaces the atmosphere in a container with an inert substance to prevent the formation of an explosive mixture.

20. **Other (specify)**

f. **Mitigation systems:** Indicate with a check mark all of the mitigation systems in place to control a release should one occur from the process.

1. **Sprinkler System:** A system for protecting a building against fire by means of overhead pipes which convey an extinguishing fluid through heat activated outlets.

2. **Dikes:** A low wall that acts as a barrier to prevent a spill from spreading.

3. **Fire Walls:** A wall constructed to prevent the spread of fire.

4. **Blast Walls:** A heavy wall used to isolate buildings or areas that contain highly combustible or explosive materials.

5. **Deluge System:** A system to overflow an area of a release with water or other extinguishing fluid.

6. **Water Curtain:** A spray of water from a horizontal pipe through nozzles, the curtain may be activated manually or automatically.

7. **Enclosure:** Physical containment of the release within a structure (e.g., a building).

8. **Neutralization:** Controlling a release by neutralizing the released chemical.

9. **Other (specify)**

g. **Monitoring/detection systems:** Indicate with a check mark the monitoring and detection systems installed to detect a release of a regulated substance from the process.

1. **Process Area Detectors:** Detection systems located on or close to process equipment. Detection systems include indicator tubes, and chromatographic, spectrometric, electrochemical, and colorimetric gas analysis.

2. **Perimeter Monitors:** Integrated detection networks at the source boundary. Detection systems can include fluorescent SO_2 analyzers, photoelectric tape sensors, or electrolytic chlorine detectors.

3. **Other (specify)**

h. **Changes since last PHA update:** Indicate with a check mark all of the changes made to the process since the last PHA. Check all that apply.

1. **Reduction in Chemical Inventory:** Decrease in the quantity of regulated substances stored on site.

2. **Increase in Chemical Inventory:** Increase in the quantity of regulated substances stored on site.

3. **Change in Process Parameters:** Increase or decrease in temperature, pressure, flow rates, etc.

4. **Installation of Process Controls:** Addition of controls such as those listed in question 5 above.

5. **Installation of Process Detection Systems:** Addition of systems such as those listed in question 7 above.

6. **Installation of Perimeter Monitoring Systems:** Addition of systems such as those listed in question 7 above.

7. **Installation of Mitigation Systems:** Addition of systems such as those listed in question 6 above.

8. **Other (specify)**

9. **None Required/Recommended:** PHA team recommended no change.

7.5 **The date of the most recent review or revision of operating procedures:** You should have developed and implemented written operating procedures as defined in § 68.69 that provide clear instructions for safely conducting activities involved in each covered process that are consistent with the process safety information. Operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to stationary sources. Indicate the date of the most recent review or revision.

7.6 **Training:** The training program, as specified in § 68.71, should cover initial training for each employee involved in operating a process that emphasizes specific safety and health hazards, emergency operations including shutdown, and safe work practices. You should also offer refresher training at least every three years and training documentation to show that each employee involved in operating a process has received and understood the required training.

a. **The date of the most recent review or revision of training programs**

b. **The type of training provided:** Indicate whether the training was held in a classroom, was a combination of classroom and on the job, on the job, or other.

c. **The type of competency testing used:** Indicate with a check mark how employees were tested to determine and evaluate comprehension of the training materials.

7.7 **Maintenance:** The maintenance program, defined in § 68.73, ensures the mechanical integrity of process equipment. The maintenance program procedures should be written, training should be provided for employees involved in maintenance activities, inspection and testing should be performed in process equipment, equipment deficiencies should be corrected before further use or in a safe and timely manner, and the owner or operator should ensure that the equipment is installed properly and consistent with design specifications.

a. **The date of the most recent review or revision of maintenance procedures**

b. **The date of the most recent equipment inspection or test**

c. **The equipment inspected or tested**

7.8 **Management of Change:** The owner or operator shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to stationary sources that affect a covered process as specified in § 68.75.

a. **The date of the most recent change that triggered management of change procedures**

b. **The date of the most recent review or revision of management of change procedures**

7.8 **The date of the most recent pre-startup review:** Pre-start up review, as specified in § 68.77, shall be performed for new stationary sources and for modified stationary sources when the modification is significant enough to require a change in the process safety information.

7.9 **Compliance audits:** Compliance audits, as specified in § 68.79, evaluate whether the source is in compliance with the risk management program provisions and should be conducted at least every three years by a person knowledgeable in the process.

a. **The date of the most recent compliance audit**

b. **The expected date of completion of any changes resulting from the compliance audit**

7.10 **Incident investigation:** The owner or operator should have procedures, as specified in § 68.81, to investigate each incident that resulted in, or could reasonably have resulted in a catastrophic release of a regulated substance.

a. **The date of the most recent incident investigation**

b. **The expected date of completion of any changes resulting from the investigation**

7.11 **The date of the most recent review or revision of employee participation plans:** Employee participation is described in § 68.83.

7.12 **The date of the most recent review or revision of hot work permit procedures:** Hot work permits are described in § 68.85.

7.13 **The date of the most recent review or revision of contractor safety procedures:** Contractor safety procedures, as described in § 68.87, describe procedures to oversee contractors performing maintenance or repair work, turnaround, major renovation, or specialty work on or adjacent to a covered process. This section does not apply to contractors providing incidental services that do not influence process safety (e.g., trash removal, groundkeeping).

7.14 **The date of the most recent evaluation of contractor safety performance:** Contractor safety procedures are described in § 68.87.

8. **PREVENTION PROGRAM — PROGRAM 2:** For each Program 2 process, the owner or operator must provide the following information. If the same information applies to more

than once covered process, the owner or operator may provide the information only once, but shall indicate to which process the information applies.

8.1 **SIC code for process:** The Standard Industrial Classification (SIC) Code is the federal government category of business activity. See Standard Industrial Classification Manual, Office of Management and Budget, U.S. Government Printing Office, Washington, D.C. The SIC code should be applicable to the process, not the source as a whole.

8.2. **Chemicals:** The name of the regulated substances in the process.

8.3 **Safety information:** As described in § 68.48 the owner or operator shall compile and maintain up-to-date safety information related to regulated substances, processes, and equipment.

a. **The date of the most recent review or revision of the safety information:**

b. **A list of Federal or state regulations or industry-specific design codes and standards used to demonstrate compliance with the safety information requirement:** Indicate with a check mark whether you are using any of the following:

1. **NFPA 58 (or state law based on NFPA 58):** National Fire Protection Association propane handling laws. Propane laws are based on NFPA 59 except in the states of California and texas.

2. **OSHA (29 CFR 1910.111):** OSHA rule for handling anhydrous ammonia.

3. **ASTM Standards:** American Society of Testing Materials standards. Establishes standards for materials, products, systems, services, test methods, specifications, classifications, definitions, and recommended practices.

4. **ANSI Standards:** American National Standards Institute standards. Nationally coordinates voluntary standards. Gives status to standards in such areas as definitions, terminology, symbols, and abbreviations; materials, performance characteristics, procedure, and methods of rating; methods of testing and analysis; size, weight, and volume; safety, health, and building construction.

5. **ASME Standards:** American Society of Mechanical Engineers standards. Conducts research and develops boiler, pressure vessel, and power test codes. Also develops safety codes and standards for equipment.

6. **Other (specify)**

7. **None**

8.4 **Hazard review:** Your hazard review, as specified in § 68.50, must identify the hazards associated with the process, opportunities for equipment malfunctions or human errors, safeguards needed to control the hazards or prevent equipment malfunction or human error, and any steps used or needed to detect or monitor releases.

a. **The date of completion of the most recent hazard review or update**

b. **The expected date of completion of any changes resulting from the hazard review**

c. **Major hazards:** Indicate with a check mark all major hazards that were identified for the Program 2 process at your source as a result of the hazard review. Major hazards are defined in 7.4(d) of this guidance.

d. **Process controls:** Indicate with a check mark all of the process controls used on this Program 2 process. Process controls are equipment and associated procedures used to prevent or limit releases. Process controls are described in 7.4(e) of this guidance.

e. **Mitigation systems:** Indicate with a check mark all of the mitigation systems in place to control a release should one occur from the process. Mitigation systems are defined in 7.4(f) of this guidance.

f. **Monitoring/detection systems:** Indicate with a check mark the monitoring and detection systems installed to detect a release of a regulated substance from the process. Monitoring/detection systems are described in 7.4(g) of this guidance.

g. **Changes since last PHA update:** Indicate with a check mark all of the changes made to the process since the last PHA. PHA changes are described in 7.4(h) of this guidance.

8.5 **The date of the most recent review or revision of operating procedures:** You should have developed and implemented written operating procedures as defined in § 68.52 that provide clear instructions for safely conducting activities involved in each covered process that are consistent with the process safety information. Operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to stationary sources. Indicate the date of the most recent review or revision.

8.6 **Training:** The training program, as specified in § 68.54, should cover initial training for each employee involved in operating a process that emphasizes specific safety and health hazards, emergency operations including shutdown, and safe work practices. You should also offer refresher training at least every three years.

a. **The date of the most recent review or revision of training programs**

b. **The type of training provided:** Indicate whether the training was held in a classroom, was a combination of classroom and on the job, on the job, or other.

c. **The type of competency testing used:** Indicate with a check mark how employees were tested to determine and evaluate comprehension of the training materials.

8.7 **Maintenance:** The maintenance program, as specified in § 68.56, ensures mechanical integrity of process equipment. The maintenance program procedures should be written, training should be provided for employees involved in maintenance activities, and inspection and testing should be performed in process equipment.

a. **The date of the most recent review or revision of maintenance procedures**

b. **The date of the most recent equipment inspection or test**

c. **The equipment inspected or tested**

8.8 **Compliance audits:** Indicate the date of your last compliance audit, as specified in § 68.58. Compliance audits are important to evaluate whether the source is in compliance with the risk management program provisions and should be conducted at least every three years by a person knowledgeable in the process.

a. **The date of the most recent compliance audit**

b. **The expected date of completion of any changes resulting from the compliance audit**

8.9 **Incident investigation:** Indicate the date of your most recent incident investigation. As specified in § 68.60, you must investigate each incident that resulted in, or could reasonably have resulted in a catastrophic release of a regulated substance.

a. **The date of the most recent incident investigation**

b. **The expected date of completion of any changes resulting from the investigation**

8.10 **The date of the most recent change that triggered a review or revision of safety information, the hazard review, operating or maintenance procedures, or training:**

9. EMERGENCY RESPONSE

9.1 **Do you have a written emergency response plan?** Indicate whether or not your source has a written emergency response plan. You are not required to have a plan if all response activities will be handled by public responders or other non-employees.

9.2 **Does the plan include specific actions to be taken in response to an accidental releases of a regulated substance?** Indicate whether or not whether your plan includes specific actions that should be taken in response to an accidental release of a regulated substance.

9.3 **Does the plan include procedures for informing the public and local agencies responsible for responding to accidental releases?** Indicate whether or not the plan includes procedures for public notification and notification of local agencies responsible for responding to accidental releases.

9.4 **Does the plan include information on emergency health care?** Indicate whether or not the plan includes information on emergency health care.

9.5 **The date of the most recent review or update of the emergency response plan**

9.6 **The date of the most recent emergency response training for employees:** Enter the date of the last emergency response training. Drills involving your personnel with or without outside emergency response agencies and tabletop exercises of your emergency response plan are acceptable. Single purpose drills (e.g., alarm system drills) may be listed, but exercises that test more aspects of the plan are preferable.

9.7 **The name and telephone number of the local agency with which the plan is coordinated:** Indicate the name and phone number of the agency that reviewed your plan (e.g., fire department). If you do not have a plan, indicate the agency that will handle responses to releases at your source.

9.8 **Subject to:** The following is a list of federal and state regulations dealing with emergency response plans. You may or may not be covered under these regulations. Check all that apply.

a. **OSHA 1910.38:** OSHA's Emergency Action Plan. All sources are subject to this rule except state and local governments in states without delegated OSHA programs.

b. **OSHA 1910.120:** OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) plan.

c. **Clean Water Act/SPCC (40 CFR 112):** EPA's oil Spill Prevention Control and Countermeasures Plan requirements.

d. **RCRA (40 CFR 264, 265, 279.52):** EPA's Resource Conservation and Recovery Act permitting requirements for solid waste.

e. **OPA 90 (40 CFR 112, 33 CFR 154, 49 CFR 194, 30 CFR 254):** EPA, U.S. Coast Guard, Department of Transportation, and Department of the Interior facility response plan requirements. Currently these apply only to oil.

f. **State EPCRA Rules/Law:** These are the state emergency planning and community right-to-know laws. Federal EPCRA does not require facility response plans, but some state laws may.

g. **Other (specify)**

RMP
OFFSITE CONSEQUENCE ANALYSIS
GUIDANCE

May 24, 1996

This document guides the owner or operator of processes covered by the Risk Management Program rule in the analysis of offsite consequences of accidental releases of substances regulated under section 112(r) of the Clean Air Act. This document does not substitute for EPA's regulations, nor is it a regulation itself. Thus, it cannot impose legally binding requirements on EPA, States, or the regulated community, and may not apply to a particular situation based upon the circumstances. EPA may change this guidance in the future, as appropriate.

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5) Determine Reference Table and Distance	
Dense or Neutrally Buoyant Plume (liquids)	Section 4 and Appendix B (Exhibit B-2)
Dense or Neutrally Buoyant Plume (solutions)	Section 4 and Appendix B (Exhibit B-3)
Urban or Rural	Section 2.1 and 4
Release Duration (liquids)	Section 3.2.2
Release Duration (solutions)	Section 4

Toxic Liquid	
Alternative Scenario	
1) Define Alternative Scenario	Section 6
2) Select Scenario	Section 7
3) Calculate Release Rates	Section 8.2
Unmitigated (from tanks and pipes)	Section 8.2.1
Active or Passive Mitigation	Section 8.2.2
Release at ambient temperature	Section 8.2.3
Release at elevated temperature	Section 8.2.3
Release of solution	Sections 8.2.4 and 3.3 and Appendix B (Exhibit B-3)
4) Find Toxic Endpoint	
For liquids/mixtures	Appendix B (Exhibit B-2)
For solutions	Appendix B (Exhibit B-3)
5) Determine Reference Table and Distance	
Dense or Neutrally Buoyant Plume (liquids/mixtures)	Section 9 and Appendix B (Exhibit B-2)
Dense or Neutrally Buoyant Plume (solutions)	Section 9 and Appendix B (Exhibit B-3)
Urban or Rural	Sections 2.1 and 9
Release Duration (liquids/mixtures)	Section 3.2.2
Release Duration (liquids/mixtures)	Section 9

Flammable Substances	
Worst-Case Scenario	
1) Define Worst Case	Sections 5.1 and 2.1
2) Select Scenario	Section 5.1 and 2.2 and 2.3
3) Determine Distance to Overpressure Endpoint	
For Pure Flammable Substances	Section 5.1
For Flammable Mixtures	Section 5.2
Alternative Scenario	
1) Define Alternative Scenario	Section 10
2) Select Scenario	Section 10
3) For Vapor Cloud Fires	Section 12.1
Calculate Release Rates (gases)	Section 11.1 and Appendix C (Exhibit C-2)
Calculate Release Rates (liquids)	Section 11.2
Find Lower Flammability Limit (gases)	Appendix C (Exhibit C-2)
Find Lower Flammability Limit (liquids)	Appendix C (Exhibit C-3)
Dense or Neutrally Buoyant (gases)	Appendix C (Exhibit C-2)
Dense or Neutrally Buoyant (liquids)	Appendix C (Exhibit C-3)
Urban or Rural	Section 2.1 and 9
Release Duration	Section 12.1
Determine Distance	Section 9
4) For Pool Fires	Section 12.2 and Appendix C (Exhibit C-3)
5) For BLEVEs	Section 12.3
6) For Vapor Cloud Explosions	Section 12.4

OFFSITE CONSEQUENCE ANALYSIS GUIDANCE

1.0 Overview

Under the accidental release provisions of the Clean Air Act, regulated sources are required to conduct hazard assessments, including offsite consequence analyses. This guidance is intended to assist sources to conduct such offsite consequence analyses for worst-case release scenarios involving regulated substances and alternative release scenarios. The worst-case consequence analyses and the analyses for alternative scenarios are to be reported in the risk management plan (RMP). Consult Chapters 13 and 14 of this document for information on what you will need to report.

If your site has Program 1 processes, you must submit information on a worst-case release scenario for <u>each</u> toxic and flammable substance held above the threshold quantity in a Program 1 process. If your site has Program 2 or Program 3 processes, you must provide information on <u>one</u> worst-case release for all toxic regulated substances present above the threshold quantity and <u>one</u> worst-case release scenario for all flammable regulated substances present above the threshold quantity. You may need to submit an additional worst-case scenario if a worst-case release from another process at the source would potentially affect public receptors different from those potentially affected by the initial worst-case scenario(s) for flammable and toxic regulated substances.

In addition to a worst-case release scenario, sources with Program 2 and Program 3 processes must also provide information on alternative release scenarios. Alternative release scenarios are should be those that may result in concentrations, overpressures, or radiant heat that reach the endpoints specified for these effects offsite. You must present information on one alternative release scenario for <u>each</u> regulated toxic substance, including the substance used for the worst-case release, held above the threshold quantity and <u>one</u> alternative release scenario to represent all flammable substances held above the threshold quantity.

The rule for risk management programs for accidental release prevention can be found at the end of this document as Appendix E. Consult the rule for details of the requirements for regulated sources.

This guidance provides simple methods and reference tables for determining consequence distances for worst-case and alternative release scenarios. Results obtained using these methods are expected to be conservative. Conservative assumptions have been introduced to compensate for high levels of uncertainty. The methodology provided is optional. If you use this guidance to derive your distances to endpoints, you will be considered to be in compliance with the requirements for offsite consequence analyses. You may, however, use other air dispersion models or computation methods provided that:

- They are publicly or commercially available or they are proprietary models that you are willing to share with the implementing agency;
- They are appropriate for the chemicals and conditions being modeled;
- You use the applicable definitions of worst-case scenarios; and
- You use the applicable parameters specified in the rule.

Exhibit 1 (next page) briefly presents the required parameters for modeling both worst-case and alternative scenarios. If you do your own modeling, you may consider some site-specific conditions for the worst-case analysis, as noted in the exhibit, and use site-specific conditions for the alternative scenario analysis. For this guidance, a number of assumptions had to be made for broad applicability and simplicity of use. These assumptions, which are noted in Exhibit 1 and in the text, are built into and chemical-specific tables of data to be used in carrying out the release rate calculations and the reference tables of distances.

Appendix A of this guidance provides some information on public domain models and references that may be consulted for other methods of analysis. You are not limited to the models and references included in the appendix, but may use any applicable model or method. This appendix does not include details on the capabilities of the models listed. You will find that modeling results may sometimes vary greatly from model to model.

In addition to this generic guidance, EPA is providing specific guidance for several industry sectors, including:

- Ammonia refrigeration, *Model Risk Management Program and Plan for Ammonia Refrigeration* (currently available);
- Propane distribution (currently in development); and
- Water treatment (currently in development).

2.0 Determining Worst-Case Scenario

2.1 Definition of Worst-Case Scenario

EPA has defined a worst-case release as the release of the largest quantity of a regulated substance from a vessel or process line failure that results in the greatest distance to a specified endpoint. The largest quantity should be determined taking into account administrative controls. Administrative controls are procedures that limit the quantity of a substance that can be stored or processed in a vessel or pipe at any one time, or, alternatively, procedures that occasionally allow the vessel or pipe to store larger than usual quantities (e.g., during shutdown/turnaround). For the worst-case analysis, you do not need to consider the possible causes of the worst-case release or the probability that such a release might occur; the release is simply assumed to take place. All releases are assumed to take place at ground level for the worst-case analysis.

Meteorological conditions for the worst-case scenario are defined for this guidance as atmospheric stability class F (stable atmosphere), wind speed of 1.5 meters per second (3.4 miles per hour), and ambient air temperature of 25° C (77° F).

Two choices are provided for topography for the worst-case scenario. If your site is located in an area with few buildings or other obstructions, you should assume open (rural) conditions. If your site is in an urban location, or is in an area with many obstructions, you should assume urban conditions.

Exhibit 1
Required Parameters for Modeling

WORST CASE	ALTERNATIVE SCENARIO
Endpoints	
Endpoints for toxic substances are specified in Appendix B.	Endpoints for toxic substances are specified in Appendix B.
For flammable substances, endpoint is overpressure of 1 pound per square inch (psi) for vapor cloud explosions.	For flammable substances, endpoint is overpressure of 1 ps for vapor cloud explosions, or
	Radiant heat level of 5 kilowatts per square meter (kW/m^2) for 40 seconds for heat from fires (or equivalent dose), or
	Lower flammability limit (LFL) as specified in NFPA documents or other generally recognized sources.
Wind speed/stability	
Use wind speed of 1.5 meters per second and F stability class unless you can demonstrate that local meteorological data applicable to the site show a higher minimum wind speed or less stable atmosphere at all times during the previous three years. If you can so demonstrate, these minimums may be used. This guidance assumes 1.5 meters per second and F stability.	For site-specific modeling, use typical meteorological conditions for your site. If you use this guidance, you assume wind speed of 3 meters per second and D stability.
Ambient temperature/humidity	
For toxic substances, use the highest daily maximum temperature and average humidity for the site during the past three years. If you are using this guidance, 25°C (77°F) and 50 percent humidity are assumed.	You may use average temperature/humidity data gathered a the site or at a local meteorological station. If you are using this guidance, 25°C and 50 percent humidity are assumed.
Height of release	
For toxic substances, assume a ground level release.	Release height may be determined by the release scenario. For this guidance, a ground-level release is assumed.
Topography	
Use urban or rural topography, as appropriate.	Use urban or rural topography, as appropriate.
Dense or neutrally buoyant gases	
Tables or models used for dispersion of regulated toxic substances must appropriately account for gas density. If you use this guidance, see Tables 1-4 for buoyant gases and Tables 5-8 for dense gases.	Tables or models used for dispersion must appropriately account for gas density. If you use this guidance, see Tables 10-13 for buoyant gases and Tables 14-17 for dense gases.
Temperature of released substance	
Consider liquids (other than gases liquefied by refrigeration) to be released at the highest daily maximum temperature, based on data for the previous three years, or at process temperature, whichever is higher. Assume gases liquefied by refrigeration at atmospheric pressure are released at their boiling points. If you are using this guidance, 25°C or the boiling point of the released substance may be used.	Substances may be considered to be released at a process o ambient temperature that is appropriate for the scenario. If you are using this guidance, 25°C or the boiling point of the released substance may be used.

Toxic gases. Toxic gases include all regulated toxic substances that are gases at ambient temperature (temperature 25° C, 77° F), with the exception of gases liquefied by refrigeration under atmospheric pressure. For the consequence analysis, a gaseous release of the total quantity is assumed to occur in 10 minutes. Passive mitigation measures (e.g., enclosure) may be taken into account in the analysis of the worst-case scenario. Gases liquefied by refrigeration alone and released into diked areas may be modeled as liquids at their boiling points and assumed to be released from a pool by evaporation.

The endpoint for air dispersion modeling to estimate the consequence distance for a release of a toxic gas is presented for each regulated toxic gas in Exhibit B-1 of Appendix B. The toxic endpoint is, in order of preference: (1) the Emergency Response Planning Guideline 2 (ERPG-2), developed by the American Industrial Hygiene Association (AIHA), or (2) the Level of Concern (LOC) for extremely hazardous substances (EHSs) regulated under section 302 of the Emergency Planning and Community Right-to-Know Act (EPCRA). This endpoint was chosen as the threshold for serious injury from exposure to a toxic substance in the air. (See Appendix D, Section D.3, for additional information on the toxic endpoint.)

Toxic liquids. For toxic liquids, the total quantity in a vessel is assumed to be spilled onto a flat, non-absorbing surface. For toxic liquids carried in pipelines, the quantity that might be released from the pipeline is assumed to form a pool. Passive mitigation systems (e.g., dikes) may be taken into account in consequence analysis. The total quantity spilled is assumed to spread instantaneously to a depth of 0.39 inch (one centimeter) in an undiked area or to cover a diked area instantaneously. The release rate to air is estimated as the rate of evaporation from the pool. If liquids at your site might be spilled onto a surface that could rapidly absorb the spilled liquid (e.g., porous soil), the methods presented in this guidance may greatly overestimate the consequences of a release. Consider using another method in such a case.

The endpoint for air dispersion modeling to estimate the consequence distance for a release of a toxic liquid is presented for each regulated toxic liquid in Exhibit B-2 of Appendix B. The toxic endpoint is, in order of preference: (1) the ERPG-2 or (2) the LOC for EHSs, as for toxic gases.

Flammable substances. For regulated flammable substances, including both flammable gases and volatile flammable liquids, the worst-case release is assumed to result in a vapor cloud containing the total quantity of the substance that could be released from a vessel or pipeline. The entire quantity in the cloud is assumed to be between the upper and lower flammability limits of the substance. For the worst-case consequence analysis, the vapor cloud is assumed to detonate.

The endpoint for the consequence analysis of a vapor cloud explosion of a regulated flammable substance is an overpressure of 1 pound per square inch (psi). This endpoint was chosen as the threshold for potential serious injuries to people as a result of property damage caused by an explosion (e.g., injuries from flying glass from shattered windows or falling debris from damaged houses). (See Appendix D, Section D.5 for additional information on this endpoint.)

2.2 Determination of Quantity for the Worst-Case Scenario

For the analysis of the worst-case scenario, you must consider the largest quantity of a regulated substance handled on site in a single vessel at any one time, taking into account administrative controls. For example, if you have written procedural restrictions that limit vessel inventories to less than the maximum, you would not consider the maximum possible vessel inventory. If the vessel normally contains only a small quantity, but may contain a much greater quantity under special circumstances, such as a turnaround, you must use the larger quantity for the worst case. You also must consider the quantity that might be released if a pipeline were sheared.

2.3 Selecting Single Worst-Case Scenario

The hazard assessment requires a single offsite consequence analysis of the worst-case scenario for substances in each hazard category (i.e., one for regulated toxic substances and one for regulated flammable substances). Only the hazard for which the substance is listed needs to be considered (i.e., substances on the list of regulated toxic substances that are also flammable should be analyzed only for their toxic hazard; substances on the list of regulated flammable substances should be considered only for flammability).

The substance chosen for the consequence analysis for each hazard should be the substance that has the potential to cause the greatest offsite consequences. Choosing the toxic substance that might lead to the greatest offsite consequences may require a screening analysis of the toxic substances on site, because the potential consequences are dependent on a number of factors, including quantity, toxicity, and volatility. Location (distance to the fenceline) and conditions of processing or storage (e.g., a high temperature process) also should be considered.

For flammable substances, the consequences of a vapor cloud explosion must be considered in the analysis. The severity of the consequences of a vapor cloud explosion depends on the quantity of the released substance in the vapor cloud and its heat of combustion. In most cases, the analysis probably should be based on the regulated flammable substance present in the greatest quantity; however, a substance with a high heat of combustion may have a greater potential offsite impact than a larger quantity of a substance with a lower heat of combustion. In some cases, a regulated flammable substance that is close to the fenceline might have a greater potential offsite impact than a larger quantity farther from the fenceline.

3.0 Release Rates for Toxic Substances

This section describes a simple method for estimating release rates for regulated toxic substances for the worst-case scenario. The estimated release rates may be used to estimate dispersion distances to the toxic endpoint for regulated toxic gases and liquids, as discussed in Section 4.

3.1 Release Rates for Toxic Gases

Regulated substances that are gases at ambient temperature (temperature 25° C, 77° F) should be considered gases for consequence analysis, with the exception of gases liquefied by refrigeration at atmospheric pressure. Gases liquefied under pressure should be treated as gases. Gases liquefied by refrigeration alone and released into diked areas may be treated as liquids at their boiling points. You may consider passive mitigation for gaseous releases and releases of gases liquefied by refrigeration. For regulated toxic gases, you may estimate a release rate as described below. Sections 3.1.1 and 3.1.2 describe methods for estimating release rates for unmitigated and mitigated gaseous releases, and Section 3.1.3 describes the estimation of the release rate of a refrigerated liquefied gas from a diked pool.

EPA is providing guidance, including guidance on offsite consequence analysis, specifically for ammonia refrigeration facilities in *Model Risk Management Program and Plan for Ammonia Refrigeration*. The ammonia-specific guidance takes into account the conditions encountered in ammonia refrigeration; modeling results are somewhat less conservative than the results obtained using this off-site consequence analysis guidance. If you are conducting a worst-case analysis for ammonia used for refrigeration, you should consult the guidance for ammonia refrigeration facilities.

3.1.1 Unmitigated Releases of Gas

If no passive mitigation system is in place, estimate the release rate for the release over a 10-minute period of the largest quantity resulting from a pipe or vessel failure. For a release from a vessel, calculate the release rate as follows:

$$QR = \frac{QS}{10} \tag{1}$$

where: QR = Release rate (pounds per minute)
QS = Quantity released (pounds)

For a gas pipeline, assume the pipeline is sheared and use the usual flow rate through the pipe as the release rate for the consequence analysis.

Example 1. Gas Release (Diborane)

You have a tank containing 2,500 pounds of diborane gas. Assuming the total quantity in the tank is released over a 10-minute period, the release rate (QR), from Equation 1, is:

QR = 2,500 pounds/10 minutes = 250 pounds per minute

3.1.2 Releases of Gas in Enclosed Space

If a gas is released in an enclosure such as a building or shed, the release rate to the outside air may be lessened considerably. The dynamics of this type of release are complex; however, you may use the simplified method presented here to estimate an approximate release rate to the outside air from a release in an enclosed space. The enclosed space is assumed to be in direct contact with the outside air; i.e., this method does not apply to a release in a room that is enclosed within a building. For the worst case, assume as before that the largest quantity resulting from a pipe or vessel failure is released over a 10-minute period. Determine the unmitigated worst-case scenario release rate of the gas as the quantity released divided by 10 (Equation 1). The release rate from the building will be approximately 55 percent of the worst case scenario release rate (see Appendix D, Section D.1.1 for the derivation of this factor), as follows:

$$QR = \frac{QS}{10} \times 0.55 \qquad (2)$$

where: QR = Release rate (pounds per minute)
QS = Quantity released (pounds)
0.55 = Mitigation factor (discussed in Appendix D, Section D.1.2)

Example 2. Gas Release in Enclosure (Diborane)

Suppose the diborane gas from Example 1 is released inside a building at the rate of 250 pounds per minute. The mitigated release to the outside air from the building would be:

QR = 250 pounds/minute × 0.55 = 138 pounds per minute

3.1.3 Releases of Liquefied Refrigerated Gas in Diked Area

If you have a toxic gas that is liquefied by refrigeration alone, and it will be released into an area where it will be contained by dikes to form a pool more than 0.033 feet (1 centimeter) in depth, you can carry out the worst-case analysis assuming evaporation from a liquid pool. First compare the diked area to the maximum area of the pool that could be formed. You can use Equation 6 in Section 3.2.3 to estimate the maximum size of the pool. Density factors (DF) for toxic gases at their boiling points are listed in Exhibit B-1 of Appendix B. If the pool formed by the released liquid would be smaller than the diked area, assume a ten-minute gaseous release, and estimate the release rate as described in Section 3.1.1. If the dikes prevent the liquid from spreading out to form a pool of maximum size (assuming a depth of 0.033 feet (one centimeter)), you may use the method described in Section 3.2.3 for mitigated liquid releases to estimate a release rate from a pool at the boiling point of the released substance. Use Equation 8 in Section 3.2.3 for the release rate. The Liquid Factor Boiling (LFB) for each toxic gas is listed in Exhibit B-1 of Appendix B.

After you have estimated the release rate, estimate the duration of the vapor release from the pool by dividing the total quantity spilled by the release rate.

Example 3. Mitigated Release of Gases Liquefied by Refrigeration (Chlorine)

You have a refrigerated tank containing 50,000 pounds of liquid chlorine. A diked area around the chlorine tank of 275 square feet is sufficient to hold all of the spilled liquid chlorine. Once the liquid spills into the dike, it is then assumed to evaporate at its boiling point (-29° F or 239 Kelvin). The evaporation rate at the boiling point is determined from Equation 8. For the calculation, wind speed is assumed to be 1.5 meters per second and the wind speed factor is 1.4, LFB for chlorine (from Exhibit B-1) is 0.19, and A is 275 square feet. The release rate is:

QR = 1.4 x 0.19 x 275 = 73 pounds per minute

The duration of the release would be:

t = 50,000 pounds/73 pounds per minute = 685 minutes

3.2 Release Rates for Toxic Liquids

The release rate to air for toxic liquids is assumed to be the rate of evaporation from the pool formed by the released liquid. Assume the total quantity in a vessel is released into the pool, or estimate the quantity that might be released from a pipe as discussed in Section 3.2.1 below. Passive mitigation measures (e.g., dikes) may be considered in determining the area of the pool and the release rate. If the substance on site is always at ambient temperature, the evaporation rate may be determined assuming the pool and surroundings are at 25° C (77° F); this guidance provides data for this calculation. This guidance also provides data for estimating the evaporation rate at the boiling point of the substance, for cases where the substance may be at elevated temperatures.

The calculation methods provided in this section apply only to substances that are liquids under ambient conditions. For substances that are gases under ambient conditions, but are liquefied under pressure or refrigeration, see Section 3.1 above.

3.2.1 Releases of Liquids from Pipes

To consider a liquid release from a broken pipe, estimate the maximum quantity that could be released assuming that the pipe is full of liquid. To estimate the quantity in the pipe, you need to know the length of the pipe (in feet) and cross-sectional area of the pipe (in square feet). Note also that liquid may be released from both directions at a pipe shear (both in the direction of operational flow and the reverse direction, depending on the location of the shear). Therefore, the length would be the full length of pipe carrying the liquid on the facility grounds. Then, the volume of the liquid in the pipe (in cubic feet) is the length of the pipe times the cross-sectional area. The quantity in the pipe (in pounds) is the volume divided by the Density Factor (DF) times 0.033. (1/(DF times 0.033) is equal to density in pounds per cubic foot). Assume the estimated quantity (in pounds) is released into a pool and use the method and equations described below in Section 3.2.2 (unmitigated releases) or 3.2.3 (releases with passive mitigation) to determine the evaporation rate of the liquid from the pool.

3.2.2 Unmitigated Releases of Liquids

If no passive mitigation measures are in place, the liquid is assumed to form a pool 0.39 inch (one centimeter) deep instantaneously. You may calculate the release rate to air from the pool (the evaporation rate) as discussed below for releases at ambient or elevated temperature.

Ambient temperature. If the liquid is always at ambient temperature, find the Liquid Factor Ambient (LFA) and the Density Factor (DF) in Exhibit B-2 of Appendix B (see Appendix D, Section D.2.2 for the derivation of these factors). Calculate the release rate of the liquid from the following equation:

$$QR = QS \times 1.4 \times LFA \times DF \qquad (3)$$

where: QR = Release rate (pounds per minute)
QS = Quantity released (pounds)
1.4 = Wind speed factor = $1.5^{0.78}$, where 1.5 meters per second (3.4 miles per hour) is the wind speed for the worst case
LFA = Liquid Factor Ambient
DF = Density Factor

Example 4. Unmitigated Liquid Release at Ambient Temperature (Acrylonitrile)

You have a tank containing 20,000 pounds of acrylonitrile at ambient temperature. The total quantity in the tank is spilled onto the ground in an undiked area, forming a pool. Assume the pool spreads out to a depth of one centimeter. The release rate from the pool (QR) is calculated from Equation 3. For the calculation, the wind speed is assumed to be 1.5 meters per second and the wind speed factor is 1.4. From Exhibit B-2, Appendix B, LFA is for acrylonitrile is 0.018 and DF is 0.61. Then:

QR = 20,000 x 1.4 x 0.018 x 0.61 = 307 pounds per minute

The duration of the release (from Equation 5) would be:

t = 20,000 pounds/307 pounds per minute = 65 minutes

Elevated temperature. If the liquid is at an elevated temperature (any temperature above 25° C), find the Liquid Factor Boiling (LFB) and the Density Factor (DF) in Exhibit B-2 of Appendix B (see Appendix D, Section D.2.2, for the derivation of these factors). Calculate the release rate of the liquid from the following equation:

$$QR = QS \times 1.4 \times LFB \times DF \tag{4}$$

where: QR = Release rate (pounds per minute)
QS = Quantity released (pounds)
1.4 = Wind speed factor = $1.5^{0.78}$, where 1.5 meters per second (3.4 miles per hour) is the wind speed for the worst case
LFB = Liquid Factor Boiling
DF = Density Factor

Example 5. Unmitigated Release at Elevated Temperature (Acrylonitrile)

You have a tank containing 20,000 pounds of acrylonitrile at an elevated temperature. The total quantity in the tank is spilled onto the ground in an undiked area, forming a pool. Assume the pool spreads out to a depth of 0.033 feet (one centimeter). The release rate from the pool is calculated from Equation 4. For the calculation, the wind speed factor for 1.5 meters per second is 1.4. From Exhibit, B-2, Appendix B, LFB for acrylonitrile is 0.11 and DF is 0.61. Then:

$$QR = 20{,}000 \times 1.4 \times 0.11 \times 0.61 = 1{,}880 \text{ pounds per minute}$$

The duration of the release (from Equation 5) would be:

$$t = 20{,}000 \text{ pounds}/1880 \text{ pounds per minute} = 11 \text{ minutes}$$

Duration of Release. After you have estimated a release rate as described above, determine the duration of the vapor release from the pool (the time it will take for the liquid pool to evaporate completely). To estimate the time in minutes, divide the total quantity released (in pounds) by the release rate (in pounds per minute) as follows:

$$t = \frac{QS}{QR} \tag{5}$$

where: t = Duration of the release (minutes)
QR = Release rate (pounds per minute)
QS = Quantity released (pounds)

You will use the duration of the vapor release from the pool to decide which table is appropriate for estimating distance, as discussed in Section 4 below.

3.2.3 Releases of Liquids with Passive Mitigation

Diked Areas. If the toxic liquid will be released into an area where it will be contained by dikes, compare the diked area to the maximum area of the pool that could be formed; the smaller of the two areas should be used in determination of the evaporation rate. The maximum area of the pool (assuming a depth of 0.033 feet (1 centimeter)) is:

$$A = QS \times DF \qquad (6)$$

where: A = Area (square feet)
QS = Quantity released (pounds)
DF = Density Factor (listed in Exhibit B-2, Appendix B)

If the maximum area of the pool is smaller than the diked area, calculate the release rate as described for "no mitigation" above. If the diked area is smaller, go to Exhibit B-2 in Appendix B to find the Liquid Factor Ambient (LFA), if the liquid is at ambient temperature, or the Liquid Factor Boiling (LFB), if the liquid is at a temperature above ambient. Calculate the release rate from the diked area as follows:

$$QR = 1.4 \times LFA \times A \qquad (7)$$

or

$$QR = 1.4 \times LFB \times A \qquad (8)$$

where: QR = Release rate (pounds per minute)
1.4 = Wind speed factor = $1.5^{0.78}$, where 1.5 meters per second (3.4 miles per hour) is the wind speed for the worst case
LFA = Liquid Factor Ambient (listed in Exhibit B-2, Appendix B)
LFB = Liquid Factor Boiling (listed in Exhibit B-2, Appendix B)
A = Diked area (square feet)

In case of a large liquid spill, you also need to consider whether the liquid could overflow the diked area. Follow these steps:

- Determine the volume of the diked area in cubic feet from length times width times depth (in feet).
- Determine the volume of liquid spilled in cubic feet from QS x DF x 0.033 (DF x 0.033 is equal to 1/density in pounds per cubic foot).
- Compare the volume of the diked area to the volume of liquid spilled. If the volume of liquid is greater than the volume of the diked area:
  - -- Subtract the volume of the diked area from the total volume spilled to determine the volume that might overflow the diked area.
  - -- Estimate the maximum size of the pool formed by the overflowing liquid (in square feet) by dividing the overflow volume (in cubic feet) by 0.033 (the depth of the pool in feet).
  - -- Add the surface area of the diked area and the area of the pool formed by the overflow to estimate the total pool area (A).

-- Estimate the evaporation rate from Equation 7 or 8 above.

After you have estimated the release rate, estimate the duration of the vapor release from the pool by dividing the total quantity spilled by the release rate (Equation 5 above).

Example 6. Mitigated Liquid Release at Ambient Temperature (Bromine)

You have a tank containing 20,000 pounds of bromine at ambient temperature. Assume that the total quantity in the tank is spilled into a diked area 10 feet by 10 feet (area 100 square feet). The area (A) that would be covered to a depth of 0.033 feet (one centimeter) by the spilled liquid is given by Equation 6 as the quantity released (QR) times the Density Factor (DF). From Exhibit B-2, Appendix B, DF for bromine is 0.16. Then:

A = 20,000 x 0.16, or 3,200 square feet

The diked area is smaller than the maximum pool area; therefore, the diked area should be used to determine the evaporation rate from Equation 7. For the calculation, wind speed is 1.5 meters per second, the wind speed factor is 1.4, LFA for bromine (from Exhibit B-2) is 0.073, and A is 100 square feet. The release rate is:

QR = 1.4 x 0.073 x 100 = 10 pounds per minute

The duration of the release would be:

t = 20,000 pounds/10 pounds per minute = 2,000 minutes

Other containment. If the toxic liquid will be contained by other means (e.g., enclosed catch basins or trenches), consider the total quantity that could be spilled and estimate the surface area of the released liquid that potentially would be exposed to the air. Look at the dimensions of trenches or other areas where spilled liquids would be exposed to the air to determine the surface area of pools that could be formed. Use the instructions above to estimate a release rate from the total surface area.

Releases Into Buildings. If the toxic liquid is released inside a building, compare the area of the building floor to the maximum area of the pool that could be formed; the smaller of the two areas should be used in determining the evaporation rate. The maximum area of the pool is determined as described above in releases into diked areas, using Equation 6. The area of the building floor is:

$$A = L \times W \qquad \textbf{(9)}$$

where: A = Area (square feet)
L = Length (feet)
W = Width (feet)

The evaporation rate is then determined for a worst case scenario (i.e., wind speed is 1.5 meters per second (3.4 miles per hour)). The maximum rate of evaporated liquid exiting the building is taken to be 10 percent of the calculated worst case scenario evaporation rate (see Appendix D, Section D.2.4 for the derivation of this factor), as follows:

$$QR_B = 0.1 \ x \ QR \qquad \textbf{(10)}$$

where: QR_B = Release rate from building
QR = Release rate from pool, estimated as discussed above
0.1 = Mitigation factor, discussed in Appendix D, Section D.2.4

Example 7. Liquid Release Inside Building (Bromine)

Suppose that your tank of bromine from Example 6 is contained inside a storage shed 10 feet by 10 feet (area 100 square feet). From Example 6, you see that the area covered by the bromine in an unenclosed space would be 3,200 square feet. The building area is smaller than the maximum pool area; therefore, the building area should be used to determine the evaporation rate from Equation 7. For the calculation, first determine the worst case scenario evaporation rate:

$$QR = 1.4 \times 0.073 \times 100 = 10 \text{ pounds per minute}$$

The release rate to the outside air of the evaporated liquid leaving the building would then be:

$$QR_B = 0.1 \times 10 \text{ pounds per minute} = 1 \text{ pound per minute}$$

3.2.4 Mixtures Containing Toxic Liquids

In case of a spill of a liquid mixture containing a regulated toxic substance (with the exception of common water solutions, discussed in the next section), you have several options for estimating a release rate:

- Carry out the analysis as described above in Sections 3.2.2 or 3.2.3 using the quantity of the regulated substance in the mixture and the liquid factor (LFA or LFB) and density factor for the regulated substance in pure form. This is a simple approach that will likely give conservative results.

- If you know the partial pressure of the regulated substance in the mixture, you may estimate a more realistic evaporation rate. An equation for the evaporation rate is given at the end of Section B.2 in Appendix B.

  -- In this case, estimate a pool size for the entire quantity of the mixture, for an unmitigated release. If you know the density of the mixture, you may use it in estimating the pool size; otherwise, you may assume the density is the same as the pure regulated substance (in most cases, this assumption is unlikely to have a large effect on the results).

- You may estimate the partial pressure of the regulated substance in the mixture by the method described in Section B.2 in Appendix B and use the equation presented there to estimate an evaporation rate. As discussed above, use the pool size for the entire quantity of the mixture for an unmitigated release.

Example 8. Mixture Containing Toxic Liquid (Acrylonitrile)

You have a tank containing 50,000 pounds of a mixture of acrylonitrile (a regulated substance) and N,N-dimethylformamide (not regulated). The weight of each of the components of the mixture is known (acrylonitrile = 20,000 pounds; N,N-dimethylformamide = 30,000 pounds.) The molecular weight of acrylonitrile, from Exhibit B-2, is 53.06, and the molecular weight of N,N-dimethylformamide is 73.09. Using Equation B-3, Appendix B, calculate the mole fraction of acrylonitrile in the solution as follows:

$$X_r = \frac{(20{,}000/53.06)}{(20{,}000/53.06) + (30{,}000/73.09)}$$

$$X_r = \frac{377}{377 + 410}$$

$$X_r = 0.48$$

Estimate the partial vapor pressure of acrylonitrile using Equation B-4 as follows (using the vapor pressure of acrylonitrile in pure form at 25°C, 108 mm Hg, from Exhibit B-2, Appendix B):

$$VP_m = 0.48 \times 108 = 51.8 \text{ mm Hg}$$

Before calculating evaporation rate for acrylonitrile in the mixture, you must determine the surface area of the pool formed by the entire quantity of the mixture, using Equation 6. The quantity released is 50,000 pounds and the Density Factor for acrylonitrile is 0.61 in Exhibit B-2; therefore:

$$A = 50{,}000 \times 0.61 = 30{,}500 \text{ square feet}$$

Now calculate the evaporation rate for acrylonitrile in the mixture from Equation B-5 using the VP_m and A calculated above:

$$QR = \frac{0.0035 \times 1.0 \times (53.06)^{2/3} \times 30{,}500 \times 51.8}{298}$$

$$QR = 262 \text{ pounds per minute}$$

3.3 Release Rates for Common Water Solutions of Toxic Substances

This section presents a simple method of estimating the release rate from spills of water solutions of several substances. Oleum (a solution of sulfur trioxide in sulfuric acid) also is discussed in this section.

The vapor pressure and evaporation rate of a substance in solution depends on its concentration in the solution. If a concentrated water solution containing a volatile toxic substance is spilled, the toxic substance initially will evaporate more quickly than water from the spilled solution, and the vapor pressure and evaporation rate will decrease as the concentration of the toxic substance in the solution decreases. At much lower concentrations, water may evaporate more quickly than the toxic substance. There is one concentration at which the composition of the solution does not change as evaporation occurs. For most situations of interest, the concentration exceeds this concentration, and the toxic substance evaporates more quickly than water.

For estimating release rates from solutions, this guidance lists liquid factors (ambient) for several common water solutions at several concentrations that take into account the decrease in evaporation rate with decreasing concentration. Exhibit B-3 in Appendix B provides LFA and DF values for several concentrations of ammonia, formaldehyde, hydrochloric acid, hydrofluoric acid, and nitric acid in water solution. Factors for oleum are also included in the exhibit. These factors may be used to estimate an average release rate for the listed substances from a pool formed by a spill of solution. Liquid factors are provided for two different wind speeds, because the wind speed affects the rate of evaporation.

For the worst case, the factor for a wind speed of 1.5 meter per second (3.4 miles per hour) should be used. You need to consider only the first 10 minutes of the release for solutions under ambient conditions in estimating the consequence distance, because the toxic component in a solution evaporates fastest during the first few minutes of a spill, when its concentration is highest. Therefore, you do not need to take the duration of the release into account. Estimate release rates as follows:

- Unmitigated. If no passive mitigation measures are in place, and the solution is at ambient temperature, find the LFA at 1.5 meters per second (3.4 miles per hour) and DF for the solution in Appendix B, Exhibit B-3. Follow the instructions for liquids presented in Section 3.2.2 above to estimate the release rate of the listed substance in solution. Use the total quantity of the solution as the quantity released (QS) in carrying out the calculation of release rate.

- Mitigated. If passive mitigation is in place, and the solution is at ambient temperature, find the LFA at 1.5 meters per second (3.4 miles per hour) in Appendix B, Exhibit B-3, and follow the instructions for liquids in Section 3.2.3 above. Use the total quantity of the solution to estimate the maximum pool area for comparison with the diked area.

Example 9. Evaporation Rate for Water Solution at Ambient Temperature (Hydrochloric Acid)

You have a tank containing 50,000 pounds of 37 percent hydrochloric acid solution, at ambient temperature. For the worst-case analysis, you assume the entire contents of the tank is released, forming a pool. The release occurs in a diked area of 9,000 square feet.

From Exhibit B-3, Appendix B, the Density Factor (DF) for 37 percent hydrochloric acid is 0.42. From Equation 6, the maximum area of the pool would be 50,000 times 0.42, or 21,000 square feet. The diked area is smaller; therefore, the diked area should be used in the evaporation rate (release rate) calculation, using Equation 7.

For the calculation using Equation 7, you need the pool area (9,000 square feet) and the Liquid Factor Ambient (LFA) for 37 percent hydrochloric acid; you assume a wind speed of 1.5 meters per second, so the wind speed factor is 1.4. From Exhibit B-3, Appendix B, the LFA is 0.0085. From Equation 7, the release rate (QR) of hydrogen chloride from the pool is:

$$QR = 1.4 \text{ x } 9{,}000 \text{ x } 0.0085 = 107 \text{ pounds per minute}$$

You do not need to consider the duration of the release, because only the first ten minutes are considered.

- Elevated temperature. If the solution is at an elevated temperature, the vapor pressure of the regulated substance and its release rate from the solution will be much higher. If you know the vapor pressure of the solution at the relevant temperature, you can carry out the calculation of the release rate using the equations in Appendix D, Sections D.2.1 and D.2.2. If you do not know the vapor pressure, as a conservative approach for the worst case analysis, use the appropriate instructions, as follows:

    -- Solutions containing substances that are gases under ambient conditions. The list of regulated substances includes several substances that, in their pure form, are gases under ambient conditions, but that may commonly be found in water solutions. These substances include ammonia, formaldehyde, hydrogen chloride, and hydrogen fluoride. For a release of a solution of ammonia, formaldehyde, hydrochloric acid, or hydrofluoric acid above ambient temperature, assume the quantity of the hydrogen chloride, hydrogen fluoride, or ammonia in the solution is released as a gas over 10 minutes, as discussed in Section 3.1 above. You may determine the amount of pure substance in the solution from the concentration (e.g., a solution of 30 percent hydrochloric acid by weight would contain a quantity of hydrogen chloride equal to 0.3 times the total weight of the solution).

Example 10. Evaporation Rate for Water Solution at Elevated Temperature (Hydrochloric Acid)

You have 50,000 pounds of 37 percent hydrochloric acid solution in a high-temperature process. For the worst-case analysis, you assume the entire contents of the process vessel is released. In this case, because the solution is at an elevated temperature, you consider the release of gaseous hydrogen chloride from the hot solution.

The solution would contain 50,000 x 0.37 pounds of hydrogen chloride, or 18,500 pounds. You assume the entire 18,500 pounds is released over 10 minutes. From Equation 1, the release rate is 18,500 divided by 10, or 1,850 pounds per minute.

-- Liquids in solution. For a release of nitric acid solution at a temperature above ambient, determine the quantity of pure nitric acid in the solution from the concentration. Assume the quantity of pure nitric acid is released at an elevated temperature and use the LFB to estimate a release rate as discussed in Section 3.2 above. Similarly, for a release of oleum at an elevated temperature, determine the quantity of free sulfur trioxide in the oleum from the concentration and assume the sulfur trioxide is released at an elevated temperature. Use the LFB to estimate a release rate as discussed in Section 3.2.

Example 11. Evaporation Rate for Liquids in Solution at Elevated Temperature (Nitric Acid)

You have 18,000 pounds of 90% nitric acid solution in a high temperature process. The solution would contain 18,000 x 0.90 pounds of nitric acid, or 16,200 pounds. You assume 16,200 pounds of pure nitric acid is released at an elevated temperature.

For the calculation using Equation 4, you need the quantity released (16,200); the Liquid Factor Boiling (LFB) for nitric acid (0.12 found in Exhibit B-2); the Density Factor (DF) for nitric acid (0.32 found in Exhibit B-2); and you assume a wind speed of 1.5 meter per second, so the wind speed factor is 1.4. From Equation 4, the release rate (QR) of hot nitric acid is:

$$QR = 16{,}200 \times 1.4 \times 0.12 \times 0.32 = 870 \text{ pounds per minute}$$

The duration of release (from Equation 5) would be:

$$t = 16{,}200 \text{ pounds}/870 \text{ pounds per minute} = 19 \text{ minutes}$$

4.0 Estimation of Distance to Toxic Endpoint

This guidance provides reference tables giving worst-case distances for neutrally buoyant gases and vapors and for dense gases and vapors for both rural (open) and urban (congested) areas. The tables were developed assuming a wind speed of 1.5 meters per second (3.4 miles per hour) and F stability. To use the reference tables, you need the worst-case release rates estimated as described in the previous sections. For liquid pool evaporation, you also need the duration of the release. In addition, you will need to determine the appropriate toxic endpoint and whether the gas or vapor is neutrally buoyant or dense, using the exhibits in Appendix B.

Tables are provided for both for 10-minute releases and for 60-minute releases. You should use the tables for 10-minute releases if the duration of your release is 10 minutes or less; use the tables for 60-minute releases if the duration of your release is more than 10 minutes. For the worst case analysis, all releases of toxic gases are assumed to last for 10 minutes; you need to consider the estimated duration of the release (from Equation 5) for evaporation of pools of toxic liquids. For evaporation of water solutions of toxic liquids, you should always use the tables for 10-minute releases.

The tables for distances (Reference Tables 1-8) are found at the end of Section 5. The conditions for which each table is applicable are summarized below.

Reference Table Number	Applicable Conditions		
	Release Duration (minutes)	**Topography**	**Gas or Vapor Density**
1	10	Rural	Neutrally buoyant
2	60		
3	10	Urban	
4	60		
5	10	Rural	Dense
6	60		
7	10	Urban	
8	60		

To use the reference tables, follow these steps:

- Find the toxic endpoint for the substance in Appendix B (Exhibit B-1 for toxic gases or Exhibit B-2 for toxic liquids).

- Determine whether the table for neutrally buoyant or dense gases and vapors is appropriate from Appendix B (Exhibit B-1 for toxic gases or Exhibit B-2 for toxic liquids).

- Determine whether the table for rural or urban conditions is appropriate.
  - -- Use the rural table if your site is in an open area with few obstructions.
  - -- Use the urban table if your site is in an urban or obstructed area
- Determine whether the 10-minute table or the 60-minute table is appropriate.
  - -- Always use the 10-minute table for worst-case releases of toxic gases.
  - -- If you estimated the release duration for an evaporating toxic liquid pool to be 10 minutes or less, use the 10-minute table.
  - -- If you estimated the release duration for an evaporating toxic liquid pool to be more than 10 minutes, use the 60-minute table.

<u>Neutrally Buoyant Gases or Vapors</u>

- If Exhibit B-1 or B-2 indicates the gas or vapor should be considered neutrally buoyant, divide the estimated release rate (pounds per minute) by the toxic endpoint (milligrams per liter).
- Find the range of release rate/toxic endpoint values that includes your calculated release rate/toxic endpoint in the first column of the appropriate table (Reference Table 1, 2, 3, or 4), then find the corresponding distance to the right.

<u>Dense Gases or Vapors</u>

- If Exhibit B-1 or B-2 indicates the substance should be considered a dense gas or vapor (heavier than air), find the distance in the appropriate table (Reference Table 5, 6, 7, or 8) as follows;
  - -- Find the toxic endpoint closest to that of the substance by reading across the top of the table. If the endpoint of the substance is halfway between two values on the table, choose the value on the table that is smaller (to the left).
  - -- Find the release rate closest to the release rate estimated for the substance at the left of the table. If the calculated release rate is halfway between two values on the table, choose the release rate that is larger (farther down on the table).
  - -- Read across from the release rate and down from the endpoint to find the distance corresponding to the toxic endpoint and release rate for your substance.

The development of Reference Tables 1-8 is discussed in Appendix D, Section D.4. These tables generally give conservative results. If you think the results of the method presented here overstate the potential consequences of a worst-case release at your site, you may choose to use other methods or models that take additional site-specific factors into account.

Example 12. Gas Release (Diborane)

In Example 1, you estimated a release rate for diborane gas of 250 pounds per minute. From Exhibit B-1, the toxic endpoint for diborane is 0.0011 mg/L; the appropriate reference table for diborane is a neutrally buoyant gas table. Your facility and the surrounding area have many buildings, pieces of equipment, and other obstructions; therefore, you assume urban conditions. The appropriate reference table is Reference Table 3, for a 10-minute release of a neutrally buoyant gas in an urban area.

The release rate divided by toxic endpoint for this example is 250/0.0011 = 230,000.

From Reference Table 3, release rate divided by toxic endpoint falls between 221,000 and 264,000, corresponding to about 8.1 miles.

Example 13. Gas Release (Ethylene Oxide)

You have a tank containing 10,000 pounds of ethylene oxide gas. Assuming the total quantity in the tank is released over a 10-minute period, the release rate (QR) from Equation 1 is:

QR = 10,000 pounds/10 minutes = 1,000 pounds per minute

From Exhibit B-1, the toxic endpoint for ethylene oxide is 0.09 mg/L; the appropriate reference table for ethylene oxide is the dense gas table. Your facility is in an open, rural area with few obstructions; therefore, you use the table for rural areas.

Using Reference Table 5 for 10-minute releases of dense gases in rural areas, the toxic endpoint of 0.09 mg/L is closer to 0.1 than 0.075 mg/L. For a release rate of 1,000 pounds per minute, the distance to 0.1 mg/L is 3.6 miles.

Example 14. Liquid Evaporation from Pool (Acrylonitrile)

You estimated an evaporation rate of 307 pounds per minute for acrylonitrile from a pool formed by the release of 20,000 pounds into an undiked area (Example 4). You estimated the time for evaporation of the pool as 65 minutes. From Exhibit B-2, the appropriate reference table for a worst-case release of acrylonitrile is the dense gas table, and the toxic endpoint for acrylonitrile is 0.076 mg/L. Your facility is in an urban area. You use Reference Table 8 for 60-minute releases of dense gases in urban areas.

From Reference Table 8, the toxic endpoint closest to 0.076 mg/L is 0.075 mg/L, and the closest release rate to 307 pounds per minute is 250 pounds per minute. Using these values, the table gives a worst-case consequence distance of 2.9 miles.

5.0 Estimation of Distance to Overpressure Endpoint for Flammable Substances

5.1 Flammable Substances Not in Mixtures

For the worst-case scenario involving a release of flammable gases and volatile flammable liquids, the total quantity of the flammable substance is assumed to form a vapor cloud within the upper and lower flammability limits, and the cloud is assumed to detonate. As a conservative assumption, 10 percent of the flammable vapor in the cloud is assumed to participate in the explosion. You need to estimate the consequence distance to an overpressure level of 1 pound per square inch (psi) from the explosion of the vapor cloud. An overpressure of 1 psi may cause partial demolition of houses, which can result in serious injuries to people, and shattering of glass windows, which may cause skin laceration from flying glass.

You may estimate the consequence distance for a given quantity of a regulated flammable substances using Reference Table 9. This table provides distances to 1 psi overpressure for vapor cloud explosions of quantities from 10,000 to 500,000 pounds. These distances were estimated from Equation C-1 in Appendix C, Section C.1, using data provided in Exhibit C-1, Appendix C. If you prefer, you may calculate your worst-case consequence distance for flammable substances directly, using Equation C-1.

Example 15. Vapor Cloud Explosion (Propane)

You have a tank containing 50,000 pounds of propane. From Reference Table 9, the distance to 1 psi overpressure is 0.30 miles for 50,000 pounds of propane.

Alternatively, you can calculate the distance to 1 psi using Equation C-1 from Appendix C:

$$D = 17 \times [\,0.1 \times (50{,}000/2.2) \times (46{,}333/4{,}680)\,]^{1/3}$$

$$D = 480 \text{ meters; converted to miles, } 480 \times 0.00062 = 0.30 \text{ miles}$$

For the worst-case analysis of propane at propane distribution facilities, you should consult the guidance developed specifically for this industry segment, when it becomes available.

The method presented here for analysis of vapor cloud explosions is based on a TNT-equivalent model. Other methods are available for analysis of vapor cloud explosions, including methods that consider site-specific conditions. You may use other methods for your worst-case analysis if you so choose, provided you assume the total quantity of flammable substance is in the cloud and the yield factor is 10 percent and use an endpoint of 1 psi. Appendix A includes references to documents and journal articles on vapor cloud explosions that may be useful.

5.2 Flammable Mixtures

If you have more than 10,000 pounds of a mixture of flammable substances that meets the criteria for listing under CAA section 112(r) (flash point below 22.8° C (73° F), boiling point below 37.8° C (100° F), National Fire Protection Association (NFPA) flammability hazard rating of 4), you may need to carry out a worst-case consequence analysis for the mixture. For simplicity, you may carry out the worst-case analysis based on the predominant flammable component of the mixture or a major component of the mixture with the highest heat of combustion (see Exhibit C-1, Appendix C for data on heat of combustion). Estimate the consequence distance from Reference Table 9 for the major component with the highest heat of combustion, assuming that the quantity in the cloud is the total quantity of the mixture.

Example 16. Vapor Cloud Explosion of Flammable Mixture (Ethylene and Isobutane)

You have 10,000 pounds of a mixture of ethylene (the reactant) and isobutane (a catalyst carrier). To carry out the worst-case analysis, assume the quantity in the cloud is the total quantity of the mixture. Use data for ethylene because it is the component with the highest heat of combustion. (Ethylene heat of combustion = 47,145 kilojoules per kilogram; isobutane heat of combustion = 45,576, from Exhibit C-1, Appendix C). From Reference Table 9, the distance to 1 psi overpressure is 0.18 miles for 10,000 pounds of ethylene; this distance would also apply to the 10,000-pound mixture of ethylene and isobutane.

Calculating the worst-case consequence distance from Equation C-1, Appendix C:

$$D = 17 \times [\ 0.1 \times (10{,}000/2.2) \times (47{,}145/4{,}680)\ ]^{1/3}$$

$D = 283$ meters; converted to miles, $283 \times 0.00062 = 0.18$ miles

Alternatively, you may estimate the heat of combustion of the mixture from the heats of combustion of the components of the mixture using the method described in Appendix C, Section C.2, and then use the Equation C-1 in Appendix C to determine the vapor cloud explosion distance.

Example 17. Estimating Heat of Combustion of Mixture for Vapor Cloud Explosion Analysis

You have a mixture of 8,000 pounds of ethylene (the reactant) and 2,000 pounds of isobutane (a catalyst carrier). To carry out the worst-case analysis, estimate the heat of combustion of the mixture from the heats of combustion of the components of the mixture. (Ethylene heat of combustion = 47,145 kilojoules per kilogram; isobutane heat of combustion = 45,576). Using Equation C-2, Appendix C:

$$HC_m = \left[\ \frac{(8{,}000/2.2)}{(10{,}000/2.2)} \times 47{,}145\ \right] + \left[\ \frac{(2{,}000/2.2)}{(10{,}000/2.2)} \times 45{,}576\ \right]$$

$$HC_m = (37{,}716) + (9{,}115)$$

$$HC_m = 46{,}831 \text{ kilojoules per kilogram}$$

Now use the calculated heat of combustion for the mixture in Equation C-1 to calculate the distance to 1 psi overpressure for vapor cloud explosion.

$$D = 17 \times [\ 0.1 \times (10{,}000/2.2) \times (46{,}831/4{,}680)\ ]^{1/3}$$

$D = 282$ meters $= 0.18$ miles

Reference Table 1
Neutrally Buoyant Plume Distances to Toxic Endpoint for Release Rate Divided by Endpoint
10-Minute Release, Rural Conditions, F Stability, Wind Speed 1.5 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 4.4	0.06
4.4 - 37	0.19
37 - 97	0.31
97 - 180	0.43
180 - 340	0.62
340 - 530	0.81
530 - 760	0.99
760 - 1,000	1.2
1,000 - 1,500	1.4
1,500 - 1,900	1.6
1,900 - 2,400	1.8
2,400 - 2,900	2.0
2,900 - 3,500	2.2
3,500 - 4,400	2.4
4,400 - 5,100	2.6
5,100 - 5,900	2.8
5,900 - 6,800	3.0
6,800 - 7,700	3.2
7,700 - 9,000	3.4
9,000 - 10,000	3.6
10,000 - 11,000	3.8
11,000 - 12,000	4.0
12,000 - 14,000	4.2
14,000 - 15,000	4.4
15,000 - 16,000	4.6

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
16,000 - 18,000	4.8
18,000 - 19,000	5.0
19,000 - 21,000	5.2
21,000 - 23,000	5.4
23,000 - 24,000	5.6
24,000 - 26,000	5.8
26,000 - 28,000	6.0
28,000 - 29,600	6.2
29,600 - 35,600	6.8
35,600 - 42,000	7.5
42,000 - 48,800	8.1
48,800 - 56,000	8.7
56,000 - 63,600	9.3
63,600 - 71,500	9.9
71,500 - 88,500	11
88,500 - 107,000	12
107,000 - 126,000	14
126,000 - 147,000	15
147,000 - 169,000	16
169,000 - 191,000	17
191,000 - 215,000	19
215,000 - 279,000	22
279,000 - 347,000	25
>347,000	>25

Reference Table 2
Neutrally Buoyant Plume Distances to Toxic Endpoint for Release Rate Divided by Endpoint
60-Minute Release, Rural Conditions, F Stability, Wind Speed 1.5 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 5.5	0.06
5.5 - 46	0.19
46 - 120	0.31
120 - 220	0.43
220 - 420	0.62
420 - 650	0.81
650 - 910	0.99
910 - 1,200	1.2
1,200 - 1,600	1.4
1,600 - 1,900	1.6
1,900 - 2,300	1.8
2,300 - 2,600	2.0
2,600 - 2,900	2.2
2,900 - 3,400	2.4
3,400 - 3,700	2.6
3,700 - 4,100	2.8
4,100 - 4,400	3.0
4,400 - 4,800	3.2
4,800 - 5,200	3.4
5,200 - 5,600	3.6
5,600 - 5,900	3.8
5,900 - 6,200	4.0
6,200 - 6,700	4.2
6,700 - 7,000	4.4
7,000 - 7,400	4.6

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
7,400 - 7,700	4.8
7,700 - 8,100	5.0
8,100 - 8,500	5.2
8,500 - 8,900	5.4
8,900 - 9,200	5.6
9,200 - 9,600	5.8
9,600 - 10,000	6.0
10,000 - 10,400	6.2
10,400 - 11,700	6.8
11,700 - 13,100	7.5
13,100 - 14,500	8.1
14,500 - 15,900	8.7
15,900 - 17,500	9.3
17,500 - 19,100	9.9
19,100 - 22,600	11
22,600 - 26,300	12
26,300 - 30,300	14
30,300 - 34,500	15
34,500 - 38,900	16
38,900 - 43,600	17
43,600 - 48,400	19
48,400 - 61,500	22
61,500 - 75,600	25
>75,600	>25

Reference Table 3
Neutrally Buoyant Plume Distances to Toxic Endpoint for Release Rate Divided by Endpoint
10-minute Release, Urban Conditions, F Stability, Wind Speed 1.5 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 21	0.06
21 - 170	0.19
170 - 420	0.31
420 - 760	0.43
760 - 1,400	0.62
1,400 - 2,100	0.81
2,100 - 3,100	0.99
3,100 - 4,200	1.2
4,200 - 6,100	1.4
6,100 - 7,800	1.6
7,800 - 9,700	1.8
9,700 - 12,000	2.0
12,000 - 14,000	2.2
14,000 - 18,000	2.4
18,000 - 22,000	2.6
22,000 - 25,000	2.8
25,000 - 29,000	3.0
29,000 - 33,000	3.2
33,000 - 39,000	3.4
39,000 - 44,000	3.6
44,000 - 49,000	3.8
49,000 - 55,000	4.0
55,000 - 63,000	4.2
63,000 - 69,000	4.4
69,000 - 76,000	4.6

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
76,000 - 83,000	4.8
83,000 - 90,000	5.0
90,000 - 100,000	5.2
100,000 - 110,000	5.4
110,000 - 120,000	5.6
120,000 - 130,000	5.8
130,000 - 140,000	6.0
140,000 - 148,000	6.2
148,000 - 183,000	6.8
183,000 - 221,000	7.5
221,000 - 264,000	8.1
264,000 - 310,000	8.7
310,000 - 361,000	9.3
361,000 - 415,000	9.9
415,000 - 535,000	11
535,000 - 671,000	12
671,000 - 822,000	14
822,000 - 990,000	15
990,000 - 1,170,000	16
1,170,000 - 1,370,000	17
1,370,000 - 1,590,000	19
1,590,000 - 2,190,000	22
2,190,000 - 2,890,000	25
>2,890,000	>25

Reference Table 4
Neutrally Buoyant Plume Distances to Toxic Endpoint for Release Rate Divided by Endpoint
60-Minute Release, Urban Conditions, F Stability, Wind Speed 1.5 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 26	0.06
26 - 210	0.19
210 - 530	0.31
530 - 940	0.43
940 - 1,700	0.62
1,700 - 2,600	0.81
2,600 - 3,700	0.99
3,700 - 4,800	1.2
4,800 - 6,400	1.4
6,400 - 7,700	1.6
7,700 - 9,100	1.8
9,100 - 11,000	2.0
11,000 - 12,000	2.2
12,000 - 14,000	2.4
14,000 - 16,000	2.6
16,000 - 17,000	2.8
17,000 - 19,000	3.0
19,000 - 21,000	3.2
21,000 - 23,000	3.4
23,000 - 24,000	3.6
24,000 - 26,000	3.8
26,000 - 28,000	4.0
28,000 - 30,000	4.2
30,000 - 32,000	4.4
32,000 - 34,000	4.6

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
34,000 - 36,000	4.8
36,000 - 38,000	5.0
38,000 - 41,000	5.2
41,000 - 43,000	5.4
43,000 - 45,000	5.6
45,000 - 47,000	5.8
47,000 - 50,000	6.0
50,000 - 52,200	6.2
52,200 - 60,200	6.8
60,200 - 68,900	7.5
68,900 - 78,300	8.1
78,300 - 88,400	8.7
88,400 - 99,300	9.3
99,300 - 111,000	9.9
111,000 - 137,000	11
137,000 - 165,000	12
165,000 - 197,000	14
197,000 - 232,000	15
232,000 - 271,000	16
271,000 - 312,000	17
312,000 - 357,000	19
357,000 - 483,000	22
483,000 - 629,000	25
>629,000	>25

Reference Table 5
Dense Gas Distances to Toxic Endpoint
10-minute Release, Rural Conditions, F Stability, Wind Speed 1.5 Meters per Second

Release Rate (lbs/min)	Toxic Endpoint (mg/L)															
	0.0004	0.0007	0.001	0.002	0.0035	0.005	0.0075	0.01	0.02	0.035	0.05	0.075	0.1	0.25	0.5	0.75
	Distance (Miles)															
1	2.2	1.7	1.5	1.1	0.81	0.68	0.53	0.46	0.31	0.23	0.19	0.15	0.12	0.06	#	#
2	3.0	2.4	2.1	1.5	1.1	0.93	0.74	0.68	0.45	0.33	0.27	0.21	0.18	0.11	<0.06	<0.06
5	4.8	3.7	3.0	2.2	1.7	1.5	1.2	0.99	0.74	0.53	0.43	0.34	0.29	0.16	0.11	0.07
10	6.8	5.0	4.2	3.0	2.4	2.1	1.7	1.4	0.99	0.74	0.62	0.50	0.42	0.24	0.15	0.12
30	11	8.7	6.8	5.2	3.9	3.4	2.8	2.4	1.7	1.3	1.1	0.87	0.74	0.42	0.27	0.20
50	14	11	9.3	6.8	5.0	4.2	3.5	3.0	2.2	1.7	1.4	1.1	0.93	0.56	0.35	0.27
100	19	15	12	8.7	6.8	5.8	4.8	4.2	2.9	2.2	1.9	1.6	1.3	0.81	0.51	0.38
150	24	18	15	11	8.1	6.8	5.7	5.0	3.6	2.7	2.3	1.9	1.6	0.93	0.61	0.47
250	>25	22	19	14	11	8.7	7.4	6.2	4.5	3.4	2.8	2.3	2.0	1.2	0.81	0.60
500	*	>25	>25	19	14	12	9.9	8.7	6.2	4.7	3.8	3.1	2.7	1.6	1.1	0.87
750	*	*	*	23	17	15	12	11	7.4	5.5	4.5	3.7	3.2	1.9	1.3	0.99
1000	*	*	*	>25	20	17	14	12	8.1	6.2	5.2	4.2	3.6	2.2	1.4	1.1
1500	*	*	*	*	24	20	16	14	9.9	7.4	6.2	5.0	4.3	2.5	1.7	1.3
2000	*	*	*	*	>25	23	19	16	11	8.7	6.8	5.6	4.8	2.9	1.9	1.5
2500	*	*	*	*	*	>25	20	18	12	9.3	8.1	6.2	5.3	3.2	2.1	1.6
3000	*	*	*	*	*	*	23	20	14	9.9	8.7	6.8	5.6	3.4	2.2	1.7
4000	*	*	*	*	*	*	>25	22	16	11	9.3	7.4	6.2	3.8	2.5	2.0
5000	*	*	*	*	*	*	*	25	17	13	11	8.7	6.8	4.2	2.7	2.1
7500	*	*	*	*	*	*	*	>25	20	15	12	9.9	8.7	4.9	3.2	2.5
10000	*	*	*	*	*	*	*	*	24	17	14	11	9.3	5.5	3.6	2.8
15000	*	*	*	*	*	*	*	*	>25	20	17	13	11	6.2	4.2	3.2
20000	*	*	*	*	*	*	*	*	*	23	19	15	12	7.4	4.7	3.7

* > 25 miles

<0.06 miles

Reference Table 6
Dense Gas Distances to Toxic Endpoint
60-minute Release, Rural Conditions, F Stability, Wind Speed 1.5 Meters per Second

Release Rate (lbs/min)	Toxic Endpoint (mg/L)															
	0.0004	0.0007	0.001	0.002	0.0035	0.005	0.0075	0.01	0.02	0.035	0.05	0.075	0.1	0.25	0.5	0.75
	Distance (Miles)															
1	3.7	2.7	2.2	1.4	0.99	0.81	0.62	0.53	0.34	0.24	0.19	0.14	0.12	<0.06	#	#
2	5.3	4.0	3.2	2.2	1.6	1.2	0.99	0.81	0.53	0.37	0.29	0.22	0.18	0.09	<0.06	<0.06
5	8.7	6.8	5.3	3.7	2.7	2.2	1.7	1.4	0.93	0.62	0.51	0.39	0.32	0.17	0.10	0.07
10	12	9.3	8.1	5.3	4.0	3.3	2.7	2.2	1.4	0.99	0.81	0.60	0.50	0.26	0.16	0.11
30	22	16	14	9.9	7.4	6.1	4.9	4.1	2.9	2.1	1.6	1.2	0.99	0.52	0.31	0.22
50	>25	21	18	12	9.3	8.1	6.2	5.4	3.8	2.7	2.2	1.7	1.4	0.74	0.43	0.31
100	*	>25	>25	18	13	11	9.3	7.4	5.5	4.0	3.2	2.5	2.1	1.1	0.68	0.48
150	*	*	*	22	17	14	11	9.9	6.8	4.9	4.0	3.1	2.7	1.4	0.87	0.61
250	*	*	*	>25	22	18	14	12	8.7	6.2	5.2	4.1	3.5	1.9	1.2	0.87
500	*	*	*	*	>25	25	20	17	12	9.3	7.4	5.8	5.0	2.9	1.8	1.3
750	*	*	*	*	*	>25	25	22	15	11	9.3	7.4	6.1	3.5	2.2	1.7
1000	*	*	*	*	*	*	>25	25	17	12	11	8.1	6.8	4.0	2.6	2.0
1500	*	*	*	*	*	*	*	>25	20	16	12	9.9	8.7	5.0	3.2	2.5
2000	*	*	*	*	*	*	*	*	24	17	14	11	9.9	5.7	3.7	2.9
2500	*	*	*	*	*	*	*	*	>25	20	16	13	11	6.2	4.2	3.2
3000	*	*	*	*	*	*	*	*	*	21	17	14	12	6.8	4.5	3.5
4000	*	*	*	*	*	*	*	*	*	24	20	16	14	8.1	5.2	4.0
5000	*	*	*	*	*	*	*	*	*	>25	22	17	15	8.7	5.7	4.4
7500	*	*	*	*	*	*	*	*	*	*	>25	21	18	11	6.8	5.2
10000	*	*	*	*	*	*	*	*	*	*	*	24	20	12	7.4	6.0
15000	*	*	*	*	*	*	*	*	*	*	*	>25	24	14	9.3	6.8
20000	*	*	*	*	*	*	*	*	*	*	*	*	>25	16	9.9	8.1

* > 25 miles

\# <0.06 miles

Reference Table 7
Dense Gas Distances to Toxic Endpoint
10-minute Release, Urban Conditions, F Stability, Wind Speed 1.5 Meters per Second

Release Rate (lbs/min)	Toxic Endpoint (mg/L)															
	0.0004	0.0007	0.001	0.002	0.0035	0.005	0.0075	0.01	0.02	0.035	0.05	0.075	0.1	0.25	0.5	0.75
	Distance (Miles)															
1	1.6	1.2	1.1	0.74	0.55	0.45	0.36	0.31	0.21	0.15	0.13	0.10	0.07	#	#	#
2	2.2	1.7	1.4	1.1	0.81	0.62	0.50	0.44	0.29	0.20	0.17	0.13	0.11	<0.06	#	#
5	3.5	2.7	2.2	1.6	1.2	0.99	0.81	0.68	0.48	0.35	0.27	0.21	0.17	0.10	<0.06	#
10	4.9	3.8	3.1	2.2	1.7	1.4	1.2	0.99	0.68	0.50	0.40	0.31	0.25	0.14	0.09	<0.06
30	8.1	6.2	5.3	3.7	2.9	2.4	2.0	1.7	1.2	0.87	0.74	0.56	0.45	0.24	0.14	0.11
50	11	8.1	6.8	4.8	3.7	3.1	2.5	2.1	1.5	1.1	0.93	0.74	0.61	0.33	0.19	0.14
100	15	11	9.3	6.8	5.2	4.2	3.5	3.0	2.1	1.6	1.3	0.99	0.87	0.47	0.28	0.20
150	19	14	12	8.1	6.1	5.2	4.3	3.6	2.5	1.9	1.6	1.2	1.1	0.58	0.35	0.25
250	24	18	15	11	8.1	6.8	5.4	4.6	3.3	2.4	2.0	1.6	1.4	0.74	0.47	0.33
500	>25	>25	21	15	11	9.3	7.4	6.2	4.5	3.4	2.8	2.2	1.9	1.1	0.68	0.48
750	*	*	>25	18	14	11	9.3	8.1	5.5	4.1	3.3	2.6	2.2	1.3	0.81	0.60
1000	*	*	*	21	16	13	11	9.3	6.2	4.6	3.8	3.0	2.5	1.5	0.93	0.68
1500	*	*	*	>25	19	16	12	11	7.4	5.6	4.6	3.7	3.0	1.7	1.1	0.81
2000	*	*	*	*	22	18	15	12	8.7	6.2	5.2	4.1	3.5	2.0	1.3	0.93
2500	*	*	*	*	24	20	16	14	9.9	6.8	5.8	4.7	3.8	2.2	1.4	1.1
3000	*	*	*	*	>25	22	18	16	11	7.4	6.2	5.0	4.2	2.4	1.6	1.2
4000	*	*	*	*	*	25	20	17	12	8.7	6.8	5.6	4.8	2.7	1.7	1.3
5000	*	*	*	*	*	>25	23	20	14	9.9	8.1	6.2	5.3	3.0	1.9	1.4
7500	*	*	*	*	*	*	>25	24	16	12	9.9	7.4	6.2	3.6	2.3	1.7
10000	*	*	*	*	*	*	*	>25	19	14	11	8.7	7.4	4.1	2.6	2.0
15000	*	*	*	*	*	*	*	*	22	16	13	11	8.7	4.9	3.1	2.3
20000	*	*	*	*	*	*	*	*	>25	19	15	12	9.9	5.5	3.5	2.7

* > 25 miles

\# <0.06 miles

Reference Table 8
Dense Gas Distances to Toxic Endpoint
60-minute Release, Urban Conditions, F Stability, Wind Speed 1.5 Meters per Second

Release Rate (lbs/min)	Toxic Endpoint (mg/L)															
	0.0004	0.0007	0.001	0.002	0.0035	0.005	0.0075	0.01	0.02	0.035	0.05	0.075	0.1	0.25	0.5	0.75
	Distance (Miles)															
1	2.6	1.9	1.5	1.1	0.68	0.55	0.43	0.35	0.22	0.16	0.12	0.09	0.07	#	#	#
2	3.8	2.9	2.3	1.5	1.1	0.87	0.68	0.55	0.35	0.24	0.19	0.14	0.11	<0.06	#	#
5	6.2	4.7	3.9	2.6	1.9	1.5	1.2	0.93	0.61	0.42	0.33	0.25	0.20	0.10	<0.06	#
10	9.3	6.8	5.6	3.9	2.9	2.3	1.8	1.5	0.93	0.68	0.51	0.38	0.31	0.16	0.09	<0.06
30	16	12	9.9	7.4	5.3	4.3	3.4	2.9	1.9	1.3	0.99	0.74	0.62	0.31	0.17	0.12
50	22	16	14	9.3	6.8	5.7	4.5	3.8	2.6	1.8	1.4	1.1	0.87	0.43	0.24	0.17
100	>25	24	20	14	9.9	8.1	6.8	5.7	3.8	2.7	2.2	1.7	1.4	0.68	0.38	0.26
150	*	>25	24	17	12	11	8.1	6.8	4.8	3.5	2.8	2.2	1.8	0.87	0.49	0.34
250	*	*	>25	22	16	14	11	9.3	6.2	4.5	3.7	2.9	2.4	1.2	0.68	0.47
500	*	*	*	>25	24	19	16	13	9.3	6.8	5.4	4.2	3.5	1.9	1.1	0.74
750	*	*	*	*	>25	24	19	16	11	8.1	6.8	5.2	4.3	2.4	1.4	0.99
1000	*	*	*	*	*	>25	22	19	13	9.3	7.4	6.0	5.0	2.8	1.6	1.2
1500	*	*	*	*	*	*	>25	24	16	12	9.3	7.4	6.2	3.4	2.1	1.5
2000	*	*	*	*	*	*	*	>25	19	13	11	8.7	7.4	4.0	2.5	1.8
2500	*	*	*	*	*	*	*	*	20	15	12	9.3	8.1	4.5	2.8	2.1
3000	*	*	*	*	*	*	*	*	22	16	13	11	8.7	4.9	3.0	2.2
4000	*	*	*	*	*	*	*	*	>25	19	16	12	9.9	5.6	3.5	2.6
5000	*	*	*	*	*	*	*	*	*	21	17	14	11	6.2	4.0	3.0
7500	*	*	*	*	*	*	*	*	*	>25	20	16	14	7.4	4.8	3.6
10000	*	*	*	*	*	*	*	*	*	*	24	19	16	8.7	5.5	4.2
15000	*	*	*	*	*	*	*	*	*	*	>25	22	19	11	6.8	5.1
20000	*	*	*	*	*	*	*	*	*	*	*	>25	21	12	7.4	5.8

* > 25 miles

\# <0.06 miles

Reference Table 9
Distance to Overpressure of 1.0 psi for Vapor Cloud Explosions of 10,000 - 500,000 Pounds of Regulated Flammable Substances
Based on TNT Equivalent Method, 10 Percent Yield Factor

	Quantity in Cloud (pounds)	10,000	20,000	30,000	50,000	100,000	150,000	200,000	300,000	500,000
CAS No.	Chemical Name	Distance (Miles) to 1 psi Overpressure								
75-07-0	Acetaldehyde	0.14	0.18	0.20	0.24	0.31	0.35	0.39	0.44	0.52
74-86-2	Acetylene	0.18	0.22	0.25	0.30	0.38	0.44	0.48	0.55	0.65
598-73-2	Bromotrifluoroethylene	0.061	0.077	0.088	0.10	0.13	0.15	0.17	0.19	0.22
106-99-0	1,3-Butadiene	0.17	0.22	0.25	0.29	0.37	0.42	0.47	0.53	0.63
106-97-8	Butane	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
25167-67-3	Butene	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
590-18-1	2-Butene-cis	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
624-64-6	2-Butene-trans	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
106-98-9	1-Butene	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
107-01-7	2-Butene	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
463-58-1	Carbon oxysulfide	0.10	0.13	0.15	0.17	0.22	0.25	0.28	0.32	0.37
7791-21-1	Chlorine monoxide	0.049	0.061	0.070	0.083	0.10	0.12	0.13	0.15	0.18
590-21-6	1-Chloropropylene	0.14	0.17	0.20	0.24	0.30	0.34	0.37	0.43	0.51
557-98-2	2-Chloropropylene	0.14	0.17	0.20	0.24	0.30	0.34	0.37	0.43	0.51
460-19-5	Cyanogen	0.13	0.17	0.19	0.23	0.29	0.33	0.36	0.42	0.49
75-19-4	Cyclopropane	0.17	0.22	0.25	0.30	0.38	0.43	0.47	0.54	0.64
4109-96-0	Dichlorosilane	0.10	0.12	0.14	0.17	0.21	0.24	0.27	0.30	0.36
75-37-6	Difluoroethane	0.11	0.14	0.16	0.19	0.24	0.27	0.30	0.34	0.40
124-40-3	Dimethylamine	0.16	0.20	0.23	0.27	0.34	0.39	0.43	0.50	0.59
463-82-1	2,2-Dimethylpropane	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
74-84-0	Ethane	0.18	0.22	0.25	0.30	0.38	0.43	0.48	0.55	0.65

Reference Table 9 (continued)

	Quantity in Cloud (pounds)	10,000	20,000	30,000	50,000	100,000	150,000	200,000	300,000	500,000
CAS No.	Chemical Name	Distance (Miles) to 1 psi Overpressure								
107-00-6	Ethyl acetylene	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
75-04-7	Ethylamine	0.16	0.20	0.23	0.27	0.34	0.39	0.43	0.49	0.59
75-00-3	Ethyl chloride	0.13	0.17	0.19	0.23	0.28	0.32	0.36	0.41	0.48
74-85-1	Ethylene	0.18	0.22	0.25	0.30	0.38	0.43	0.48	0.55	0.65
60-29-7	Ethyl ether	0.16	0.20	0.23	0.27	0.34	0.39	0.43	0.49	0.58
75-08-1	Ethyl mercaptan	0.15	0.19	0.21	0.25	0.32	0.36	0.40	0.46	0.54
109-95-5	Ethyl nitrite	0.13	0.16	0.18	0.22	0.27	0.31	0.35	0.40	0.47
1333-74-0	Hydrogen	0.24	0.30	0.35	0.41	0.52	0.59	0.65	0.74	0.88
75-28-5	Isobutane	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
78-78-4	Isopentane	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
78-79-5	Isoprene	0.17	0.22	0.25	0.29	0.37	0.42	0.46	0.53	0.63
75-31-0	Isopropylamine	0.16	0.20	0.23	0.28	0.35	0.40	0.44	0.50	0.59
75-29-6	Isopropyl chloride	0.14	0.18	0.20	0.24	0.30	0.34	0.38	0.43	0.51
74-82-8	Methane	0.18	0.23	0.26	0.31	0.39	0.44	0.49	0.56	0.66
74-89-5	Methylamine	0.15	0.19	0.22	0.26	0.33	0.38	0.42	0.48	0.56
563-45-1	3-Methyl-1-butene	0.17	0.22	0.25	0.29	0.37	0.42	0.47	0.53	0.63
563-46-2	2-Methyl-1-butene	0.17	0.22	0.25	0.29	0.37	0.42	0.47	0.53	0.63
115-10-6	Methyl ether	0.15	0.19	0.21	0.25	0.32	0.37	0.40	0.46	0.55
107-31-3	Methyl formate	0.12	0.15	0.17	0.21	0.26	0.30	0.33	0.37	0.44
115-11-7	2-Methylpropene	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
504-60-9	1,3-Pentadiene	0.17	0.22	0.25	0.29	0.37	0.42	0.46	0.53	0.63
109-66-0	Pentane	0.17	0.22	0.25	0.29	0.37	0.42	0.47	0.54	0.63
109-67-1	1-Pentene	0.17	0.22	0.25	0.29	0.37	0.42	0.47	0.54	0.63

Reference Table 9 (continued)

	Quantity in Cloud (pounds)	10,000	20,000	30,000	50,000	100,000	150,000	200,000	300,000	500,000
CAS No.	Chemical Name	Distance (Miles) to 1 psi Overpressure								
646-04-8	2-Pentene, (E)-	0.17	0.22	0.25	0.29	0.37	0.42	0.47	0.53	0.63
627-20-3	2-Pentene, (Z)-	0.17	0.22	0.25	0.29	0.37	0.42	0.47	0.53	0.63
463-49-0	Propadiene	0.17	0.22	0.25	0.30	0.38	0.43	0.47	0.54	0.64
74-98-6	Propane	0.17	0.22	0.25	0.30	0.38	0.43	0.47	0.54	0.64
115-07-1	Propylene	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
74-99-7	Propyne	0.17	0.22	0.25	0.30	0.38	0.43	0.47	0.54	0.64
7803-62-5	Silane	0.17	0.22	0.25	0.29	0.37	0.42	0.47	0.53	0.63
116-14-3	Tetrafluoroethylene	0.053	0.066	0.076	0.090	0.11	0.13	0.14	0.16	0.19
75-76-3	Tetramethylsilane	0.17	0.21	0.24	0.29	0.36	0.42	0.46	0.52	0.62
10025-78-2	Trichlorosilane	0.075	0.10	0.11	0.13	0.16	0.19	0.20	0.23	0.28
79-38-9	Trifluorochloroethylene	0.059	0.075	0.086	0.10	0.13	0.15	0.16	0.18	0.22
75-50-3	Trimethylamine	0.16	0.21	0.24	0.28	0.35	0.40	0.44	0.51	0.60
689-97-4	Vinyl acetylene	0.17	0.22	0.25	0.30	0.37	0.43	0.47	0.54	0.64
75-01-4	Vinyl chloride	0.13	0.16	0.19	0.22	0.28	0.32	0.35	0.40	0.48
109-92-2	Vinyl ethyl ether	0.16	0.20	0.22	0.27	0.34	0.38	0.42	0.48	0.57
75-02-5	Vinyl fluoride	0.063	0.079	0.091	0.11	0.14	0.16	0.17	0.20	0.23
75-35-4	Vinylidene chloride	0.11	0.13	0.15	0.18	0.23	0.26	0.29	0.33	0.39
75-38-7	Vinylidene fluoride	0.11	0.14	0.15	0.18	0.23	0.26	0.29	0.33	0.40
107-25-5	Vinyl methyl ether	0.15	0.19	0.22	0.26	0.33	0.37	0.41	0.47	0.56

6.0 Determining Alternative Release Scenarios

You are required to analyze at least one alternative release scenario for each listed toxic substance you have in a Program 2 or Program 3 process above its threshold quantity. You also are required to analyze one alternative release scenario for flammable substances in Program 2 or 3 processes as a class. You do not need to analyze an alternative scenario for each flammable substance. For example, if you have five listed substances – chlorine, ammonia, hydrogen chloride, propane, and acetylene – above the threshold in Program 2 or 3 processes, you will need to analyze one alternative scenario each for chlorine, ammonia, and hydrogen chloride and a single alternative scenario to cover propane and acetylene (listed flammable substances). Even if you have a substance above the threshold in several processes or locations, you need only analyze one alternative scenario for it.

Alternative release scenarios for toxic substances should be those that lead to concentrations above the toxic endpoint beyond your fenceline. Scenarios for flammable substances should have the potential to cause substantial damage, including on-site damage. Those releases that have the potential to reach the public are of the greatest concern.

For alternative release scenarios, you are allowed to consider active mitigation systems, such as interlocks, shutdown systems, pressure relieving devices, flares, emergency isolation systems, and fire water and deluge systems, as well as passive mitigation systems, as described in Sections 3.1.2 and 3.2.3.

For alternative release scenarios for ammonia used for refrigeration, consult EPA's *Model Risk Management Program and Plan for Ammonia Refrigeration*. For toxic substances at water treatment facilities, see the guidance for this industry segment.

7.0 Analysis of Alternative Scenarios for Toxic Substances

You have a number of options for selecting release scenarios for toxic substances.

- You may use your worst-case release scenario and apply your active mitigation system to limit the quantity released and the duration of the release.
- You may use information from your process hazards analysis, if you have conducted one, to select a scenario.
- You may review your accident history and choose an actual event as the basis of your scenario.
- If you have not conducted a process hazards analysis, you may review your operations and identify possible events and failures.

Whichever approach you select, the key information you need to define is the quantity to be released and the time over which it will be released; together, these allow you to estimate the release rate and use essentially the same methods you used for the worst-case analysis.

Section 8 below provides detailed information on calculating release rates for alternative release scenarios. If you can estimate release rates for the toxic gases and liquids you have on site based on readily available information, you may skip Section 8 and go to Section 9. Section 9 describes how to estimate distances to the toxic endpoint for alternative scenarios for toxic substances.

8.0 Estimation of Release Rates for Alternative Release Scenarios for Toxic Substances

8.1 Release Rates for Toxic Gases

8.1.1 Unmitigated Releases of Gases

Gaseous Release from Tank. Instead of assuming release of the entire contents of a vessel containing a toxic gas, you may decide to consider a release from a hole in a vessel or pipe. To estimate a hole size you might assume, for example, the hole size that would result from shearing off a valve or pipe from a vessel containing a regulated substance. If you have a gas leak from a tank, you may use the following simplified equation to estimate a release rate based on hole size, tank pressure, and the properties of the gas. (See Appendix D, Section D.6 for the derivation of this equation.)

$$QR = HA \ x \ P_t \ x \ \frac{1}{\sqrt{T_t}} \ x \ GF \qquad (11)$$

where: QR = Release rate (pounds per minute)
HA = Hole or puncture area (square inches) (from hazard evaluation or best estimate)
P_t = Tank pressure (pounds per square inch - absolute (psia)) (from process information)
T_t = Tank temperature (K)
GF = Gas Factor, incorporating discharge coefficient, ratio of specific heats, molecular weight, and conversion factors (listed for each regulated toxic gas in Exhibit B-1, Appendix B)

This equation will give an estimate of the initial release rate. It will overestimate the overall release rate, because it does not take into account the decrease in the release rate as the pressure in the tank decreases. You may use a computer model or another calculation method if you want a more realistic estimate of the release rate.

Example 18. Release of Toxic Gas from Tank (Diborane)

You have a tank that contains diborane gas at a pressure of 30 pounds per square inch - absolute (psia). The temperature of the tank and its contents is 298 K (25°C). A valve on the side of the tank shears off, leaving a hole in the tank wall 5 square inches. From Exhibit B-1, the Gas Factor for diborane is 17. Therefore, the release rate is:

$$QR = 5 \times 30 \times 1/(298)^{1/2} \times 17 = 148 \text{ pounds per minute}$$

Gaseous Release from Pipe. If shearing of a pipe may be an alternative scenario for a toxic gas at your site, you could use the usual flow rate through the pipe as the release rate and carry out the estimation of distance as discussed in Section 9.

If you want to consider a release of toxic gas through a hole in a pipe as an alternative scenario, you may use the method described above for a gas release from a hole in a tank. This method neglects the effects of friction along the pipe and, therefore, provides a conservative estimate of the release rate.

Duration of Release. The duration of the release is used in choosing the appropriate reference table for distances (Section 9 below). You may calculate the maximum duration by dividing the quantity in the tank or the quantity that may be released from pipes by your calculated release rate. You may use 60 minutes as a default value for maximum release duration. If you know how long it is likely to take to stop the leak, you may use that time as the release duration.

If a gaseous release from a hole in a tank or pipe is likely to be stopped very quickly (e.g., by a block valve), resulting in a puff of toxic gas that forms a vapor cloud rather than a plume, you may want to consider other methods for determining a consequence distance. The behavior of a cloud of toxic gas resulting from a puff release will not exhibit the same behavior as a plume resulting from a longer release (e.g., a release over 10 minutes).

Gases Liquefied Under Pressure. Gases stored under pressure as liquids may be released very rapidly in case of tank or pipe damage or failure. Such releases may involve rapid vaporization of a fraction of the liquified gas and possibly aerosolization. The methods presented in this guidance are not appropriate for this type of release. If you think release of a liquefied gas under pressure is a potential release scenario at your site, you may want to consider other models or methods to carry out a consequence analysis.

8.1.2 Mitigated Releases of Gases

For gases, passive mitigation may include enclosed spaces, as discussed in Section 3.1.2. Active mitigation for gases, which may be considered in analyzing alternative release scenarios, may include an assortment of techniques including automatic shutoff valves, rapid transfer systems (emergency deinventory), and water/chemical sprays. These mitigation techniques have the effect of reducing either the release rate or the duration of the release, or both.

Active Mitigation to Reduce Release Duration. An example of a mitigation technique to reduce the release duration is automatic shutoff valves. If you have an estimate of the rate at which the gas will be released and the time it will take to shut off the release, you may estimate the quantity potentially released (release rate times time). If the release will take place over a period of 10 minutes or more, you may use the release rate to estimate the distance to the toxic endpoint, as discussed in Section 9. For releases stopped in less than 10 minutes, multiply the initial release rate by the duration of release to estimate the quantity released, then divide the new quantity by 10 minutes to estimate a mitigated release rate that you may apply to the reference tables in Section 9 to estimate the consequence distance. If the release would be stopped very quickly, you might want to consider other methods that will estimate consequence distances for a puff release.

Active Mitigation to Directly Reduce Release Rate to Air. Examples of mitigation techniques to directly reduce the release rate include scrubbers and flares. Use test data, manufacturer design specifications, or past experience to determine the fractional reduction of the release rate by the mitigation technique. Apply this fraction to the release rate that would have occurred without the mitigation technique. The initial release rate, without mitigation, may be the release rate for the alternative scenario (e.g., a release rate estimated from the equations presented earlier in this section) or the worst-case release rate. The mitigated release rate is:

$$QR_R = (1 - FR) \times QR \qquad (12)$$

where: QR_R = Reduced release rate (pounds per minute)
FR = Fractional reduction resulting from mitigation
QR = Release rate without mitigation (pounds per minute)

Example 19. Water Spray Mitigation (Hydrogen Fluoride)

A bleeder valve on a hydrogen fluoride (HF) tank opens, releasing 660 pounds per minute of HF. Water sprays are applied almost immediately. Experimental field and laboratory test data indicate that HF vapors could be reduced by 90 percent. The reduced release rate is:

$$QR_R = (1 - 0.9) \times (660 \text{ pounds per minute}) = 66 \text{ pounds per minute}$$

Passive Mitigation. The same simplified method used for worst-case releases may be used for alternative release scenarios to estimate the release rate to the outside air from a release in an enclosed space. For alternative scenarios, you may use a modified release quantity, if appropriate. Use the equations presented in Section 3.1.2 to estimate the release rate to the outside air.

Duration of Release. You should estimate the duration of the release either from your knowledge of the length of time it may take to stop the release or by dividing the quantity that may be released by your estimated release rate.

8.2 Release Rates for Toxic Liquids

This section describes methods for estimating liquid release rates from tanks and pipes. The released liquid is assumed to form a pool, and the evaporation rate from the pool is estimated as for the worst-case scenario. For the alternative scenario, you may assume the average wind speed in your area in the calculation of evaporation rate, instead of a wind speed of 1.5 meters per second (3.4 miles per hour). For the reference tables in this guidance, the wind speed for alternative scenarios is assumed to be 3.0 meters per second (6.7 miles per hour).

If you have sufficient information to estimate the quantity of liquid that might be released to an undiked area under an alternative scenario, you may go directly to Section 8.2.3 to estimate the the evaporation rate from the pool and the release duration. After you have estimated the evaporation rate and release duration, go to Section 9 for instructions on estimating distance to the toxic endpoint.

8.2.1 Liquid Release Rate and Quantity Released for Unmitigated Releases

Liquid Release from Tank under Atmospheric Pressure. If you have a liquid stored in a tank at atmospheric pressure, you may use the following simple equation to estimate the liquid release rate from a hole in the tank below the liquid level. (See Appendix D, Section D.7.1, for the derivation of this equation.)

$$QR_L = HA \times \sqrt{LH} \times LLF \qquad (13)$$

where: QR_L = Liquid release rate (pounds per minute)
HA = Hole or puncture area (square inches) (from hazard evaluation or best estimate)
LH = Height of liquid column above hole (inches) (from hazard evaluation or best estimate)
LLF = Liquid Leak Factor incorporating discharge coefficient and liquid density (listed for each toxic liquid in Exhibit B-2, Appendix B).

This equation will give an overestimate of the release rate, because it does not take into account the decrease in the release rate as the height of the liquid above the hole decreases. You may use a computer model or another calculation method if you want a more realistic estimate of the liquid release rate.

You may estimate the quantity that might be released by multiplying the liquid release rate from the above equation by the time (in minutes) that likely would be needed to stop the release. Alternatively, you may assume the release would stop when the level of liquid in the tank drops to the level of the hole. You may estimate the quantity of liquid above that level in the tank from the dimensions of the tank, the liquid level at the start of the leak, and the level of the hole. Assume the estimated quantity is released into a pool and use the method and equations in Section 8.2.3 below to determine the evaporation rate of the liquid from the pool and the duration of the release.

Example 20. Liquid Release from Atmospheric Tank (Acrylonitrile)

You have a tank that contains 20,000 pounds of acrylonitrile at ambient temperature and pressure. A valve on the side of the tank shears, leaving a hole in the tank wall 5 square inches in area. The liquid column is 23 inches above the hole in the tank. From Exhibit B-2, the Liquid Leak Factor for acrylonitrile is 39. Therefore, the release rate is:

$$QR = 5 \times (23)^{1/2} \times 39 = 936 \text{ pounds per minute}$$

It takes 10 minutes to stop the release so that 10 minutes × 936 pounds per minute = 9,360 pounds of acrylonitrile is released. From Exhibit B-2, the Density Factor for acrylonitrile is 0.61, and the Liquid Factor Ambient is 0.018. Assuming that the liquid is not released into a diked area or inside a building, the evaporation rate from the pool of acrylonitrile, from Equation 3, using a wind speed factor of 2.4 for wind speed 3 meters per second, is:

$$QR = 9{,}360 \times 2.4 \times 0.018 \times 0.61 = 247 \text{ pounds per minute}$$

Release from Pressurized Tank. If you have a liquid stored in a tank under pressure, you may estimate a release rate using the equations presented in Appendix D, Section D.7.1.

Release from Pipe. To consider a liquid release from a broken pipe, you may use the equations below (see Appendix D, Section D.7.2 for more information on these equations.) First estimate the initial operational flow velocity of the substance through the pipe using the initial operational flow rate as follows:

$$V_a = \frac{FR \ x \ DF \ x \ 0.033}{A_p} \qquad \textbf{(14)}$$

where: V_a = Initial operational flow velocity (feet per minute)
FR = Initial operational flow rate (pounds per minute)
DF = Density Factor (from Exhibit B-2, Appendix B)
A_p = Cross-sectional area of pipe (square feet)

The release velocity is then calculated based on the initial operational flow, any gravitational acceleration or deceleration effects, and the pressure difference between the hole/shear and tank using a form of the Bernoulli equation:

$$V_b = \sqrt{\frac{(77{,}500 \ x \ P_a \ - \ 7.85 \ x \ 10^9)}{D} + (77{,}460 \ x \ g \ x \ Z) + V_a^2} \tag{15}$$

where: V_b = Release velocity (feet per minute)
P_a = Operational pipe pressure (Pascals)
Z = Change in pipe elevation, inlet to outlet (meters)
g = Gravitational acceleration (9.8 meters per second^2)
V_a = Operational velocity (feet per minute)
D = Density of liquid (kilograms per cubic meter)

Please note that if the height of the pipe at the release point is higher than the initial pipe height, then Z is negative and the release rate is actually lower than the operational rate.

The release velocity can then be used to calculate a release rate as follows:

$$QR_L = \frac{V_b \ x \ A_p}{DF \ x \ 0.033} \tag{16}$$

where: QR_L = Release rate (pounds per minute)
V_b = Release velocity (feet per minute)
DF = Density Factor
A_p = Cross-sectional area of pipe (square feet)

You may estimate the quantity released into a pool from the broken pipe by multiplying the liquid release rate (QR_L) from the equation above by the time (in minutes) that likely would be needed to stop the release. Assume the estimated quantity is released into a pool and use the method and equations described in Section 8.2.3 below to determine the evaporation rate of the liquid from the pool.

In the case of very long pipes, estimated release rates from a sheer or hole will be lower due pipe roughness and frictional head loss. If this effect is deemed considerable, an established method for calculating frictional head loss such as the Darcy formula may be used.

8.2.2 Liquid Release Rate and Quantity Released for Mitigated Releases

For alternative release scenarios, you are permitted to take credit for both passive and active mitigation systems, or a combination if both are in place. For liquids, passive mitigation may include techniques already discussed in Section 3.2.3 such as dikes and trenches. Active mitigation for liquids may include an assortment of techniques including automatic shutoff valves, emergency deinventory, foam or tarp coverings, and water or chemical sprays. These mitigation techniques have the effect of reducing either the quantity released into the pool or the evaporation rate from the pool. Some methods of accounting for active mitigation are discussed below.

Active Mitigation to Reduce Quantity Released. Examples of mitigation techniques to reduce the quantity released into the pool include automatic shutoff valves and emergency deinventory. You may use the equations in Section 8.2.1 above for calculating liquid release rate, if applicable. Estimate the approximate time needed to stop the release by the mitigation technique. Multiply the release rate times the duration of release to estimate quantity released. Assume the estimated quantity is released into a pool and use the method and equations described in Section 8.2.3 below to determine the evaporation rate of the liquid from the pool. You should also consider mitigation of evaporation from the pool, if applicable; see the discussion of active mitigation below or passive mitigation in Section 3.2.3.

Example 21. Mitigated Liquid Release

A bromine injection system suffers a hose failure; the greatly lowered system pressure triggers an automatic shutoff valve within 30 seconds of the release. The flow rate out of the ruptured hose is approximately 330 pounds per minute. Because the release occurred for only 30 seconds (0.5 minutes), the total quantity spilled was 330 x 0.5, or 165 pounds.

Active Mitigation to Reduce Evaporation Rate. Examples of active mitigation techniques to reduce the evaporation rate from the pool include water sprays and foam or tarp covering. Use test data, manufacturer design specifications, or past experience to determine the fractional reduction of the release rate by the mitigation technique. Apply this fraction to the release rate (evaporation rate from the pool) that would have occurred without the mitigation technique, as follows:

$$QR_{RV} = (1 - FR) \times QR \qquad \textbf{(17)}$$

where: QR_{RV} = Reduced evaporation rate from pool or release rate to air (pounds per minute)
FR = Fractional reduction resulting from mitigation
QR = Evaporation rate from pool without mitigation (pounds per minute)

Releases Into Buildings. If a toxic liquid is released inside a building, compare the area of the building floor to the maximum area of the pool that could be formed; the smaller of the two areas should be used in determining the evaporation rate, as for the worst case scenario. The maximum area of the pool is determined from Equation 6 in Section 3.2.3 for releases into diked areas. The area of the building floor is the length times width of the floor (in feet) (Equation 9).

If the floor area is smaller than the maximum pool size, estimate the outdoor evaporation rate from a pool the size of the floor area from Equation 20 in the next section (Section 8.2.3). If the maximum pool area is smaller, estimate the outdoor evaporation rate from a pool of maximum size from Equation 18 in the next section. Estimate the rate of release of the toxic vapor from the building as five percent of the calculated outdoor evaporation rate (multiply your evaporation rate by 0.05). See Appendix D, Section D.2.4 for more information on releases into buildings.

8.2.3 Evaporation Rate from Liquid Pool

Ambient temperature. For pools with no mitigation, if the liquid is always at ambient temperature, find the Liquid Factor Ambient (LFA) and the Density Factor (DF) in Exhibit B-2 of Appendix B (see Appendix D, Section D.2.2 for the derivation of these factors). Calculate the release rate of the liquid from the following equation:

$$QR = QS \times 2.4 \times LFA \times DF \qquad \textbf{(18)}$$

where: QR = Release rate (pounds per minute)
QS = Quantity released (pounds)
2.4 = Wind speed factor = $3.0^{0.78}$, where 3.0 meters per second (6.7 miles per hour) is the wind speed for the alternative scenario for purposes of this guidance
LFA = Liquid Factor Ambient
DF = Density Factor

Elevated temperature. For pools with no mitigation, if the liquid is at an elevated temperature (any temperature above 25° C), find the Liquid Factor Boiling (LFB) and the Density Factor (DF) in Exhibit B-2 of Appendix B (see Appendix D, Section D.2.2, for the derivation of these factors). Calculate the release rate of the liquid from the following equation:

$$QR = QS \times 2.4 \times LFB \times DF \qquad \textbf{(19)}$$

where: QR = Release rate (pounds per minute)
QS = Quantity released (pounds)
2.4 = Wind speed factor = $3.0^{0.78}$, where 3.0 meters per second (6.7 miles per hour) is the wind speed for the alternative scenario for purposes of this guidance
LFB = Liquid Factor Boiling
DF = Density Factor

Diked Areas. If the toxic liquid will be released into an area where it will be contained by dikes, compare the diked area to the maximum area of the pool that could be formed, as described in Section 3.2.3 (see Equation 6). The smaller of the two areas should be used in determination of the evaporation rate. If the maximum area of the pool is smaller than the diked area, calculate the release rate as described for pools with no mitigation (above). If the diked area is smaller, go to Exhibit B-2 in Appendix B to find the Liquid Factor Ambient (LFA), if the liquid is at ambient temperature, or the Liquid Factor Boiling (LFB), if the liquid is at a temperature above ambient. Calculate the release rate from the diked area as follows:

$$QR = 2.4 \ x \ LFA \ x \ A \qquad (20)$$

or

$$QR = 2.4 \ x \ LFB \ x \ A \qquad (21)$$

where: QR = Release rate (pounds per minute)
2.4 = Wind speed factor = $3.0^{0.78}$, where 3.0 meters per second (6.7 miles per hour) is the wind speed for the alternative scenario for purposes of this guidance
LFA = Liquid Factor Ambient (listed in Exhibit B-2, Appendix B)
LFB = Liquid Factor Boiling (listed in Exhibit B-2, Appendix B)
A = Diked area (square feet)

Duration of Release. After you have estimated a release rate as described above, determine the duration of the vapor release from the pool (the time it will take for the liquid pool to evaporate completely). To estimate the time in minutes, divide the total quantity released (in pounds) by the release rate (in pounds per minute) (see Equation 5 in Section 3.2.2).

8.2.4 Common Water Solutions of Toxic Substances

You may use the methods described above for pure liquids to estimate the quantity of a solution of a toxic substance that may be spilled into a pool. LFA and DF values for several concentrations of ammonia, formaldehyde, hydrochloric acid, hydrofluoric acid, and nitric acid in water solution and for oleum are listed in Appendix B, Exhibit B-3. The LFA for a wind speed of 3.0 meters per second (6.7 miles per hour) should be used in the release rate calculations for alternative scenarios for pools of solutions at ambient temperature. For unmitigated releases or releases with passive mitigation, follow the instructions in Section 8.2.3. If active mitigation measures are in place, you may estimate a reduced release rate from the instructions in 8.2.2 above. Use the total quantity of the solution as the quantity released from the vessel or pipeline (QS) in carrying out the calculation of the release rate to the atmosphere. If the solution is at an elevated temperature, you may treat the substance in solution as a pure substance and follow the instructions in Section 3.3, or use a method that accounts for increased volatilization of the toxic regulated substance.

9.0 Estimating Impact Distances for Alternative Release Scenarios for Toxic Substances

If you do your own modeling for analysis of alternative release scenarios, you should consider typical weather conditions at your site. If you do not keep weather data for your site (most sources do not), you may call another nearby source, such as an airport, or a compiler, such as the National Weather Service, to determine the average wind speed for your area. Atmospheric stability classes are described in Exhibit 2. Select one that describes your typical weather. Your airport or other source will be able to tell you average percent of cloud cover.

Exhibit 2. Atmospheric Stability Classes

Surface Wind Speed at 10 Meters		Day			Night	
Meters per second	Miles per hour	Incoming Solar Radiation			Thinly Overcast or $\geq$4/8 low cloud	$\leq$ 3/8 Cloud
		Strong*	Moderate	Slight**		
<2	<4.5	A	A-B	B		
2-3	4.5-5	A-B	B	C	E	F
3-5	5-11	B	B-C	C	D	E
5-6	11-13	C	C-D	D	D	D
>6	>13	C	D	D	D	D

Class A is the most unstable, class D is neutral, class F is the most stable.

The neutral class, D, should be assumed for overcast conditions during day or night.

* Sun high in the sky with no clouds. Solar radiation would be reduced to moderate with broken middle clouds (5/8 to 7/8 cloud cover) and to slight with broken low clouds.

** Sun low in the sky with no clouds.

Source: D. Bruce Turner, *Workbook of Atmospheric Dispersion Estimates*, U.S. Department of Health, Education and Welfare. Cincinnati: 1970.

For estimating distances for toxic substances, this guidance provides four reference tables for neutrally buoyant plumes and four for dense gases. These tables were developed assuming D stability and a wind speed of 3.0 meters per second (6.7 miles per hour) as representative of likely conditions for many sites. Many wind speed and atmospheric stability combinations may be possible at different times in different parts of the country. If D stability and 3.0 meters per second are not reasonable conditions for your site, you may want to use other methods to estimate distances.

To use the reference tables, you need to consider the release rates estimated for gases and evaporation from liquid pools and the duration of the release. For the alternative scenarios, the duration of toxic gas releases may be longer than the 10 minutes assumed for the worst-case analysis for gases. You need to determine the appropriate toxic endpoint and whether the gas or vapor is neutrally buoyant or dense, using the tables in Appendix B.

The reference tables for distances (Reference Tables 10-17) are found at the end of Section 12. The tables and the conditions for which each table is applicable are:

Reference Table Number	Applicable Conditions		
	Release Duration (minutes)	**Topography**	**Gas or Vapor Density**
10	10	Rural	Neutrally buoyant
11	60		
12	10	Urban	
13	60		
14	10	Rural	Dense
15	60		
16	10	Urban	
17	60		

For releases lasting 10 minutes or less, use the 10-minute tables. For releases lasting more than 10 minutes, use the 60-minute tables. You should always use the 10-minute tables for releases of water solutions of toxic substances. Follow the instructions in Section 4 to estimate distances to the toxic endpoint for toxic gases and liquids.

Example 22. Gas Release of Chlorine

Assume that you calculated a release rate of 500 pounds per minute of chlorine from a tank. From Exhibit B-1, Appendix B, the toxic endpoint for chlorine is 0.0087 mg/L, and chlorine is listed as a dense gas. Based on emergency response systems available, you have estimated that the release will last for 6 minutes. At a release rate of 500 pounds per minute, 3,000 pounds of chlorine would be released in 6 minutes. To derive a release rate applicable to the reference tables, you calculate a 10-minute release rate as 3,000 pounds/10 minutes, or 300 pounds per minute. The 10-minute reference tables are appropriate for estimating the distance. The topography of your site is urban. For a 10-minute release of a dense gas under average meteorology (D stability and 3 meters per second wind speed) and urban topography, Reference Table 16 is appropriate. The toxic endpoint of 0.0087 mg/L is approximately halfway between 0.0075 and 0.01; you go to the lower endpoint of 0.0075 mg/L. The estimated release rate of 300 pounds per minute is closer to 250 pounds per minute on the table than to 500 pounds per minute, so you use 250 pounds per minute. Then the consequence distance for the alternative scenario is 2.0 miles.

10.0 Analysis of Alternative Release Scenarios for Flammable Substances

Alternative release scenarios for flammable substances are somewhat more complicated than for toxic substances because the consequences of a release and the endpoint of concern may vary. For the worst case, the consequence of concern is a vapor cloud explosion, with an overpressure endpoint. For alternative scenarios (e.g., fires), other endpoints (e.g., heat radiation) may need to be considered.

Possible scenarios involving flammable substances include:

- Vapor cloud fires (flash fires) may result from dispersion of a cloud of flammable vapor and ignition of the cloud following dispersion. Such a fire could flash back and could represent a severe heat radiation hazard to anyone in the area of the cloud. This guidance provides methods to estimate distances to a concentration equal to the lower flammability limit (LFL) for this type of fire. (See Sections 11 and 12.1.)

- A pool fire, with potential radiant heat effects, may result from a spill of a flammable liquid. This guidance provides a simple method for estimating the distance from a pool fire to a radiant heat level that could cause second degree burns from a 40-second exposure. (See Section 12.2).

- A boiling liquid, expanding vapor explosion (BLEVE), leading to a fireball that may produce intense heat, may occur if a vessel containing flammable material ruptures explosively as a result of exposure to fire. Heat radiation from the fireball is the primary hazard; vessel fragments and overpressure from the explosion also can result. BLEVEs are generally considered unlikely events; however, if you think a BLEVE is possible at your site, this guidance provides a method to estimate the distance at which radiant heat effects might lead to second degree burns. (See Section 12.3.)

You also may want to consider models or calculation methods to estimate effects of vessel fragmentation.

- For a vapor cloud explosion to occur, rapid release of a large quantity, turbulent conditions (caused by a turbulent release or congested conditions in the area of the release, or both), and other factors are generally necessary. Vapor cloud explosions generally are considered unlikely events; however, if conditions at your site are conducive to vapor cloud explosions, you may want to consider a vapor cloud explosion as an alternative scenario. This guidance provides methods you may use to estimate the distance to 1 psi overpressure for a vapor cloud detonation, based on less conservative assumptions than the worst-case analysis. (See Section 12.4.) A vapor cloud deflagration, involving lower flame speeds than a detonation and resulting in less damaging blast effects, is more likely than a detonation. This guidance does not provide methods for estimating the effects of a deflagration, but you may use other methods of analysis if you want to consider such events.

- A jet fire may result from the puncture or rupture of a tank or pipeline containing a compressed or liquefied gas under pressure. The gas discharging from the hole can form a jet that "blows" into the air in the direction of the hole; the jet then may ignite. Jet fires could contribute to BLEVEs and fireballs if they impinge on tanks of flammable substances. A large horizontal jet fire may have the potential to pose an offsite hazard. This guidance does not include a method for estimating consequence distances for jet fires. If you want to consider a jet fire as an alternative scenario, you should consider other models or methods for the consequence analysis.

11.0 Estimation of Release Rates for Alternative Release Scenarios for Flammable Substances

This section describes methods to estimate a release rate that may be used in determination of dispersion distance to the LFL for a vapor cloud fire (Section 12.1).

11.1 Flammable Gases

An alternative scenario for a release of a flammable gas may involve a leak from a vessel or piping. To estimate a release rate for flammable gases from hole size and storage conditions, you may use the method described above in Section 8.1 for toxic gases. This release rate may be used to determine the dispersion distance to the lower flammability limit (LFL), as described in Section 12.1. Exhibit C-2 in Appendix C includes Gas Factors (GF) that may be used in carrying out the calculations for each of the regulated flammable gases.

Example 23. Release Rate of Flammable Gas from Hole in Tank

A pipe tears off a tank containing acetylene. The release rate from the hole can be estimated from Equation 11 in Section 8.1. You estimate that the pipe would leave a hole with an area (HA) of 5 square inches. The temperature inside the tank (T_t) is 282 K, 9°C, and the square root of the temperature is 16.8. The pressure in the tank (P_t) is approximately 481 psia. From Exhibit C-2, Appendix C, the gas factor (GF) for acetylene is 17. From Equation 11, the release rate (QR) is:

$$QR = 5 \times 481 \times (1/16.8) \times 17 = 2{,}400 \text{ pounds per minute}$$

11.2 Flammable Liquids

You may estimate a release rate for flammable liquids by estimating the evaporation rate from a pool. You first need to estimate the quantity in the pool.

You may use the method discussed in Section 8.2 to estimate a rate of liquid release for flammable liquids into a pool from a hole in a tank or from a pipe shear. Exhibit C-3 in Appendix C includes liquid leak factors (LLF) for calculating release rate from a hole. Note that the LLF is appropriate only for atmospheric tanks.

Once you have an estimate of the quantity of flammable liquid in a pool, you may use the methods presented in Section 3.2 to estimate the evaporation rate from the pool. Liquid factors at ambient and boiling temperature (LFA and LFB) for the calculation are listed in Exhibit C-3 in Appendix C. Assume a wind speed of 3.0 meters per second and use a value of 2.4 for the wind speed factor for the evaporation rate calculations. Both passive mitigation (discussed in Section 3.2.3) and active mitigation measures (discussed in Section 8.2.2) may be taken into account. You do not need to estimate the duration of the release, because this information is not used to estimate distance to the LFL, as discussed in the next section.

12.0 Estimating Impact Distances for Alternative Release Scenarios for Flammable Substances

12.1 Vapor Cloud Fires

The distance to the LFL represents the maximum distance at which the radiant heat effects of a vapor cloud fire might have serious consequences. Exhibit C-2, Appendix C, provides LFL data (in volume percent and milligrams per liter) for listed flammable gases; Exhibit C-3 provides these data for flammable liquids. To determine the distance to the LFL, find the LFL in milligrams per liter and identify the appropriate reference table (neutrally buoyant or dense gas) from Exhibit C-2 or C-3, Appendix C. Follow the steps described in Section 9 and Section 4 for toxic substances to find the distance to the LFL from the release rate, using the appropriate reference table for flammable substances, as discussed below.

Because LFL values are generally much larger than toxic endpoints for regulated toxic substances, and because vapor cloud fires are instantaneous events (in contrast to releases of toxic substances, where the duration of exposure to the toxic cloud is an important factor), the reference tables of distances for toxic substances are not applicable to vapor cloud fires. Therefore, additional reference tables for the alternative scenario conditions (D stability and wind speed 3.0 meters per second) are provided for estimating the distance to the LFL. Release duration does not need to be considered for estimating vapor cloud fire distances; the reference tables for flammable substances apply to both 10-minute and 60-minute releases. The reference tables for flammable substances (Reference Tables 18-21 at the end of Section 12) are:

Reference Table Number	**Applicable Conditions**		
	Release Duration (minutes)	**Topography**	**Gas or Vapor Density**
18	10 - 60	Rural	Neutrally buoyant
19	10 - 60	Urban	
20	10 - 60	Rural	Dense
21	10 - 60	Urban	

The development of these tables is discussed in Appendix D, Section D.4.

Example 24. Vapor Cloud Fire from Evaporating Pool of Flammable Liquid

You have a tank containing 20,000 pounds of ethyl ether. A likely scenario for a release might be shearing of a pipe from the tank, with the released liquid forming a pool. You want to estimate the consequences of a vapor cloud fire that might result from evaporation of the pool and ignition of the vapor.

You first need to estimate the rate of release of the liquid from the tank. You can do this using Equation 13, Section 8.2.1. For this calculation, you need the area of the hole that would result from shearing the pipe (HA), the height of the liquid in the tank above the hole (LH), and the liquid leak factor (LLF) for ethyl ether, from Exhibit C-3 in Appendix C. The pipe diameter is 2 inches, so the cross sectional area of the hole would be 3.1 square inches. You estimate that the pipe is 2 feet, or 24 inches, below the level of the liquid when the tank is full. The square root of LH (24 inches) is 4.9. LLF for ethyl ether is 34. From Equation 13, the rate of release of the liquid from the hole is calculated as:

$$
\begin{aligned}
QR_L &= 3.1 \times 4.9 \times 34 \\
&= 520 \text{ pounds per minute}
\end{aligned}
$$

You estimate that the release of the liquid could be stopped in about 10 minutes. In 10 minutes, 10 x 520, or 5,200 pounds, would be released.

The liquid would be released into an area without dikes. To estimate the evaporation rate from the pool formed by the released liquid, you use Equation 3 from Section 3.2.2. To carry out the calculation, you need the Liquid Factor Ambient (LFA) and the Density Factor (DF) for ethyl ether. From Exhibit C-3, Appendix C, LFA for ethyl ether is 0.11 and DF is 0.69. Wind speed (U) is assumed to be 3.0 meters per second; 3 to the 0.78 power is 2.4. The release rate to air is:

$$
\begin{aligned}
QR &= 5{,}200 \times 2.4 \times 0.11 \times 0.69 \\
&= 950 \text{ pounds per minute}
\end{aligned}
$$

To estimate the maximum distance at which people in the area of the vapor cloud could suffer serious injury, you use the estimated release rate and the lower flammability limit (LFL) (in milligrams per liter) for ethyl ether, and find the distance on the appropriate reference table. From Exhibit C-3, Appendix C, LFL for ethyl ether is 57 mg/L, and the appropriate reference table is a dense gas table. Your site is in a rural area with few obstructions, so you use Reference Table 20.

From Reference Table 20, the closest LFL is 60 mg/L. The lowest release rate on the table is 1,500 pounds per minute, which is higher than the evaporation rate estimated for the pool of ethyl ether. For a release rate less than 1,500 pounds per minute, the distance to the LFL is less than 0.06 miles.

Example 25. Flammable Gas Release (Acetylene)

In Example 23, you estimated a release rate for acetylene from a hole in a tank of 2,400 pounds per minute. You want to estimate the distance to the LFL for a vapor cloud fire resulting from this release.

From Exhibit C-2, Appendix C, the LFL for acetylene is 27 mg/L, and the appropriate table for distance estimation is a neutrally buoyant gas table for flammable substances. Your site is in a rural area, so you would use Reference Table 18.

To use the neutrally buoyant gas tables, you need to calculate release rate/endpoint. In this case, release rate/LFL = 2,400/27 or 89. On Reference Table 18, 89 falls in the range of release rate/LFL values corresponding to 0.20 miles.

12.2 Pool Fires

A "Pool Fire Factor" (PFF) has been derived for each of the regulated flammable substances to aid in the consequence analysis. This factor, listed in Appendix C, Exhibits C-2 and C-3 for each regulated flammable substance, may be used to estimate a distance from the center of a pool fire where people could potentially receive second degree burns from a 40-second exposure. The heat radiation endpoint for this analysis is 5 kilowatts per square meter (kW/m^2). Ambient temperature is assumed to be 25° C (77° F) for calculation of the PFF for flammable liquids.

To estimate a distance using the PFF, you first need to estimate the size of the pool, in square feet, that might be formed by the release of a flammable substance. You may use the methods described above for toxic liquids to estimate pool size (density factors (DF) for the estimation of pool size in undiked areas may be found for flammable liquids in Exhibit C-3 of Appendix C). Distances may be estimated from the PFF and the pool area as follows:

$$d = PFF \times \sqrt{A} \tag{22}$$

where: d = Distance (feet)
PFF = Pool Fire Factor (listed for each flammable substance in Appendix C, Exhibits C-2 and C-3)
A = Pool area (square feet)

The derivation of these factors is discussed in Appendix D, Section D.9.

Example 26. Pool Fire of Flammable Liquid

For the tank containing 20,000 pounds of ethyl ether, discussed in Example 24, you want to estimate the consequences of a pool fire, for comparison with the vapor cloud fire results.

In Example 25, you estimated that 15,000 pounds would be released into an area without dikes, forming a pool. Assuming the liquid spreads to a depth of 1 centimeter (0.39 inches), you estimate the area of the pool formed from Equation 6, Section 3.2.3. For this calculation, you need the density factor (DF) for ethyl ether; from Exhibit C-3, Appendix C, DF for ethyl ether is 0.69. From Equation 6, the area of the pool is:

$$A = 15{,}000 \times 0.69 = 10{,}400 \text{ square feet}$$

You can use Equation 18 to estimate the distance from the center of the burning pool where the heat radiation level would reach 5 kW/m^2. For the calculation, you need the square root of the pool area (A) and the pool fire factor (PFF) for ethyl ether. The square root of A, 10,400 square feet, is 102 feet. From Exhibit C-3, Appendix C, PFF for ethyl ether is 4.3. From Equation 18, the distance (d) to 5 kW/m^2 is:

$$d = 4.3 \times 102 = 440 \text{ feet (about 0.08 miles)}$$

12.3 BLEVEs

If a fireball from a BLEVE is a potential release scenario at your site, you may use Reference Table 22 to estimate the distance to a potentially harmful radiant heat level. The table shows distances for a range of quantities to the radiant heat level that potentially could cause second degree burns to a person exposed for the duration of the fire. The quantity you use should be the total quantity in a tank that might be involved in a BLEVE. The equations used to derive this table of distances are presented in Appendix D, Section D.10. If you prefer, you may use the equations to estimate a distance for BLEVEs, or you may use a different calculation method or model.

12.4 Vapor Cloud Explosion

If you have the potential at your site for the rapid release of a large quantity of a flammable vapor, particularly into a congested area, a vapor cloud explosion may be an appropriate alternative release scenario. For the consequence analysis, you may use the same methods as for the worst case to estimate consequence distances to an overpressure endpoint of 1 psi (see Section 5.1 and the equation in Appendix C). Instead of assuming the total quantity of flammable substance released is in the vapor cloud, you may estimate a smaller quantity in the cloud. You could base your estimate of the quantity in the cloud on the release rate estimated as described above for gases and liquids multiplied by the time required to stop the release.

To estimate the quantity in the cloud for a gas liquefied under pressure (not refrigerated), you may use the following equation, incorporating a "flash fraction factor" (FFF), listed in Appendix C, Exhibit C-2 for regulated flammable gases, to estimate the quantity that could be immediately flashed into vapor upon release plus the quantity that might be carried along as spray or aerosol (see Appendix D, Section D.11 for the derivation of this equation):

$$QF = FFF \; x \; QS \; x \; 2 \tag{23}$$

where: QF = Quantity flashed into vapor plus aerosol (pounds) (cannot be larger than QS)
QS = Quantity spilled (pounds)
FFF = Flash fraction factor (unitless) (listed in Appendix C, Exhibit C-2)
2 = Factor to account for spray and aerosol

For derivation of the FFF, the temperature of the stored gas was assumed to be 25° C (77° F). You may estimate the flash fraction under other conditions using the equation presented in Appendix D, Section D.11.

You may estimate the distance to 1 psi for a vapor cloud explosion from the quantity in the cloud using Reference Table 9 (at the end of the worst-case analysis discussion) or from Equation C-1 in Appendix C. For the alternative scenario analysis, you may use a yield factor of 3 percent, instead of the yield factor of 10 percent used in the worst-case analysis. If you use the equation in Appendix C, use 0.03 instead of 0.1 in the calculation. If you use Reference Table 9, you can incorporate the lower yield factor by multiplying the distance you read from Reference Table 9 by 0.67.

Example 27. Vapor Cloud Explosion (Propane)

You have a tank containing 50,000 pounds of propane liquefied under pressure at ambient temperature. You want to estimate the consequence distance for a vapor cloud explosion resulting from rupture of the tank.

You use Equation 19 to estimate the quantity that might be released to form a cloud. You base the calculation on the entire contents of the tank (QS = 50,000 pounds). From Exhibit C-2 of Appendix C, the Flash Fraction Factor (FFF) for propane is 0.38. From Equation 19, the quantity flashed into vapor, plus the quantity that might be carried along as aerosol, (QF) is:

$$QF = 0.38 \; x \; 50{,}000 \; x \; 2 = 38{,}000 \text{ pounds}$$

You assume 38,000 pounds of propane is in the flammable part of the vapor cloud. This quantity falls between 30,000 pounds and 50,000 pounds in Reference Table 9; 30,000 pounds is the quantity closest to your quantity. From the table, the distance to 1 psi overpressure is 0.33 miles for 30,000 pounds of propane for a 10 percent yield factor. To change the yield factor to 3 percent, you multiply this distances by 0.67; then the distance becomes 0.22 miles.

Reference Table 10
Neutrally Buoyant Plume Distances to Toxic Endpoint for Release Rate Divided by Endpoint
10-Minute Release, Rural Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 64	0.06
64 - 510	0.19
510 - 1,300	0.31
1,300 - 2,300	0.43
2,300 - 4,100	0.62
4,100 - 6,300	0.81
6,300 - 8,800	0.99
8,800 - 12,000	1.2
12,000 - 16,000	1.4
16,000 - 19,000	1.6
19,000 - 22,000	1.8
22,000 - 26,000	2.0
26,000 - 30,000	2.2
30,000 - 36,000	2.4
36,000 - 42,000	2.6
42,000 - 47,000	2.8
47,000 - 54,000	3.0
54,000 - 60,000	3.2
60,000 - 70,000	3.4
70,000 - 78,000	3.6
78,000 - 87,000	3.8
87,000 - 97,000	4.0
97,000 - 110,000	4.2
110,000 - 120,000	4.4
120,000 - 130,000	4.6

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
130,000 - 140,000	4.8
140,000 - 160,000	5.0
160,000 - 180,000	5.2
180,000 - 190,000	5.4
190,000 - 210,000	5.6
210,000 - 220,000	5.8
220,000 - 240,000	6.0
240,000 - 261,000	6.2
261,000 - 325,000	6.8
325,000 - 397,000	7.5
397,000 - 477,000	8.1
477,000 - 566,000	8.7
566,000 - 663,000	9.3
663,000 - 769,000	9.9
769,000 - 1,010,000	11
1,010,000 - 1,280,000	12
1,280,000 - 1,600,000	14
1,600,000 - 1,950,000	15
1,950,000 - 2,340,000	16
2,340,000 - 2,770,000	17
2,770,000 - 3,240,000	19
3,240,000 - 4,590,000	22
4,590,000 - 6,190,000	25
>6,190,000	>25

Reference Table 11
Neutrally Buoyant Plume Distances to Toxic Endpoint for Release Rate Divided by Endpoint
60-Minute Release, Rural Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 79	0.06
79 - 630	0.19
630 - 1,600	0.31
1,600 - 2,800	0.43
2,800 - 5,200	0.62
5,200 - 7,900	0.81
7,900 - 11,000	0.99
11,000 - 14,000	1.2
14,000 - 19,000	1.4
19,000 - 23,000	1.6
23,000 - 27,000	1.8
27,000 - 32,000	2.0
32,000 - 36,000	2.2
36,000 - 42,000	2.4
42,000 - 47,000	2.6
47,000 - 52,000	2.8
52,000 - 57,000	3.0
57,000 - 61,000	3.2
61,000 - 68,000	3.4
68,000 - 73,000	3.6
73,000 - 79,000	3.8
79,000 - 84,000	4.0
84,000 - 91,000	4.2
91,000 - 97,000	4.4
97,000 - 100,000	4.6
100,000 - 110,000	4.8
110,000 - 110,000	5.0
110,000 - 120,000	5.2
120,000 - 130,000	5.4
130,000 - 130,000	5.6
130,000 - 140,000	5.8
140,000 - 150,000	6.0
150,000 - 151,000	6.2
151,000 - 171,000	6.8
171,000 - 191,000	7.5
191,000 - 212,000	8.1
212,000 - 233,000	8.7
233,000 - 256,000	9.3
256,000 - 280,000	9.9
280,000 - 332,000	11
332,000 - 390,000	12
390,000 - 456,000	14
456,000 - 529,000	15
529,000 - 610,000	16
610,000 - 699,000	17
699,000 - 796,000	19
796,000 - 1,080,000	22
1,080,000 - 1,410,000	25
>1,410,000	>25

Reference Table 12
Neutrally Buoyant Plume Distances to Toxic Endpoint for Release Rate Divided by Endpoint
10-Minute Release, Urban Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 160	0.06
160 - 1,400	0.19
1,400 - 3,600	0.31
3,600 - 6,900	0.43
6,900 - 13,000	0.62
13,000 - 22,000	0.81
22,000 - 31,000	0.99
31,000 - 42,000	1.2
42,000 - 59,000	1.4
59,000 - 73,000	1.6
73,000 - 88,000	1.8
88,000 - 100,000	2.0
100,000 - 120,000	2.2
120,000 - 150,000	2.4
150,000 - 170,000	2.6
170,000 - 200,000	2.8
200,000 - 230,000	3.0
230,000 - 260,000	3.2
260,000 - 310,000	3.4
310,000 - 340,000	3.6
340,000 - 390,000	3.8
390,000 - 430,000	4.0
430,000 - 490,000	4.2
490,000 - 540,000	4.4
540,000 - 600,000	4.6

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
600,000 - 660,000	4.8
660,000 - 720,000	5.0
720,000 - 810,000	5.2
810,000 - 880,000	5.4
880,000 - 950,000	5.6
950,000 - 1,000,000	5.8
1,000,000 - 1,100,000	6.0
1,100,000 - 1,220,000	6.2
1,220,000 - 1,530,000	6.8
1,530,000 - 1,880,000	7.5
1,880,000 - 2,280,000	8.1
2,280,000 - 2,710,000	8.7
2,710,000 - 3,200,000	9.3
3,200,000 - 3,730,000	9.9
3,730,000 - 4,920,000	11
4,920,000 - 6,310,000	12
6,310,000 - 7,890,000	14
7,890,000 - 9,660,000	15
9,660,000 - 11,600,000	16
11,600,000 - 13,800,000	17
13,800,000 - 16,200,000	19
16,200,000 - 23,100,000	22
23,100,000 - 31,300,000	25
>31,300,000	>25

Reference Table 13
Neutrally Buoyant Plume Distances to Toxic Endpoint for Release Rate Divided by Endpoint
60-Minute Release, Urban Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 200	0.06
200 - 1,700	0.19
1,700 - 4,500	0.31
4,500 - 8,600	0.43
8,600 - 17,000	0.62
17,000 - 27,000	0.81
27,000 - 39,000	0.99
39,000 - 53,000	1.2
53,000 - 73,000	1.4
73,000 - 90,000	1.6
90,000 - 110,000	1.8
110,000 - 130,000	2.0
130,000 - 150,000	2.2
150,000 - 170,000	2.4
170,000 - 200,000	2.6
200,000 - 220,000	2.8
220,000 - 240,000	3.0
240,000 - 270,000	3.2
270,000 - 300,000	3.4
300,000 - 320,000	3.6
320,000 - 350,000	3.8
350,000 - 370,000	4.0
370,000 - 410,000	4.2
410,000 - 430,000	4.4
430,000 - 460,000	4.6
460,000 - 490,000	4.8
490,000 - 520,000	5.0
520,000 - 550,000	5.2
550,000 - 580,000	5.4
580,000 - 610,000	5.6
610,000 - 640,000	5.8
640,000 - 680,000	6.0
680,000 - 705,000	6.2
705,000 - 804,000	6.8
804,000 - 905,000	7.5
905,000 - 1,010,000	8.1
1,010,000 - 1,120,000	8.7
1,120,000 - 1,230,000	9.3
1,230,000 - 1,350,000	9.9
1,350,000 - 1,620,000	11
1,620,000 - 1,920,000	12
1,920,000 - 2,250,000	14
2,250,000 - 2,620,000	15
2,620,000 - 3,030,000	16
3,030,000 - 3,490,000	17
3,490,000 - 3,980,000	19
3,980,000 - 5,410,000	22
5,410,000 - 7,120,000	25
>7,120,000	>25

Reference Table 14
Dense Gas Distances to Toxic Endpoint
10-minute Release, Rural Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate (lbs/min)	Toxic Endpoint (mg/L)															
	0.0004	0.0007	0.001	0.002	0.0035	0.005	0.0075	0.01	0.02	0.035	0.05	0.075	0.1	0.25	0.5	0.75
	Distance (Miles)															
1	0.60	0.44	0.36	0.24	0.17	0.14	0.11	0.09	<0.06	<0.06	#	#	#	#	#	#
2	0.87	0.62	0.50	0.37	0.26	0.22	0.17	0.14	0.09	0.07	<0.06	<0.06	#	#	#	#
5	1.4	1.1	0.87	0.60	0.44	0.36	0.29	0.24	0.17	0.12	0.09	0.07	<0.06	#	#	#
10	2.0	1.5	1.2	0.87	0.62	0.54	0.43	0.36	0.25	0.18	0.14	0.11	0.09	<0.06	<0.06	#
30	3.7	2.7	2.2	1.5	1.1	0.93	0.74	0.68	0.47	0.34	0.28	0.22	0.19	0.11	0.07	<0.06
50	5.0	3.7	3.0	2.1	1.9	1.2	0.99	0.87	0.62	0.45	0.37	0.30	0.25	0.15	0.10	0.08
100	7.4	5.3	4.3	3.0	2.3	1.7	1.4	1.2	0.87	0.62	0.56	0.43	0.37	0.23	0.15	0.12
150	8.7	6.8	5.5	3.8	2.8	2.3	1.9	1.6	1.1	0.81	0.68	0.56	0.47	0.29	0.19	0.15
250	12	8.7	7.4	5.0	3.7	3.0	2.4	2.1	1.4	1.1	0.87	0.74	0.51	0.38	0.26	0.20
500	17	13	11	7.4	5.3	4.5	3.6	3.0	2.1	1.6	1.3	1.1	0.87	0.56	0.37	0.30
750	22	16	13	9.3	6.8	5.6	4.5	3.8	2.7	1.9	1.6	1.3	1.1	0.68	0.47	0.37
1000	>25	19	16	11	8.1	6.8	5.2	4.5	3.1	2.3	2.2	1.5	1.3	0.81	0.56	0.44
1500	*	23	19	13	9.9	8.1	6.8	5.6	3.9	2.9	2.4	1.9	1.6	0.99	0.68	0.55
2000	*	>25	22	15	12	9.3	7.4	6.8	4.5	3.4	2.7	2.2	1.9	1.2	0.81	0.62
2500	*	*	25	17	13	11	8.7	7.4	5.2	3.8	3.2	2.5	2.1	1.3	0.87	0.74
3000	*	*	>25	19	14	12	9.3	8.1	5.7	4.2	3.5	2.8	2.4	1.4	0.99	0.81
4000	*	*	*	22	17	14	11	9.3	6.8	4.9	4.1	3.3	2.8	1.7	1.1	0.93
5000	*	*	*	>25	19	16	12	11	7.4	5.6	4.7	3.7	3.1	2.1	1.3	1.1
7500	*	*	*	*	24	19	16	13	9.3	6.8	5.8	4.7	4.0	2.4	1.6	1.3
10000	*	*	*	*	>25	22	18	16	11	8.1	6.8	5.3	4.6	2.8	1.9	1.5
15000	*	*	*	*	*	>25	22	19	13	9.9	8.1	6.8	5.7	3.5	2.4	1.9
20000	*	*	*	*	*	*	>25	22	16	11	9.3	7.4	6.8	4.0	2.8	2.2

* > 25 miles

\# <0.06 miles

Reference Table 15
Dense Gas Distances to Toxic Endpoint
60-minute Release, Rural Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate (lbs/min)	Toxic Endpoint (mg/L)															
	0.0004	0.0007	0.001	0.002	0.0035	0.005	0.0075	0.01	0.02	0.035	0.05	0.075	0.1	0.25	0.5	0.75
	Distance (Miles)															
1	0.53	0.39	0.32	0.22	0.16	0.13	0.10	0.09	<0.06	#	#	#	#	#	#	#
2	0.81	0.57	0.47	0.32	0.23	0.19	0.15	0.13	0.09	<0.06	<0.06	<0.06	#	#	#	#
5	1.6	0.99	0.81	0.54	0.39	0.32	0.25	0.22	0.15	0.11	0.09	0.07	<0.06	#	#	#
10	2.0	1.4	1.2	0.81	0.58	0.47	0.38	0.32	0.22	0.16	0.13	0.11	0.09	<0.06	<0.06	#
30	4.0	2.8	2.2	1.5	1.1	0.87	0.68	0.61	0.42	0.30	0.25	0.20	0.17	0.10	0.07	<0.06
50	5.5	3.9	3.1	2.1	1.5	1.2	0.99	0.81	0.56	0.41	0.34	0.27	0.23	0.14	0.09	0.07
100	8.7	6.1	4.8	3.2	2.2	1.8	1.4	1.2	0.81	0.61	0.50	0.40	0.34	0.20	0.14	0.11
150	12	8.1	6.2	4.1	2.9	2.3	1.8	1.6	1.1	0.74	0.62	0.51	0.43	0.26	0.18	0.14
250	17	11	8.7	5.6	4.0	3.2	2.5	2.1	1.4	1.1	0.87	0.68	0.57	0.35	0.24	0.19
500	>25	19	14	9.3	6.2	5.0	3.9	3.3	2.2	1.6	1.3	0.99	0.87	0.51	0.35	0.28
750	*	25	19	12	8.7	6.8	5.1	4.2	2.8	2.0	1.6	1.3	1.1	0.62	0.44	0.35
1000	*	>25	24	15	11	8.1	6.1	5.2	3.4	2.4	1.9	1.5	1.3	0.74	0.52	0.42
1500	*	*	>25	20	14	11	8.1	6.8	4.3	3.0	2.5	1.9	1.7	0.99	0.68	0.52
2000	*	*	*	24	17	13	9.9	8.1	5.2	3.7	2.9	2.3	1.9	1.2	0.74	0.61
2500	*	*	*	>25	19	15	12	9.3	6.0	4.3	3.4	2.7	2.2	1.3	0.87	0.68
3000	*	*	*	*	22	17	13	11	6.8	4.8	3.8	3.0	2.5	1.5	0.99	0.81
4000	*	*	*	*	>25	21	16	14	8.7	5.8	4.7	3.6	3.0	1.7	1.2	0.93
5000	*	*	*	*	*	25	19	16	9.9	6.8	5.3	4.1	3.5	2.0	1.4	1.1
7500	*	*	*	*	*	>25	25	20	13	9.3	6.8	5.4	4.5	2.6	1.7	1.4
10000	*	*	*	*	*	*	>25	25	16	11	8.7	6.8	5.4	3.1	2.1	1.6
15000	*	*	*	*	*	*	*	>25	21	14	11	8.7	7.4	4.0	2.6	2.1
20000	*	*	*	*	*	*	*	*	25	17	14	11	8.7	4.8	3.1	2.5

* > 25 miles

\# <0.06 miles

Reference Table 16
Dense Gas Distances to Toxic Endpoint
10-minute Release, Urban Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate (lbs/min)	Toxic Endpoint (mg/L)															
	0.0004	0.0007	0.001	0.002	0.0035	0.005	0.0075	0.01	0.02	0.035	0.05	0.075	0.1	0.25	0.5	0.75
	Distance (Miles)															
1	0.49	0.34	0.24	0.19	0.12	0.11	0.08	0.06	<0.06	#	#	#	#	#	#	#
2	0.68	0.50	0.43	0.28	0.22	0.17	0.12	0.11	0.07	<0.06	<0.06	#	#	#	#	#
5	1.1	0.81	0.62	0.47	0.33	0.28	0.21	0.19	0.12	0.09	0.07	<0.06	<0.06	#	#	#
10	2.1	1.2	0.99	0.68	0.50	0.42	0.31	0.28	0.19	0.13	0.11	0.08	0.06	<0.06	#	#
30	3.0	2.2	1.9	1.2	0.93	0.81	0.62	0.56	0.37	0.27	0.22	0.17	0.14	0.08	<0.06	#
50	4.1	3.0	2.5	1.6	1.2	0.99	0.81	0.68	0.50	0.30	0.29	0.23	0.19	0.11	0.07	<0.06
100	5.8	4.3	3.5	2.7	1.8	1.4	1.2	0.99	0.74	0.56	0.45	0.36	0.29	0.17	0.11	0.08
150	7.4	5.5	4.5	3.1	2.2	1.9	1.4	1.2	0.87	0.68	0.56	0.44	0.37	0.22	0.17	0.11
250	9.9	7.4	5.8	4.1	3.0	2.5	2.0	1.7	1.1	0.87	0.68	0.58	0.50	0.29	0.19	0.14
500	14	11	8.7	5.9	4.3	3.6	2.9	2.5	1.7	1.2	0.99	0.81	0.68	0.45	0.28	0.21
750	17	13	11	7.4	5.5	4.5	3.6	3.1	2.1	1.6	1.2	0.99	0.87	0.54	0.35	0.27
1000	20	15	12	8.7	6.2	5.3	4.3	3.5	2.5	1.8	1.5	1.2	0.99	0.62	0.42	0.32
1500	>25	19	16	11	8.1	6.2	5.2	4.5	3.0	2.2	1.8	1.5	1.2	0.74	0.52	0.40
2000	*	22	18	12	9.3	7.4	6.2	5.2	3.7	2.7	2.2	1.7	1.4	0.87	0.60	0.47
2500	*	24	20	14	11	8.7	6.8	6.0	3.8	3.0	2.2	1.9	1.7	0.99	0.68	0.55
3000	*	>25	22	16	11	9.3	7.4	6.8	4.5	3.3	2.7	2.1	1.9	1.1	0.74	0.57
4000	*	*	>25	18	14	11	8.7	7.4	5.3	4.0	3.2	2.6	2.1	1.2	0.87	0.68
5000	*	*	*	20	15	12	9.9	8.7	5.8	4.4	3.6	2.9	2.4	1.4	0.93	0.74
7500	*	*	*	>25	19	16	12	11	7.4	5.5	4.5	3.6	3.0	1.8	1.2	0.93
10000	*	*	*	*	22	18	14	12	8.7	6.2	5.2	4.2	3.6	2.1	1.4	1.1
15000	*	*	*	*	>25	22	18	16	11	8.1	6.8	5.2	4.4	2.6	1.7	1.3
20000	*	*	*	*	*	>25	20	18	12	9.3	7.4	6.0	5.2	3.0	2.0	1.6

* > 25 miles

<0.06 miles

Reference Table 17
Dense Gas Distances to Toxic Endpoint
60-minute Release, Urban Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate (lbs/min)	Toxic Endpoint (mg/L)															
	0.0004	0.0007	0.001	0.002	0.0035	0.005	0.0075	0.01	0.02	0.035	0.05	0.075	0.1	0.25	0.5	0.75
	Distance (Miles)															
1	0.43	0.31	0.25	0.17	0.12	0.09	0.07	<0.06	#	#	#	#	#	#	#	#
2	0.68	0.47	0.38	0.25	0.18	0.15	0.11	0.09	<0.06	<0.06	#	#	#	#	#	#
5	1.1	0.81	0.68	0.43	0.32	0.25	0.20	0.17	0.11	0.08	<0.06	<0.06	<0.06	#	#	#
10	1.7	1.2	0.99	0.68	0.47	0.38	0.30	0.26	0.17	0.12	0.10	0.07	0.06	<0.06	#	#
30	3.3	2.4	1.9	1.3	0.93	0.74	0.58	0.50	0.33	0.24	0.19	0.16	0.13	0.07	<0.06	#
50	4.7	3.3	2.6	1.7	1.2	0.99	0.81	0.68	0.45	0.33	0.27	0.21	0.17	0.10	0.06	<0.06
100	7.4	5.2	4.1	2.7	1.9	1.5	1.2	0.99	0.68	0.48	0.40	0.32	0.27	0.16	0.10	0.07
150	9.9	6.8	5.3	3.4	2.4	1.9	1.5	1.3	0.87	0.61	0.50	0.40	0.33	0.19	0.13	0.10
250	14	9.3	7.4	4.7	3.4	2.7	2.1	1.7	1.1	0.81	0.68	0.53	0.45	0.26	0.17	0.13
500	22	16	12	7.4	5.2	4.2	3.2	2.7	1.7	1.2	0.99	0.81	0.68	0.38	0.25	0.20
750	>25	20	16	9.9	6.8	5.4	4.2	3.5	2.2	1.6	1.3	0.99	0.87	0.49	0.32	0.27
1000	*	24	19	12	8.1	6.8	5.0	4.2	2.7	1.8	1.6	1.2	0.99	0.58	0.38	0.30
1500	*	>25	>25	16	11	8.7	6.8	5.5	3.5	1.9	2.0	1.6	1.3	0.74	0.48	0.37
2000	*	*	>25	19	14	11	8.1	6.8	4.2	3.0	2.2	1.9	1.6	0.87	0.56	0.44
2500	*	*	>25	23	16	12	9.3	7.4	4.9	3.4	2.7	2.1	1.7	0.99	0.62	0.50
3000	*	*	*	>25	18	14	11	8.7	5.5	3.8	3.0	2.4	2.0	1.1	0.74	0.56
4000	*	*	*	>25	22	17	13	11	6.8	4.7	3.1	2.8	2.4	1.3	0.87	0.68
5000	*	*	*	*	>25	20	16	12	8.1	5.3	4.3	3.3	2.7	1.5	0.99	0.74
7500	*	*	*	*	*	25	20	17	11	6.8	5.6	4.3	3.5	2.0	1.2	0.93
10000	*	*	*	*	*	>25	24	20	13	8.7	6.8	5.2	4.3	2.4	1.5	1.1
15000	*	*	*	*	*	*	>25	>25	17	11	8.7	6.8	5.6	3.0	1.9	1.5
20000	*	*	*	*	*	*	*	>25	20	14	11	8.1	6.8	3.6	2.3	1.7

* > 25 miles

\# <0.06 miles

Reference Table 18
Neutrally Buoyant Plume Distances to Lower Flammability Limit (LFL)
For Release Rate Divided by LFL
Rural Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 28	0.06
28 - 40	0.08
40 - 60	0.10
60 - 220	0.20
220 - 530	0.30
530 - 860	0.40
860 - 1,300	0.50
1,300 - 1,700	0.60
1,700 - 2,200	0.70
2,200 - 2,700	0.80

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
2,700 - 3,300	0.90
3,300 - 3,900	1.0
3,900 - 4,500	1.1
4,500 - 5,200	1.2
5,200 - 5,800	1.3
5,800 - 6,800	1.4
6,800 - 8,200	1.6
8,200 - 9,700	1.8
9,700 - 11,000	2.0
11,000 - 13,000	2.2

Reference Table 19
Neutrally Buoyant Plume Distances to Lower Flammability Limit (LFL)
For Release Rate Divided by LFL
Urban Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
0 - 68	0.06
68 - 100	0.08
100 - 150	0.10
150 - 710	0.20
710 - 1,500	0.30
1,500 - 2,600	0.40
2,600 - 4,000	0.50
4,000 - 5,500	0.60

Release Rate/Endpoint [(lbs/min)/(mg/L)]	Distance to Endpoint (miles)
5,500 - 7,300	0.70
7,300 - 9,200	0.80
9,200 - 11,000	0.90
11,000 - 14,000	1.0
14,000 - 18,000	1.2
18,000 - 26,000	1.4
26,000 - 31,000	1.6
31,000 - 38,000	1.8

Reference Table 20
Dense Gas Distances to Lower Flammability Limit
Rural Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate (lbs/min)	Lower Flammability Limit (mg/L)									
	27	30	35	40	45	50	60	70	100	>100
	Distance (Miles)									
<1500	#	#	#	#	#	#	#	#	#	#
1500	<0.06	<0.06	#	#	#	#	#	#	#	#
2000	0.07	0.06	<0.06	#	#	#	#	#	#	#
2500	0.08	0.07	0.07	<0.06	#	#	#	#	#	#
3000	0.09	0.08	0.07	0.07	<0.06	<0.06	#	#	#	#
4000	0.11	0.10	0.09	0.08	0.07	0.07	<0.06	#	#	#
5000	0.12	0.11	0.10	0.09	0.08	0.07	0.07	<0.06	#	#
7500	0.15	0.14	0.12	0.11	0.11	0.10	0.09	0.07	<0.06	#
10000	0.17	0.16	0.14	0.13	0.12	0.11	0.10	0.09	0.07	<0.06

< 0.06 mile

Reference Table 21
Dense Gas Distances to Lower Flammability Limit
Urban Conditions, D Stability, Wind Speed 3.0 Meters per Second

Release Rate (lbs/min)	Lower Flammability Limit (mg/L)				
	27	30	35	40	>40
	Distance (Miles)				
<5000	#	#	#	#	#
5000	<0.06	<0.06	#	#	#
7500	0.07	0.06	<0.06	#	#
10000	0.09	0.07	0.07	<0.06	#

\# < 0.06 miles

Reference Table 22
Distance to Radiant Heat Dose at Potential Second Degree Burn Threshold Assuming Exposure for Duration of Fireball
(Dose = $[5 \text{ kW/m}^2]^{4/3}$ x Exposure Time)

Quantity in Fireball (pounds)		1,000	5,000	10,000	20,000	30,000	50,000	75,000	100,000	200,000	300,000	500,000
Duration of Fireball (seconds)		3.5	5.9	7.5	9.4	10.8	12.7	14.8	15.5	17.4	18.7	20.3
CAS No.	Chemical Name	Distance (miles) at which Exposure for Duration of Fireball May Cause Second Degree Burns										
75-07-0	Acetaldehyde	0.036	0.076	0.10	0.14	0.17	0.22	0.26	0.30	0.39	0.46	0.56
74-86-2	Acetylene	0.050	0.11	0.14	0.20	0.24	0.30	0.37	0.41	0.54	0.64	0.78
598-73-2	Bromotrifluoroethylene	0.010	0.021	0.029	0.040	0.048	0.061	0.074	0.083	0.11	0.13	0.16
106-99-0	1,3-Butadiene	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.61	0.75
106-97-8	Butane	0.049	0.10	0.14	0.19	0.23	0.29	0.36	0.40	0.53	0.62	0.76
106-98-9	1-Butene	0.049	0.10	0.14	0.19	0.23	0.29	0.36	0.40	0.53	0.62	0.76
107-01-7	2-Butene	0.049	0.10	0.14	0.19	0.23	0.29	0.36	0.40	0.53	0.62	0.76
25167-67-3	Butene	0.048	0.10	0.14	0.19	0.23	0.29	0.36	0.40	0.52	0.62	0.76
590-18-1	2-Butene-cis	0.048	0.10	0.14	0.19	0.23	0.29	0.36	0.40	0.52	0.62	0.76
624-64-6	2-Butene-trans	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.62	0.75
463-58-1	Carbon oxysulfide	0.022	0.046	0.063	0.086	0.10	0.13	0.16	0.18	0.24	0.28	0.34
7791-21-1	Chlorine monoxide	0.007	0.015	0.021	0.029	0.035	0.044	0.053	0.060	0.078	0.092	0.11
557-98-2	2-Chloropropylene	0.035	0.073	0.10	0.14	0.17	0.21	0.25	0.28	0.37	0.44	0.54
590-21-6	1-Chloropropylene	0.035	0.073	0.10	0.14	0.17	0.21	0.25	0.28	0.37	0.44	0.54
460-19-5	Cyanogen	0.033	0.069	0.10	0.13	0.16	0.20	0.24	0.27	0.36	0.42	0.52
75-19-4	Cyclopropane	0.049	0.10	0.14	0.20	0.24	0.30	0.36	0.40	0.53	0.63	0.77
4109-96-0	Dichlorosilane	0.021	0.043	0.060	0.082	0.10	0.13	0.15	0.17	0.22	0.26	0.32
75-37-6	Difluoroethane	0.024	0.051	0.071	0.10	0.12	0.15	0.18	0.20	0.26	0.31	0.38
124-40-3	Dimethylamine	0.043	0.091	0.12	0.17	0.21	0.26	0.32	0.35	0.47	0.55	0.67
463-82-1	2,2-Dimethylpropane	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.62	0.75
74-84-0	Ethane	0.050	0.10	0.14	0.20	0.24	0.30	0.36	0.41	0.54	0.63	0.77

Reference Table 22 (continued)

Quantity in Fireball (pounds)		1,000	5,000	10,000	20,000	30,000	50,000	75,000	100,000	200,000	300,000	500,000
Duration of Fireball (seconds)		3.5	5.9	7.5	9.4	10.8	12.7	14.8	15.5	17.4	18.7	20.3
CAS No.	Chemical Name	Distance (miles) at which Exposure for Duration of Fireball May Cause Second Degree Burns										
107-00-6	Ethyl acetylene	0.049	0.10	0.14	0.19	0.23	0.29	0.36	0.40	0.53	0.62	0.76
75-04-7	Ethylamine	0.043	0.090	0.12	0.17	0.20	0.26	0.31	0.35	0.46	0.54	0.67
75-00-3	Ethyl chloride	0.032	0.068	0.093	0.13	0.15	0.19	0.24	0.26	0.35	0.41	0.50
74-85-1	Ethylene	0.050	0.10	0.14	0.20	0.24	0.30	0.36	0.41	0.54	0.63	0.77
60-29-7	Ethyl ether	0.042	0.088	0.12	0.17	0.20	0.25	0.31	0.34	0.45	0.53	0.65
75-08-1	Ethyl mercaptan	0.038	0.080	0.11	0.15	0.18	0.23	0.28	0.31	0.41	0.48	0.59
109-95-5	Ethyl nitrite	0.031	0.064	0.088	0.12	0.15	0.19	0.22	0.25	0.33	0.39	0.48
1333-74-0	Hydrogen	0.079	0.17	0.23	0.31	0.38	0.48	0.58	0.65	0.85	1.0	1.2
75-28-5	Isobutane	0.049	0.10	0.14	0.19	0.23	0.29	0.36	0.40	0.53	0.62	0.76
78-78-4	Isopentane	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.61	0.75
78-79-5	Isoprene	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.39	0.52	0.61	0.74
75-31-0	Isopropylamine	0.044	0.091	0.13	0.17	0.21	0.26	0.32	0.36	0.47	0.55	0.68
75-29-6	Isopropyl chloride	0.035	0.074	0.10	0.14	0.17	0.21	0.26	0.29	0.38	0.45	0.55
74-82-8	Methane	0.051	0.11	0.15	0.20	0.24	0.31	0.37	0.42	0.55	0.65	0.79
74-89-5	Methylamine	0.040	0.085	0.12	0.16	0.19	0.24	0.30	0.33	0.44	0.51	0.63
563-45-1	3-Methyl-1-butene	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.61	0.75
563-46-2	2-Methyl-1-butene	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.39	0.52	0.61	0.75
115-10-6	Methyl ether	0.039	0.081	0.11	0.15	0.19	0.23	0.28	0.32	0.42	0.49	0.60
107-31-3	Methyl formate	0.028	0.059	0.081	0.11	0.14	0.17	0.21	0.23	0.31	0.36	0.44
115-11-7	2-Methylpropene	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.62	0.75
504-60-9	1,3-Pentadiene	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.39	0.51	0.60	0.74
109-66-0	Pentane	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.61	0.75
109-67-1	1-Pentene	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.61	0.75

Reference Table 22 (continued)

	Quantity in Fireball (pounds)	1,000	5,000	10,000	20,000	30,000	50,000	75,000	100,000	200,000	300,000	500,000
	Duration of Fireball (seconds)	3.5	5.9	7.5	9.4	10.8	12.7	14.8	15.5	17.4	18.7	20.3
CAS No.	Chemical Name	Distance (miles) at which Exposure for Duration of Fireball May Cause Second Degree Burns										
646-04-8	2-Pentene, (E)-	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.61	0.75
627-20-3	2-Pentene, (Z)-	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.40	0.52	0.61	0.75
463-49-0	Propadiene	0.049	0.10	0.14	0.19	0.23	0.30	0.36	0.40	0.53	0.62	0.76
74-98-6	Propane	0.049	0.10	0.14	0.19	0.23	0.30	0.36	0.40	0.53	0.62	0.76
115-07-1	Propylene	0.049	0.10	0.14	0.19	0.23	0.30	0.36	0.40	0.53	0.62	0.76
74-99-7	Propyne	0.049	0.10	0.14	0.19	0.23	0.30	0.36	0.40	0.53	0.62	0.76
7803-62-5	Silane	0.048	0.10	0.14	0.19	0.23	0.29	0.35	0.39	0.52	0.61	0.75
116-14-3	Tetrafluoroethylene	0.008	0.017	0.024	0.032	0.039	0.049	0.060	0.067	0.088	0.10	0.13
75-76-3	Tetramethylsilane	0.047	0.098	0.13	0.18	0.22	0.28	0.34	0.38	0.50	0.59	0.73
10025-78-2	Trichlorosilane	0.014	0.029	0.040	0.055	0.067	0.085	0.10	0.11	0.15	0.18	0.22
79-38-9	Trifluorochloroethylene	0.010	0.020	0.028	0.039	0.047	0.059	0.072	0.080	0.11	0.12	0.15
75-50-3	Trimethylamine	0.044	0.093	0.13	0.18	0.21	0.27	0.33	0.37	0.48	0.57	0.69
689-97-4	Vinyl acetylene	0.049	0.10	0.14	0.19	0.23	0.29	0.36	0.40	0.53	0.62	0.76
75-01-4	Vinyl chloride	0.031	0.066	0.090	0.12	0.15	0.19	0.23	0.26	0.34	0.40	0.49
109-92-2	Vinyl ethyl ether	0.041	0.087	0.12	0.16	0.20	0.25	0.30	0.34	0.45	0.53	0.64
75-02-5	Vinyl fluoride	0.011	0.022	0.031	0.042	0.051	0.065	0.078	0.088	0.12	0.14	0.17
75-35-4	Vinylidene chloride	0.023	0.049	0.067	0.092	0.11	0.14	0.17	0.19	0.25	0.30	0.36
75-38-7	Vinylidene fluoride	0.024	0.050	0.068	0.094	0.11	0.14	0.17	0.19	0.26	0.30	0.37
107-25-5	Vinyl methyl ether	0.040	0.084	0.11	0.16	0.19	0.24	0.29	0.33	0.43	0.51	0.62

13.0 Estimating Offsite Receptors

The rule requires that you estimate residential populations within the circle of your worst-case and alternative release scenarios. In addition, you must report in the RMP whether types of public receptors and environmental receptors are within the circles.

To estimate residential populations, you may use the most recent Census data or any other source of data that you believe is more accurate. You are not required to update Census data or conduct any surveys to develop your estimates. Census data are available in public libraries and in the LANDVIEW system, which is available on CD-ROM. The rule requires that you estimate populations to two-significant digits. For example, if there are 1,260 people within the circle, you may report 1,300 people.

Census data are presented by Census tract. If your circle covers only a portion of the tract, you should develop an estimate for that portion. The easiest way to do this is to determine the population density per square mile (total population of the Census tract divided by the number of square miles in the tract) and apply that density figure to the number of square miles within your circle. Because there is likely to be considerable variation in actual densities within a Census tract, this number will be approximate. The rule, however, does not require you to correct the number.

Other public receptors must be noted in the RMP. If there are any schools, residences, hospitals, prisons, public recreational areas or arenas, or major commercial or industrial areas within the circle, you must report that. You are not required to develop a list of all institutions and areas; you must simply checkoff that one or more such areas are within the circle. Most of these institutions or areas can be identified from local street maps. Recreational areas include public swimming pools, public parks, and other areas that are used on a regular basis for recreational activities (e.g., baseball fields). Commercial and industrial areas include shopping malls, strip malls, downtown business areas, industrial parks, etc.

Environmental receptors are defined as national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, or refuges; and Federal wilderness areas. All of these can be identified on local U.S. Geological Survey maps. You are not required to locate each of these specifically. You are only required to checkoff in the RMP that these specific types of areas are within the circle. If any part of one of these receptors is within your circles, you must note that in the RMP.

The rule does not require you to assess the likelihood, type, or severity of potential impacts on either public or environmental receptors. Identifying them as within the circle indicates that they could be adversely affected by the release.

14.0 Submitting Offsite Consequence Analysis Information for Risk Management Plan

For the offsite consequence analysis (OCA) component of the RMP you must provide information on your worst-case and alternative release scenario(s) for toxic and flammable regulated chemicals held above the threshold quantity. The requirements for what information you must submit differs if your source has Program 1, Program 2, or Program 3 processes.

If your source has Program 1 processes, you must submit information on a worst-case release scenario for each toxic and flammable substance held above the threshold quantity in a Program 1 process. If your source has Program 2 or Program 3 processes, you must provide information on one worst-case release for all toxic regulated substances present above the threshold quantity and one worst-case release scenario for all flammable regulated substances present above the threshold quantity. You may need to submit an additional worst-case scenario if a worst-case release from another process at the source would potentially affect public receptors different from those potentially affected by the initial worst-case scenario(s) for flammable and toxic regulated substances.

In addition to a worst-case release scenario, sources with Program 2 and Program 3 processes must also provide information on alternative release scenarios. Alternative releases are releases that could occur, other than the worst-case, that may result in concentrations, overpressures, or radiant heat that reach endpoints offsite. You must present information on one alternative release scenario for each regulated toxic substance, including the substance used for the worst-case release, held above the threshold quantity and one alternative release scenario to represent all flammable substances held above the threshold quantity. The format of the information will be provided by EPA in general guidance to the Risk Management Program. The types of documentation to submit are presented below for worst-case scenarios involving toxic substances, alternative scenarios involving toxic substances, worst-case scenarios involving flammable substances, and alternative scenarios involving flammable toxic substances.

14.1 Documentation Required for Worst-Case Scenarios for Toxic Substances

For worst-case scenarios involving toxic substances, you will have to submit the following information. See the Risk Management Plan Data Elements Guide for complete instructions.

- Chemical name;
- Physical state of the chemical released (gas, liquid, refrigerated gas, refrigerated liquid);
- Basis of results (OCA reference tables or modeling; name of the model used);
- Scenario (toxic gas release or liquid spill and vaporization);
- Quantity released (pounds);
- Release rate (pounds per minute);
- Duration of release (minutes) (10 minutes for gases; if you used OCA guidance for liquids, indicate either 10 or 60 minutes);
- Wind speed (meters per second) and stability class (1.5 meters per second and F stability unless you can show higher minimum wind speed or less stable atmosphere at all times during the last three years);
- Topography (rural or urban);
- Distance to endpoint (miles);
- Population within distance (residential population rounded to two significant digits);

- Public receptors within the distance (schools, residences, hospitals, prisons, public recreation areas or arenas, major commercial or industrial areas);
- Environmental receptors within the distance (national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, or refuges; Federal wilderness areas); and
- Passive mitigation measures considered (dikes, enclosures, berms, drains, sumps, other).

14.2 Documentation Required for Alternative Scenarios for Toxic Substances

For alternative scenarios involving toxic substances held above the threshold quantity in a Program 2 or Program 3 process, you will have to submit the following information. See the Risk Management Plan Data Elements Guide for complete instructions.

- Chemical name;
- Physical state of the chemical released (gas, liquid, refrigerated gas, refrigerated liquid);
- Basis of results (OCA reference tables or modeling; name of model used);
- Scenario (transfer hose failure, pipe leak, vessel leak, overfilling, rupture disk/relief valve, excess flow valve, other);
- Quantity released (pounds);
- Release rate (pounds per minute);
- Duration of release (minutes) (if you used OCA guidance, indicate either 10 or 60 minutes);
- Wind speed (meters per second) and stability class (3.0 meters per second and D stability if you use OCA guidance, otherwise use typical meteorological conditions at your site);
- Topography (rural or urban);
- Distance to endpoint (miles);
- Population within distance (residential population rounded to two significant digits);
- Public receptors within the distance (schools, residences, hospitals, prisons, public recreation areas or arenas, major commercial or industrial areas);
- Environmental receptors within the distance (national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, or refuges; Federal wilderness areas);
- Passive mitigation measures considered (dikes, enclosures, berms, drains, sumps, other); and
- Active mitigation measures considered (sprinkler system, deluge system, water curtain, neutralization, excess flow valve, flares, scrubbers, emergency shutdown system, other).

14.3 Documentation Required for Worst-Case Scenarios for Flammable Substances

For worst-case scenarios involving flammable substances, you will have to submit the following information. See the Risk Management Plan Data Elements Guide for complete instructions.

- Chemical name;
- Basis of results (OCA reference tables or modeling; name of model used);
- Scenario (vapor cloud explosion; BLEVE if it produces worst-case consequences);
- Quantity released (pounds);
- Endpoint used (for vapor cloud explosions use 1 psi, for BLEVE use 5 kw/m^2 for 40 seconds (or thermal dose equivalent to receive second degree burns));
- Distance to endpoint (miles);
- Population within distance (residential population rounded to two significant digits);
- Public receptors within the distance (schools, residences, hospitals, prisons, public recreation areas, major commercial or industrial areas);
- Environmental receptors within the distance (national or state parks, forests, or monuments, officially designated wildlife sanctuaries, preserves, or refuges, Federal wilderness areas); and
- Passive mitigation measures considered (dikes, fire walls, blast walls, enclosures, other).

14.4 Documentation Required for Alternative Scenarios for Flammable Substances

For alternative scenarios involving flammable substances held above the threshold quantity in a Program 2 or Program 3 process, you will have to submit the following information. See the Risk Management Plan Data Elements Guide for complete instructions.

- Chemical name;
- Basis of results (OCA reference tables or modeling; name of the model used);
- Scenario (vapor cloud explosion, vapor cloud fire, BLEVE, pool fire, jet fire, other);
- Quantity released (pounds);
- Release rate (pounds per minute) (only for vapor cloud fires);
- Wind speed (meters per second) and stability class (only for vapor cloud fires; 3.0 meters per second and D stability if you use OCA guidance, otherwise use typical meteorological conditions at your site);
- Topography (rural, urban) (only for vapor cloud fires);
- Endpoint used (for vapor cloud explosions use 1 psi; for BLEVE, jet fire, pool fire, use 5 kw/m^2 for 40 seconds (or thermal dose equivalent to receive second degree burns); for vapor cloud fire use lower flammability limit);
- Distance to endpoint (miles);
- Population within distance (residential population rounded to two significant digits);
- Public receptors within the distance (schools, residences, hospitals, prisons, public recreation areas, major commercial or industrial areas);
- Environmental receptors within the distance (national or state parks, forests, or monuments, officially designated wildlife sanctuaries, preserves, or refuges, Federal wilderness areas);
- Passive mitigation measures considered (e.g., dikes, fire walls, blast walls, enclosures, other); and
- Active mitigation measures considered (e.g., sprinkler system, deluge system, water curtain, neutralization, excess flow valve, flares, scrubbers, emergency shutdown system, other).

APPENDIX A

PUBLICLY AVAILABLE MODELS AND REFERENCES FOR CALCULATION METHODS

This appendix provides information on some models that could be used for the offsite consequence analyses required under CAA section 112(r) and lists references that may provide useful information for modeling or calculation methods that could be used in the offsite consequence analyses. Exhibit A-1 summarizes information on some publicly available models. Exhibit A-2 lists references that provide information on consequence analysis methods. Neither of these exhibits is intended to be a complete listing of models or references that may be used in the consequence analysis; any appropriate model or method may be used.

Exhibit A-1
Summary of Several Public Domain Models

Identification	Description	Information on Acquiring Software
AIRTOX Modeling System Developed by ENSR	AIRTOX calculates concentrations of toxic or flammable chemicals for steady, instantaneous, or time-varying releases of volatile liquids or gases. A number of accompanying spreadsheet-based models are available for calculation of specific release profiles. AIRTOX has algorithms that address releases from various source configurations, including buoyant and heavier-than-air sources, jets, liquid pools, fires, and explosions. The model has been applied to offsite consequence assessments, response planning, and accident investigations.	**Address:** ENSR 35 Nagog Park Acton, MA 01720 **Phone:** 1-508-635-9500, ext. 3150 **Cost:** Dependent upon the modeling package selected; contact ENSR for information
ALOHA (Areal Locations of Hazardous Atmospheres) Developed by the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency (EPA)	ALOHA is an emergency response model, intended primarily for rapid deployment by responders as well as for use in emergency pre-planning. It incorporates source strength as well as Gaussian and heavy gas dispersion models and an extensive chemical library. Model output data is in both text and graphic form and includes a "footprint" plot of the area downwind of a release where concentrations may exceed a user-set threshold level. ALOHA can accept weather data transmitted from portable monitoring stations and can plot footprints on electronic maps displayed in a companion mapping application, MARPLOT™. ALOHA runs on a Macintosh or in Microsoft Windows.	**Address:** National Safety Council P.O. Box 558 Itasca, IL 60611 **Phone:** 1-800-621-7619 **Fax:** 1-708-285-0797 **Cost:** ALOHA: $215/Govt. & Non-profit $610/Commercial CAMEO MAC/ALOHA: $375/Govt. & Non-profit, $1050/Commercial

Exhibit A-1 (continued)

Identification	Description	Information on Acquiring Software
ARCHIE (Automated Resource for Chemical Hazard Incident Evaluation) Prepared for the Federal Emergency Management Agency (FEMA), Department of Transportation (DOT), and Environmental Protection Agency (EPA)	ARCHIE estimates downwind dispersion of a chemical release to provide emergency planning personnel with the tools necessary to evaluate the nature and magnitude of chemical release threats at potentially hazardous sites. Includes methods to estimate the discharge rate and duration of a gas or liquid release from a tank or pipeline, the size of a liquid pool, the rate at which a liquid pool will evaporate or boil, the overpressure and heat generated from explosions and fires, and the downwind chemical concentration and hazard zones.	**Contact/Address:** William Dorsey ARCHIE (DHM-15/Room 8104) U.S. Dept. of Transportation 400 7th St., SW Washington, DC 20590 **Phone:** (202)366-4900 **Cost:** Free
BP CIRRUS Developed by the Corporate Safety Services of British Petroleum, International	BP CIRRUS is a package of models to forecast the effects of a release of hydrocarbon or other chemical liquid or vapor. It is used for consequence modeling in relation to the design of new facilities, in risk assessment studies, and in developing emergency plans for currently operating facilities.	**HELPLINE** **Address:** Corporate Safety Services BP International Ltd. London **Phone:** (044) 71 920 3157 **Fax:** (044) 71 628 2709
DEGADIS (Dense Gas Dispersion) Developed by the United States Coast Guard	DEGADIS predicts contaminant movement for heavier-than-air gases for instantaneous and continuous ground level releases. It is used for emergency response planning and vulnerability analysis.	**Address:** National Technical Information Service (NTIS) 5285 Port Royal Rd. Springfield, VA 22161 **Phone:** (703)487-4600 **Cost:** $90 (Version 2.1) The FORTRAN source code for operation on a VAX or PC can be downloaded through the Support Center for Regulatory Air Models (SCRAM) Bulletin Board System, (919)541-5742.

Exhibit A-1 (continued)

Identification	Description	Information on Acquiring Software
HGSYSTEM Developed by the Industry Cooperative HF Mitigation / Assessment Program (20 companies from the chemical and petroleum industries)	HGSYSTEM is a package of models for predicting the transient and steady-state release and dispersion behavior of hydrogen fluoride or ideal gases; incorporates the thermodynamic and cloud aerosol effects of hydrogen fluoride.	**Address:** Energy, Science & Technology Software Center P.O. Box 1020 Oak Ridge, TN 37831-1020 **Phone:** (615)576-2606 **Cost:** $510
SAFER System - **TRACE** and **SAFER Real-Time** System Developed by DuPont	TRACE can model ground level and elevated releases of dense, neutral, or buoyant gases and predict downwind chemical concentrations and impact on receptors. Methods are included to estimate the discharge rate and duration of releases from tanks or pipelines and size and evaporation rate of liquid pools. A high momentum jet model, special algorithms to model hydrogen fluoride and titanium tetrachloride, and models for a variety of fire and explosion scenarios are included. Output is presented in text and graphical forms. An optional enhancement allows in-depth evaluation of impact on population. SAFER Real-Time System is based on the same modeling algorithms as the TRACE model, but is designed for emergency preparedness and response activities. The model uses real-time meteorological data for modeling, has optional complex terrain modeling capabilities, and can interface with toxic gas sensors.	**Address:** DuPont SAFER Systems, Inc. 4165 E. Thousand Oaks Blvd., Suite 350 Westlake Village, CA 91362 **Phone:** (805) 446-2450 **FAX:** (805) 446-2470 **Cost:** TRACE (including Fire and Explosion models): $15,000 SAFER Real-Time System: $18,400

Exhibit A-1 (continued)

Identification	Description	Information on Acquiring Software
SLAB Developed by the Lawrence Livermore National Laboratory	SLAB is a dense gas model for various types of releases including a ground-level evaporating pool, an elevated horizontal jet, a stack or elevated vertical jet, and an instantaneous volume source; solves conservation equations of mass, momentum, energy, and species for continuous, finite duration, and instantaneous releases.	**Contact/Address:** BOWMAN Environmental Engineering, Inc. P.O. Box 59916 Dallas, TX 75229 **Phone:** (214)233-5463 FORTRAN version available on EPA Bulletin Board at no cost / (919)541-5742
TSCREEN Developed for EPA by Pacific Environmental Services, Inc.	TSCREEN is a model for screening toxic air pollutants to assist state and local agencies in analyzing toxic emissions and their subsequent dispersion from one of many different types of possible releases from Superfund sites. SCREEN, RVD, and PUFF are three air toxics dispersion screening models imbedded within TSCREEN that are used to simulate the release and to calculate the dispersion characteristics and pollutant concentrations of the resulting plume.	**Contact/Address:** Jawad Touma USEPA, OAQPS Maildrop 14 Research Triangle Park, NC 27711 **Phone:** (919)541-5381 TSCREEN can be acquired through the EPA Electronic Bulletin Board at no cost by means of a modem or via the Internet / (919)541-5742
WHAZAN II (World Bank Hazard Analysis) Developed by DNV Technica Ltd. and the World Bank	WHAZAN is a series of models to predict the consequences of accidental releases of toxic and flammable gases or liquids. The models provide information about outflow, behavior immediately after release, dispersion, and fires and explosion. WHAZAN includes a database containing the values of relevant properties for twenty hazardous chemicals.	**Contact/Address:** Mike Johnson DNV Technica Ltd. 40925 County Center Drive Suite 200 Temechula, CA 92591 **Phone:** (909)694-5790 **Cost:** $2500

Exhibit A-2
Selected References for Information on Consequence Analysis Methods

Center for Process Safety of the American Institute of Chemical Engineers (AIChE). *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs*. New York: AIChE, 1994.

Center for Process Safety of the American Institute of Chemical Engineers (AIChE). *Guidelines for Use of Vapor Cloud Dispersion Models*. New York: AIChE, 1987.

Center for Process Safety of the American Institute of Chemical Engineers (AIChE). *International Conference and Workshop on Modeling and Mitigating the Consequences of Accidental Releases of Hazardous Materials*, September 26-29, 1995. New York: AIChE, 1995.

Federal Emergency Management Agency, U.S. Department of Transportation, U.S. Environmental Protection Agency. *Handbook of Chemical Hazard Analysis Procedures*. 1989.

Madsen, Warren W. and Robert C. Wagner. "An Accurate Methodology for Modeling the Characteristics of Explosion Effects." *Process Safety Progress*, 13 (July 1994), 171-175.

Mercx, W.P.M., D.M. Johnson, and J. Puttock. "Validation of Scaling Techniques for Experimental Vapor Cloud Explosion Investigations." *Process Safety Progress*, 14 (April 1995), 120.

Mercx, W.P.M., R.M.M. van Wees, and G. Opschoor. "Current Research at TNO on Vapor Cloud Explosion Modelling." *Process Safety Progress*, 12 (October 1993), 222.

Prugh, Richard W. "Quantitative Evaluation of Fireball Hazards." *Process Safety Progress*, 13 (April 1994), 83-91.

Scheuermann, Klaus P. "Studies About the Influence of Turbulence on the Course of Explosions." *Process Safety Progress*, 13 (October 1994), 219.

TNO Bureau for Industrial Safety, Netherlands Organization for Applied Scientific Research. *Methods for the Calculation of the Physical Effects of the Escape of Dangerous Material (Liquids and Gases)*. Voorburg, the Netherlands: TNO (Commissioned by Directorate-General of Labour), 1980.

TNO Bureau for Industrial Safety, Netherlands Organization for Applied Scientific Research. *Methods for the Determination of Possible Damage to People and Objects Resulting from Releases of Hazardous Materials*. Rijswijk, the Netherlands: TNO (Commissioned by Directorate-General of Labour), 1992.

Touma, Jawad S., et al. "Performance Evaluation of Dense Gas Dispersion Models." *Journal of Applied Meteorology*, 34 (March 1995), 603-615.

U.S. Environmental Protection Agency, Federal Emergency Management Agency, U.S. Department of Transportation. *Technical Guidance for Hazards Analysis, Emergency Planning for Extremely Hazardous Substances*. December 1987.

U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. *Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants*. EPA-450/4-88-009. September 1988.

U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. *Guidance on the Application of Refined Dispersion Models for Hazardous/Toxic Air Release*. EPA-454/R-93-002. May 1993.

U.S. Environmental Protection Agency, Office of Pollution Prevention and Toxic Substances. *Flammable Gases and Liquids and Their Hazards*. EPA 744-R-94-002. February 1994.

APPENDIX B

TOXIC SUBSTANCES

B.1 Data for Toxic Substances

The exhibits in this section of Appendix B provide the data needed to carry out the calculations for regulated toxic substances using the methods presented in the text of this guidance. Exhibit B-1 presents data for toxic gases, Exhibit B-2 presents data for toxic gases, and Exhibit B-3 presents data for several toxic substances commonly found in water solution and for oleum.

Exhibit B-1
Data for Toxic Gases

CAS Number	Chemical Name	Molecular Weight	Ratio of Specific Heats	Toxic Endpoint		Liquid Factor Boiling (LFB)	Density Factor (Boiling)	Gas Factor (GF)	Reference Table (See Notes)
				Level (mg/L)	Basis				
7664-41-7	Ammonia (anhydrous)*	17.03	1.31	0.14	ERPG-2	0.073	0.71	14	Buoyant
7784-42-1	Arsine	77.95	1.28	0.0019	EHS-LOC (IDLH)	0.23	0.30	30	Dense
10294-34-5	Boron trichloride	117.17	1.15	0.010	EHS-LOC (Tox**)	0.22	0.36	36	Dense
7637-07-2	Boron trifluoride	67.81	1.20	0.028	EHS-LOC (IDLH)	0.25	0.31	28	Dense
7782-50-5	Chlorine	70.91	1.32	0.0087	ERPG-2	0.19	0.31	29	Dense
10049-04-4	Chlorine dioxide	67.45	1.25	0.0028	EHS-LOC equivalent (IDLH)†	0.15	0.30	28	Dense
506-77-4	Cyanogen chloride	61.47	1.22	0.030	EHS-LOC equivalent (Tox)‡	0.14	0.41	26	Dense
19287-45-7	Diborane	27.67	1.17	0.0011	ERPG-2	0.13	1.13	17	Buoyant
75-21-8	Ethylene oxide	44.05	1.21	0.090	ERPG-2	0.12	0.55	22	Dense
7782-41-4	Fluorine	38.00	1.36	0.0039	EHS-LOC (IDLH)	0.35	0.32	22	Dense
50-00-0	Formaldehyde (anhydrous)*	30.03	1.31	0.012	ERPG-2	0.10	0.59	19	Dense
74-90-8	Hydrocyanic acid	27.03	1.30	0.011	ERPG-2	0.079	0.72	18	Buoyant
7647-01-0	Hydrogen chloride (anhydrous)*	36.46	1.40	0.030	ERPG-2	0.15	0.41	21	Dense
7664-39-3	Hydrogen fluoride (anhydrous)*	20.01	1.40	0.016	ERPG-2	0.066	0.51	16	Buoyant
7783-07-5	Hydrogen selenide	80.98	1.32	0.00066	EHS-LOC (IDLH)	0.21	0.25	31	Dense
7783-06-4	Hydrogen sulfide	34.08	1.32	0.042	ERPG-2	0.13	0.51	20	Dense
74-87-3	Methyl chloride	50.49	1.26	0.82	ERPG-2	0.14	0.48	24	Dense
74-93-1	Methyl mercaptan	48.11	1.20	0.049	ERPG-2	0.12	0.55	23	Dense
10102-43-9	Nitric oxide	30.01	1.38	0.031	EHS-LOC (TLV#)	0.21	0.38	19	Dense

Exhibit B-1 (continued)

CAS Number	Chemical Name	Molecular Weight	Ratio of Specific Heats	Toxic Endpoint		Liquid Factor Boiling (LFB)	Density Factor (Boiling)	Gas Factor (GF)	Reference Table (See Notes)
				Level (mg/L)	Basis				
75-44-5	Phosgene	98.92	1.17	0.00081	ERPG-2	0.20	0.35	33	Dense
7803-51-2	Phosphine	34.00	1.29	0.0035	ERPG-2	0.15	0.65	20	Dense
7446-09-5	Sulfur dioxide (anhydrous)	64.07	1.26	0.0078	ERPG-2	0.16	0.33	27	Dense
7783-60-0	Sulfur tetrafluoride	108.06	1.30	0.0092	EHS-LOC (Tox**)	0.25	0.25 (at -73°C)	36	Dense

Notes:

"Buoyant" in the Reference Table column refers to the tables for neutrally buoyant gases and vapors; "Dense" refers to the tables for dense gases and vapors. See Appendix D, Section D.4.3, for more information on the choice of reference tables.

* See Exhibit B-3 of this appendix for data on water solutions.

** LOC is based on the IDLH-equivalent level estimated from toxicity data.

† Not an EHS; LOC-equivalent value was estimated from one-tenth of the IDLH.

‡ Not an EHS; LOC-equivalent value was estimated from one-tenth of the IDLH-equivalent level estimated from toxicity data.

LOC based on Threshold Limit Value (TLV) - Time-weighted average (TWA) developed by the American Conference of Governmental Industrial Hygienists (ACGIH).

Exhibit B-2
Data for Toxic Liquids

CAS Number	Chemical Name	Molecular Weight	Vapor Pressure at 25° C (mm Hg)	Toxic Endpoint		Liquid Factors		Density Factor (DF)	Liquid Leak Factor (LLF)	Reference Table (See Notes)	
				Level (mg/L)	Basis	Ambient (LFA)	Boiling (LFB)			Worst Case	Alternative Case
107-02-8	Acrolein	56.06	274	0.0011	ERPG-2	0.047	0.12	0.58	40	Dense	Dense
107-13-1	Acrylonitrile	53.06	108	0.076	ERPG-2	0.018	0.11	0.61	39	Dense	Dense
814-68-6	Acrylyl chloride	90.51	110	0.00090	EHS-LOC (Tox†)	0.026	0.15	0.44	54	Dense	Dense
107-18-6	Allyl alcohol	58.08	26.1	0.036	EHS-LOC (IDLH)	0.0046	0.11	0.58	41	Dense	Buoyant*
107-11-9	Allylamine	57.10	242	0.0032	EHS-LOC (Tox†)	0.042	0.12	0.64	36	Dense	Dense
7784-34-1	Arsenous trichloride	181.28	10	0.01	EHS-LOC (Tox†)	0.0037	0.21	0.23	100	Dense	Buoyant*
353-42-4	Boron trifluoride compound with methyl ether (1:1)	113.89	11	0.023	EHS-LOC (Tox†)	0.0030	0.16	0.49	48	Dense	Buoyant*
7726-95-6	Bromine	159.81	212	0.0065	ERPG-2	0.073	0.23	0.16	150	Dense	Dense
75-15-0	Carbon disulfide	76.14	359	0.16	ERPG-2	0.075	0.15	0.39	60	Dense	Dense
67-66-3	Chloroform	119.38	196	0.49	EHS-LOC (IDLH)	0.055	0.19	0.33	71	Dense	Dense
542-88-1	Chloromethyl ether	114.96	29.4	0.00025	EHS-LOC (Tox†)	0.0080	0.17	0.37	63	Dense	Dense
107-30-2	Chloromethyl methyl ether	80.51	199	0.0018	EHS-LOC (Tox†)	0.043	0.15	0.46	51	Dense	Dense
4170-30-3	Crotonaldehyde	70.09	30.8	0.029	ERPG-2	0.0061	0.12	0.57	41	Dense	Buoyant*
123-73-9	Crotonaldehyde, (E)-	70.09	30.8	0.029	ERPG-2	0.0061	0.12	0.57	41	Dense	Buoyant*
108-91-8	Cyclohexylamine	99.18	10.1	0.16	EHS-LOC (Tox†)	0.0025	0.14	0.56	41	Dense	Buoyant*
75-78-5	Dimethyldichlorosilane	129.06	141	0.026	ERPG-2	0.042	0.20	0.46	51	Dense	Dense
57-14-7	1,1-Dimethylhydrazine	60.10	157	0.012	EHS-LOC (IDLH)	0.028	0.12	0.62	38	Dense	Dense
106-89-8	Epichlorohydrin	92.53	16.5	0.076	ERPG-2	0.0039	0.14	0.41	56	Dense	Buoyant*
107-15-3	Ethylenediamine	60.10	12.2	0.49	EHS-LOC (IDLH)	0.0022	0.13	0.54	43	Dense	Buoyant*
151-56-4	Ethyleneimine	43.07	211	0.018	EHS-LOC (IDLH)	0.030	0.10	0.58	40	Dense	Dense
110-00-9	Furan	68.08	600	0.0012	EHS-LOC (Tox†)	0.12	0.14	0.52	45	Dense	Dense
302-01-2	Hydrazine	32.05	14.4	0.011	EHS-LOC (IDLH)	0.0017	0.069	0.48	48	Buoyant*	Buoyant*

Exhibit B-2 (continued)

CAS Number	Chemical Name	Molecular Weight	Vapor Pressure at 25° C (mm Hg)	Toxic Endpoint		Liquid Factors		Density Factor (DF)	Liquid Leak Factor (LLF)	Reference Table (See Notes)	
				Level (mg/L)	Basis	Ambient (LFA)	Boiling (LFB)			Worst Case	Alternative Case
13463-40-6	Iron, pentacarbonyl-	195.90	40	0.00044	EHS-LOC (Tox†)	0.016	0.24	0.33	70	Dense	Dense
78-82-0	Isobutyronitrile	69.11	32.7	0.14	ERPG-2	0.064	0.12	0.63	37	Dense	Buoyant*
108-23-6	Isopropyl chloroformate	122.55	28	0.10	EHS-LOC (Tox†)	0.080	0.17	0.45	52	Dense	Dense
126-98-7	Methacrylonitrile	67.09	71.2	0.0027	EHS-LOC (TLV#)	0.014	0.12	0.61	38	Dense	Dense
79-22-1	Methyl chloroformate	94.50	108	0.0019	EHS-LOC (Tox†)	0.026	0.16	0.40	58	Dense	Dense
60-34-4	Methyl hydrazine	46.07	49.6	0.0094	EHS-LOC (IDLH)	0.0074	0.094	0.56	42	Dense	Buoyant*
624-83-9	Methyl isocyanate	57.05	457	0.0012	ERPG-2	0.079	0.13	0.52	45	Dense	Dense
556-64-9	Methyl thiocyanate	73.12	10	0.085	EHS-LOC (Tox†)	0.0020	0.11	0.45	51	Dense	Buoyant*
75-79-6	Methyltrichlorosilane	149.48	173	0.018	ERPG-2	0.057	0.22	0.38	61	Dense	Dense
13463-39-3	Nickel carbonyl	170.73	400	0.00067	EHS-LOC (Tox†)	0.14	0.26	0.37	63	Dense	Dense
7697-37-2	Nitric acid (100%)**	63.01	63.0	0.026	EHS-LOC (IDLH)	0.012	0.12	0.32	73	Dense	Dense
79-21-0	Peracetic acid	76.05	14.4	0.0045	EHS-LOC (Tox†)	0.0030	0.12	0.42	55	Dense	Buoyant*
594-42-3	Perchloromethylmercaptan	185.87	6	0.0076	EHS-LOC (IDLH)	0.0023	0.20	0.29	81	Dense	Buoyant*
10025-87-3	Phosphorus oxychloride	153.33	35.8	0.0030	EHS-LOC (Tox†)	0.012	0.20	0.29	80	Dense	Dense
7719-12-2	Phosphorus trichloride	137.33	120	0.028	EHS-LOC (IDLH)	0.037	0.20	0.31	75	Dense	Dense
110-89-4	Piperidine	85.15	32.1	0.022	EHS-LOC (Tox†)	0.072	0.13	0.57	41	Dense	Buoyant*
107-12-0	Propionitrile	55.08	47.3	0.0037	EHS-LOC (Tox†)	0.080	0.10	0.63	37	Dense	Buoyant*
109-61-5	Propyl chloroformate	122.56	20.0	0.010	EHS-LOC (Tox†	0.0058	0.17	0.45	52	Dense	Buoyant*
75-55-8	Propyleneimine	.57.10	533	0.12	EHS-LOC (IDLH)	0.032	0.12	0.61	39	Dense	Dense
75-56-9	Propylene oxide	58.08	187	0.59	ERPG-2	0.093	0.13	0.59	40	Dense	Dense
7446-11-9	Sulfur trioxide	80.06	263	0.010	ERPG-2	0.057	0.15	0.26	91	Dense	Dense
75-74-1	Tetramethyllead	267.33	22.5	0.0040	EHS-LOC (IDLH)	0.011	0.29	0.24	96	Dense	Dense
509-14-8	Tetranitromethane	196.04	13	0.0040	EHS-LOC (IDLH)	0.051	0.22	0.30	78	Dense	Buoyant*
7550-45-0	Titanium tetrachloride	189.69	12.4	0.020	ERPG-2	0.0048	0.21	0.28	82	Dense	Buoyant*

Exhibit B-2 (continued)

CAS Number	Chemical Name	Molecular Weight	Vapor Pressure at 25° C (mm Hg)	Toxic Endpoint		Liquid Factors		Density Factor (DF)	Liquid Leak Factor (LLF)	Reference Table (See Notes)	
				Level (mg/L)	Basis	Ambient (LFA)	Boiling (LFB)			Worst Case	Alternative Case
584-84-9	Toluene 2,4-diisocyanate	174.16	0.013	0.0070	EHS-LOC (IDLH)	0.000005	0.16	0.40	59	Buoyant*	Buoyant*
91-08-7	Toluene 2,6-diisocyanate	174.16	0.05	0.0070	EHS-LOC (IDLH‡)	0.000018	0.16	0.40	59	Buoyant*	Buoyant*
26471-62-5	Toluene diisocyanate (unspecified isomer)	174.16	0.013	0.0070	EHS-LOC equivalent (IDLH+)	0.000005	0.16	0.40	59	Buoyant*	Buoyant*
75-77-4	Trimethylchlorosilane	108.64	231	0.050	EHS-LOC (Tox†)	0.061	0.18	0.57	41	Dense	Dense
108-05-4	Vinyl acetate monomer	86.09	114	0.26	ERPG-2	0.026	0.15	0.52	45	Dense	Dense

Notes:

"Buoyant" in the Reference Table column refers to the tables for neutrally buoyant gases and vapors; "Dense" refers to the tables for dense gases and vapors. See Appendix D, Section D.4.3, for more information on the choice of reference tables.

* Use dense gas table if substance is at an elevated temperature.

** See Exhibit B-3 of this appendix for data on water solutions.

† LOC is based on IDLH-equivalent level estimated from toxicity data.

‡ LOC for this isomer is based on IDLH for toluene 2,4-diisocyanate.

\+ Not an EHS; LOC-equivalent value is based on IDLH for toluene 2,4-diisocyanate.

\# LOC based on Threshold Limit Value (TLV) - Time-weighted average (TWA) developed by the American Conference of Governmental Industrial Hygienists (ACGIH).

Exhibit B-3
Data for Water Solutions of Toxic Substances and for Oleum
Average Vapor Pressure and Liquid Factors Over 10 Minutes for Wind Speeds of 1.5 and 3.0 Meters per Second (m/s)

CAS Number	Regulated Substance in Solution	Molecular Weight	Toxic Endpoint		Initial Concentration (Wt %)	10-minute Average Vapor Pressure (mm Hg)		Liquid Factor at 25° C (LFA)		Density Factor (DF)	Reference Table (See Notes)	
			Level (mg/L)	Basis		Wind Speed 1.5 m/sec	Wind Speed 3.0 m/s	Wind Speed 1.5 m/sec	Wind Speed 3.0 m/s		Worst Case	Alternative Case
7664-41-7	Ammonia	17.03	0.14	ERPG-2	30	332	248	0.026	0.019	0.55	Buoyant	Buoyant
					24	241	184	0.019	0.014	0.54	Buoyant	Buoyant
					20	290	148	0.015	0.011	0.53	Buoyant	Buoyant
50-00-0	Formaldehyde	30.027	0.012	ERPG-2	37	1.5	1.4	0.0002	0.0002	0.44	Buoyant	Buoyant
7647-01-0	Hydrochloric acid	36.46	0.030	ERPG-2	38	78	55	0.010	0.0070	0.41	Dense	Buoyant
					37	67	48	0.0085	0.0062	0.42	Dense	Buoyant
					36	56	42	0.0072	0.0053	0.42	Dense	Buoyant
					34	38	29	0.0048	0.0037	0.42	Dense	Buoyant
					30	13	12	0.0016	0.0015	0.42	Buoyant	Buoyant
7664-39-3	Hydrofluoric acid	20.01	0.016	ERPG-2	70	124	107	0.011	0.010	0.39	Buoyant	Buoyant
					50	16	15	0.0014	0.0013	0.41	Buoyant	Buoyant
7697-37-2	Nitric acid	63.01	0.026	EHS-LOC (IDLH)	90	25	22	0.0046	0.0040	0.33	Dense	Buoyant
					85	17	16	0.0032	0.0029	0.33	Dense	Buoyant
					80	10.2	10	0.0019	0.0018	0.33	Dense	Buoyant
8014-95-7	Oleum - based on sulfur trioxide (SO_3)	80.06 (SO_3)	0.010	ERPG-2	30 (SO_3)	3.5 (SO_3)	3.4 (SO_3)	0.0008	0.0007	0.25	Buoyant	Buoyant

Notes:

"Buoyant" in the Reference Table column refers to the tables for neutrally buoyant gases and vapors; "Dense" refers to the tables for dense gases and vapors. See Appendix D, Section D.4.3, for more information on the choice of reference tables.

B.2. Mixtures Containing Toxic Liquids

In case of a spill of a liquid mixture containing a regulated toxic substance (with the exception of common water solutions, discussed in Section 3.3 in the text), the area of the pool formed by the entire liquid spill is determined as described in Section 3.2.2 or 3.2.3. For the area determination, if the density of the mixture is unknown, the density of the regulated substance in the mixture may be assumed as the density of the entire mixture.

If the partial vapor pressure of the regulated substance in the mixture is known, that vapor pressure may be used to derive a release rate using the equations in Section 3.2. If the partial vapor pressure of the regulated toxic substance in the mixture is unknown, it may be estimated from the vapor pressure of the pure substance (listed in Exhibit B-2, Appendix B) and the concentration in the mixture, if you assume the mixture is an ideal solution (an ideal solution is one in which there is complete uniformity of cohesive forces). Use the following steps, based on Raoult's Law for ideal solutions:

- Determine the mole fraction of the regulated substance in the mixture.

  -- The mole fraction of the regulated substance in the mixture is the number of moles of the regulated substance in the mixture divided by the total number of moles of all substances in the mixture.

  -- If the molar concentration (moles per liter) of each component of the mixture is known, the mole fraction may be determined as follows:

$$X_r = \frac{M_r \ x \ V_t}{(M_r \ x \ V_t) + (M_x \ x \ V_t) + (M_n \ x \ V_t)} \qquad \textbf{(B-1)}$$

or

$$X_r = \frac{M_r}{M_r + M_x + M_n} \qquad \textbf{(B-2)}$$

where:

X_r	=	Mole fraction of the regulated substance in the mixture (unitless)
M_r	=	Molar concentration of the regulated substance in the mixture (moles per liter)
V_t	=	Total volume of mixture (liters)
M_x	=	Molar concentration of second component of the mixture (moles per liter)
M_n	=	Molar concentration of any other components of the mixture (moles per liter)

  -- If the weight of each of the components of the mixture is known, the mole fraction of the regulated substance in the mixture may be calculated as follows:

$$X_r = \frac{\left(\frac{W_r}{MW_r}\right)}{\left(\frac{W_r}{MW_r}\right) + \left(\frac{W_x}{MW_x}\right) + \left(\frac{W_n}{MW_n}\right)} \qquad \textbf{(B-3)}$$

where: X_r = Mole fraction of the regulated substance
W_r = Weight of the regulated substance
MW_r = Molecular weight of the regulated substance
W_x = Weight of the second component of the mixture
MW_x = Molecular weight of the second component of the mixture
W_n = Weight of any other component of the mixture
MW_n = Molecular weight of any other component of the mixture
(Weights can be in any consistent units)

- Estimate the partial vapor pressure of the regulated substance in the mixture as follows:

$$VP_m = X_r \ x \ VP_p \qquad \textbf{(B-4)}$$

where: VP_m = Partial vapor pressure of the regulated substance in the mixture (millimeters of mercury (mm Hg))
X_r = Mole fraction of the regulated substance (unitless)
VP_p = Vapor pressure of the regulated substance in pure form at the same temperature as the mixture (mm Hg) (vapor pressure at 25° C is given in Exhibit B-1, Appendix B)

The evaporation rate for the regulated substance in the mixture is determined as for pure substances, with VP_m as the vapor pressure. If the mixture contains more than one regulated toxic substance, carry out the analysis individually for each of the regulated components. The release rate equation is:

$$QR = \frac{0.0035 \ x \ U^{0.78} \ MW^{2/3} \ x \ A \ x \ VP}{T} \qquad \textbf{(B-5)}$$

where: QR = Evaporation rate (pounds per minute)
U = Wind speed (meters per second)
MW = Molecular weight (given in Exhibit B-2, Appendix B)
A = Surface area of pool formed by the entire quantity of the mixture (square feet) (determined as described in 3.2.2)
VP = Vapor pressure (mm Hg) (VP_m from Equation B-4 above)
T = Temperature (Kelvin (K); temperature in ° C plus 273, or 298 for 25° C)

Worst-case consequence distances to the toxic endpoint may be estimated from the release rate using the tables and instructions presented in Section 4.

APPENDIX C

FLAMMABLE SUBSTANCES

C.1 Equation for Estimation of Distance to 1 psi Overpressure for Vapor Cloud Explosions

For a worst-case release of flammable gases and volatile flammable liquids, the release rate is not considered. The total quantity of the flammable substance is assumed to form a vapor cloud. The entire contents of the cloud is assumed to be within the flammability limits, and the cloud is assumed to explode. For the worst-case, analysis, 10 percent of the flammable vapor in the cloud is assumed to participate in the explosion (i.e., the yield factor is 0.10). Consequence distances to an overpressure level of 1 pound per square inch (psi) may be determined using the following equation, which is based on the TNT-equivalency method:

$$D = 17 \; x \left(0.1 \; x \; W_f \; x \; \frac{HC_f}{HC_{TNT}}\right)^{1/3} \qquad \textbf{(C-1)}$$

where: D = Distance to overpressure of 1 psi (meters)
W_f = Weight of flammable substance (kilograms or pounds/2.2)
HC_f = Heat of combustion of flammable substance (kilojoules per kilogram) (listed in Appendix C)
HC_{TNT} = Heat of combustion of trinitrotoluene (TNT) (4,680 kilojoules per kilogram)

The factor 17 is a constant for damages associated with 1.0 psi overpressures. The factor 0.1 represents an explosion efficiency of 10 percent. To convert distances from meters to miles, multiply by 0.00062.

C.2 Mixtures of Flammable Substances

For a mixture of flammable substances, you may estimate the heat of combustion of the mixture from the heats of combustion of the components of the mixture using the equation below and then use the equation given in the previous section of this appendix to determine the vapor cloud explosion distance. The heat of combustion of the mixture may be estimated as follows:

$$HC_m = \frac{W_x}{W_m} \; x \; HC_x + \frac{W_y}{W_m} \; x \; HC_y \qquad \textbf{(C-2)}$$

where: HC_m = Heat of combustion of mixture (kilojoules per kilogram)
W_x = Weight of component "X" in mixture (kilograms or pounds/2.2)
W_m = Total weight of mixture (kilograms or pounds/2.2)
HC_x = Heat of combustion of component "X" (kilojoules per kilogram)
W_y = Weight of component "Y" in mixture (kilograms or pounds/2.2)
HC_y = Heat of combustion of component "Y" (kilojoules per kilogram)

Heats of combustion for regulated flammable substances are listed in Exhibit B-1 in Exhibit C-1 in the next section (Section C.3) of this appendix.

C.3 Data for Flammable Substances

The exhibits in this section of Appendix C provide the data needed to carry out the calculations for regulated flammable substances using the methods presented in the text of this guidance. Exhibit C-1 presents heat of combustion data for all regulated flammable substances, Exhibit C-2 presents additional data for flammable gases, and Exhibit C-3 presents additional data for flammable liquids.

Exhibit C-1
Heats of Combustion for Flammable Substances

CAS No.	Chemical Name	Physical State at 25° C	Heat of Combustion (kjoule/kg)
75-07-0	Acetaldehyde	Gas	25,072
74-86-2	Acetylene [Ethyne]	Gas	48,222
598-73-2	Bromotrifluoroethylene [Ethene, bromotrifluoro-]	Gas	1,967
106-99-0	1,3-Butadiene	Gas	44,548
106-97-8	Butane	Gas	45,719
25167-67-3	Butene	Gas	45,200*
590-18-1	2-Butene-cis	Gas	45,171
624-64-6	2-Butene-trans [2-Butene, (E)]	Gas	45,069
106-98-9	1-Butene	Gas	45,292
107-01-7	2-Butene	Gas	45,100*
463-58-1	Carbon oxysulfide [Carbon oxide sulfide (COS)]	Gas	9,126
7791-21-1	Chlorine monoxide [Chlorine oxide]	Gas	1,011*
590-21-6	1-Chloropropylene [1-Propene, 1-chloro-]	Liquid	23,000*
557-98-2	2-Chloropropylene [1-Propene, 2-chloro-]	Gas	22,999
460-19-5	Cyanogen [Ethanedinitrile]	Gas	21,064
75-19-4	Cyclopropane	Gas	46,560
4109-96-0	Dichlorosilane [Silane, dichloro-]	Gas	8,225
75-37-6	Difluoroethane [Ethane, 1,1-difluoro-]	Gas	11,484
124-40-3	Dimethylamine [Methanamine, N-methyl-]	Gas	35,813
463-82-1	2,2-Dimethylpropane [Propane, 2,2-dimethyl-]	Gas	45,051
74-84-0	Ethane	Gas	47,509
107-00-6	Ethyl acetylene [1-Butyne]	Gas	45,565
75-04-7	Ethylamine [Ethanamine]	Gas	35,210
75-00-3	Ethyl chloride [Ethane, chloro-]	Gas	19,917
74-85-1	Ethylene [Ethene]	Gas	47,145
60-29-7	Ethyl ether [Ethane, 1,1'-oxybis-]	Liquid	33,775

Exhibit C-1 (continued)

CAS No.	Chemical Name	Physical State at 25° C	Heat of Combustion (kjoule/kg)
75-08-1	Ethyl mercaptan [Ethanethiol]	Liquid	27,948
109-95-5	Ethyl nitrite [Nitrous acid, ethyl ester]	Gas	18,000
1333-74-0	Hydrogen	Gas	119,950
75-28-5	Isobutane [Propane, 2-methyl]	Gas	45,576
78-78-4	Isopentane [Butane, 2-methyl-]	Liquid	44,911
78-79-5	Isoprene [1,3-Butadiene, 2-methyl-]	Liquid	43,809
75-31-0	Isopropylamine [2-Propanamine]	Liquid	36,484
75-29-6	Isopropyl chloride [Propane, 2-chloro-]	Liquid	23,720
74-82-8	Methane	Gas	50,029
74-89-5	Methylamine [Methanamine]	Gas	31,396
563-45-1	3-Methyl-1-butene	Gas	44,559
563-46-2	2-Methyl-1-butene	Liquid	44,414
115-10-6	Methyl ether [Methane, oxybis-]	Gas	28,835
107-31-3	Methyl formate [Formic acid, methyl ester]	Liquid	15,335
115-11-7	2-Methylpropene [1-Propene, 2-methyl-]	Gas	44,985
504-60-9	1,3-Pentadiene	Gas	43,510*
109-66-0	Pentane	Liquid	44,697
109-67-1	1-Pentene	Liquid	44,625
646-04-8	2-Pentene, (E)-	Liquid	44,458
627-20-3	2-Pentene, (Z)-	Liquid	44,520
463-49-0	Propadiene [1,2-Propadiene]	Gas	46,332
74-98-6	Propane	Gas	46,333
115-07-1	Propylene [1-Propene]	Gas	45,762
74-99-7	Propyne [1-Propyne]	Gas	46,165
7803-62-5	Silane	Gas	44,307
116-14-3	Tetrafluoroethylene [Ethene, tetrafluoro-]	Gas	1,280
75-76-3	Tetramethylsilane [Silane, tetramethyl-]	Liquid	41,712

Exhibit C-1 (continued)

CAS No.	Chemical Name	Physical State at 25° C	Heat of Combustion (kjoule/kg)
10025-78-2	Trichlorosilane [Silane, trichloro-]	Liquid	3,754
79-38-9	Trifluorochloroethylene [Ethene, chlorotrifluoro-]	Gas	1,837
75-50-3	Trimethylamine [Methanamine, N,N-dimethyl-]	Gas	37,978
689-97-4	Vinyl acetylene [1-Buten-3-yne]	Gas	45,357
75-01-4	Vinyl chloride [Ethene, chloro-]	Gas	18,848
109-92-2	Vinyl ethyl ether [Ethene, ethoxy-]	Liquid	32,909
75-02-5	Vinyl fluoride [Ethene, fluoro-]	Gas	2,194
75-35-4	Vinylidene chloride [Ethene, 1,1-dichloro-]	Liquid	10,354
75-38-7	Vinylidene fluoride [Ethene, 1,1-difluoro-]	Gas	10,807
107-25-5	Vinyl methyl ether [Ethene, methoxy-]	Gas	30,549

* Estimated heat of combustion

Exhibit C-2
Data for Flammable Gases

CAS Number	Chemical Name	Molecular Weight	Ratio of Specific Heats	Flammability Limits (Vol %)		LFL (mg/L)	Gas Factor (GF)	Reference Table (See Notes)	Pool Fire Factor (PFF)	Flash Fraction Factor (FFF)‡
				Lower (LFL)	Upper (UFL)					
75-07-0	Acetaldehyde	44.05	1.18	4.0	60.0	72	22	Dense	2.7	0.018
74-86-2	Acetylene	26.04	1.23	2.5	80.0	27	17	Buoyant	4.8	0.23
598-73-2	Bromotrifluoroethylene	160.92	1.11	*	37.0	*	41*	Dense	0.42	0.15
106-99-0	1,3-Butadiene	54.09	1.12	2.0	11.5	44	24	Dense	5.5	0.15
106-97-8	Butane	58.12	1.09	1.5	9.0	36	25	Dense	5.9	0.15
25167-67-3	Butene	56.11	1.10	1.7	9.5	39	24	Dense	5.6	0.14
590-18-1	2-Butene-cis	56.11	1.12	1.6	9.7	37	24	Dense	5.6	0.11
624-64-6	2-Butene-trans	56.11	1.11	1.8	9.7	41	24	Dense	5.6	0.12
106-98-9	1-Butene	56.11	1.11	1.6	9.3	37	24	Dense	5.7	0.17
107-01-7	2-Butene	56.11	1.10	1.7	9.7	39	24	Dense	5.6	0.12
463-58-1	Carbon oxysulfide	60.08	1.25	12.0	29.0	290	26	Dense	1.3	0.29
7791-21-1	Chlorine monoxide	86.91	1.21	23.5	NA	830	31	Dense	0.15	NA
557-98-2	2-Chloropropylene	76.53	1.12	4.5	16.0	140	29	Dense	3.3	0.011
460-19-5	Cyanogen	52.04	1.17	6.0	32.0	130	24	Dense	2.5	0.40
75-19-4	Cyclopropane	42.08	1.18	2.4	10.4	41	22	Dense	5.4	0.21
4109-96-0	Dichlorosilane	101.01	1.16	4.0	96.0	160	33	Dense	1.3	0.084
75-37-6	Difluoroethane	66.05	1.14	3.7	18.0	100	27	Dense	1.6	0.23
124-40-3	Dimethylamine	45.08	1.14	2.8	14.4	52	22	Dense	3.7	0.089
463-82-1	2,2-Dimethylpropane	72.15	1.07	1.4	7.5	41	27	Dense	6.4	0.11
74-84-0	Ethane	30.07	1.19	2.9	13.0	36	18	Dense	5.4	0.75
107-00-6	Ethyl acetylene	54.09	1.11	2.0	32.9	44	24	Dense	5.4	0.091

Exhibit C-2 (continued)

CAS Number	Chemical Name	Molecular Weight	Ratio of Specific Heats	Flammability Limits (Vol %)		LFL (mg/L)	Gas Factor (GF)	Reference Table (See Notes)	Pool Fire Factor (PFF)	Flash Fraction Factor (FFF)‡
				Lower (LFL)	Upper (UFL)					
75-04-7	Ethylamine	45.08	1.13	3.5	14.0	64	22	Dense	3.6	0.040
75-00-3	Ethyl chloride	64.51	1.15	3.8	15.4	100	27	Dense	2.6	0.053
74-85-1	Ethylene	28.05	1.24	2.7	36.0	31	18	Buoyant	5.4	0.63
109-95-5	Ethyl nitrite	75.07	1.30	4.0	50.0	120	30	Dense	2.0	NA
1333-74-0	Hydrogen	2.02	1.41	4.0	75.0	3.3	5.0	**	†	NA
75-28-5	Isobutane	58.12	1.09	1.8	8.4	43	25	Dense	6.0	0.23
74-82-8	Methane	16.04	1.30	5.0	15.0	33	14	Buoyant	5.6	0.87
74-89-5	Methylamine	31.06	1.19	4.9	20.7	62	19	Dense	2.7	0.12
563-45-1	3-Methyl-1-butene	70.13	1.08	1.5	9.1	43	26	Dense	6.0	0.030
115-10-6	Methyl ether	46.07	1.15	3.3	27.3	64	22	Dense	3.4	0.22
115-11-7	2-Methylpropene	56.11	1.10	1.8	8.8	41	24	Dense	5.7	0.18
504-60-9	1,3-Pentadiene	68.12	1.30	2.0	NA	56	28	Dense	NA	NA
463-49-0	Propadiene	40.07	1.16	2.1	2.1	34	21	Dense	5.2	0.20
74-98-6	Propane	44.10	1.13	2.0	9.5	36	22	Dense	5.7	0.38
115-07-1	Propylene	42.08	1.15	2.0	11.0	34	21	Dense	5.5	0.35
74-99-7	Propyne	40.07	1.16	1.7	39.9	28	21	Dense	4.9	0.18
7803-62-5	Silane	32.12	1.24	*	*	*	19*	Dense	5.7	0.41
116-14-3	Tetrafluoroethylene	100.02	1.12	11.0	60.0	450	33	Dense	0.25	0.55
79-38-9	Trifluorochloroethylene	116.47	1.11	8.4	38.7	400	35	Dense	0.34	0.27
75-50-3	Trimethylamine	59.11	1.10	2.0	11.6	48	25	Dense	4.8	0.12
689-97-4	Vinyl acetylene	52.08	1.13	2.2	31.7	47	24	Dense	5.4	0.086
75-01-4	Vinyl chloride	62.50	1.18	3.6	33.0	92	26	Dense	2.4	0.14

Exhibit C-2 (continued)

CAS Number	Chemical Name	Molecular Weight	Ratio of Specific Heats	Flammability Limits (Vol %)		LFL (mg/L)	Gas Factor (GF)	Reference Table (See Notes)	Pool Fire Factor (PFF)	Flash Fraction Factor (FFF)‡
				Lower (LFL)	Upper (UFL)					
75-02-5	Vinyl fluoride	46.04	1.20	2.6	21.7	49	23	Dense	0.28	0.41
75-38-7	Vinylidene fluoride	64.04	1.16	5.5	21.3	140	27	Dense	1.8	0.50
107-25-5	Vinyl methyl ether	58.08	1.12	2.6	39.0	62	25	Dense	3.7	0.093

Notes

"Buoyant" in the Reference Table column refers to the tables for neutrally buoyant gases and vapors; "Dense" refers to the tables for dense gases and vapors. See Appendix D, Section D.4.3, for more information on the choice of reference tables.

NA: Data not available

* Reported to be spontaneously combustible; estimation of dispersion distance to LFL not appropriate.

** Much lighter than air; table of distances for neutrally buoyant gases not appropriate.

† Pool fire unlikely.

‡ Calculated at 298 K (25° C) with the following exceptions:

Acetylene factor at 250 K as reported in TNO, *Methods for the Calculation of the Physical Effects of the Escape of Dangerous Material* (1980).
Ethylene factor calculated at critical temperature, 282 K.
Methane factor calculated at critical temperature, 191 K.
Silane factor calculated at critical temperature, 270 K.

Exhibit C-3
Data for Flammable Liquids

CAS Number	Chemical Name	Molecular Weight	Flammability Limit (Vol%)		LFL (mg/L)	Liquid Factors		Density Factor	Liquid Leak Factor (LLF)	Reference Table	Pool Fire Factor (PFF)
			Lower (LFL)	Upper (UFL)		Ambient (LFA)	Boiling (LFB)				
590-21-6	1-Chloropropylene	76.53	4.5	16.0	140	0.17	0.15	0.52	45	Dense	3.2
60-29-7	Ethyl ether	74.12	1.9	48.0	57	0.11	0.15	0.69	34	Dense	4.3
75-08-1	Ethyl mercaptan	62.14	2.8	18.0	71	0.10	0.13	0.58	40	Dense	3.3
78-78-4	Isopentane	72.15	1.4	7.6	41	0.14	0.15	0.79	30	Dense	6.1
78-79-5	Isoprene	68.12	2.0	9.0	56	0.11	0.14	0.72	32	Dense	5.5
75-31-0	Isopropylamine	59.11	2.0	10.4	48	0.10	0.13	0.71	33	Dense	4.1
75-29-6	Isopropyl chloride	78.54	2.8	10.7	90	0.11	0.16	0.57	41	Dense	3.1
563-46-2	2-Methyl-1-butene	70.13	1.4	9.6	40	0.12	0.15	0.75	31	Dense	5.8
107-31-3	Methyl formate	60.05	5.9	20.0	140	0.10	0.13	0.50	46	Dense	1.8
109-66-0	Pentane	72.15	1.3	8.0	38	0.10	0.15	0.78	30	Dense	5.8
109-67-1	1-Pentene	70.13	1.5	8.7	43	0.13	0.15	0.77	31	Dense	5.8
646-04-8	2-Pentene, (E)-	70.13	1.4	10.6	40	0.10	0.15	0.76	31	Dense	5.6
627-20-3	2-Pentene, (Z)-	70.13	1.4	10.6	40	0.10	0.15	0.75	31	Dense	5.6
75-76-3	Tetramethylsilane	88.23	1.5	NA	54	0.17	0.17	0.59	40	Dense	6.3
10025-78-2	Trichlorosilane	135.45	1.2	90.5	66	0.18	0.23	0.37	64	Dense	0.68
109-92-2	Vinyl ethyl ether	72.11	1.7	28.0	50	0.10	0.15	0.65	36	Dense	4.2
75-35-4	Vinylidene chloride	96.94	7.3	NA	290	0.15	0.18	0.44	54	Dense	1.6

NA: Data not available

APPENDIX D

TECHNICAL BACKGROUND

D.1 Worst-Case Release Rate for Gases

D.1.1 Unmitigated Release

The assumption that the total quantity of gas is released in 10 minutes is the same assumption used in EPA's *Technical Guidance for Hazards Analysis* (1987).

D.1.2 Gaseous Release Inside Building

The mitigation factor for gaseous release inside a building is based on a document entitled "Risk Mitigation in Land Use Planning: Indoor Releases of Toxic Gases" by S.R. Porter. This paper presented three release scenarios and discussed the mitigating effects that would occur in a building with a volume of 1,000 cubic meters at three different building air exchange rates. There is a concern that a building may not be able to withstand the pressures of a very large release. However, this paper indicated that release rates of at least 2,000 pounds per minute could be withstood by a building.

Analyzing the data in this paper several ways, the value of 55 percent emerged as representing the mitigation that could occur for a release scenario into a building. Data are provided on the maximum release rate in a building and the maximum release rate from a building. Making this direct comparison at the lower maximum release rate (3.36 kg/s) gave a release rate from the building of 55 percent of the release rate into the building. Using information provided on another maximum release rate (10.9 kg/min) and accounting for the time for the release to accumulate in the building, approximately 55 percent emerged again.

The choice of building ventilation rates affects the results. The paper presented mitigation for three different ventilation rates, 0.5, 3, and 10 air changes per hour. A ventilation rate of 0.5 changes per hour is typical for buildings designed to house toxic gases; therefore, EPA decided that this ventilation rate was appropriate for this analysis. A release factor of 55 percent serves as a conservative value to use in the event of a gaseous release which does not destroy the building into which it is released.

D.2 Worst-Case Release Rate for Liquids

D.2.1 Evaporation Rate Equation

The equation for estimating the evaporation rate of a liquid from a pool is from the *Technical Guidance for Hazards Analysis*, Appendix G. The same assumptions are made for determination of maximum pool area (i.e., the pool is assumed to be 1 centimeter (0.033 feet) deep). The evaporation rate equation has been modified to include a different mass transfer coefficient for water, the reference compound. For this document, a value of 0.67 centimeters per second is used as the mass transfer coefficient, instead of the value of 0.24 cited in the *Technical Guidance for Hazards Analysis*. The value of 0.67 is based on Donald MacKay and Ronald S. Matsugu, "Evaporation Rates of Liquid Hydrocarbon Spills on Land and Water," *Canadian Journal of Chemical Engineering*, August 1973, p. 434. The evaporation equation becomes:

$$QR = \frac{0.284 \; x \; U^{0.78} \; x \; MW^{\frac{2}{3}} \; x \; A \; x \; VP}{82.05 \; x \; T} \qquad \textbf{(D-1)}$$

where: QR = Evaporation rate (pounds per minute)
U = Wind speed (meters per second)
MW = Molecular weight (given in Exhibit B-2, Appendix B)
A = Surface area of pool formed by the entire quantity of the mixture (square feet) (determined as described in 3.2.2)
VP = Vapor pressure (mm Hg) (VP_m from Equation B-4 above)
T = Temperature (Kelvin (K); temperature in ^{o} C plus 273, or 298 for 25^{o} C)

D.2.2 Factors for Evaporation Rate Estimates

Liquid Factors. The liquid factors, Liquid Factor Ambient (LFA) and Liquid Factor Boiling (LFB) used to estimate the evaporation rate from a liquid pool (see Section 3.2 of this guidance document), are derived as described in the *Technical Guidance for Hazards Analysis*, Appendix G, with the following differences:

- The mass transfer coefficient of water is assumed to be 0.67, as discussed above; the value of the factor that includes conversion factors, the mass transfer coefficient for water, and the molecular weight of water to the one-third power, given as 0.106 in the *Technical Guidance* is 0.284 in this guidance.

- Density of all substances was assumed to be the density of water in the *Technical Guidance*; the density was included in the liquid factors. For this guidance document, density is not included in the LFA and LFB values presented in the tables; instead, a separate Density Factor (DF) (discussed below) is provided to be used in the evaporation rate estimation.

With these modifications, the LFA is:

$$LFA = \frac{0.284 \; x \; MW^{\frac{2}{3}} \; x \; VP}{82.05 \; x \; 298} \qquad \textbf{(D-2)}$$

where: MW = Molecular weight
VP = Vapor pressure at ambient temperature in millimeters of mercury
298 K (25^{o} C) = Ambient temperature

LFB is:

$$LFB = \frac{0.284 \; x \; MW^{\frac{2}{3}} \; x \; 760}{82.05 \; x \; BP} \qquad \textbf{(D-3)}$$

where: MW = Molecular weight
760 = Vapor pressure at boiling temperature (millimeters of mercury (mm Hg))
BP = Boiling point (K)

Density Factor. Because some of the regulated liquids have densities very different from that of water, the density of each substance was used to develop a Density Factor (DF) for the determination of maximum pool area for the evaporation rate estimation. The density factor is:

$$DF = \frac{1}{d \; x \; 0.033} \qquad \textbf{(D-4)}$$

where: DF = Density factor ($1/(\mathrm{lbs/ft}^2)$
d = Density of the substance in pounds per cubic foot
0.033 = Depth of pool for maximum area (feet)

D.2.3 Common Water Solutions

Water solutions of regulated toxic substances must be analyzed somewhat differently from pure toxic liquids. Except for solutions of relatively low concentration, the evaporation rate varies with the concentration of the solution. At one specific concentration, the composition of the liquid does not change as evaporation occurs. For concentrated solutions of volatile substances, the evaporation rate from a pool may decrease, very rapidly in some cases, as the toxic substance volatilizes and its concentration in the pool decreases. Using a the ALOHA model with an additional feature (not available in the public version), changes in the release rate could be incorporated and the effects of these changes on the consequence distance analyzed. The distance results obtained using this model for various solutions were compared with the results from various time averages to examine the sensitivity of the results. An averaging time of 10 minutes was found to give reasonable agreement with the step-function model for most substances at various concentrations.

NOAA developed a computerized calculation method to estimate partial vapor pressures and release rates for regulated toxic substance in solution as a function of concentration, based on vapor pressure data from *Perry's Engineers' Handbook* and other sources. Using this method, EPA estimated partial vapor pressures and evaporation rates at one-minute intervals over 10 minutes for solutions of various concentrations. The 10-minute time period was chosen based on the ALOHA results. For each one-minute interval, EPA estimated the concentration of the solution based on the quantity evaporated in the previous interval, and estimated the partial vapor pressure based on the concentration. These estimated vapor pressures were used to calculate an average vapor pressure over the 10-minute period; this average vapor pressure was used to derive Liquid Factor Ambient (LFA) values, as described above for liquids. Use of these factors is intended to give an evaporation rate that accounts for the decrease in evaporation rate expected to take place as the solution evaporates.

Density Factors (DF) were developed for solutions of various concentrations from data in *Perry's Engineers' Handbook* and other sources, as discussed above for liquids.

Because solutions do not have defined boiling points, EPA did not develop Liquid Factor Boiling (LFB) values for solutions. As a simple and conservative approach, the quantity of a regulated substance in a solution at an elevated temperatures is treated as a pure substance. This approach will likely give an overestimate of the consequence distance.

D.2.4 Releases Inside Buildings

If a toxic liquid is released inside a building, its release to the outside air will be mitigated in two ways. First, the evaporation rate of the liquid may be much lower inside a building than outside. This is due to wind speed, which directly affects the evaporation rate. The second mitigating factor is that the building provides resistance to discharge of contaminated air to the outdoors.

In this method, a conservative wind speed, U, of 0.1 m/s was assumed in the building. (See end of text for a justification of this wind speed.) For a release outdoors in a worst-case scenario, U is set to 1.5 m/s, and for an alternative scenario, U is set to 3 m/s. The evaporation rate equation is:

$$QR = U^{0.78} \; x \; (LFA, \; LFB) \; x \; A \qquad \textbf{(D-5)}$$

where: QR = Release rate (pounds per minute)
U = Wind speed (meters per second)
LFA = Liquid Factor Ambient
LFB = Liquid Factor Boiling
A = Area of pool (square feet).

As can be seen, if U inside a building is only 0.1, then the evaporation rate inside a building will be much lower than a corresponding evaporation rate outside (assuming the temperature is the same). The rate will only be $(0.1/1.5)^{0.78}$, about 12 percent of the rate for a worst case, and $(0.1/3)^{0.78}$, about seven percent of the rate for an alternative case.

The evaporated liquid mixes with and contaminates the air in the building. What EPA is ultimately interested in is the rate at which this contaminated air exits the building. In order to calculate the release of contaminated air outside the building, EPA adapted a method from an UK Health and Safety Executive paper entitled, *Risk Mitigation in Land Use Planning: Indoor Releases of Toxic Gases*, by S.R. Porter. EPA assumed that the time for complete evaporation of the liquid pool was one hour. The rate at which contaminated air was released from the building during liquid evaporation (based on the paper) was assumed to be equal to the evaporation rate plus the building ventilation rate (no pressure buildup in building). The building ventilation rate was set equal to 0.5 air changes per hour, which is a typical ventilation rate for a building used to store toxic liquids and gases. EPA used a typical storage building with a volume of 1000 m^3 and a floor area of 200 m^2 (2152 ft^2), and assumed that the liquid pool would cover the entire building floor, representing a conservative scenario.

To provide a conservative estimate, EPA calculated the evaporation rate for a spill of a volatile liquid, carbon disulfide, under ambient conditions inside the building:

$$QR = 0.1^{0.78} \times 0.075 \times 2152 = 26.8 \text{ lbs/min.}$$

Next, this evaporation rate was converted to m^3/min using the ideal gas law:

$$26.8 \text{ lbs/min} \times 454 \text{ g/lb} \times 1 \text{ mol } CS_2/76.1 \text{ g} \times 0.0224 \text{ m}^3/\text{mol} = 3.58 \text{ m}^3/\text{min.}$$

The ventilation rate of the building is 0.5 changes per hour, which equals 500 m^3 per hour, or 8.33 m^3/min. Therefore, during evaporation, contaminated air is leaving the building at a rate of 8.33 + 3.58, or 11.9 m^3/min.

EPA used an iterative calculation for carbon disulfide leaving a building using the above calculated parameters. During the first minute of evaporation, 26.8 lbs of pure carbon disulfide evaporates, and EPA assumed this evenly disperses through the building so that the concentration of CS_2 in the building air is 0.0268 lbs/m^3 (assuming 1000 m^3 volume in the building). Contaminated air is exiting the building at a rate of 11.9 m^3/min, so EPA deduced that $11.9 \times 0.0268 = 0.319$ lbs of carbon disulfide exit the building in the first minute, leaving 26.5 lbs still evenly dispersed inside. Since this release occurs over one minute, the release rate of the carbon disulfide to the outside is 0.319 lbs/min. During the second minute, another 26.8 lbs of pure carbon disulfide evaporates and disperses, so that the building now contains 26.8 + 26.5 = 53.3 lbs of carbon disulfide, or 0.0533 lbs/m^3. Contaminated air is still exiting the building at a rate of 11.9 m^3/min, so $11.9 \times 0.05328 =$ 0.634 lbs of carbon disulfide are released, leaving 52.6 lbs inside. Again, this release occurs over one minute so that the rate of carbon disulfide exiting the building in terms of contaminated air is 0.634 lbs/min. EPA continued to perform this estimation over a period of one hour. The rate of release of carbon disulfide exiting the building in the contaminated air at the sixty minute mark is 13.7 lbs/min. This represents the maximum rate of carbon disulfide leaving the building. After all of the carbon disulfide is evaporated, there is a drop in the concentration of carbon disulfide in the contaminated air leaving the building because the evaporation of carbon disulfide no longer contributes to the overall contamination of the air.

Note that if the same size pool of carbon disulfide formed outside, the release rate for a worst case scenario would be:

$$QR = 1.5^{0.78} \times 0.075 \times 2152 = 221 \text{ lbs/min.}$$

and for an alternative case:

$$QR = 3^{0.78} \times 0.075 \times 2152 = 380 \text{ lbs/min.}$$

The maximum release rate of carbon disulfide in the contaminated building air, assuming a 1,000 m^3 building with a building exchange rate of 0.5 air changes per hour, was only about 6 percent ($13.7 \div 221$ lbs/min x 100) of the worst case scenario rate, and only about 3.6 percent ($13.7 \div 380$ lbs/min x 100) of the alternative scenario rate. EPA set an overall building mitigation factor equal to 10 percent and five percent, respectively, in order to be conservative. Please note that (at a constant ventilation rate of 0.5 changes per hour) as the size of the building increases, the maximum rate of contaminated air leaving the building will decrease, although only slightly due to the balancing effect of building volume and ventilation rate. Obviously, a higher ventilation rate will yield a higher maximum release rate of contaminated air from the building, but most buildings used to store a toxic chemical should have ventilation rates close to 0.5 changes per hour.

For a release inside a building, EPA assumed a building air velocity of 0.1 m/s. This conservative value was derived by setting the size of the ventilation fan equal to 1.0 m^2. This fan is exchanging air from the building with the outside at a rate of 0.5 changes per hour. For a 1000 m^3 building, this value becomes 500 m^3/hour, or 0.14 m^3/s. Dividing 0.14 m^3/s by the area of the fan yields a velocity of 0.14 m/s, which was rounded down to 0.1 m/s.

D.3 Toxic Endpoints

The toxic endpoints found in Appendix B, Exhibits B-1, B-2, and B-3, were chosen as follows, in order of preference:

(1) Emergency Response Planning Guideline 2 (ERPG-2), developed by the American Industrial Hygiene Association, if available;

(2) Level of Concern (LOC) derived for extremely hazardous substances (EHSs) regulated under section 302 of the Emergency Planning and Community Right-to-Know Act (EPCRA) (see the *Technical Guidance for Hazards Analysis* for more information on LOCs); the LOC for EHSs is based on:

- -- One-tenth of the Immediately Dangerous to Life and Health (IDLH) level, developed by the National Institute of Occupational Safety and Health (NIOSH), using IDLH values developed before 1994,

  or, if no IDLH value is available,

- -- One-tenth of an estimated IDLH derived from toxicity data; the IDLH is estimated as described in Appendix D of the *Technical Guidance for Hazards Analysis*.

ERPG-2 is defined as the maximum airborne concentration below which it is believed nearly all individuals could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms that could impair an individual's ability to take protective action.

IDLH is defined in the NIOSH *Pocket Guide to Chemical Hazards* (1994) as a condition that poses a threat of exposure to airborne contaminants when that exposure is likely to cause death or immediate or delayed adverse health effects or prevent escape from such an environment. The IDLHs are intended to ensure that workers can escape from a given contaminated environment in the event of failure of the respiratory protection equipment.

The estimated IDLH is derived from animal toxicity data, in order of preferred data, as follows:

- From median lethal concentration (LC_{50}) (inhalation): 0.1 x LC_{50}

- From lowest lethal concentration (LC_{LO}) (inhalation): 1 x LC_{LO}
- From median lethal dose (LD_{50}) (oral): 0.01 x LD_{50}
- From lowest lethal dose (LD_{LO}) (oral): 0.1 x LD_{LO}

The toxic endpoints based on LOCs for EHSs presented in the tables in Appendix B are, in some cases, different from the LOCs listed in the *Technical Guidance for Hazards Analysis*, because some of the LOCs were updated based on IDLHs that were published after the development of the LOCs (and before 1994) or on new or revised toxicity data.

D.4 Reference Tables for Distances to Toxic and Flammable Endpoints

D.4.1 Neutrally Buoyant Gases

Toxic Substances. Reference tables for distances to toxic endpoints for neutrally buoyant gases and vapors were derived from the Gaussian model using the longitudinal dispersion coefficients based on work by Beals (*Guide to Local Diffusion of Air Pollutants*. Technical Report 214. Scott Air Force Base, Illinois: U.S. Air Force, Air Weather Service. 1971). The reasons for using the Beals dispersion coefficients are discussed below.

Longitudinal dispersion (dispersion in the along-wind direction) is generated mostly by vertical wind shear. Wind shear results from the tendency of the wind speed to assume a wind profile—the speed is lowest next to the ground and increases with height until it reaches an asymptotic value at approximately a few hundred feet above the surface. To account for shear-driven dispersion, any air dispersion model intended for modeling short-duration releases must include either (a) a formulation that accounts, either implicitly or explicitly, for the height-dependence of wind speed or (b) some type of parameterization that converts shear effect into σ_x, the standard deviation function in the along-wind direction.

Because the standard Gaussian formula does not incorporate σ_x (it includes only σ_y and σ_z, the crosswind and horizontal functions), very few alternate ways to formulate σ_x have been proposed. The simplest method was proposed by Turner (*Workbook of Atmospheric Dispersion Estimates*. Report PB-191 482. Research Triangle Park, North Carolina: Office of Air Programs, U.S. Environmental Protection Agency. 1970), who suggested simply setting σ_x equal to σ_y. Textbooks such as that by Pasquill and Smith (*Atmospheric Diffusion*. 3rd ed. New York: Halstead Press. 1983) describe a well-known analytic model. However, this model is more complex than a Gaussian model because according to it, dispersion depends on wind shear and the vertical variation of the vertical diffusion coefficient. Wilson (Along-wind Diffusion of Source Transients, *Atmospheric Environment* 15:489-495. 1981) proposed another method in which σ_x is determined as a function of wind shear, but in a form that can then be used in a Gaussian model. However, it is now believed that Wilson's formulation gives σ_xs that are too large.

To avoid the problems of the analytic method and Wilson's formulation, we chose to include a formulation for σ_x derived from work by Beals (1971). We had three reasons for doing so. First, in terms of magnitude, Beals' σ_x fell in the midrange of the alternative formulations that we reviewed. Second, Beals' σ_x indirectly accounts for wind shear by using (unpublished) experimental data. Third, both the ALOHA and DEGADIS models incorporate the Beal's methodology.

Averaging time is the time interval over which the instantaneous concentration of the hazardous material in the vapor cloud is averaged to assess the health effects of the exposure. Averaging time should generally be equal to or shorter than either the release duration or cloud duration and if possible, should reflect the exposure time associated with the toxic exposure guideline of interest. In this regulation, the exposure time associated with the toxic endpoints include 30 minutes for the Immediately Dangerous to Life and Health (IDLH) level and 60 minutes for the Emergency Response Planning Guideline (ERPG). For the neutrally buoyant tables, the 10-minute release scenario was modeled using a 10-minute averaging time. The 60-minute release scenario was modeled using a 30-minute averaging time to be consistent with the 30-minute exposure time associated with the IDLH. A 60-minute averaging time may have underpredicted consequence distances.

Cloud dispersion from a release of finite duration (10 and 60-minute releases) is calculated using an equation specified in the NOAA publication *ALOHA™ 5.0 Theoretical Description*, Technical Memorandum NOS ORCA 65, August 1992.

Flammable Substances. The reference tables of distances for neutrally buoyant flammable substances were derived using the same model as for toxic substances, as described above. The endpoint for modeling was the lower flammability limit (LFL). For flammable substances, an averaging time of 0.1 minute (six seconds) was used, because fires are considered to be nearly instantaneous events.

Distances of interest for flammable substances are generally much shorter than for toxic substance, because the LFL concentrations are much larger than the toxic endpoints. For the short distances found in modeling the flammable substances, modeling results were found to be the same for 10-minute and 30-minute releases; therefore, one table of distances for rural conditions and one table for urban conditions, applicable for both 10-minute and 30-minute releases, were developed for flammable substances.

D.4.2 Dense Gases

Toxic Substances. The reference tables for dense gases were developed using the widely accepted SLAB model, developed by Lawrence Livermore National Laboratory. SLAB solves conservation equations of mass, momentum, energy, and species for continuous, finite duration, and instantaneous releases. The reference tables were based on the evaporating pool algorithm and on releases of hydrogen chloride (HCl). A SLAB modeling analysis of releases of dense CAA gases or vapors with different molecular weights revealed that releases of HCl generally provided conservative results under a variety of stability/wind speed combinations, release rates, and toxic endpoints.

Similar to the modeling of neutrally buoyant plumes, the 10-minute release scenario of toxic chemicals was modeled using a 10-minute averaging time. The 60-minute release scenario was modeled using a 30-minute averaging time to be consistent with the 30 minute exposure time associated with the IDLH.

For all dense gas tables, the reference height for the wind speed was 10 meters. Relative humidity was assumed to be 50 percent, and the ambient temperature was 25°C. The source area was the smallest value that still enabled the model to run for all release rates. The surface roughness factor was one meter for urban scenarios and three centimeters for rural scenarios.

Flammable Substances. The reference tables for dispersion of dense flammable gases, the same model was used as for toxic substances, as described above, and the same assumptions were made. For the dispersion of flammable chemicals, averaging time should be very small (i.e., no more than a few seconds) since flammable vapors need only be exposed to an ignition source for a short period of time to initiate the combustion process. Thus, both the 10-minute and 60-minute reference tables for flammable substances use an averaging time of 10 seconds. The 10-minute and 60-minute tables were combined for flammable substances because the modeling results were found to be the same.

D.4.3 Choice of Reference Table for Liquids and Solutions

The methodology presented in this guidance for consequence analysis for liquids and solutions assumes evaporation from a pool. All of the toxic liquids regulated under CAA section 112(r) have molecular weights greater than the molecular weight of air; therefore, their vapor would be heavier than air. However, because the vapor from a pool will mix with air as it evaporates, the initial density of the vapor with respect to air may not in all cases indicate whether the vapor released from a pool should be modeled as a dense gas or a neutrally buoyant gas. If the rate of release from the pool is relatively low, the vapor-air mixture that is generated may be neutrally buoyant even if the vapor is denser than air.

To identify substances with molecular weight greater than air that might behave as neutrally buoyant gases when evaporating from a pool, EPA used the ALOHA model for pool evaporation of a number of substances with a range of molecular weights and vapor pressures. Modeling was carried out for F stability and wind speed 1.0 meter per second and for D stability and wind speed 3.0 meters per second. Pool spread to a depth of one centimeter was assumed. EPA noted the molecular weights and vapor pressures in cases where ALOHA used the model for neutrally buoyant gases. The molecular weight-vapor pressure combinations at which ALOHA used the neutrally buoyant gas model for the two stability and wind speed combinations were used to develop the reference table choices given in Exhibit B-2 (for liquids) and B-3 (for solutions) in Appendix B. The neutrally buoyant tables are to be used at ambient conditions when indicated, for the liquids; at elevated temperatures, evaporation rates will be greater, and the dense gas tables should be used. When use of the neutrally buoyant tables is indicated, these tables should generally give reasonable results for pool evaporation under ambient conditions; however, the reference table choices shown in Exhibit B-2 are not intended to predict the behavior of the substances when evaporating under all conditions. The analysis did not take into account all factors (e.g., pool size) that may affect the degree of mixing of the vapor with air.

D.5 Worst-Case Consequence Analysis for Flammable Substances

The equation used for the vapor cloud explosion analysis for the worst case involving flammable substances is given in Appendix C. This equation is based on the TNT-equivalency method of the UK Health and Safety Executive, as presented in the publication of the Center for Chemical Process Safety of the American Institute of Chemical Engineers (AIChE), *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs* (1994). The assumption was made for the worst case that the total quantity of the released substance is in the flammable part of the cloud. The AIChE document lists this assumption as one of a number that have been used for vapor cloud explosion blast prediction; it was chosen as a conservative assumption for the worst-case analysis. The yield factor of 10 percent was a conservative worst-case assumption, based on information presented in the AIChE document. According to the AIChE document, reported values for TNT equivalency for vapor cloud explosions range from a fraction of one percent to tens of percent; for most major vapor cloud explosions, the range is one to ten percent.

The endpoint for the vapor cloud explosion analysis, 1 psi, is reported to cause damage such as shattering of glass windows and partial demolition of houses. Skin laceration from flying glass also is reported. This endpoint was chosen for the consequence analysis because of the potential for serious injuries to people from the property damage that might result from an explosion.

The TNT equivalent model was chosen as the basis for the consequence analysis because of its simplicity and wide use. This model does not take into account site-specific factors and many chemical-specific factors that may affect the results of a vapor cloud explosion. Other methods are available for vapor cloud explosion modeling; see the list of references in Appendix A for some publications that include information on other vapor cloud explosion modeling methods.

D.6 Alternative Scenario Analysis for Toxic Gases

The equation for estimating release rate of a gas from a hole in a tank is based on the equations for gas discharge rate presented in the *Handbook of Chemical Hazard Analysis Procedures* by the Federal Emergency Management Agency (FEMA), DOT, and EPA, and equations in EPA's *Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants*. The equation for an instantaneous discharge under non-choked flow conditions is:

$$m = C_d A_h \sqrt{2 p_0 \rho_0 \left(\frac{\gamma}{\gamma - 1}\right) \left[\left(\frac{p_1}{p_0}\right)^{\frac{2}{\gamma}} - \left(\frac{p_1}{p_0}\right)^{\frac{\gamma+1}{\gamma}}\right]} \qquad \textbf{(D-6)}$$

where: m = Discharge rate, kg/s
C_d = Discharge coefficient
A_h = Opening area, m^2
γ = Ratio of specific heats
p_0 = Tank pressure, Pascals
p_1 = Ambient pressure, Pascals
ρ_0 = Density, kg/m^3

Under choked flow conditions (maximum flow rate), the equation becomes:

$$m = C_d A_h \sqrt{\gamma p_0 \rho_0 \left(\frac{2}{\gamma + 1}\right)^{\frac{\gamma+1}{\gamma-1}}} \qquad \textbf{(D-7)}$$

For development of the equation and gas factors presented in this guidance, density (ρ) was rewritten as a function of pressure and molecular weight, based on the ideal gas law:

$$\rho = \frac{p_0 MW}{RT_t} \tag{D-8}$$

where: MW = Molecular weight (kilograms per kilomole)
R = Gas constant (8314 Joules per degree-kilomole)
T_t = Tank temperature (K)

The choked flow equation can be rewritten:

$$m = C_d \, p_0 \frac{1}{\sqrt{T_t}} \sqrt{\gamma \left(\frac{2}{\gamma+1}\right)^{\frac{\gamma+1}{\gamma-1}}} \sqrt{\frac{MW}{8314}} \, A_h \tag{D-9}$$

To derive the equation presented in the guidance, all the chemical-specific properties, constants, and appropriate conversion factors were combined into the "Gas Factor" (GF). The discharge coefficient was assumed to have a value of 0.8, based on the screening value recommended in EPA's *Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants*. The GF was derived as follows:

$$GF = 132.2 \ x \ 0.6895 \ x \ 10^4 \ x \ 6.4516 \ x \ 10^{-4} \ x \ 0.8 \sqrt{\gamma \left(\frac{2}{\gamma+1}\right)^{\frac{\gamma+1}{\gamma-1}}} \sqrt{\frac{MW}{8314}} \tag{D-10}$$

where: 132.2 = Conversion factor for kg/s to lbs/min
0.6895×10^4 = Conversion factor for Pascals to psi
6.4516×10^{-4} = Conversion factor for square meters to square inches

GF values were calculated for all gases regulated under CAA section 112(r) and are listed in Appendix B, Exhibit B-1, for toxic gases and Appendix C, Exhibit C-2, for flammable gases.

From the equation for choked flow above and the equation for the GF above, the initial release rate for a gas from a hole in a tank can be written as:

$$Q_r = HA \ x \ P_t \ x \ \frac{1}{\sqrt{T_t}} \ x \ GF \tag{D-11}$$

where: QR = Release rate (pounds per minute)
HA = Hole area (square inches)
P_t = Tank pressure (psia)
T_t = Tank temperature (K)

D.7 Alternative Scenario Analysis for Toxic Liquids

D.7.1 Releases from Holes in Tanks

The equation for estimating release rate of a liquid from a hole in a tank is based on the equations for liquid release rate presented in the *Handbook of Chemical Hazard Analysis Procedures* by FEMA, DOT, and EPA and EPA's *Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants*. The equation for the instantaneous release rate:

$$m = A_h C_d \sqrt{\rho_l \left[2g\rho_l \left(H_L - H_h\right) + 2\left(P_0 - P_a\right)\right]} \quad \textbf{(D-12)}$$

where: m = Discharge rate (kilograms per second)
A_h = Opening area (square meters)
C_d = Discharge coefficient (unitless)
g = Gravitational constant (9.8 meters per second squared)
ρ_l = Liquid density (kilograms per cubic meter)
P_0 = Storage pressure (Pascals)
P_a = Ambient pressure (Pascals)
H_L = Liquid height above bottom of container (meters)
H_h = Height of opening (meters)

If the liquid is stored at ambient pressure, the equation becomes:

$$m = A_h C_d \rho_l \sqrt{2g\left(H_L - H_h\right)} \quad \textbf{(D-13)}$$

To derive the equation presented in the guidance, all the chemical-specific properties, constants, and conversion factors were combined into the "Liquid Leak Factor" (LLF). The discharge coefficient was assumed to have a value of 0.8, based on the screening value recommended in EPA's *Workbook of Screening Techniques for Assessing Impacts of Toxic Air Pollutants*. The LLF was derived as follows:

$$LLF = 132.2 \times 6.4516 \times 10^{-4} \times 0.1594 \times 0.8 \times \sqrt{2 \times 9.8} \times \rho_l \quad \textbf{(D-14)}$$

where: LLF = Liquid Leak Factor (pounds per minute-inches$^{2.5}$)
132.2 = Conversion factor for kilograms per second to pounds per minute
6.4516×10^{-4} = Conversion factor for square meters to square inches
0.1594 = Conversion factor for square root of meters to square root of inches
0.8 = Discharge coefficient (0.8),
9.8 = Gravitational constant (meters per second squared)
ρ_l = Liquid density (kilograms per cubic meter)

LLF values were calculated for all liquids regulated under CAA section 112(r) and are listed in Appendix B, Exhibit B-2, for toxic liquids and Appendix C, Exhibit C-3, for flammable liquids.

From the equation for liquid release rate from a hole in a tank at ambient pressure and the equation for the LLF, the initial release rate for a liquid from a tank under atmospheric pressure can be written as:

$$QR_L = HA \times \sqrt{LH} \times LLF \qquad \text{(D-15)}$$

where: QR_L = Liquid release rate (pounds per minute)
HA = Hole area (square inches)
LH = Height of liquid above hole (inches)

D.7.2 Releases from Pipes

The equation used to estimate releases of liquids from pipes is the Bernoulli equation. It assumes that the density of the liquid is constant and does not account for losses in velocity due to wall friction. The equation follows:

$$\frac{(P_a - P_b)}{D} + \frac{g\,(Z_a - Z_b)}{g_c} = \frac{(V_b^2 - V_a^2)}{2g_c} \qquad \text{(D-16)}$$

where: P_a = Pressure at pipe inlet (Pascals)
P_b = Pressure at pipe outlet (Pascals)
Z_a = Height above datum plane at pipe inlet (meters)
Z_b = Height above datum plane at pipe release (meters)
g = Gravitational acceleration (9.8 meters per second^2)
g_c = Newton's law proportionality factor (1.0)
V_a = Operational velocity (meters per second)
V_b = Release velocity (meters per second)
D = Density of liquid (kilograms per cubic meter)

Isolating V_b yields:

$$V_b = \sqrt{\frac{2 \times g_c \times (P_a - P_b)}{D} + 2 \times g \times (Z_a - Z_b) + V_a^2} \qquad \text{(D-17)}$$

Adjusting V_b in feet per minute yields:

$$V_b = \sqrt{\frac{(77{,}500 \times P_a - 7.85 \times 10^9)}{D} + (77{,}460 \times g \times Z) + V_a^2} \qquad \text{(D-18)}$$

where: P_a = Operational pipe pressure (Pascals)
Z = Change in pipe elevation, inlet to outlet (meters)
g = Gravitational acceleration (9.8 meters per second^2)
V_a = Operational velocity (feet per minute)
V_b = Release velocity (feet per minute)
D = Density of liquid (kilograms per cubic meter)

D.8 Vapor Cloud Fires

Factors for leaks from tanks for flammable substances were derived as described for toxic substances (see above).

The endpoint for estimating impact distances for vapor cloud fires of flammable substances, the lower flammability limit (LFL), was chosen as a reasonable, but not very conservative, estimation of the possible extent of a vapor cloud fire.

D.9 Pool Fires

Factors for estimating the distances to a heat radiation level that could cause second degree burns from a 40-second exposure was developed based on equations presented in the AIChE document, *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs* and in the Netherlands TNO document, *Methods for the Determination of Possible Damage to People and Objects Resulting from Releases of Hazardous Materials* (1992). The AIChE and TNO documents present a point-source model that assumes that a selected fraction of the heat of combustion is emitted as radiation in all directions. The radiation per unit area received by a target at some distance from the point source is given by:

$$q = \frac{f\, m\, H_c\, \tau_a}{4\pi x^2} \qquad \textbf{(D-19)}$$

where: q = Radiation per unit area received by the receptor (Watts per square meter)
m = Rate of combustion (kilograms per second)
τ_a = Atmospheric transmissivity
H_c = Heat of combustion (Joules per kilogram)
f = Fraction of heat of combustion radiated
x = Distance from point source to receptor (meters)

The fraction of combustion energy dissipated as thermal radiation (f in the equation above) is reported to range from 0.1 to 0.4. To develop factors for estimating distances for pool fires, this fraction was assumed to be 0.4 for all the regulated flammable substances. The heat radiation level (q) was assumed to be 5,000 Watts per square meter. This level is reported to cause second degree burns from a 40-second exposure. It was assumed that exposed people would be able to escape from the heat in 40 seconds. The atmospheric transmissivity (τ_a) was assumed equal to one.

For a pool fire of a flammable substance with a boiling point above the ambient temperature, the combustion rate can be estimated by the following empirical equation:

$$m = \frac{0.0010\, H_c\, A}{H_v + C_p\, (T_b - T_a)} \tag{D-20}$$

where: m = Rate of combustion (kilograms per second)
H_c = Heat of combustion (Joules per kilogram)
H_v = Heat of vaporization (Joules per kilogram)
C_p = Liquid heat capacity (Joules per kilogram-degree K)
A = Pool area (square meters)
T_b = Boiling temperature (K)
T_a = Ambient temperature (K)
0.0010 = Constant

Combining the two equations given above, and assuming a heat radiation level of 5,000 Watts per square meter, gives the following equation for liquid pools of substances with boiling points above ambient temperature:

$$x = H_c \sqrt{0.4\, \frac{\left(\dfrac{0.0010\, A}{H_v + C_p(T_b - T_a)}\right)}{4\pi q}} \tag{D-21}$$

or

$$x = H_c \sqrt{\frac{0.0001\, A}{5{,}000\pi\, (H_v + C_p(T_b - T_a))}} \tag{D-22}$$

where: x = Distance from point source to receptor (meters)
q = Radiation per unit area received by the receptor = 5,000 Watts per square meter
H_c = Heat of combustion (Joules per kilogram)
f = Fraction of heat of combustion radiated = 0.4
H_v = Heat of vaporization (Joules per kilogram)
C_p = Liquid heat capacity (Joules per kilogram-degree K)
A = Pool area (square meters)
T_b = Boiling temperature (K)
T_a = Ambient temperature (K)
0.0010 = Constant

For a pool fire of a flammable substance with a boiling point below the ambient temperature (i.e., liquefied gases) the combustion rate can be estimated by the following equation, based on the TNO document:

$$m = \frac{0.0010\ H_c\ A}{H_v} \tag{D-23}$$

where: m = Rate of combustion (kilograms per second)
H_v = Heat of vaporization (Joules per kilogram)
H_c = Heat of combustion (Joules per kilogram)
A = Pool area (square meters)
0.0010 = Constant

Then the equation for distance at which the radiation received equals 5,000 Watts per square meter becomes:

$$x = H_c \sqrt{\frac{0.0001\ A}{5{,}000\pi\ H_v}} \tag{D-24}$$

where: x = Distance from point source to receptor (meters)
Radiation per unit area received by the receptor = 5,000 Watts per square meter
H_c = Heat of combustion (Joules per kilogram)
H_v = Heat of vaporization (Joules per kilogram)
A = Pool area (square meters)
0.0001 = Derived constant (see equations D-20 and D-21)

A "Pool Fire Factor" (PFF) was calculated for each regulated flammable liquid and gas to allow estimation of the distance to the heat radiation level that would lead to second degree burns. For the derivation of this factor, ambient temperature was assumed to be 298 K (25° C). Other factors are discussed above. The PFF for liquids with boiling points above ambient temperature was derived as follows:

$$PFF = H_c \sqrt{\frac{0.0001}{5{,}000\pi\ (H_v + C_p(T_b - 298))}}\ \sqrt{0.0929} \tag{D-25}$$

where: 5,000 = Radiation per unit area received by the receptor (Watts per square meter)
H_c = Heat of combustion (Joules per kilogram)
H_v = Heat of vaporization (Joules per kilogram)
C_p = Liquid heat capacity (Joules per kilogram-degree K)
T_b = Boiling temperature (K)
298 = Assumed ambient temperature (K)
0.0001 = Derived constant (see above)
0.0929 = Conversion factor for square meters to square feet

For liquids with boiling points below ambient temperature, the PFF is derived as follows:

$$PFF = H_c \sqrt{\frac{0.0001}{5{,}000\ \pi\ H_v}}\ \sqrt{0.0929} \qquad \text{(D-26)}$$

where: 5,000 = Radiation per unit area received by the receptor (Watts per square meter)
H_c = Heat of combustion (Joules per kilogram)
H_v = Heat of vaporization (Joules per kilogram)
0.0001 = Derived constant (see above)
0.0929 = Conversion factor for square meters to square feet

Distances where exposed people could potentially suffer second degree burns can be estimated as the PFF multiplied by the square root of the pool area (in square feet), as discussed in the text.

D.10 BLEVEs

Reference Table 22, the table of distances for BLEVEs, was developed based on equations presented in the AIChE document, *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs*. The Hymes point-source model for a fireball, as cited in the AIChE document, uses the following equation for the radiation received by a receptor:

$$q = \frac{2.2\ \tau_a\ R\ H_c\ m_f^{0.67}}{4 \pi L^2} \qquad \text{(D-27)}$$

where: q = Radiation received by the receptor (W/m^2)
m_f = Mass of fuel in the fireball (kg)
τ_a = Atmospheric transmissivity
H_c = Heat of combustion (J/kg)
R = Radiative fraction of heat of combustion
L = Distance from fireball center to receptor (meters)
π = 3.14

Hymes (as cited by AIChE) suggests the following values for R:

R = 0.3 for vessels bursting below relief valve pressure
R = 0.4 for vessels bursting at or above relief valve pressure

For development of the table in Exhibit 16, the following conservative assumptions were made:

R = 0.4
τ_a = 1

The effects of radiant heat on an exposed person depend on both the intensity of the radiation and the duration of the exposure. For development of the table of distances for BLEVEs, it was assumed that the time of exposure would equal the duration of the fireball. The AIChE document gives the following equations for duration of a fireball:

$$t_c = 0.45\ m_f^{\frac{1}{3}}\ for\ m_f < 30{,}000\ kg \qquad \textbf{(D-28)}$$

and

$$t_c = 2.6\ m_f^{\frac{1}{6}}\ for\ m_f > 30{,}000\ kg \qquad \textbf{(D-29)}$$

where: m_f = Mass of fuel (kg)
t_c = Combustion duration (seconds)

According to several sources (e.g., Eisenberg, et al., *Vulnerability Model, A Simulation System for Assessing Damage Resulting from Marine Spills*; Mudan, *Thermal Radiation Hazards from Hydrocarbon Pool Fires* (citing K. Buettner)), the effects of thermal radiation are generally proportional to radiation intensity to the four-thirds power times time of exposure. Thus, a thermal "dose" can be estimated using the following equation:

$$Dose = t\ q^{\frac{4}{3}} \qquad \textbf{(D-30)}$$

where: t = Duration of exposure (seconds)
q = Radiation intensity (Watts/m^2)

The thermal "dose" that could cause second-degree burns was estimated assuming 40 seconds as the duration of exposure and 5,000 Watts/m^2 as the radiation intensity. The corresponding dose is 3,420,000 (Watts/m^2)$^{4/3}$-s.

For estimating the distance from a fireball at which a receptor might receive enough thermal radiation to cause second degree burns, the dose estimated above was substituted into the equation for radiation received from a fireball:

$$q = \left[\frac{3{,}420{,}000}{t}\right]^{\frac{3}{4}} \qquad \textbf{(D-31)}$$

$$\left[\frac{3{,}420{,}000}{t}\right]^{\frac{3}{4}} = \frac{2.2\ \tau_a\ R\ H_c\ m_f^{0.67}}{4\pi L^2} \quad \textbf{(D-32)}$$

$$L = \sqrt{\frac{2.2\ \tau_a\ R\ H_c\ m_f^{0.67}}{4\pi\left[\frac{3{,}420{,}000}{t}\right]^{\frac{3}{4}}}} \quad \textbf{(D-33)}$$

where: L = Distance from fireball center to receptor (meters)
q = Radiation received by the receptor (W/m^2)
m_f = Mass of fuel in the fireball (kg)
τ_a = Atmospheric transmissivity (assumed to be 1)
H_c = Heat of combustion (J/kg)
R = Radiative fraction of heat of combustion (assumed to be 0.4)
t = Duration of the fireball (seconds) (estimated from the equations above); assumed to be duration of exposure

D.11 Alternative Scenario Analysis for Vapor Cloud Explosions

For consideration of vapor cloud explosion as a potential alternative scenario, the guidance provides a method to estimate the quantity in the cloud from the fraction flashed into vapor plus the quantity that might be carried along as aerosol. The recommendation to use twice the quantity flashed into vapor as the quantity flashed plus aerosol for determination of consequence distance is based on the method recommended by the UK Health and Safety Executive (HSE), as cited in the AIChE document, *Guidelines for Evaluating the Characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs*. In addition, according to T.A. Kletz, in "Unconfined Vapor Cloud Explosions" (Eleventh Loss Prevention Symposium, sponsored by AIChE, 1977), unconfined vapor cloud explosions almost always result from the release of flashing liquids.

The equation for the flash fraction, for possible use in for the alternative scenario analysis, is based on the Netherlands TNO document, *Methods for the Calculation of the Physical Effects of the Escape of Dangerous Material* (1980), Chapter 4, "Spray Release." The following equation is provided:

$$X_{vap,a} = \left(X_{vap,b}\ \frac{T_b}{T_l}\right) + \left(\frac{T_b C_l}{h_v}\ \ln\frac{T_l}{T_b}\right) \quad \textbf{(D-34)}$$

where: $X_{vap,a}$ = Weight fraction of vapor after expansion
$X_{vap,b}$ = Weight fraction of vapor before expansion (assumed to be 0 for calculation of the flash fraction)

T_b = Boiling temperature of gas compressed to liquid (K)
T_l = Temperature of stored gas compressed to liquid (K)
C_l = Specific heat of gas compressed to liquid (Joules/kilogram-K)
h_v = Heat of evaporation of gas compressed to liquid (Joules/kilogram)

To develop a Flash Fraction Factor (FFF) for use in consequence analysis, compressed gases were assumed to be stored at 25°C (298 K) (except in cases where the gas could not be liquefied at that temperature). The equation for FFF is:

$$FFF = \left(\frac{T_b C_l}{h_v} \ln \frac{298}{T_b} \right) \tag{D-35}$$

where: T_b = Boiling temperature of gas compressed to liquid (K)
C_l = Specific heat of gas compressed to liquid (Joules/kilogram-K)
h_v = Heat of evaporation of gas compressed to liquid (Joules/kilogram)
298 = Temperature of stored gas compressed to liquid (K)

The recommendation to use a yield factor of 0.03 for the alternative scenario analysis for vapor cloud explosions also is based on the UK HSE method cited by AIChE.

APPENDIX E

RISK MANAGEMENT PROGRAM RULE

1. Part 68 is amended by redesignating Subpart C as Subpart F as follows:

Subpart F Regulated Substances for Accidental Release Prevention

2. The table of contents of Part 68 is revised to read as follows:

Part 68 — ACCIDENTAL RELEASE PREVENTION PROVISIONS

Subpart E Emergency Response
68.90 Applicability.
68.95 Emergency response program.

Subpart F Regulated Substances for Accidental Release Prevention
68.100 Purpose.
68.115 Threshold determination.
68.120 Petition process.
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Subpart G Risk Management Plan
68.150 Submission.
68.155 Executive summary.
68.160 Registration.
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68.168 Five-year accident history.
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Subpart H Other Requirements
68.200 Recordkeeping.
68.210 Availability of information to the public.
68.215 Permit content and air permitting authority or designated agency requirements.
68.220 Audits.

APPENDIX A Table of Toxic Endpoints

3. The authority citation is revised to read as follows:

Authority: 42 U.S.C. 7412(r), 7601(a)(1), 7661-7661f.

4. Section 68.3 is amended to add the following definitions:

68.3 Definitions

Act means the Clean Air Act as amended (42 U.S.C. 7401 *et seq.*)

Administrative controls mean written procedural mechanisms used for hazard control.

AIChE/CCPS means the American Institute of Chemical Engineers/Center for Chemical Process Safety.

API means the American Petroleum Institute.

ASME means the American Society of Mechanical Engineers.

Catastrophic release means a major uncontrolled emission, fire, or explosion, involving one or more regulated substances that presents imminent and substantial endangerment to public health and the environment.

Classified information means "classified information" as defined in the Classified Information Procedures Act, 18 U.S.C. App. 3, section 1(a) as "any information or material that has been determined by the United States Government pursuant to an executive order, statute, or regulation, to require protection against unauthorized disclosure for reasons of national security."

Covered process means a process that has a regulated substance present in more than a threshold quantity as determined under § 68.115 of this part.

Designated agency means the state, local, or Federal agency designated by the state under the provisions of § 68.215(d) of this part.

Environmental receptor means natural areas such as national or state parks, forests, or monuments; officially designated wildlife sanctuaries, preserves, refuges, or areas; and Federal wilderness areas, that could be exposed at any time to toxic concentrations, radiant heat, or overpressure greater than or equal to the endpoints provided in § 68.22(a) of this part, as a result of an accidental release and that can be identified on local U. S. Geological Survey maps.

Hot work means work involving electric or gas welding, cutting, brazing, or similar flame or spark-producing operations.

Implementing agency means the state or local agency that obtains delegation for an accidental release prevention program under subpart E, 40 CFR part 63. The implementing agency may, but is not required to, be the state or local air permitting agency. If no state or local agency is granted delegation, EPA will be the implementing agency for that state.

Injury means any effect on a human that results either from direct exposure to toxic concentrations; radiant heat; or overpressures from accidental releases or from the direct consequences of a vapor cloud explosion (such as flying glass, debris, and other projectiles) from an accidental release and that requires medical treatment or hospitalization.

Major change means introduction of a new process, process equipment, or regulated substance, an alteration of process chemistry that results in any change to safe operating limits, or other alteration that introduces a new hazard.

Mechanical integrity means the process of ensuring that process equipment is fabricated from the proper materials of construction and is properly installed, maintained, and replaced to prevent failures and accidental releases.

Medical treatment means treatment, other than first aid, administered by a physician or registered professional personnel under standing orders from a physician.

Mitigation or mitigation system means specific activities, technologies, or equipment designed or deployed to capture or control substances upon loss of containment to minimize exposure of the public or the environment. Passive mitigation means equipment, devices, or technologies that function without human, mechanical, or other energy input. Active mitigation means equipment, devices, or technologies that need human, mechanical, or other energy input to function.

NFPA means the National Fire Protection Association.

Offsite means areas beyond the property boundary of the stationary source, and areas within the property boundary to which the public has routine and unrestricted access during or outside business hours.

OSHA means the U.S. Occupational Safety and Health Administration.

Owner or operator means any person who owns, leases, operates, controls, or supervises a stationary source.

Population means the public.

Public means any person except employees or contractors at the stationary source.

Public receptor means offsite residences, institutions (e.g., schools, hospitals), industrial, commercial, and office buildings, parks, or recreational areas inhabited or occupied by the public at any time without restriction by the stationary source where members of the public could be exposed to toxic concentrations, radiant heat, or overpressure, as a result of an accidental release.

Replacement in kind means a replacement that satisfies the design specifications.

RMP means the risk management plan required under subpart G of this part.

SIC means Standard Industrial Classification.

Typical meteorological conditions means the temperature, wind speed, cloud cover, and atmospheric stability class, prevailing at the site based on data gathered at or near the site or from a local meteorological station.

Worst-case release means the release of the largest quantity of a regulated substance from a vessel or process line failure that results in the greatest distance to an endpoint defined in § 68.22(a) of this part.

5. Section 68.10 is added to read as follows:

68.10 Applicability.

(a) An owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a process, as determined under § 68.115 of this part, shall comply with the requirements of this part no later than the latest of the following dates:

(1) <u>[insert date 3 years after the date of publication in the FEDERAL REGISTER];</u>

(2) Three years after the date on which a regulated substance is first listed under § 68.130 of this part; or

(3) The date on which a regulated substance is first present above a threshold quantity in a process.

(b) *Program 1 eligibility requirements*. A covered process is eligible for Program 1 requirements as provided in § 68.12(b) of this part if it meets all of the following requirements:

(1) For the five years prior to the submission of an RMP, the process has not had an accidental release of a regulated substance where exposure to the substance, its reaction products, overpressure generated by an explosion involving the substance, or radiant heat generated by a fire involving the substance led to any of the following offsite:

(i) Death;

(ii) Injury; or

(iii) Response or restoration activities for an exposure of an environmental receptor;

(2) The distance to a toxic or flammable endpoint for a worst-case release assessment conducted under Subpart B and § 68.25 of this part is less than the distance to any public receptor, as defined in § 68.30 of this part; and

(3) Emergency response procedures have been coordinated between the stationary source and local emergency planning and response organizations.

(c) *Program 2 eligibility requirements*. A covered process is subject to Program 2 requirements if it does not meet the eligibility requirements of either paragraph (b) or paragraph (d) of this section.

(d) *Program 3 eligibility requirements*. A covered process is subject to Program 3 if the process does not meet the requirements of paragraph (b) of this section, and if either of the following conditions is met:

(1) The process is in SIC code 2611, 2812, 2819, 2821, 2865, 2869, 2873, 2879, or 2911; or

(2) The process is subject to the OSHA process safety management standard, 29 CFR 1910.119.

(e) If at any time a covered process no longer meets the eligibility criteria of its Program level, the owner or operator shall comply with the requirements of the new Program level that applies to the process and update the RMP as provided in § 68.190 of this part.

6. Section 68.12 is added to read as follows:

68.12 General requirements.

(a) *General requirements*. The owner or operator of a stationary source subject to this part shall submit a single RMP, as provided in §§ 68.150 to 68.185 of this part. The RMP shall include a registration that reflects all covered processes.

(b) *Program 1 requirements*. In addition to meeting the requirements of paragraph (a) of this section, the owner or operator of a stationary source with a process eligible for Program 1, as provided in § 68.10(b) of this part, shall:

(1) Analyze the worst-case release scenario for the process(es), as provided in § 68.25 of this part; document that the nearest public receptor is beyond the distance to a toxic or flammable endpoint defined in § 68.22(a) of this part; and submit in the RMP the worst-case release scenario as provided in § 68.165 of this part;

(2) Complete the five-year accident history for the process as provided in § 68.42 of this part and submit it in the RMP as provided in § 68.168 of this part;

(3) Ensure that response actions have been coordinated with local emergency planning and response agencies; and

(4) Certify in the RMP the following: "Based on the criteria in 40 CFR 68.10, the distance to the specified endpoint for the worst-case accidental release scenario for the following process(es) is less than the distance to the nearest public receptor: [list process(es)]. Within the past five years, the process(es) has (have) had no accidental release that caused offsite impacts provided in the risk management program rule (40 CFR 68.10(b)(1)). No additional measures are necessary to prevent offsite impacts from accidental releases. In the event of fire, explosion, or a release of a regulated substance from the process(es), entry within the distance to the specified endpoints may pose a danger to public emergency responders. Therefore, public emergency responders should not enter this area except as arranged with the emergency contact indicated in the RMP. The undersigned certifies that, to the best of my knowledge, information, and belief, formed after reasonable inquiry, the information submitted is true, accurate, and complete. [Signature, title, date signed]."

(c) *Program 2 requirements*. In addition to meeting the requirements of paragraph (a) of this section, the owner or operator of a stationary source with a process subject to Program 2, as provided in § 68.10(c) of this part, shall:

(1) Develop and implement a management system as provided in § 68.15 of this part;

(2) Conduct a hazard assessment as provided in §§ 68.20 through 68.42 of this part;

(3) Implement the Program 2 prevention steps provided in §§ 68.48 through 68.60 of this part or implement the Program 3 prevention steps provided in §§ 68.65 through 68.87 of this part;

(4) Develop and implement an emergency response program as provided in §§ 68.90 to 68.95 of this part; and

(5) Submit as part of the RMP the data on prevention program elements for Program 2 processes as provided in § 68.170 of this part.

(d) *Program 3 requirements*. In addition to meeting the requirements of paragraph (a) of this section, the owner or operator of a stationary source with a process subject to Program 3, as provided in § 68.10(d) of this part shall:

(1) Develop and implement a management system as provided in § 68.15 of this part;

(2) Conduct a hazard assessment as provided in §§ 68.20 through 68.42 of this part;

(3) Implement the prevention requirements of §§ 68.65 through 68.87 of this part;

(4) Develop and implement an emergency response program as provided in §§ 68.90 to 68.95 of this part; and

(5) Submit as part of the RMP the data on prevention program elements for Program 3 processes as provided in § 68.175 of this part.

7. Section 68.15 is added to read as follows:

68.15 Management.

(a) The owner or operator of a stationary source with processes subject to Program 2 or Program 3 shall develop a management system to oversee the implementation of the risk management program elements.

(b) The owner or operator shall assign a qualified person or position that has the overall responsibility for the development, implementation, and integration of the risk management program elements.

(c) When responsibility for implementing individual requirements of this part is assigned to persons other than the person identified under paragraph (b) of this section, the names or positions of these people shall be documented and the lines of authority defined through an organization chart or similar document.

8. Subpart B is added to read as follows:

Subpart B Hazard Assessment

68.20 Applicability.
68.22 Offsite consequence analysis parameters.
68.25 Worst-case release scenario analysis.
68.28 Alternative release scenario analysis.
68.30 Defining offsite impacts — population.
68.33 Defining offsite impacts — environment.
68.36 Review and update.
68.39 Documentation.
68.42 Five-year accident history.

68.20 Applicability. The owner or operator of a stationary source subject to this part shall prepare a worst-case release scenario analysis as provided in § 68.25 of this part and complete the five-year accident history as provided in § 68.42 of this part. The owner or operator of a Program 2 and 3 process must comply with all sections in this subpart for these processes.

68.22 Offsite consequence analysis parameters.

(a) Endpoints. For analyses of offsite consequences, the following endpoints shall be used:

(1) Toxics. The toxic endpoints provided in Appendix A of this part.

(2) Flammables. The endpoints for flammables vary according to the scenarios studied:

(i) Explosion. An overpressure of 1 psi.

(ii) Radiant heat/exposure time. A radiant heat of 5 kw/m^2 for 40 seconds.

(iii) Lower flammability limit. A lower flammability limit as provided in NFPA documents or other generally recognized sources.

(b) Wind speed/atmospheric stability class. For the worst-case release analysis, the owner or operator shall use a wind speed of 1.5 meters per second and F atmospheric stability class. If the owner or operator can demonstrate that local meteorological data applicable to the stationary source show a higher minimum wind speed or less stable atmosphere at all times during the previous three years, these minimums may be used. For analysis of alternative scenarios, the owner or operator may use the typical meteorological conditions for the stationary source.

(c) Ambient temperature/humidity. For worst-case release analysis of a regulated toxic substance, the owner or operator shall use the highest daily maximum temperature in the previous three years and average humidity for the site, based on temperature/humidity data gathered at the stationary source or at a local meteorological station; an owner or operator using the *RMP Offsite Consequence Analysis Guidance* may use 25°C and 50 percent humidity as values for these variables. For analysis of alternative scenarios, the owner or operator may use typical temperature/humidity data gathered at the stationary source or at a local meteorological station.

(d) Height of release. The worst-case release of a regulated toxic substance shall be analyzed assuming a ground level (0 feet) release. For an alternative scenario analysis of a regulated toxic substance, release height may be determined by the release scenario.

(e) Surface roughness. The owner or operator shall use either urban or rural topography, as appropriate. Urban means that there are many obstacles in the immediate area; obstacles include buildings or trees. Rural means there are no buildings in the immediate area and the terrain is generally flat and unobstructed.

(f) Dense or neutrally buoyant gases. The owner or operator shall ensure that tables or models used for dispersion analysis of regulated toxic substances appropriately account for gas density.

(g) Temperature of released substance. For worst case, liquids other than gases liquified by refrigeration only shall be considered to be released at the highest daily maximum temperature, based on data for the previous three years appropriate for the stationary source, or at process temperature, whichever is higher. For alternative scenarios, substances may be considered to be released at a process or ambient temperature that is appropriate for the scenario.

68.25 Worst-case release scenario analysis.

(a) The owner or operator shall analyze and report in the RMP:

(1) For Program 1 processes, one worst-case release scenario for each Program 1 process;

(2) For Program 2 and 3 processes:

(i) One worst-case release scenario that is estimated to create the greatest distance in any direction to an endpoint provided in Appendix A of this part resulting from an accidental release of regulated toxic substances from covered processes under worst-case conditions defined in § 68.22 of this part;

(ii) One worst-case release scenario that is estimated to create the greatest distance in any direction to an endpoint defined in § 68.22(a) of this part resulting from an accidental release of regulated flammable substances from covered processes under worst-case conditions defined in § 68.22 of this part; and

(iii) Additional worst-case release scenarios for a hazard class if a worst-case release from another covered process at the stationary source potentially affects public receptors different from those potentially affected by the worst-case release scenario developed under paragraphs (a)(2)(i) or (a)(2)(ii) of this section.

(b) Determination of worst-case release quantity. The worst-case release quantity shall be the greater of the following:

(1) For substances in a vessel, the greatest amount held in a single vessel, taking into account administrative controls that limit the maximum quantity; or

(2) For substances in pipes, the greatest amount in a pipe, taking into account administrative controls that limit the maximum quantity.

(c) Worst-case release scenario — toxic gases.

(1) For regulated toxic substances that are normally gases at ambient temperature and handled as a gas or as a liquid under pressure, the owner or operator shall assume that the quantity in the vessel or pipe, as determined under paragraph (b) of this section, is released as a gas over 10 minutes. The release rate shall be assumed to be the total quantity divided by 10 unless passive mitigation systems are in place.

(2) For gases handled as refrigerated liquids at ambient pressure:

(i) If the released substance is not contained by passive mitigation systems or if the contained pool would have a depth of 1 cm or less, the owner or operator shall assume that the substance is released as a gas in 10 minutes;

(ii) If the released substance is contained by passive mitigation systems in a pool with a depth greater than 1 cm, the owner or operator may assume that the quantity in the vessel or pipe, as determined under paragraph (b) of this section, is spilled instantaneously to form a liquid pool. The volatilization rate (release rate) shall be calculated at the boiling point of the substance and at the conditions specified in paragraph (d) of this section.

(d) Worst-case release scenario — toxic liquids.

(1) For regulated toxic substances that are normally liquids at ambient temperature, the owner or operator shall assume that the quantity in the vessel or pipe, as determined under paragraph (b) of this section, is spilled instantaneously to form a liquid pool.

(i) The surface area of the pool shall be determined by assuming that the liquid spreads to 1 centimeter deep unless passive mitigation systems are in place that serve to contain the spill and limit the surface area. Where passive mitigation is in place, the surface area of the contained liquid shall be used to calculate the volatilization rate.

(ii) If the release would occur onto a surface that is not paved or smooth, the owner or operator may take into account the actual surface characteristics.

(2) The volatilization rate shall account for the highest daily maximum temperature occurring in the past three years, the temperature of the substance in the vessel, and the concentration of the substance if the liquid spilled is a mixture or solution.

(3) The rate of release to air shall be determined from the volatilization rate of the liquid pool. The owner or operator may use the methodology in the *RMP Offsite Consequence Analysis Guidance* or any other publicly available techniques that account for the modeling conditions and are recognized by industry as applicable as part of current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

(e) Worst-case release scenario - flammables. The owner or operator shall assume that the quantity of the substance, as determined under paragraph (b) of this section, vaporizes resulting in a vapor cloud explosion. A yield factor of 10 percent of the available energy released in the explosion shall be used to determine the distance to the explosion endpoint if the model used is based on TNT-equivalent methods.

(f) Parameters to be applied. The owner or operator shall use the parameters defined in § 68.22 of this part to determine distance to the endpoints. The owner or operator may use the methodology provided in the *RMP Offsite Consequence Analysis Guidance* or any commercially or publicly available air dispersion modeling techniques, provided the techniques account for the modeling conditions and are recognized by industry as applicable as part of current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

(g) Consideration of passive mitigation. Passive mitigation systems may be considered for the analysis of worst case provided that the mitigation system is capable of withstanding the release event triggering the scenario and would still function as intended.

(h) Factors in selecting a worst-case scenario. Notwithstanding the provisions of paragraph (b) of this section, the owner or operator shall select as the worst case for flammable regulated substances or the worst case for regulated toxic substances, a scenario based on the following factors if such a scenario would result in a greater distance to an endpoint defined in § 68.22(a) of this part beyond the stationary source boundary than the scenario provided under paragraph (b) of this section:

(1) Smaller quantities handled at higher process temperature or pressure; and

(2) Proximity to the boundary of the stationary source.

68.28 Alternative release scenario analysis.

(a) The number of scenarios. The owner or operator shall identify and analyze at least one alternative release scenario for each regulated toxic substance held in a covered process(es) and at least one alternative release scenario to represent all flammable substances held in covered processes.

(b) Scenarios to consider. (1) For each scenario required under paragraph (a) of this section, the owner or operator shall select a scenario:

(i) That is more likely to occur than the worst-case release scenario under § 68.25 of this part; and

(ii) That will reach an endpoint offsite, unless no such scenario exists.

(2) Release scenarios considered should include, but are not limited to, the following, where applicable:

(i) Transfer hose releases due to splits or sudden hose uncoupling;

(ii) Process piping releases from failures at flanges, joints, welds, valves and valve seals, and drains or bleeds;

(iii) Process vessel or pump releases due to cracks, seal failure, or drain, bleed, or plug failure;

(iv) Vessel overfilling and spill, or overpressurization and venting through relief valves or rupture disks; and

(v) Shipping container mishandling and breakage or puncturing leading to a spill.

(c) Parameters to be applied. The owner or operator shall use the appropriate parameters defined in § 68.22 of this part to determine distance to the endpoints. The owner or operator may use either the methodology provided in the *RMP Offsite Consequence Analysis Guidance* or any commercially or publicly available air dispersion modeling techniques, provided the techniques account for the specified modeling conditions and are recognized by industry as applicable as part of current practices. Proprietary models that account for the modeling conditions may be used provided the owner or operator allows the implementing agency access to the model and describes model features and differences from publicly available models to local emergency planners upon request.

(d) Consideration of mitigation. Active and passive mitigation systems may be considered provided they are capable of withstanding the event that triggered the release and would still be functional.

(e) Factors in selecting scenarios. The owner or operator shall consider the following in selecting alternative release scenarios:

(1) The five-year accident history provided in § 68.42 of this part; and

(2) Failure scenarios identified under §§ 68.50 or 68.67 of this part.

68.30 Defining offsite impacts — population.

(a) The owner or operator shall estimate in the RMP the population within a circle with its center at the point of the release and a radius determined by the distance to the endpoint defined in § 68.22(a) of this part.

(b) Population to be defined. Population shall include residential population. The presence of institutions (schools, hospitals, prisons), parks and recreational areas, and major commercial, office, and industrial buildings shall be noted in the RMP.

(c) Data sources acceptable. The owner or operator may use the most recent Census data, or other updated information, to estimate the population potentially affected.

(d) Level of accuracy. Population shall be estimated to two significant digits.

68.33 Defining offsite impacts — environment.

(a) The owner or operator shall list in the RMP environmental receptors within a circle with its center at the point of the release and a radius determined by the distance to the endpoint defined in § 68.22(a) of this part.

(b) Data sources acceptable. The owner or operator may rely on information provided on local U.S. Geological Survey maps or on any data source containing U.S.G.S. data to identify environmental receptors.

68.36 Review and update.

(a) The owner or operator shall review and update the offsite consequence analyses at least once every five years.

(b) If changes in processes, quantities stored or handled, or any other aspect of the stationary source might reasonably be expected to increase or decrease the distance to the endpoint by a factor of two or more, the owner or operator shall complete a revised analysis within six months of the change and submit a revised risk management plan as provided in § 68.190 of this part.

68.39 Documentation. The owner or operator shall maintain the following records on the offsite consequence analyses:

(a) For worst-case scenarios, a description of the vessel or pipeline and substance selected as worst case, assumptions and parameters used, and the rationale for selection; assumptions shall include use of any administrative controls and any passive mitigation that were assumed to limit the quantity that could be released. Documentation shall include the anticipated effect of the controls and mitigation on the release quantity and rate.

(b) For alternative release scenarios, a description of the scenarios identified, assumptions and parameters used, and the rationale for the selection of specific scenarios; assumptions shall include use of any administrative controls and any mitigation that were assumed to limit the quantity that could be released. Documentation shall include the effect of the controls and mitigation on the release quantity and rate.

(c) Documentation of estimated quantity released, release rate, and duration of release.

(d) Methodology used to determine distance to endpoints.

(e) Data used to estimate population and environmental receptors potentially affected.

68.42 Five-year accident history.

(a) The owner or operator shall include in the five-year accident history all accidental releases from covered processes that resulted in deaths, injuries, or significant property damage on site, or known offsite deaths, injuries, evacuations, sheltering in place, property damage, or environmental damage.

(b) Data required. For each accidental release included, the owner or operator shall report the following information:

(1) Date, time, and approximate duration of the release;
(2) Chemical(s) released;
(3) Estimated quantity released in pounds;
(4) The type of release event and its source;
(5) Weather conditions, if known;
(6) On-site impacts;
(7) Known offsite impacts;
(8) Initiating event and contributing factors if known;
(9) Whether offsite responders were notified if known; and
(10) Operational or process changes that resulted from investigation of the release.

(c) Level of accuracy. Numerical estimates may be provided to two significant digits.

9. Subpart C is added to read as follows:

Subpart C Program 2 Prevention Program

68.48 Safety information.
68.50 Hazard review.
68.52 Operating procedures.
68.54 Training.
68.56 Maintenance.
68.58 Compliance audits.
68.60 Incident investigation.

68.48 Safety information.

(a) The owner or operator shall compile and maintain the following up-to-date safety information related to the regulated substances, processes, and equipment:

(1) Material Safety Data Sheets that meet the requirements of 29 CFR 1910.1200(g);

(2) Maximum intended inventory of equipment in which the regulated substances are stored or processed;

(3) Safe upper and lower temperatures, pressures, flows, and compositions;

(4) Equipment specifications; and

(5) Codes and standards used to design, build, and operate the process.

(b) The owner or operator shall ensure that the process is designed in compliance with recognized and generally accepted good engineering practices. Compliance with Federal or state regulations that address industry-specific safe design or with industry-specific design codes and standards may be used to demonstrate compliance with this paragraph.

(c) The owner or operator shall update the safety information if a major change occurs that makes the information inaccurate.

68.50 Hazard review

(a) The owner or operator shall conduct a review of the hazards associated with the regulated substances, process, and procedures. The review shall identify the following:

(1) The hazards associated with the process and regulated substances;

(2) Opportunities for equipment malfunctions or human errors that could cause an accidental release;

(3) The safeguards used or needed to control the hazards or prevent equipment malfunction or human error; and

(4) Any steps used or needed to detect or monitor releases.

(b) The owner or operator may use checklists developed by persons or organizations knowledgeable about the process and equipment as a guide to conducting the review. For processes designed to meet industry standards or Federal or state design rules, the hazard review shall, by inspecting all equipment, determine whether the process is designed, fabricated, and operated in accordance with the applicable standards or rules.

(c) The owner or operator shall document the results of the review and ensure that problems identified are resolved in a timely manner.

(d) The review shall be updated at least once every five years. The owner or operator shall also conduct reviews whenever a major change in the process occurs; all issues identified in the review shall be resolved before startup of the changed process.

68.52 Operating procedures.

(a) The owner or operator shall prepare written operating procedures that provide clear instructions or steps for safely conducting activities associated with each covered process consistent with the safety information for that process. Operating procedures or instructions provided by equipment manufacturers or developed by persons or organizations knowledgeable about the process and equipment may be used as a basis for a stationary source's operating procedures.

(b) The procedures shall address the following:

(1) Initial startup;

(2) Normal operations;

(3) Temporary operations;

(4) Emergency shutdown and operations;

(5) Normal shutdown;

(6) Startup following a normal or emergency shutdown or a major change that requires a hazard review;

(7) Consequences of deviations and steps required to correct or avoid deviations; and

(8) Equipment inspections.

(c) The owner or operator shall ensure that the operating procedures are updated, if necessary, whenever a major change occurs and prior to startup of the changed process.

68.54 Training.

(a) The owner or operator shall ensure that each employee presently operating a process, and each employee newly assigned to a covered process have been trained or tested competent in the operating procedures provided in § 68.52 of this part that pertain to their duties. For those employees already operating a process on [insert date 3 years after the date of publication in the FEDERAL REGISTER], the owner or operator may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as provided in the operating procedures.

(b) Refresher training. Refresher training shall be provided at least every three years, and more often if necessary, to each employee operating a process to ensure that the employee understands and adheres to the current operating procedures of the process. The owner or operator, in consultation with the employees operating the process, shall determine the appropriate frequency of refresher training.

(c) The owner or operator may use training conducted under Federal or state regulations or under industry-specific standards or codes or training conducted by covered process equipment vendors to demonstrate compliance with this section to the extent that the training meets the requirements of this section.

(d) The owner or operator shall ensure that operators are trained in any updated or new procedures prior to startup of a process after a major change.

68.56 Maintenance.

(a) The owner or operator shall prepare and implement procedures to maintain the on-going mechanical integrity of the process equipment. The owner or operator may use procedures or instructions provided by covered process equipment vendors or procedures in Federal or state regulations or industry codes as the basis for stationary source maintenance procedures.

(b) The owner or operator shall train or cause to be trained each employee involved in maintaining the on-going mechanical integrity of the process. To ensure that the employee can perform the job tasks in a safe manner, each such employee shall be trained in the hazards of the process, in how to avoid or correct unsafe conditions, and in the procedures applicable to the employee's job tasks.

(c) Any maintenance contractor shall ensure that each contract maintenance employee is trained to perform the maintenance procedures developed under paragraph (a) of this section.

(d) The owner or operator shall perform or cause to be performed inspections and tests on process equipment. Inspection and testing procedures shall follow recognized and generally accepted good engineering practices. The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations, industry standards or codes, good engineering practices, and prior operating experience.

68.58 Compliance audits.

(a) The owner or operator shall certify that they have evaluated compliance with the provisions of this subpart at least every three years to verify that the procedures and practices developed under the rule are adequate and are being followed.

(b) The compliance audit shall be conducted by at least one person knowledgeable in the process.

(c) The owner or operator shall develop a report of the audit findings.

(d) The owner or operator shall promptly determine and document an appropriate response to each of the findings of the compliance audit and document that deficiencies have been corrected.

(e) The owner or operator shall retain the two (2) most recent compliance audit reports. This requirement does not apply to any compliance audit report that is more than five years old.

68.60 Incident investigation.

(a) The owner or operator shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release.

(b) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

(c) A summary shall be prepared at the conclusion of the investigation which includes at a minimum:

(1) Date of incident;

(2) Date investigation began;

(3) A description of the incident;

(4) The factors that contributed to the incident; and,

(5) Any recommendations resulting from the investigation.

(d) The owner or operator shall promptly address and resolve the investigation findings and recommendations. Resolutions and corrective actions shall be documented.

(e) The findings shall be reviewed with all affected personnel whose job tasks are affected by the findings.

(f) Investigation summaries shall be retained for five years.

10. Subpart D is added to read as follows:

Subpart D Program 3 Prevention Program

68.65 Process safety information.

(a) In accordance with the schedule set forth in § 68.67 of this part, the owner or operator shall complete a compilation of written process safety information before conducting any process hazard analysis required by the rule. The compilation of written process safety information is to enable the owner or operator and the employees involved in operating the process to identify and understand the hazards posed by those processes involving regulated substances. This process safety information shall include information pertaining to the hazards of the regulated substances used or produced by the process, information pertaining to the technology of the process, and information pertaining to the equipment in the process.

(b) Information pertaining to the hazards of the regulated substances in the process. This information shall consist of at least the following:

(1) Toxicity information;

(2) Permissible exposure limits;

(3) Physical data;

(4) Reactivity data:

(5) Corrosivity data;

(6) Thermal and chemical stability data; and

(7) Hazardous effects of inadvertent mixing of different materials that could foreseeably occur.

Note: Material Safety Data Sheets meeting the requirements of 29 CFR 1910.1200(g) may be used to comply with this requirement to the extent they contain the information required by this subparagraph.

(c) Information pertaining to the technology of the process.

(1) Information concerning the technology of the process shall include at least the following:

(i) A block flow diagram or simplified process flow diagram;

(ii) Process chemistry;

(iii) Maximum intended inventory;

(iv) Safe upper and lower limits for such items as temperatures, pressures, flows or compositions; and,

(v) An evaluation of the consequences of deviations.

(2) Where the original technical information no longer exists, such information may be developed in conjunction with the process hazard analysis in sufficient detail to support the analysis.

(d) Information pertaining to the equipment in the process.

(1) Information pertaining to the equipment in the process shall include:

(i) Materials of construction;

(ii) Piping and instrument diagrams (P&ID's);

(iii) Electrical classification;

(iv) Relief system design and design basis;

(v) Ventilation system design;

(vi) Design codes and standards employed;

(vii) Material and energy balances for processes built after [insert date 3 years after the date of publication in the FEDERAL REGISTER]; and

(viii) Safety systems (e.g. interlocks, detection or suppression systems).

(2) The owner or operator shall document that equipment complies with recognized and generally accepted good engineering practices.

(3) For existing equipment designed and constructed in accordance with codes, standards, or practices that are no longer in general use, the owner or operator shall determine and document that the equipment is designed, maintained, inspected, tested, and operating in a safe manner.

68.67 Process hazard analysis.

(a) The owner or operator shall perform an initial process hazard analysis (hazard evaluation) on processes covered by this part. The process hazard analysis shall be appropriate to the complexity of the process and shall identify, evaluate, and control the hazards involved in the process. The owner or operator shall determine and document the priority order for conducting process hazard analyses based on a rationale which includes such considerations as extent of the process hazards, number of potentially affected employees, age of the process, and operating history of the process. The process hazard analysis shall be conducted as soon as possible, but not later than [insert date 3 years after the date of publication in the FEDERAL REGISTER]. Process hazards analyses completed to comply with 29 CFR 1910.119(e) are acceptable as initial process hazards analyses. These process hazard analyses shall be updated and revalidated, based on their completion date.

(b) The owner or operator shall use one or more of the following methodologies that are appropriate to determine and evaluate the hazards of the process being analyzed.

(1) What-If;

(2) Checklist;

(3) What-If/Checklist;

(4) Hazard and Operability Study (HAZOP);

(5) Failure Mode and Effects Analysis (FMEA);

(6) Fault Tree Analysis; or

(7) An appropriate equivalent methodology.

(c) The process hazard analysis shall address:

(1) The hazards of the process;

(2) The identification of any previous incident which had a likely potential for catastrophic consequences.

(3) Engineering and administrative controls applicable to the hazards and their interrelationships such as appropriate application of detection methodologies to provide early warning of releases. (Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors.);

(4) Consequences of failure of engineering and administrative controls;

(5) Stationary source siting;

(6) Human factors; and

(7) A qualitative evaluation of a range of the possible safety and health effects of failure of controls.

(d) The process hazard analysis shall be performed by a team with expertise in engineering and process operations, and the team shall include at least one employee who has experience and knowledge specific to the process being evaluated. Also, one member of the team must be knowledgeable in the specific process hazard analysis methodology being used.

(e) The owner or operator shall establish a system to promptly address the team's findings and recommendations; assure that the recommendations are resolved in a timely manner and that the resolution is documented; document what actions are to be taken; complete actions as soon as possible; develop a written schedule of when these actions are to be completed; communicate the actions to operating, maintenance and other employees whose work assignments are in the process and who may be affected by the recommendations or actions.

(f) At least every five (5) years after the completion of the initial process hazard analysis, the process hazard analysis shall be updated and revalidated by a team meeting the requirements in paragraph (d) of this section, to assure that the process hazard analysis is consistent with the current process. Updated and revalidated process hazard analyses completed to comply with 29 CFR 1910.119(e) are acceptable to meet the requirements of this paragraph.

(g) The owner or operator shall retain process hazards analyses and updates or revalidations for each process covered by this section, as well as the documented resolution of recommendations described in paragraph (e) of this section for the life of the process.

68.69 Operating procedures.

(a) The owner or operator shall develop and implement written operating procedures that provide clear instructions for safely conducting activities involved in each covered process consistent with the process safety information and shall address at least the following elements.

(1) Steps for each operating phase:

(i) Initial startup;

(ii) Normal operations;

(iii) Temporary operations;

(iv) Emergency shutdown including the conditions under which emergency shutdown is required, and the assignment of shutdown responsibility to qualified operators to ensure that emergency shutdown is executed in a safe and timely manner.

(v) Emergency operations;

(vi) Normal shutdown; and,

(vii) Startup following a turnaround, or after an emergency shutdown.

(2) Operating limits:

(i) Consequences of deviation; and

(ii) Steps required to correct or avoid deviation.

(3) Safety and health considerations:

(i) Properties of, and hazards presented by, the chemicals used in the process;

(ii) Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;

(iii) Control measures to be taken if physical contact or airborne exposure occurs;

(iv) Quality control for raw materials and control of hazardous chemical inventory levels; and,

(v) Any special or unique hazards.

(4) Safety systems and their functions.

(b) Operating procedures shall be readily accessible to employees who work in or maintain a process.

(c) The operating procedures shall be reviewed as often as necessary to assure that they reflect current operating practice, including changes that result from changes in process chemicals, technology, and equipment, and changes to stationary sources. The owner or operator shall certify annually that these operating procedures are current and accurate.

(d) The owner or operator shall develop and implement safe work practices to provide for the control of hazards during operations such as lockout/tagout; confined space entry; opening process equipment or piping; and control over entrance into a stationary source by maintenance, contractor, laboratory, or other support personnel. These safe work practices shall apply to employees and contractor employees.

68.71 Training.

(a) Initial training. (1) Each employee presently involved in operating a process, and each employee before being involved in operating a newly assigned process, shall be trained in an overview of the process and in the operating procedures as specified in § 68.69 of this part. The training shall include emphasis on the specific safety and health hazards, emergency operations including shutdown, and safe work practices applicable to the employee's job tasks.

(2) In lieu of initial training for those employees already involved in operating a process on [insert date 3 years after the date of publication in the FEDERAL REGISTER] an owner or operator may certify in writing that the employee has the required knowledge, skills, and abilities to safely carry out the duties and responsibilities as specified in the operating procedures.

(b) Refresher training. Refresher training shall be provided at least every three years, and more often if necessary, to each employee involved in operating a process to assure that the employee understands and adheres to the current operating procedures of the process. The owner or operator, in consultation with the employees involved in operating the process, shall determine the appropriate frequency of refresher training.

(c) Training documentation. The owner or operator shall ascertain that each employee involved in operating a process has received and understood the training required by this paragraph. The owner or operator shall prepare a record which contains the identity of the employee, the date of training, and the means used to verify that the employee understood the training.

68.73 Mechanical integrity.

(a) Application. Paragraphs (b) through (f) of this section apply to the following process equipment:

(1) Pressure vessels and storage tanks;

(2) Piping systems (including piping components such as valves);

(3) Relief and vent systems and devices;

(4) Emergency shutdown systems;

(5) Controls (including monitoring devices and sensors, alarms, and interlocks) and,

(6) Pumps.

(b) Written procedures. The owner or operator shall establish and implement written procedures to maintain the on-going integrity of process equipment.

(c) Training for process maintenance activities. The owner or operator shall train each employee involved in maintaining the on-going integrity of process equipment in an overview of that process and its hazards and in the procedures applicable to the employee's job tasks to assure that the employee can perform the job tasks in a safe manner.

(d) Inspection and testing. (1) Inspections and tests shall be performed on process equipment.

(2) Inspection and testing procedures shall follow recognized and generally accepted good engineering practices.

(3) The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.

(4) The owner or operator shall document each inspection and test that has been performed on process equipment. The documentation shall identify the date of the inspection or test, the name of the person who performed the inspection or test, the serial number or other identifier of the equipment on which the inspection or test was performed, a description of the inspection or test performed, and the results of the inspection or test.

(e) Equipment deficiencies. The owner or operator shall correct deficiencies in equipment that are outside acceptable limits (defined by the process safety information in § 68.65 of this part) before further use or in a safe and timely manner when necessary means are taken to assure safe operation.

(f) Quality assurance. (1) In the construction of new plants and equipment, the owner or operator shall assure that equipment as it is fabricated is suitable for the process application for which they will be used.

(2) Appropriate checks and inspections shall be performed to assure that equipment is installed properly and consistent with design specifications and the manufacturer's instructions.

(3) The owner or operator shall assure that maintenance materials, spare parts and equipment are suitable for the process application for which they will be used.

68.75 Management of change.

(a) The owner or operator shall establish and implement written procedures to manage changes (except for "replacements in kind") to process chemicals, technology, equipment, and procedures; and, changes to stationary sources that affect a covered process.

(b) The procedures shall assure that the following considerations are addressed prior to any change:

(1) The technical basis for the proposed change;

(2) Impact of change on safety and health;

(3) Modifications to operating procedures;

(4) Necessary time period for the change; and,

(5) Authorization requirements for the proposed change.

(c) Employees involved in operating a process and maintenance and contract employees whose job tasks will be affected by a change in the process shall be informed of, and trained in, the change prior to start-up of the process or affected part of the process.

(d) If a change covered by this paragraph results in a change in the process safety information required by § 68.65 of this part, such information shall be updated accordingly.

(e) If a change covered by this paragraph results in a change in the operating procedures or practices required by § 68.69 of this part, such procedures or practices shall be updated accordingly.

68.77 Pre-startup review.

(a) The owner or operator shall perform a pre-startup safety review for new stationary sources and for modified stationary sources when the modification is significant enough to require a change in the process safety information.

(b) The pre-startup safety review shall confirm that prior to the introduction of regulated substances to a process:

(1) Construction and equipment is in accordance with design specifications;

(2) Safety, operating, maintenance, and emergency procedures are in place and are adequate;

(3) For new stationary sources, a process hazard analysis has been performed and recommendations have been resolved or implemented before startup; and modified stationary sources meet the requirements contained in management of change, § 68.75 of this part.

(4) Training of each employee involved in operating a process has been completed.

68.79 Compliance audits.

(a) The owner or operator shall certify that they have evaluated compliance with the provisions of this section at least every three years to verify that the procedures and practices developed under the standard are adequate and are being followed.

(b) The compliance audit shall be conducted by at least one person knowledgeable in the process.

(c) A report of the findings of the audit shall be developed.

(d) The owner or operator shall promptly determine and document an appropriate response to each of the findings of the compliance audit, and document that deficiencies have been corrected.

(e) The owner or operator shall retain the two (2) most recent compliance audit reports.

68.81 Incident investigation.

(a) The owner or operator shall investigate each incident which resulted in, or could reasonably have resulted in a catastrophic release of a regulated substance.

(b) An incident investigation shall be initiated as promptly as possible, but not later than 48 hours following the incident.

(c) An incident investigation team shall be established and consist of at least one person knowledgeable in the process involved, including a contract employee if the incident involved work of the contractor, and other persons with appropriate knowledge and experience to thoroughly investigate and analyze the incident.

(d) A report shall be prepared at the conclusion of the investigation which includes at a minimum:

(1) Date of incident;

(2) Date investigation began;

(3) A description of the incident;

(4) The factors that contributed to the incident; and,

(5) Any recommendations resulting from the investigation.

(e) The owner or operator shall establish a system to promptly address and resolve the incident report findings and recommendations. Resolutions and corrective actions shall be documented.

(f) The report shall be reviewed with all affected personnel whose job tasks are relevant to the incident findings including contract employees where applicable.

(g) Incident investigation reports shall be retained for five years.

68.83 Employee participation.

(a) The owner or operator shall develop a written plan of action regarding the implementation of the employee participation required by this section.

(b) The owner or operator shall consult with employees and their representatives on the conduct and development of process hazards analyses and on the development of the other elements of process safety management in this rule.

(c) The owner or operator shall provide to employees and their representatives access to process hazard analyses and to all other information required to be developed under this rule.

68.85 Hot work permit.

(a) The owner or operator shall issue a hot work permit for hot work operations conducted on or near a covered process.

(b) The permit shall document that the fire prevention and protection requirements in 29 CFR 1910.252(a) have been implemented prior to beginning the hot work operations; it shall indicate the date(s) authorized for hot work; and identify the object on which hot work is to be performed. The permit shall be kept on file until completion of the hot work operations.

68.87 Contractors.

(a) Application. This section applies to contractors performing maintenance or repair, turnaround, major renovation, or specialty work on or adjacent to a covered process. It does not apply to contractors providing incidental services which do not influence process safety, such as janitorial work, food and drink services, laundry, delivery or other supply services.

(b) Owner or operator responsibilities. (1) The owner or operator, when selecting a contractor, shall obtain and evaluate information regarding the contract owner or operator's safety performance and programs.

(2) The owner or operator shall inform contract owner or operator of the known potential fire, explosion, or toxic release hazards related to the contractor's work and the process.

(3) The owner or operator shall explain to the contract owner or operator the applicable provisions of subpart E of this part.

(4) The owner or operator shall develop and implement safe work practices consistent with § 68.69(d) of this part, to control the entrance, presence, and exit of the contract owner or operator and contract employees in covered process areas.

(5) The owner or operator shall periodically evaluate the performance of the contract owner or operator in fulfilling their obligations as specified in paragraph (c) of this section.

(c) Contract owner or operator responsibilities. (1) The contract owner or operator shall assure that each contract employee is trained in the work practices necessary to safely perform his/her job.

(2) The contract owner or operator shall assure that each contract employee is instructed in the known potential fire, explosion, or toxic release hazards related to his/her job and the process, and the applicable provisions of the emergency action plan.

(3) The contract owner or operator shall document that each contract employee has received and understood the training required by this section. The contract owner or operator shall prepare a record which contains the identity of the contract employee, the date of training, and the means used to verify that the employee understood the training.

(4) The contract owner or operator shall assure that each contract employee follows the safety rules of the stationary source including the safe work practices required by § 68.69(d) of this part.

(5) The contract owner or operator shall advise the owner or operator of any unique hazards presented by the contract owner or operator's work, or of any hazards found by the contract owner or operator's work.

11. Subpart E is added to read as follows:

Subpart E Emergency Response

68.90 Applicability.

(a) Except as provided in paragraph (b) of this section, the owner or operator of a stationary source with Program 2 and Program 3 processes shall comply with the requirements of § 68.95 of this part.

(b) The owner or operator of stationary source whose employees will not respond to accidental releases of regulated substances need not comply with § 68.95 of this part provided that they meet the following:

(1) For stationary sources with any regulated toxic substance held in a process above the threshold quantity, the stationary source is included in the community emergency response plan developed under 42 U.S.C. 11003;

(2) For stationary sources with only regulated flammable substances held in a process above the threshold quantity, the owner or operator has coordinated response actions with the local fire department; and

(3) Appropriate mechanisms are in place to notify emergency responders when there is a need for a response.

68.95 Emergency response program

(a) The owner or operator shall develop and implement an emergency response program for the purpose of protecting public health and the environment. Such program shall include the following elements:

(1) An emergency response plan, which shall be maintained at the stationary source and contain at least the following elements:

(i) Procedures for informing the public and local emergency response agencies about accidental releases;

(ii) Documentation of proper first-aid and emergency medical treatment necessary to treat accidental human exposures; and

(iii) Procedures and measures for emergency response after an accidental release of a regulated substance;

(2) Procedures for the use of emergency response equipment and for its inspection, testing, and maintenance;

(3) Training for all employees in relevant procedures; and

(4) Procedures to review and update, as appropriate, the emergency response plan to reflect changes at the stationary source and ensure that employees are informed of changes.

(b) A written plan that complies with other Federal contingency plan regulations or is consistent with the approach in the National Response Team's *Integrated Contingency Plan Guidance* ("One Plan") and that, among other matters, includes the elements provided in paragraph (a) of this section, shall satisfy the requirements of this section if the owner or operator also complies with paragraph (c) of this section.

(c) The emergency response plan developed under paragraph (a)(1) of this section shall be coordinated with the community emergency response plan developed under 42 U.S.C. 11003. Upon request of the local emergency planning committee or emergency response officials, the owner or operator shall promptly provide to the local emergency response officials information necessary for developing and implementing the community emergency response plan.

12. Subpart G is added to read as follows:

Subpart G Risk management plan

68.150 Submission.

(a) The owner or operator shall submit a single RMP that includes the information required by §§ 68.155 through 68.185 of this part for all covered processes. The RMP shall be submitted in a method and format to a central point as specified by EPA prior to [insert date 3 years after the date of publication in the FEDERAL REGISTER].

(b) The owner or operator shall submit the first RMP no later than the latest of the following dates:

(1) [insert date 3 years after the date of publication in the FEDERAL REGISTER];

(2) Three years after the date on which a regulated substance is first listed under § 68.130 of this part; or

(3) The date on which a regulated substance is first present above a threshold quantity in a process.

(c) Subsequent submissions of RMPs shall be in accordance with § 68.190 of this part.

(d) Notwithstanding the provisions of §§ 68.155 to 68.190 of this part, the RMP shall exclude classified information. Subject to appropriate procedures to protect such information from public disclosure, classified data or information excluded from the RMP may be made available in a classified annex to the RMP for review by Federal and state representatives who have received the appropriate security clearances.

68.155 Executive summary.

The owner or operator shall provide in the RMP an executive summary that includes a brief description of the following elements:

(a) The accidental release prevention and emergency response policies at the stationary source;

(b) The stationary source and regulated substances handled;

(c) The worst-case release scenario(s) and the alternative release scenario(s), including administrative controls and mitigation measures to limit the distances for each reported scenario;

(d) The general accidental release prevention program and chemical-specific prevention steps;

(e) The five-year accident history;
(f) The emergency response program; and
(g) Planned changes to improve safety.

68.160 Registration.

(a) The owner or operator shall complete a single registration form and include it in the RMP. The form shall cover all regulated substances handled in covered processes.

(b) The registration shall include the following data:

(1) Stationary source name, street, city, county, state, zip code, latitude, and longitude;

(2) The stationary source Dun and Bradstreet number;

(3) Name and Dun and Bradstreet number of the corporate parent company;

(4) The name, telephone number, and mailing address of the owner or operator;

(5) The name and title of the person or position with overall responsibility for RMP elements and implementation;

(6) The name, title, telephone number, and 24-hour telephone number of the emergency contact;

(7) For each covered process, the name and CAS number of each regulated substance held above the threshold quantity in the process, the maximum quantity of each regulated substance or mixture in the process (in pounds) to two significant digits, the SIC code, and the Program level of the process;

(8) The stationary source EPA identifier;

(9) The number of full-time employees at the stationary source;

(10) Whether the stationary source is subject to 29 CFR 1910.119;

(11) Whether the stationary source is subject to 40 CFR part 355;

(12) Whether the stationary source has a CAA Title V operating permit; and

(13) The date of the last safety inspection of the stationary source by a Federal, state, or local government agency and the identity of the inspecting entity.

68.165 Offsite consequence analysis.

(a) The owner or operator shall submit in the RMP information:

(1) One worst-case release scenario for each Program 1 process; and

(2) For Program 2 and 3 processes, one worst-case release scenario to represent all regulated toxic substances held above the threshold quantity and one worst-case release scenario to represent all regulated flammable substances held above the threshold quantity. If additional worst-case scenarios for toxics or flammables are required by § 68.25(a)(2)(iii) of this part, the owner or operator shall submit the same information on the additional scenario(s). The owner or operator of Program 2 and 3 processes shall also submit information on one alternative release scenario for each regulated toxic substance held above the threshold quantity and one alternative release scenario to represent all regulated flammable substances held above the threshold quantity.

(b) The owner or operator shall submit the following data:

(1) Chemical name;

(2) Physical state (toxics only);

(3) Basis of results (give model name if used);

(4) Scenario (explosion, fire, toxic gas release, or liquid spill and vaporization);

(5) Quantity released in pounds;

(6) Release rate;

(7) Release duration;

(8) Wind speed and atmospheric stability class (toxics only);

(9) Topography (toxics only);
(10) Distance to endpoint;
(11) Public and environmental receptors within the distance;
(12) Passive mitigation considered; and
(13) Active mitigation considered (alternative releases only);

68.168 Five-year accident history. The owner or operator shall submit in the RMP the information provided in § 68.42(b) of this part on each accident covered by § 68.42(a) of this part.

68.170 Prevention program/Program 2.

(a) For each Program 2 process, the owner or operator shall provide in the RMP the information indicated in paragraphs (b) through (k) of this section. If the same information applies to more than one covered process, the owner or operator may provide the information only once, but shall indicate to which processes the information applies.

(b) The SIC code for the process.

(c) The name(s) of the chemical(s) covered.

(d) The date of the most recent review or revision of the safety information and a list of Federal or state regulations or industry-specific design codes and standards used to demonstrate compliance with the safety information requirement.

(e) The date of completion of the most recent hazard review or update.

(1) The expected date of completion of any changes resulting from the hazard review;
(2) Major hazards identified;
(3) Process controls in use;
(4) Mitigation systems in use;
(5) Monitoring and detection systems in use; and
(6) Changes since the last hazard review.

(f) The date of the most recent review or revision of operating procedures.

(g) The date of the most recent review or revision of training programs;

(1) The type of training provided — classroom, classroom plus on the job, on the job; and
(2) The type of competency testing used.

(h) The date of the most recent review or revision of maintenance procedures and the date of the most recent equipment inspection or test and the equipment inspected or tested.

(i) The date of the most recent compliance audit and the expected date of completion of any changes resulting from the compliance audit.

(j) The date of the most recent incident investigation and the expected date of completion of any changes resulting from the investigation.

(k) The date of the most recent change that triggered a review or revision of safety information, the hazard review, operating or maintenance procedures, or training.

68.175 Prevention program/Program 3.

(a) For each Program 3 process, the owner or operator shall provide the information indicated in paragraphs (b) through (p) of this section. If the same information applies to more than one covered process, the owner or operator may provide the information only once, but shall indicate to which processes the information applies.

(b) The SIC code for the process.

(c) The name(s) of the substance(s) covered.

(d) The date on which the safety information was last reviewed or revised.

(e) The date of completion of the most recent PHA or update and the technique used.

(1) The expected date of completion of any changes resulting from the PHA;
(2) Major hazards identified;
(3) Process controls in use;
(4) Mitigation systems in use;
(5) Monitoring and detection systems in use; and
(6) Changes since the last PHA.
(f) The date of the most recent review or revision of operating procedures.
(g) The date of the most recent review or revision of training programs;
(1) The type of training provided — classroom, classroom plus on the job, on the job; and
(2) The type of competency testing used.

(h) The date of the most recent review or revision of maintenance procedures and the date of the most recent equipment inspection or test and the equipment inspected or tested.

(i) The date of the most recent change that triggered management of change procedures and the date of the most recent review or revision of management of change procedures.

(j) The date of the most recent pre-startup review.

(k) The date of the most recent compliance audit and the expected date of completion of any changes resulting from the compliance audit;

(l) The date of the most recent incident investigation and the expected date of completion of any changes resulting from the investigation;

(m) The date of the most recent review or revision of employee participation plans;
(n) The date of the most recent review or revision of hot work permit procedures;
(o) The date of the most recent review or revision of contractor safety procedures; and
(p) The date of the most recent evaluation of contractor safety performance.

68.180 Emergency response program.

(a) The owner or operator shall provide in the RMP the following information:
(1) Do you have a written emergency response plan?

(2) Does the plan include specific actions to be taken in response to an accidental releases of a regulated substance?

(3) Does the plan include procedures for informing the public and local agencies responsible for responding to accidental releases?

(4) Does the plan include information on emergency health care?
(5) The date of the most recent review or update of the emergency response plan;
(6) The date of the most recent emergency response training for employees.

(b) The owner or operator shall provide the name and telephone number of the local agency with which the plan is coordinated.

(c) The owner or operator shall list other Federal or state emergency plan requirements to which the stationary source is subject.

68.185 Certification.

(a) For Program 1 processes, the owner or operator shall submit in the RMP the certification statement provided in § 68.12(b)(4) of this part.

(b) For all other covered processes, the owner or operator shall submit in the RMP a single certification that, to the best of the signer's knowledge, information, and belief formed after reasonable inquiry, the information submitted is true, accurate, and complete.

68.190 Updates.

(a) The owner or operator shall review and update the RMP as specified in paragraph (b) of this section and submit it in a method and format to a central point specified by EPA prior to [insert date 3 years after the date of publication in the FEDERAL REGISTER].

(b) The owner or operator of a stationary source shall revise and update the RMP submitted under § 68.150 as follows:

(1) Within five years of its initial submission or most recent update required by paragraphs (b)(2)-(b)(7) of this section, whichever is later.

(2) No later than three years after a newly regulated substance is first listed by EPA;

(3) No later than the date on which a new regulated substance is first present in an already covered process above a threshold quantity;

(4) No later than the date on which a regulated substance is first present above a threshold quantity in a new process;

(5) Within six months of a change that requires a revised PHA or hazard review;

(6) Within six months of a change that requires a revised offsite consequence analysis as provided in § 68.36 of this part; and

(7) Within six months of a change that alters the Program level that applied to any covered process.

(c) If a stationary source is no longer subject to this part, the owner or operator shall submit a revised registration to EPA within six months indicating that the stationary source is no longer covered.

13. Subpart H is added to read as follows:

Subpart H Other Requirements

68.200 Recordkeeping.
68.210 Availability of information to the public.
68.215 Permit content and air permitting authority or designated agency requirements.
68.220 Audits.

68.200 Recordkeeping.

The owner or operator shall maintain records supporting the implementation of this part for five years unless otherwise provided in Subpart D of this part.

68.210 Availability of information to the public.

(a) The RMP required under subpart G of this part shall be available to the public under 42 U.S.C. 7414(c).

(b) The disclosure of classified information by the Department of Defense or other Federal agencies or contractors of such agencies shall be controlled by applicable laws, regulations, or executive orders concerning the release of classified information.

68.215 Permit content and air permitting authority or designated agency requirements.

(a) These requirements apply to any stationary source subject to part 68 and parts 70 or 71 of this Chapter. The 40 CFR part 70 or part 71 permit for the stationary source shall contain:

(1) A statement listing this part as an applicable requirement;

(2) Conditions that require the source owner or operator to submit:

(i) A compliance schedule for meeting the requirements of this part by the date provided in § 68.10(a) of this part or;

(ii) As part of the compliance certification submitted under 40 CFR 70.6(c)(5), a certification statement that the source is in compliance with all requirements of this part, including the registration and submission of the RMP.

(b) The owner or operator shall submit any additional relevant information requested by the air permitting authority or designated agency.

(c) For 40 CFR part 70 or part 71 permits issued prior to the deadline for registering and submitting the RMP and which do not contain permit conditions described in paragraph (a) of this section, the owner or operator or air permitting authority shall initiate permit revision or reopening according to the procedures of 40 CFR 70.7 or 71.7 to incorporate the terms and conditions consistent with paragraph (a) of this section.

(d) The state may delegate the authority to implement and enforce the requirements of paragraph (e) of this section to a state or local agency or agencies other than the air permitting authority. An up-to-date copy of any delegation instrument shall be maintained by the air permitting authority. The state may enter a written agreement with the Administrator under which EPA will implement and enforce the requirements of paragraph (e) of this section.

(e) The air permitting authority or the agency designated by delegation or agreement under paragraph (d) of this section shall, at a minimum:

(1) Verify that the source owner or operator has registered and submitted an RMP or a revised plan when required by this part;

(2) Verify that the source owner or operator has submitted a source certification or in its absence has submitted a compliance schedule consistent with paragraph (a)(2) of this section;

(3) For some or all of the sources subject to this section, use one or more mechanisms such as, but not limited to, a completeness check, source audits, record reviews, or facility inspections to ensure that permitted sources are in compliance with the requirements of this part; and

(4) Initiate enforcement action based on paragraphs (e)(1) and (e)(2) of this section as appropriate.

68.220 Audits.

(a) In addition to inspections for the purpose of regulatory development and enforcement of the Act, the implementing agency shall periodically audit RMPs submitted under subpart G of this part to review the adequacy of such RMPs and require revisions of RMPs when necessary to ensure compliance with subpart G of this part.

(b) The implementing agency shall select stationary sources for audits based on any of the following criteria:

(1) Accident history of the stationary source;

(2) Accident history of other stationary sources in the same industry;

(3) Quantity of regulated substances present at the stationary source;

(4) Location of the stationary source and its proximity to the public and environmental receptors;

(5) The presence of specific regulated substances;

(6) The hazards identified in the RMP; and

(7) A plan providing for neutral, random oversight.

(c) Exemption from audits. A stationary source with a Star or Merit ranking under OSHA's voluntary protection program shall be exempt from audits under paragraph (b)(2) and (b)(7) of this section.

(d) The implementing agency shall have access to the stationary source, supporting documentation, and any area where an accidental release could occur.

(e) Based on the audit, the implementing agency may issue the owner or operator of a stationary source a written preliminary determination of necessary revisions to the stationary source's RMP to ensure that the RMP meets the criteria of subpart G of this part. The preliminary determination shall include an explanation for the basis for the revisions, reflecting industry standards and guidelines (such as AIChE/CCPS guidelines and ASME and API standards) to the extent that such standards and guidelines are applicable, and shall include a timetable for their implementation.

(f) Written response to a preliminary determination.

(1) The owner or operator shall respond in writing to a preliminary determination made in accordance with paragraph (e) of this section. The response shall state the owner or operator will implement the revisions contained in the preliminary determination in accordance with the timetable included in the preliminary determination or shall state that the owner or operator rejects the revisions in whole or in part. For each rejected revision, the owner or operator shall explain the basis for rejecting such revision. Such explanation may include substitute revisions.

(2) The written response under paragraph (f)(1) of this section shall be received by the implementing agency within 90 days of the issue of the preliminary determination or a shorter period of time as the implementing agency specifies in the preliminary determination as necessary to protect public health and the environment. Prior to the written response being due and upon written request from the owner or operator, the implementing agency may provide in writing additional time for the response to be received.

(g) After providing the owner or operator an opportunity to respond under paragraph (f) of this section, the implementing agency may issue the owner or operator a written final determination of necessary revisions to the stationary source's RMP. The final determination may adopt or modify the revisions contained in the preliminary determination under paragraph (e) of this section or may adopt or modify the substitute revisions provided in the response under paragraph (f) of this section. A final determination that adopts a revision rejected by the owner or operator shall include an explanation of the basis for the revision. A final determination that fails to adopt a substitute revision provided under paragraph (f) of this section shall include an explanation of the basis for finding such substitute revision unreasonable.

(h) Thirty days after completion of the actions detailed in the implementation schedule set in the final determination under paragraph (g) of this section, the owner or operator shall be in violation of subpart G of this part and this section unless the owner or operator revises the RMP prepared under subpart G of this part as required by the final determination, and submits the revised RMP as required under § 68.150 of this part.

(i) The public shall have access to the preliminary determinations, responses, and final determinations under this section in a manner consistent with § 68.210 of this part.

(j) Nothing in this section shall preclude, limit, or interfere in any way with the authority of EPA or the state to exercise its enforcement, investigatory, and information gathering authorities concerning this part under the Act.

14. Part 68 Appendix A is added to read as follows:

APPENDIX A
TABLE OF TOXIC ENDPOINTS
(as defined in § 68.22 of this part)

CAS No.	Chemical Name	Toxic Endpoint (mg/L)
107-02-8	Acrolein [2-Propenal]	0.0011
107-13-1	Acrylonitrile [2-Propenenitrile]	0.076
814-68-6	Acrylyl chloride [2-Propenoyl chloride]	0.00090
107-18-6	Allyl alcohol [2-Propen-1-ol]	0.036
107-11-9	Allylamine [2-Propen-1-amine]	0.0032
7664-41-7	Ammonia (anhydrous)	0.14
7664-41-7	Ammonia (conc 20% or greater)	0.14
7784-34-1	Arsenous trichloride	0.010
7784-42-1	Arsine	0.0019
10294-34-5	Boron trichloride [Borane, trichloro-]	0.010
7637-07-2	Boron trifluoride [Borane, trifluoro-]	0.028
353-42-4	Boron trifluoride compound with methyl ether (1:1) [Boron, trifluoro[oxybis[methane]]-, T-4	0.023
7726-95-6	Bromine	0.0065
75-15-0	Carbon disulfide	0.16
7782-50-5	Chlorine	0.0087
10049-04-4	Chlorine dioxide [Chlorine oxide (ClO2)]	0.0028
67-66-3	Chloroform [Methane, trichloro-]	0.49
542-88-1	Chloromethyl ether [Methane, oxybis[chloro-]	0.00025
107-30-2	Chloromethyl methyl ether [Methane, chloromethoxy-]	0.0018
4170-30-3	Crotonaldehyde [2-Butenal]	0.029
123-73-9	Crotonaldehyde, (E)- [2-Butenal, (E)-]	0.029
506-77-4	Cyanogen chloride	0.030
108-91-8	Cyclohexylamine [Cyclohexanamine]	0.16
19287-45-7	Diborane	0.0011
75-78-5	Dimethyldichlorosilane [Silane, dichlorodimethyl-]	0.026
57-14-7	1,1-Dimethylhydrazine [Hydrazine, 1,1-dimethyl-]	0.012

CAS No.	Chemical Name	Toxic Endpoint (mg/L)
106-89-8	Epichlorohydrin [Oxirane, (chloromethyl)-]	0.076
107-15-3	Ethylenediamine [1,2-Ethanediamine]	0.49
151-56-4	Ethyleneimine [Aziridine]	0.018
75-21-8	Ethylene oxide [Oxirane]	0.090
7782-41-4	Fluorine	0.0039
50-00-0	Formaldehyde (solution)	0.012
110-00-9	Furan	0.0012
302-01-2	Hydrazine	0.011
7647-01-0	Hydrochloric acid (conc 30% or greater)	0.030
74-90-8	Hydrocyanic acid	0.011
7647-01-0	Hydrogen chloride (anhydrous) [Hydrochloric acid]	0.030
7664-39-3	Hydrogen fluoride/Hydrofluoric acid (conc 50% or greater) [Hydrofluoric acid]	0.016
7783-07-5	Hydrogen selenide	0.00066
7783-06-4	Hydrogen sulfide	0.042
13463-40-6	Iron, pentacarbonyl- [Iron carbonyl (Fe(CO)5), (TB-5-11)-]	0.00044
78-82-0	Isobutyronitrile [Propanenitrile, 2-methyl-]	0.14
108-23-6	Isopropyl chloroformate [Carbonochloridic acid, 1-methylethyl ester]	0.10
126-98-7	Methacrylonitrile [2-Propenenitrile, 2-methyl-]	0.0027
74-87-3	Methyl chloride [Methane, chloro-]	0.82
79-22-1	Methyl chloroformate [Carbonochloridic acid, methylester]	0.0019
60-34-4	Methyl hydrazine [Hydrazine, methyl-]	0.0094
624-83-9	Methyl isocyanate [Methane, isocyanato-]	0.0012
74-93-1	Methyl mercaptan [Methanethiol]	0.049
556-64-9	Methyl thiocyanate [Thiocyanic acid, methyl ester]	0.085
75-79-6	Methyltrichlorosilane [Silane, trichloromethyl-]	0.018
13463-39-3	Nickel carbonyl	0.00067
7697-37-2	Nitric acid (conc 80% or greater)	0.026
10102-43-9	Nitric oxide [Nitrogen oxide (NO)]	0.031
8014-95-7	Oleum (Fuming Sulfuric acid) [Sulfuric acid, mixture with sulfur trioxide]	0.010
79-21-0	Peracetic acid [Ethaneperoxoic acid]	0.0045

CAS No.	Chemical Name	Toxic Endpoint (mg/L)
594-42-3	Perchloromethylmercaptan [Methanesulfenyl chloride, trichloro-]	0.0076
75-44-5	Phosgene [Carbonic dichloride]	0.00081
7803-51-2	Phosphine	0.0035
10025-87-3	Phosphorus oxychloride [Phosphoryl chloride]	0.0030
7719-12-2	Phosphorus trichloride [Phosphorous trichloride]	0.028
110-89-4	Piperidine	0.022
107-12-0	Propionitrile [Propanenitrile]	0.0037
109-61-5	Propyl chloroformate [Carbonochloridic acid, propylester]	0.010
75-55-8	Propyleneimine [Aziridine, 2-methyl-]	0.12
75-56-9	Propylene oxide [Oxirane, methyl-]	0.59
7446-09-5	Sulfur dioxide (anhydrous)	0.0078
7783-60-0	Sulfur tetrafluoride [Sulfur fluoride (SF4), (T-4)-]	0.0092
7446-11-9	Sulfur trioxide	0.010
75-74-1	Tetramethyllead [Plumbane, tetramethyl-]	0.0040
509-14-8	Tetranitromethane [Methane, tetranitro-]	0.0040
7550-45-0	Titanium tetrachloride [Titanium chloride (TiCl4) (T-4)-]	0.020
584-84-9	Toluene 2,4-diisocyanate [Benzene, 2,4-diisocyanato-1-methyl-]	0.0070
91-08-7	Toluene 2,6-diisocyanate [Benzene, 1,3-diisocyanato-2-methyl-]	0.0070
26471-62-5	Toluene diisocyanate (unspecified isomer) [Benzene, 1,3-diisocyanatomethyl-]	0.0070
75-77-4	Trimethylchlorosilane [Silane, chlorotrimethyl-]	0.050
108-05-4	Vinyl acetate monomer [Acetic acid ethenyl ester]	0.26

U.S. Department of Transportation

United States Coast Guard

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COMDTNOTE 16471

24 June 1996

COMMANDANT NOTICE 16471

CANCELLED: JUN 23 1997

Subj: DEVELOPMENT OF HAZARDOUS SUBSTANCE RESPONSE PLANNING CRITERIA WITHIN AREA CONTINGENCY PLANS (ACPs)

Ref: (a) Oil Pollution Act of 1990, Public Law 101-380
(b) Federal Register Notice (57 FR 15201) of 24 Apr 92
(c) COMDTNOTE 16471, Establishment of Area Committees and Development of Area Contingency Plans, 30 Sep 92
(d) COMDTINST 16471.1, Incident Command System, 9 Feb 96

1. PURPOSE. This Notice provides guidelines for the preparation of a hazardous substance response annex to all Area Contingency Plans (ACPs) required by reference (a). The information contained in this annex will add value to the ACP and enhance the response community's ability to manage responses to hazardous substance releases and successfully abate such releases in the marine environment.

2. ACTION. Commanding Officers of Marine Safety Offices and Captains of the Port (COTP) with responsibility for areas designated in reference (b) shall, through the Area Committee process, incorporate hazardous substance response information into their ACPs. The hazardous substance response planning information shall be included in the ACP as updated during the 1996 plan review and revision cycle. District Commanders shall review submitted ACPs for consistency with the guidelines contained in this Notice.

3. BACKGROUND. Reference (a) required that Area Committees develop ACPs to address actions to be undertaken in response to discharges of oil and releases of hazardous substances, as well as the threat of such discharges and releases from

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NON-STANDARD DISTRIBUTION: *B:c MLCs (16) Extra vessels, offshore facilities, and on shore facilities operating in or near the Area. At present, all coastal zone Areas have prepared and submitted ACPs for approval. The focus of most ACPs prepared thus far has been on oil. The guidance contained in this instruction is intended to aid in the development of plans to meet the statutory requirement that ACPs also address releases of hazardous substances. The information contained in this instruction has been derived from the input of a workgroup whose members included field unit, district and Headquarters personnel as well as a NOAA Scientific Support Coordinator (SSC).

4. DISCUSSION. Successful development of hazardous substance capability within an Area will depend greatly on the relationships built in the planning process. Hazardous substance response planning should be accomplished through the Area Committee. The existing Area Committee assembled by the OSC should be convened to plan for hazardous substance response. In the event that the lead state or local government agency is different for hazardous substance response than for oil, a representative from the lead hazardous substance response agency should be added to the committee. Representatives of local public organizations such as fire departments and hazardous materials (HAZMAT) teams as well as representatives from cooperatives, private chemical manufacturing and response industries and nongovernmental organizations should participate in subcommittee activities. Local Emergency Planning Committees (LEPCs) and State Emergency Response Commissions (SERCs) will be an essential source of information on hazardous substance response which was obtained through the Superfund Amendments and Reauthorization Act (SARA), Emergency Planning, Community Right-to-Know Act (EPCRA) planning process.

a. A format option for the Hazardous Substance Response Plan is to create the plan based on the functional organization of the response management system which will be used in the incident response. The Coast Guard has recently adopted National Inter-Agency Incident Management System (NIIMS) Incident Command System (ICS) for response to oil and hazardous substance incidents. The duties and responsibilities of the Unified Command, and Finance, Logistics, Operations and Planning Sections (FLOP) will be addressed in separate appendices to facilitate implementation of the plan. While this format is different than what was specified in reference (c) for the ACP as whole, that inconsistency will be temporary. For the 1997 ACP revisions, the entire ACP will be required to be organized in a functional format along NIIMS ICS lines. Enclosure (1) provides guidance on preparing the Combined ACP in the functional format.

b. The development of the Hazardous Substance annex should flow from working through a series of realistic scenarios and case-study debriefs. An important requirement of scenario based planning is that the scenarios be developed with the input of the Area Committee and subcommittees and be carefully crafted to include significant releases of hazardous substances known to be produced or transported in the COTP zone. Although the simulated incidents represent real risks in the port, the exact scenarios chosen for the planning process are not likely to actually occur and the response plan is not written to resolve those specific situations. However, the process of developing scenarios and resolving them via tabletop workups will identify the resources and relationships needed to respond to a broader spectrum of probable hazardous substance incidents.

c. Reference (d) provides guidance on response management systems for use in ACPs. The basic response organizational structure used in a hazardous substance response should be the same as for oil. The parties involved in the incident, both potential responsible parties and responders however, may be quite different. The lead organization for hazardous substance incidents in many port areas are the local fire department or state HAZMAT team. It is therefore logical that while the COTP is the predesignated federal On-Scene Coordinator (OSC), and is responsible for ensuring that a proper response is mounted, the operational incident command may be handled by a representative of the lead responding agency (i.e., fire or HAZMAT Department) or its overseeing authority (Mayor or Commissioner's Office). The importance of identifying and building relationships, and formalizing local agreements in these situations is paramount.

d. Many Coast Guard OSC's have established excellent working relationships with hazardous substance responders in their Areas. The challenge remaining for the Area Committees in such ports is to formalize those relationships and to focus planning efforts on potential response gaps within their Areas. While many ports have well established plans and capabilities for facilities within the zone, the most significant gaps occur in portions of the zone where shore based response assets can not respond. Area Committees, through the scenario resolution process, should develop strategies and identify waterborne resources, relevant response expertise and safe havens for responding to releases from vessels and remote facilities and pipelines in locations where the local fire department's "hose doesn't reach".

5. PROCEDURES. Each Commanding Officer identified in paragraph (2), shall convene the Area Committee(s) and prepare hazardous substance response information for their ACP(s) which is consistent with the guidelines and format contained in enclosure (1). The new response information shall be included in the ACP submitted to their respective District Commander(m) by the due date established by the District for the 1996 revision cycle, no later than the end of the calendar year.

   a. The Area Committee shall forward the completed ACP to the cognizant District Commander via District(m) for review and approval. District(m) will be responsible for distributing a copy of the ACP to the National Strike Force Coordination Center (NSFCC) and the Regional Response Team (RRT) for comment, in accordance with 33 CFR Parts 115 and 145, within a prescribed time frame (30-60 days). The ACP review process should verify all areas are addressed, including consistency with the NCP, adjacent coastal and inland zone ACPs and other federal, state and regional plans. The NSFCC will review each plan to ensure that Strike Force resources can be utilized during a response. RRT's will review plans with particular attention to interagency coordination issues, use of alternate response techniques and the need for regional asset coordination. District(m) will review ACPs for consistency with this guidance, review NSFCC and RRT comments and recommend that the District Commander approve the plan or return it for necessary revisions. District(m) shall ensure copies of the approved plan are distributed to Commandant (G-MOR-2), NSFCC and the RRT, including all changes, updates and modifications.

J. C. CARD
Rear Admiral, U.S. Coast Guard
Chief, Marine Safety and
Environmental Protection

Encl: (1) HAZMAT Planning Guidance
(2) List of References

HAZMAT PLANNING GUIDANCE

1. IDENTIFICATION OF STAKE HOLDERS AND GETTING STARTED

Introduction

In the Area Contingency Plan (ACP) process proper planning for HAZMAT incidents is essential to safe and effective response. Response plans must define the roles, responsibilities, resources, and procedures necessary to ensure a coordinated, cooperative, safe, efficient and effective response capability. Hazardous substance responses may be complex, involving the coordinated actions of many during the response. The quality of this coordination and the effectiveness of the planning - such as properly defining command, control and communication systems or ensuring that adequate resources are planned for and are provided - often play at least as large a role as individual responder training. The importance of pre-planning for effective response cannot be overstated. The fundamental logic of pre-planning is that all matters - or at least the likely/forseeable ones - must be addressed before a incident occurs.

The Oil Pollution Act of 1990 (OPA 90) directed that Area Committees (ACs) be established to plan for community response to oil and hazardous substance releases. The response plans that were created by this process initially focused on oil spill response planning. Concurrent with OPA 90 oil spill response planning, many Local Emergency Planning Committees (LEPCs) and State Emergency Response Commissions (SERCs) were working on plans for hazardous substance response with a focus on transportation related incidents at shore-based facilities and complexes on land. These planning activities have been conducted under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA Title III), the Emergency Planning and Community Right-To-Know-Act (EPCRA) of 1986. The incorporation of hazardous substance response policy into the ACPs is through the utilization of the expertise and knowledge already gathered by LEPCs and SERCs.

Purpose

This Notice provides development guidance for ACs and a standardized format for ACPs which address comprehensive response plans for hazardous substance incidents in the coastal zone. Incorporating hazardous substance response planning into the already existing ACPs will bring SARA Title III and OPA 90 together. The strategies and tactics that best serve responders during an oil response may not adequately function during a hazardous substance response. The differences in response methodologies will be documented in the Hazardous Substance Response portion of the ACP. Format options for the Hazardous Substance Response Plan are outlined in this instruction.

Risk Recognition

At the start of the planning process it is important to understand the risks hazardous substances pose. Existing guidelines relevant to SARA Title III, published by a variety of sources (see enclosure 2), call for hazardous substance planners to review existing plans, complete a detailed hazards identification and analysis, risk analysis and assess the community's preparedness, prevention, and response capabilities before planning begins. Conducting a complex hazards assessment or risk analysis that quantitatively examines all the hazards, vulnerabilities, and risks for an Area could dominate the planners' workload and the result might not realistically reflect the Area's the planning needs and priorities. At a time when resources are being stretched to the limit, it is important to focus on realistic local needs and avoid duplication of efforts. Risk assessment for the purpose of developing realistic planning scenarios can be accomplished through a more qualitative approach by utilizing: information in MSIS and other existing databases, existing analyses, assessments and plans, and the expertise of the LEPC and SERC members.

ACs should identify LEPC's, SERC's and other key stakeholders in the Area critical to the planning process. The planning team assembled should review existing local plans, incorporate useful information, and then identify and focus on those places where there is a "gap" in the planning. It is critical to involve the LEPCs and SERCs in the planning process. An example that may fall into the "gap" is response planning for hazardous substance incidents in open waterways from vessels transiting the port.

2. SCENARIO BASED PLANNING

Introduction

The planning process is based on exercising probable scenarios that are created by AC participants. The scenario should be developed by the participants of ACs and the local port community responders so they are sure to include specific issues relevant to their localities. Therefore, contingency planners, shippers/ manufacturers of hazardous substances, as well as members of the response community, both public and private, should participate in the scenario development step. Scenarios should challenge existing plans and test a variety of modes of transportation and locations of incidents.

Response preparedness should concentrate not only on development of a plan, but should focus on all aspects of response that will ensure a prepared and equipped response organization. Once a plan is developed, response equipment tested and personnel trained, the organization is ready to exercise its plan and determine its adequacy to meet the needs of the Area.

Scenario Development Process

The hazardous substance scenario development process focus is to identify those aspects of a HAZMAT response that need planning attention - the "gaps" that are identified after reviewing all existing response plans (local, federal, county, etc.). This phase requires that the stakeholders of the Incident Command System (ICS) participate in either imaginary scenarios or to debrief actual incidents. The exercise of scenarios tests the plans premises and begins the process of identifying conflicting goals, developing common goals and decision making methods the response organization will use to solve problems together. To successfully manage a response that is evolving and is constantly changing, it is critical that the stakeholders understand the goals of each other's organization and how they are all brought together in the Unified Command. The goal is for participants to learn from the experience and adjust the way in which they will respond to the next incident. The goal of the planning community is, that needed changes be captured in the ACP and that the lessons learned benefit the community and the responders during future incidents. While the planning processes are parallel to oil response planning, there will be areas requiring particular attention which are unique to hazardous substance response priorities, players, organizational structure, etc.

There are a number of other programs within the Marine Environmental Protection Program that can aid planners. They are:

(1) SPEARS - Spill, Planning, Exercise and Response System: This is a computer based tool that may help identify facilities, areas of potential incidents, response resources, etc. It can

also provides a geographic information system (MARPLOT), list chemical and oil properties, etc.

(2) PREP - National Preparedness for Response Exercise Program (PREP): PREP exercises are opportunities for continuous improvement of the response plans and the response system. PREP utilizes exercise evaluations that are documented in part through the PREP Lesson Learned System (PLLS).

(3) ISPRS - Incident Specific Preparedness Review: ISPR require a review and report the Area's preparedness regarding certain oil spills or hazardous substance releases. The final evaluation is documented in part through the PREP Lessons Learned System (PLLS).

Scenario Development Methods

There are two methods for developing scenarios for use in the planning process:

* Scenario Exercise
* Case Study Evaluations

Scenario Exercise

Using the scenario exercise method, the participants can explore - in a no-fault environment - differences and similarities in hazardous substance and oil response regarding perceptions of risk, expectations, resource availability, tactics, information needs, responders and decision making methods. Since we can often understand why something failed, we can begin to predict where in the response management system improvements can be made. One purpose of the exercise process is to identify and work through potential conflicts.
Using their knowledge and experiences of the local area, stakeholders can assess potential hazardous substance incidents likely to occur in their port. From a list of such incidents, the planning team can create and fully develop scenarios to exercise.

In the scenario exercise the participants:

1. Identify response capabilities and identify any necessary changes or improvements.

2. Identify the other functional areas and organizations impacted by identified shortfalls.

3. Together, identify specific tasks for each functional area to implement that will prevent the problem.

4. Document results regarding scenario exercise in lessons learned and recommend plan revisions to reflect lessons learned.

In the mature phases of a significant incident the range of tasks required of the functional areas (i.e. command, finance, operation, logistics and planning) within the incident command structure are large and complex. Therefore, the need for strong coordination and support between all of the stakeholders and functional areas involved to achieve a successful response is paramount. This is facilitated when the stakeholders are involved in the planning process.

Scenario Categories and Ideas

Examples of multi-agency response scenarios will vary greatly by port. However, scenarios need to be numerous and diverse enough to cover a variety of incidents, different modes of handling or transporting product, various locations of an incident, and the time frame in which the scenario is initiated.

Case Study Evaluations

Another method to improve planning and create scenarios is to thoroughly evaluate a real hazardous substance incident response and capture the lessons learned. During the evaluation process, the team of stakeholders discuss how the response effort was handled, how each agency responded, how decisions were made, and how agencies communicated. The evaluation process should document the demonstrated ability and suggest plan revisions, if appropriate, to reflect lessons learned. This technique can accomplish the same results as the exercise of an imaginary scenario. The main difference is that a real incident is used as a case study evaluation. Scenario development should not be limited to only case study evaluations.

Tasking for Scenarios and Case Study Evaluations

During each planning cycle the planning team should consider the development and exercise of at least 2 (at the most 5) scenarios and/or case evaluations. During each subsequent planning cycle new scenarios would be developed and exercised. This would allow a variety of categories of potential hazardous substances, locations and time frames to be exercised. As discussed previously, scenarios and case evaluations need to be diverse and numerous enough to exercise various combinations of stakeholders, chemicals, locations of incidents and modes of transportation, hence in subsequent planning cycles new cases should be examined or new scenarios developed and exercised.

Consensus Building

Each stakeholder may have different or even conflicting goals, and each may have its own version of success. To successfully respond to an incident, stakeholders may have to temporarily alter their goals or ideas about what constitutes a successful response. To negotiate this process, it is important that the participants understand the roles and responsibilities of the other stakeholders brought together in the Incident Command System. Personnel safety is the principal and universally agreed upon goal against which others should be prioritized.

The experience needed for a complex response requires an expanded perspective on organizational dynamics and group problem solving. This type of experience focuses on stakeholders working together to solve problems and to reach consensus on priorities. This is much easier to accomplish if the stakeholders already agree on how consensus will be reached in light of the functions of the entire organization.

Lessons Learned - Outcome of the Evaluation Process

The Scenario Development & Exercise Process should provide participants with the experience they need in working in the type of response structure that can successfully respond to a hazardous substance incident.

The written outcome of the evaluation process should be documented in the lessons learned. The capture of the lessons learned is one of the goals of the scenario exercise process. Capturing, documenting and sharing lessons learned enables each participating stakeholder to identify and address weaknesses in the ACP and their own response plans, learn from experiences of other plan holders and achieve the greatest return on their investment by ultimately becoming more cohesive during responses.

Some lessons learned may include:

* how stakeholders and organizations will identify goals
* how stakeholders will arrive at goal consensus and conduct problem solving processes

* how stakeholders will implement solutions
* how stakeholders communicate within the response structure
* availablilty and implementation of materiel and personnel resources

Lessons learned and the documentation regarding scenarios should be maintained in a separate document to avoid cluttering the ACP and keep it strictly response guidance.

3. FORMAT CONSIDERATIONS

Introduction - ICS and Functional Plan Format

This document prescribes the general functional format for the ACP. A plan structured to parallel NIIMS Incident Command (see COMDTNOTE 16471.2) and provide an organization capable of efficiently responding to oil discharges and hazardous substance releases is the goal. The Incident Command System and a plan structured functionally to support it can be used for all oil and hazardous substance responses.

The Incident Command System is intended to provide a "common ground" that will allow command and control for the response effort by all involved. The versatility of the Incident Command System enables the On Scene Coordinator to fill the positions identified in the organizational structure as needed. The functional format utilized in the ACP and the Incident Command System is very important because it can be used equally well for both small and large responses and it parallels many response management systems used across the nation by many different agencies. The system has considerable internal flexibility. It can grow or shrink to meet constantly changing needs. This makes it a very cost effective and efficient system. Practically every incident has certain functional areas that must be performed for a successful response effort. The basic functional areas are Command, Finance, Logistics, Operations, and Planning. Even in the event of a very small response, and only one or two people or agencies are involved, these functional activities will still apply to some degree although several functions may be performed by a single person.

Recommended Plan Format

The numbering convention and formatting below is for a combined plan that incorporates the present ACP format with a few modifications to make one combined, oil and HAZMAT response plan in the functional format required in the 1997 revision. A stand alone HAZMAT Plan or HAZMAT Annex to the present ACP can be written but will eventually need to be incorporated into a combined ACP (oil & hazmat) in the 1997 revisions and reformated functionally as outlined below. Note that most of the appendices and tabs listed below already exist in the current oil Area plan. Only a few additional sections or enhancements to the present plan that identify HAZMAT information and some reformatting need to be addressed to form an effective combined plan.

Annexes and appendices should be presented and named as they are in this guidance. Applicable tab subjects should be addressed but tabs may be reorganized, reserved, combined or further delineated at the discretion of the Area Committee. The proposed format will standardize the location of information yet allow maximum flexibility to Areas for development of, and the degree of detail needed in each appendix.

Annex A - - Introduction to Combined ACP Response Strategy
- Appendix I : Authority
  - II : Definitions and Acronyms
  - III : Area Committee Purpose and Objective
    - Tab a Area
    - Tab b Area Subdivision
    - Tab c Area Subdivision
    - Tab d Area of Responsibility
    - Tab e Area Committee Organization
      - i. Area Committee Members *
      - ii. Subcommittee Titles and Members *
  - IV : Geographic Boundaries
    - Tab a Area Spill History
    - Tab b Sensitive Areas
  - V : Response Organization and Policies
    - Tab a National Response System,(Incident Command System/Unified Command)
    - Tab b National Response Policy
    - Tab c State Response System
    - Tab d State Response Policy
    - Tab e Local Response System
    - Tab f Local Response Policy
    - Tab g Responsible Party Response Policy
    - Tab h Role of the On-Scene Coordinator (in the ICS)
  - VI : Plan Review
  - VII : Exercises/Drills

* to include historical list of participants

Annex B Command & Command Structure
- Appendix I: Command/Command Staff
  - II: Command Structure - Unified Command
  - III: Health and Safety
    - Tab a Health and Safety Officer (Fed, state, local, private)
    - Tab b Site Safety and Health Plan

VI. Public Affairs Information
- Tab a General Logistical Concerns for Press
- Tab b Media Contacts
- Tab c Media Addresses
- Tab d Joint Information Center (JIC)
- Tab e New Release Samples
- Tab f Sample Fact Sheets
- Tab g Sample Press Release
- Tab h Sample News Advisory
- Tab i Checklist for Public Affairs Response to Pollution Incidents

V. Legal Officer
- Tab a Legal Guidelines

Annex C - - Planning Section

Appendix I : Planning Organization
- Tab a National Response Team
- Tab b Regional Response Team
- Tab c Area Committees Role and Members
- Tab d ICS Planning Section Roles and Responsibilities
  - i. Resources Unit
  - ii. Situation Unit
  - iii. Documentation Unit
  - iv. Demobilization Unit
  - v. Technical Specialists
- Tab e Chemical countermeasures - dispersants, and other spill mitigating substances
- Tab f Natural Resource Damage Assessement Unit
- Tab g Communications Plan
- Tab h General Protection Strategy Priorities
- Tab i Environmental Sensitivity Area Maps & Protection Priorities
- Tab j Identification of Surface Water Intakes both municipal and industrial.
- Tab k National Historic Preservation Act Consideration (NHPA) *
- Tab l Endangered Species Act Considerations/Consultation (ESA) *

* may be "reserved" until developed IAW forthcoming COMDT guidance

Annex D - - Finance Section

Appendix I : Finance Section Organization
- Tab a Finance Section Chief's Responsibilities
- Tab b OSC Access to the Fund

Tab c State Access to the Fund - direct and indirect
Tab d Resource Damage Assessment Procedures
Tab e Lead Administrative Trustee Access to the Fund
Tab f Claims Unit
Tab g Cost Unit
Tab h Time Unit
Tab i Procurement Unit

Annex E - - Operations Section
Appendix I : Operations Section Organization
Tab a Operations Section Chief's Responsibilities
Tab b Air Operations Branch
Tab c Emergency Notifications
Tab d Response Strategy/Containment & Cleanup
i. Offshore, Nearshore, Shoreline, Inland Sensitive Area
ii. Integrated Cleanup Systems
Tab e Containment and Cleanup Branch
Tab f Salvage Branch
Tab g Decontamination Branch
Tab h Wildlife Recovery Branch
Tab i Vessel Operations Branch
Tab j Health and Medical Services (including site safety)
i. Warning Systems and Emergency Public Notification
ii. Evacuation Procedures
Tab K Removal & Waste Disposal
Appendix II Required Letters and Reports
Tab a Letters
Exhibit 1 - Notice of Federal Interest CG-5549)
Exhibit 2 - Notice of Federal Assumption
Exhibit 3 - Letter of Designation (TOPS) (see Annex C Tab f)
Exhibit 4 - Administrative/Directive Order
Tab b OSC Report (Guidance and/or sample)
Tab c Pollution Reports (Guidance and/or sample)

Annex F Logistics Section
Appendix I : Logistic Section Organization
Appendix II : Summary of Area Equipment
Tab a Boom
Tab b Skimmers
Tab c Vacuum Trucks
Tab d Government Agency Resources
Tab e Work Boats
Tab f Support Vessels
Tab g Ocean Tugs

Tab h Harbor Tugs
Tab i Aircraft
Tab j Storage

Appendix III : Summary of Area Support
Tab a Staging AreasTab b Airports
Tab c Fueling Facilities - land/marine
Tab d Maintenance Facilities
Tab e Portable Facilities (restrooms, comms suites)
Tab f Boat Ramps
Tab g Hotels/berthing
Tab h Command Centers (fixed/portable)
Tab i Storage/disposal facilities
Tab j Waste Transportation Companies

Appendix IV : Summary of Personnel and Resources Support
Tab a Clean-up Companies (BOA & Non-BOA)
Tab b Coast Guard (reserve and active duty)
Tab c Wildlife Cleanup Companies and Volunteer Organizations
Tab d Law Enforcement Agencies
Tab e Hospitals/EMS
Tab f Port Authority/Harbormaster
Tab g Salvage Companies/Divers (gov't and commercial)
Tab h State & local Environmental Agencies
Tab i Laboratories
Tab j Weather Services (to include NOAA)
Tab k Natural Resource Trustees
Tab l Local Emergency Planning Committees (LEPCs)
Tab m State Emergency Response Committees (SERCs)
Tab n Government Official Liaisons (Governors aide, County Executive)
Tab o Fishing Cooperatives and Fleets
Tab p Explosive Ordinance Details
Tab q Site Safety Personnel/Health Departments

Appendix V: Special Forces
Tab a USCG National Strike Force
Tab b USCG District Response Assist Team (DRAT)
Tab c Public Info Assist Team (PIAT)
Tab d U.S. Navy Supervisor Salvage (SUPSALV)
Tab e NOAA Scientific Support Coordinators (SSC)
Tab f EPA Emergency Response Teams
Tab g Agency for Toxic Substance and Diseases (ATSDR)
Tab h State and local special forces

BIBLIOGRAPHY

Department of Transportation. *National Preparedness for Response Exercise Program (PREP) Guidelines.* Washington, DC: GPO, 1994. O - 381-595 QL 3.

Department of Transportation. *Report to the Congress on Hazardous Materials Training, Planning, and Preparedness.* Washington, DC: GPO, 1986. S/N 623-331/00510.

National Response Team. *Developing a Hazardous Materials Exercise Program: A Handbook for State and Local Officials.* September 1990.

Environmental Protection Agency. *Chemical Emergency Preparedness Program.* Interim Guidance. Washington, DC: GPO, 1985. S/N 491 483 20226.

National Response Team. *Hazardous Materials Emergency Planning Guide.* March 1987.

Guidelines for Developing and Evaluating an Oil Spill Response Exercise. October 1995.

National Response Team. *Criteria for Review of Hazardous Materials Emergency Plans.* May 1988.

Environmental Protection Agency. *A Review of Federal Authorities for Hazardous Materials Accident Safety.* 1990.

Director, Center for Disease Control. Letter to Captain Marcelo Alejandro Ricardes, subject: "Chemical Spill Response Program." 13 December 1995.

Johnson, Barry L., Assistant Surgeon General. Letter to distribution, subject: "Information on the Toxic Effects of Hazardous Substances."

National Institute for Chemical Studies. *Communicating About Enviromental Risks: A Case Study.* Charleston, WV. 1995

Ullian, James C., CDR. Memorandum to CDR Richard M. Gaudiosi and others, subject: "Review of Marine Fire Fighting Contingency Plans (MFFCP)." 13 September 1995.

Associate Director, Chemical Manufacturers Association. Letter to CMA/CCPA Cross Border Manual Task Group, subject: "New Draft of Manual." 19 December 1995.

Stalfort, David C., LT and Gary L. Ott. *Training for Success: A Training Design for Response Management Systems.* February 1995.

National Wildfire Coordinating Group. *Unified Command.* Module 13, I-400. October 1994.

U.S. Coast Guard Marine Environmental Protection Division Pamphlet. *SPEARS Spill Planning Exercise And Response System*. Washington, DC: U.S. Coast Guard Headquarters.

Marine Enviromental Protection Committee. *Implementation of the OPRC Convention and the OPRC Conference Resolutions.* MEPC, 37th sess., agenda item 15/5, 15 June 1995.

Marine Enviromental Protection Committee. *Implementation of the OPRC Convention and the OPRC Conference Resolutions.* MEPC, 37th sess., agenda item 15/5, 9 June 1995.

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(SERC/TERC/LEPC/AA Chairperson)

Signature Bruce S Anderson Date 12/05/96

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REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

Monday, 28 October 1996

CAMEO At No Charge

Dear Hawaii State Emergency Response Commission Chair:

I am pleased to announce an exciting offer that can help you to effectively manage and use the information you collect under the Emergency Planning and Community Right-To-Know Act (EPCRA), and to plan for and prevent chemical emergencies.

A cooperative agreement between EPA and the National Safety Council (NSC) now makes it possible for your State Emergency Response Commission (SERC) to obtain, at no charge, the Computer Aided Management of Emergency Operations (CAMEO) software applications set, with toll-free hotline technical assistance to help you use the CAMEO software most effectively.

We are making this offer to qualified State Emergency Response Commissions (SERCs), Tribal Emergency Response Commissions (TERCs), Local Emergency Planning Committees (LEPCs), and California's Administering Agencies (AAs) in EPA Region 9.

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A single county map, chosen by the recipient, is included with this CAMEO offer. Additional map files can be provided by this Regional office on request.

Training to use CAMEO is not included with this offer.

Train-The-Trainer CAMEO training is being provided to selected agencies in Region 9 through this office; please contact

Gordon Woodrow
State Planning & Assessment (H-8-1)
1-415 744-2330

for details.

Note that CAMEO training is a reimbursable expense under the Hazardous Materials Emergency Preparedness (HMEP) Grant Program.

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  Please review the *Hardware and Software Requirements*, enclosed, to ensure that you now have or will be able to procure the appropriate equipment to operate CAMEO.

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Michael Ardito
State Planning & Assessment (H-8-1)
Region 9, U.S. EPA
75 Hawthorne St.
San Francisco CA 94105-3901

to arrive there no later than Friday, 15 November 1996.

NSC will begin distribution of CAMEO under this agreement to initial applicants in early December, 1996.

Applications received after Friday, 15 November 1996 will be shipped in three to six weeks after receipt of the application.

Applications received after Friday, 31 January 1997 will not be considered.

If your organization has already purchased the new CAMEO Windows version and you would like to take advantage of this offer, you may designate a member agency of your SERC to receive CAMEO for its chemical safety activities.

Please note that CAMEO will be shipped via UPS, and cannot be sent to a Post Office Box. The county map file you request will be shipped separately from CAMEO, and will probably arrive after you have received CAMEO.

Sincerely,

Michael Ardito

Michael Ardito
Hawaii State Project Officer for
Superfund Programs

Enclosures: *Hardware and Software Requirements*
Order Form and Terms and Conditions Agreement: CAMEO™ At No Charge

01-961028MY

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CAMEO Suite For Windows 1.0

- IBM or compatible 486 (Pentium recommended)
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- 8 Megabytes (MB) RAM (16 MB RAM recommended)
- 30 MB free hard disk space
- Additional free space on hard drive for maps

CAMEO Suite For DOS 2.2

- IBM-PC AT or compatible personal computer with 286 (386SX*)
- MS-DOS 3.3 or later
- EGA or VGA color monitor
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- Microsoft Windows (if using ALOHA)*
- Additional free space on hard drive for maps*
- Math Co-Processor*

* ALOHA is included in the CAMEO package. You'll need this equipment to use it.

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- Hypercard V.2.1
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HEER OFFICE

November 29, 1996

Meeting Summary
HAWAII STATE EMERGENCY RESPONSE COMMISSION
MEETING #24

Wednesday, May 29, 1996 from 9:00 a.m. to 12:00 noon.

Department of Health
919 Ala Moana Boulevard, 5th Floor Conference Room
Honolulu, Hawaii 96814

Attendees
Voting

Dr. Bruce Anderson, Chair, Department of Health, Environmental Health
Gary Gill, Environmental Quality Control Office
Bob Boesch, Board of Agriculture
Russell Charlton, Department of Labor and Industry
Jay Sasan, Hawaii LEPC Representative
Clifford Ikeda, Kauai LEPC Representative
Joseph Blackburn, Maui LEPC Representative
Capt. Carter Davis, Oahu LEPC Representative
Thomas Smyth, Department of Business, Economic Development and Tourism
Roy Schaefer for Gilbert Coloma-Agaran, Department of Land and Natural Resources
Harry Murakami for Ralph E. Moore, Department of Transportation

Non Voting

Leland Nakai, Oahu Civil Defense
Mike Ardito, USEPA Region IX
Leighton Au Cook, State Civil Defense
Dean Kurakawa, State Civil Defense
Lauren Volpini, USEPA Region IX
Jim Vinton, BHP Hawaii
Sterling Yong, Department of Land and Natural Resources
Pat Torres,Department of Transportation, Harbors Division
Greg Olmsted, Department of Health, Hazard Evaluation and Emergency Response Office
Walter Yoshimitsu, Campbell Estate
Chris Takeno, Department of Health, Hazard Evaluation and Emergency Response Office
Janet Ashman, Hawaii American Red Cross
Steve Armann, Department of Health, Hazard Evaluation and Emergency Response Office
Marsha Mealey, Department of Health, Hazard Evaluation and Emergency Response Office

1) Call to Order

1.1 Bruce Anderson, DOH, Environmental Health Administrator made opening remarks and welcomed attendees.

1.2 The Minutes from Meeting #22 were accepted as printed.

2) EPA Updates

Mike Ardito, Hawaii State Projects Officer for Superfund, USEPA, presented updates from the EPA and the finalized Video of Operation Diamond Head.

2.1 This year marks the tenth anniversary of EPCRA.

2.2 One plan guidance has been drafted.

2.3 The Operation Diamond Head video is intended to promote exercises. The written critique of the exercise is available. HEER, the RRT, Oahu and State Civil Defense will have copies.

2.4 Safety for victims and responders must be balanced.

3) Recent EPA Enforcement and Outreach Efforts

Lauren Volpini, USEPA, discussed EPA's recent enforcement and training efforts in Hawaii. See handout.

3.1 The approach was a three part program.

- Create a profile of Campbell Industrial Park (CIP).
- Make evaluations.
- Conduct training.

3.2 Carter Davis noted that the original Tier IIs received are kept at HazMat, and copies are sent to the appropriate firehouse and to Fire Prevention.

4) LEPC Updates and Membership Changes

4.1 Jay Sasan, Hawaii LEPC Representative

4.1.1 Public committees can't accept a lot of donations. Alternatively, companies could participate in training and exercises.

4.2 Clifford Ikeda, Kauai LEPC Representative

4.2.1 KCC Community Awareness Course.

4.2.2 Internet access.

4.2.3 The Kauai Fire Department has been inputting Tier II data.

4.2.4 No responses.

4.2.5 Clifford will attend the International Hazardous Materials Spills meeting.

4.3 Joe Blackburn, Maui LEPC Representative

4.3.1 Comments on the Maui Emergency Plan are back from State Civil Defense.

4.3.2 They will be conducting an exercise.

4.4 Carter Davis, Oahu LEPC Representative

4.4.1 A draft of the Oahu Emergency Plan (April '96) has been submitted to State Civil Defense and the HSERC.

4.4.2 The last Honolulu LEPC meeting was held on Feb. 22nd and the next is scheduled for June 4th.

4.4.3 We will design a simple Web Page using resources within our organizations but would still like to obtain $2500 to hire a programmer to improve access to stored data.

4.4.4 CLEAN has continued for CIP tenants.

4.4.4.1 Leland Nakai, OCD, sits on CLEAN.
4.4.4.2 CLEAN has a non profit status.
4.4.4.3 They have asked members for dues in three tiers.
4.4.4.4 A contractor will develop the park wide emergency plan and communications.
4.4.5 Leland and Carter were involved in the EPCRA audits and workshops.
4.4.6 Sent a communication to Joe Suki.
4.4.6.1 Commissioned a letter from the Mayor to the Governor regarding maintaining the HEPCRA Coordinator position.
4.4.7 Participated in the exercise critique.
4.4.8 Members have been taking training through Civil Defense.
4.4.9 Will attend Spill Conference.
4.4.10 Tech class.
4.4.11 Exercises with the ambulance and fire.
4.4.12 Continue EPCRA.
4.4.13 Membership as listed on the November 28, 1995 letter was accepted.

5) Legislation on Public Meetings Briefing

Steve Armann, Acting Manager, HEER Office, gave an update of HEER and RRT/ACP activities.
5.1 A bill to direct HEPCRA filing fees to the localities instead of the General Fund was not passed.
5.2 Bill 1966, on public meetings, was passed.
5.2.1 It allows for emergency meetings to be called by director. If there is a favorable vote then the meeting can occur.
5.2.2 Allows for subcommittees to meet.
5.3 The In-Situ Burn MOA is close to final. In-situ burning will be allowed as long smoke will not enter the breathing zone of human receptors or sensitive wildlife.
5.4 NPREP is scheduled for Sept. 26, 1996. BHP will role play responsible party.

6) Other Business

6.1 Ed Hondack, Pipeline Safety, Western Division, DOT, made a presentation on his review of the 912-918 barrel Chevron Oil Spill.
6.1.1. Calls went out around 2am.
6.1.2 Equipment was staged for deployment at dawn.
6.1.3 Health risk from vapors was assessed. The Arizona Memorial was closed and schools were visited with information.
6.1.4 Booms were deployed. Since it was #6 with neutral buoyancy, oil may have gone under the booms.
6.1.5 The Hawaii Responder was able to skim a lot of product during tide changes.
6.1.6 The shoreline was cleaned.
6.1.7 A natural resources damage assessment will be done.
6.1.8 How clean is clean and what is the damage done by cleaning is being assessed.
6.1.9 Pipetronics consultants will check the pipeline. 128D gives authority to the DOH to require that their conditions are met before the pipeline goes back into service.
6.1.10 DOT was asked to oversee by Dr. Anderson.
6.1.10.1 Sent a letter on May 15th.
6.1.10.2 Dig up and replace similar sections.
6.1.10.3 Restart at 80% pressure.
6.1.10.4 Need an annual electrical survey.
6.1.10.5 DOT reviewed records.
6.1.10.6 DOT reviewed the smart pig log.

The pig shaped unit is sent through the line and records the pipeline's response to the magnetic signals it sends at regular intervals. The pig associates the records with its own position in the pipeline diagraming any anomalous areas.

6.1.10.7 No problems were seen.

6.1.10.8 The breach was a fish mouth shaped gap 1"x4".

6.1.10.9 It would take 40 to 45 minutes to spill 25,000 gallons.

6.1.10.10 Pipeline rectifier interference is the most likely cause of the breach.

When two rectifier currents cross they can interact to cause electrons to flow from the metal at the point of interference which is equivalent to mortar coming loose.

6.1.10.11 Want to establish a State Pipeline Safety Program funded 50% by federal and 50% by user fees.

In 1995 a Federal Inspection was missed.

If a state program were instated, the state would inspect and someone here would act as an employee of the federal government, perhaps in the RCRA program.

6.1.10.12 The pressure detector in the line is SCADA by Honeywell but Chevron wrote the program. The feeder booster cycle gave a false negative and pressure readings are incorrect for 49 seconds after the hour.

6.1.10.13 Cathodic protection must be in place.

Until the early 1990s, there was a Pipeline Interference Committee but it is now inactive.

6.1.10.14 Some of the pipelines are owned by DOT and DOT wouldn't approve regulating itself.

6.1.10.15 A Smart Pig will be run on June 10th 1996 through the pipeline that failed.

6.1.10.16 Representative Jim Shon commented on pipeline safety in Hawaii.

Coordination is the key since it is the interference between pipelines that causes many of the problems.

Damage needs to be reported to help identify interference.

The harbor infrastructure is corroding.

Extra protection is needed for sensitive areas.

He has called a joint hearing on pig day to discuss prevention, response, night response in particular.

6.1.10.17 Federal Legislation is pending to require changes to pigable lines in sensitive areas.

7) The next HSERC meeting is tentatively scheduled for August, not to conflict with the Maui exercise.

Respectfully Submitted,

Marsha Mealey

Marsha Mealey

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

LAWRENCE MIIKE
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801

IN REPLY, PLEASE REFER TO:
HEER OFFICE

November 29, 1996

DRAFT MEETING SUMMARY
HAWAII STATE EMERGENCY RESPONSE COMMISSION
MEETING #25

Monday, September 16, 1996 from 9:00 a.m. to 12:00 noon.

Department of Health
919 Ala Moana Boulevard, 5th Floor Conference Room
Honolulu, Hawaii 96814

Attendees
Voting
Dr. Bruce Anderson, Chair, Department of Health, Environmental Health
Gary Gill, Environmental Quality Control Office
Bob Boesch, Board of Agriculture
Russell Charlton, Department of Labor and Industry
Jay Sasan, Hawaii LEPC Representative
Clifford Ikeda, Kauai LEPC Representative
Leland Nakai for Capt. Carter Davis, Oahu LEPC Representative
Dr. John Harrison, University of Hawaii Environmental Center
Thomas Smyth, Department of Business, Economic Development and Tourism Chris Takeno, Department of Transportation
Sterling Yong, Department of Land and Natural Resources

Non Voting
Capt. Frank Whipple, USCG
Curtis Martin, Department of Health, Hazard Evaluation and Emergency Response Office
Russel Takata, Department of Health Noise and Radiation
Donna Maiava, Department of Health Emergency Medical Systems
Jim Vinton, BHP Hawaii
Susan Colborn, Chevron
Ralph Fronczkowski, State Civil Defense
Richard Sakuma, State Civil Defense
LCDR Ken Hertzler, USCG MSO Honolulu, Planning Department
Rich Teubner, USCG
Ray Petow, USCG
Steve Armann, Department of Health, Hazard Evaluation and Emergency Response Office
Marsha Mealey, Department of Health, Hazard Evaluation and Emergency Response Office

AGENDA Part I Formal Meeting

1) Call to Order

The meeting was called to order at 9:12 by Bruce Anderson, DOH, Env. Health Admin.

1.1 Opening Remarks

Opening remarks and a welcome to Capt. Whipple, the new Captain of the Port, were made. A correction to the agenda was noted; the HMTUSA Grant Vote should read HMEP Grant Vote.

1.2 Discussion/Approval of Minutes from Meeting #24

The minutes from HSERC Meeting #24 were accepted with one change, the addition of the list of attendees.

2) HMEP Grant Proposal Vote

Each county's grant proposal(s) were presented. Please see attachment containing the proposal submittals. A vote passed to recommend Proposals 2 and 1 for funding.

3) LEPC Updates and Membership Changes

3.1 Jay Sasan, Hawaii LEPC Representative

A motion was made, seconded and passed to adopt membership changes as indicated in the Hawaii handout.

3.2 Clifford Ikeda, Kauai LEPC Representative

There were no membership changes. See Kauai handout.

3.3 Leland Nakai, Oahu LEPC Representative

Leland presented an overview of the last Honolulu LEPC meeting.

3.3.1 May EPA compliance audits were discussed. The overall profile of the CIP is still in progress.

3.3.2 Carter Davis attended the spills meeting.

He requested that EPA standardize electronic submissions.

Successful LEPC programs had strong state support.

EPA CAMEO training will come to Honolulu on October 7-11.

The conference is an excellent networking opportunity.

Chief Lopez has elevated HazWOper training requirements to Incident Commander for all Battalion Chiefs.

Risk Management Plans, due in June 1999, will be submitted electronically.

3.3.3 A CLEAN update of the CIP Plan was made.

3.4 and 4) Joe Blackburn, Maui LEPC Representative

Joe Blackburn did not attend the meeting. A motion to place Maui in the EPA exercise queue was made, seconded and approved.

A 10 minute break was held.

5) Nat'l Radiological Emergency Response Plan

Roy Price, State Civil Defense, presented the current and anticipated participation of various agencies with regard to radiological incidents. See the attached 1979 Radiological Incident Response Plan. Roy asked that the HSERC make an assessment of the preparedness which should be maintained by the State Civil Defense for incidents involving radiation without FEMA funding to maintain instruments.

Part II Informational Meeting

6) 11:00 Clean Update — Dave Hoffman, CLEAN President

6.1 Dave Hoffman , of BHP, stated that the purpose of CLEAN is to protect the CIP area, improve public warning systems and to educate.

6.2 CLEAN has an active membership of dues paying members of the community.

6.3 The first draft of an emergency plan will be submitted by Risk Management Consultants on September 27th, 1996. The consultant, Paul Dixon, is developing a vulnerability analysis by contacting each business and discussing their operations.
6.4 Several standing committees have been established including drills, compliance awareness and finance.
6.5 Their accomplishments have included incorporation as a not for profit organization, raising $100,000 for the plan and presenting at the Hoolaulea.
6.6 Roy Price asked what the process will be for alerting the community. The document developed will make recommendations. Until any improvements can be made, the 911 process will be in use.

7) 11:20 Marine Fire Fighting Plan — Rich Teubner, USCG MSO
Rich called for assistance from the LEPCs in developing a resource list, tasking and site restoration criteria with regard to ports.

8) 11:30 Area Contingency Plan Update — Ken Hertzler, USCG MSO
8.1 US Fish and Wildlife, DOH, Coast Guard, NOAA and the DLNR are the natural resources trustees.
8.2 Goals include:

- Renew handling permits,
- Identify priorities with the LEPCs,
- Determine geographic resources,
- Look at high risk strategies,
- Review responses and revise booming strategies,
- Improve the notification process,
- Develop and renew DOD MOAs,
- Review disposal options for the neighbor islands.
  Currently waste comes to Oahu and then to the mainland. Other options are landfilling, burning, in situ disposal and the use of dispersants.

9) 11:40 Chevron Oil Spill Update — Ray Petow, USCG MSO
9.1 The spill occurred at 1:30am. Booms were put out by HECO's Waiau Power Plant and the DOD before daylight and sensitive areas were boomed early in the day.
9.2 Response personnel worked well as a team because of planning throughout the year.
9.3 The Arizona memorial was an object of focus since it had to be closed during the early portion of the response.
9.4 The presence of the RIMPAC vessels necessitated a stepped up decon.
9.5 Minimal oil remains in the mangroves. There is still a sheen coming from Waiau Stream even though recovery of product from the stream is considered 100%.

10) 11:50 Other Business
Legislation to direct HEPCRA filing fees to the LEPCs will be reintroduced this year.
Interest on the ERRF will be used to support oiled wildlife clean ups and the DLNR will be responsible and will provide facilities.

11) 11:55 Schedule next HSERC meeting
A motion to schedule the next HSERC meeting in November was made, seconded and approved.

The meeting was adjourned at 12:13.

Proposal 1

TO: Marsha Mealey, Hawaii State Emergency Response Commission

FROM: Jay Sasan, Hawaii LEPC Lead Agency Coordinator
Clifford Ikeda, Kauai LEPC Chairperson

DATE: September 5, 1996

SUBJECT: HMEP Grant Application Proposal

The Local Emergency Planning Committee (LEPC) for Kauai and Hawaii counties have agreed to pool the limited funds for a joint HMEP grant proposal. It is hoped that this will maximize use of the funds for both counties.

Problem

The education of the total public, which includes the general population, LEPC members, and individuals under the requirements of the right-to-know act needs to be continually reinforced. It would be much more beneficial if an educational tool be developed that would focus on Hawaii.

It is proposed that a working committee from Kauai and Hawaii work with an educational video company to develop an educational video.

1. Detailed Description of The Project

Prepare educational video: Information to include law, state requirements, state and county organization and program, and LEPC.

2. Detailed Budget

$15,000 contract for video production.

3. Description of How Project Will Benefit LEPC

Educational video for government officials and employees, LEPC training, business organizations, and general public.

4. Description of How This Project Meets The Requirements of The Approved Grant

There is a need to educate all sections of the public.

This video would serve to expedite the whole educational process while depicting accurate and timely information. The video would provide For public outreach and education and provide support for the LEPCs.

Thank you for your consideration to this proposal.

dy

Proposal 2

HONOLULU LOCAL EMERGENCY PLANNING COMMITTEE
HMEP PLANNING GRANT PROPOSAL

PROJECT DESCRIPTION

The Honolulu LEPC proposes to develop a Home Page along with a Search Engine on the Internet for the Honolulu LEPC. This will allow the public ready access to information about the Honolulu LEPC and its activities, the LEPC Hazmat Plan, and facilities which report EPCRA data. Data will reside in the State Civil Defense server.

BUDGET

Costs involved are as follows:

Development of Home Page	$2500
Search Engine Software	$1000 (est.)
Total	$3500

BENEFIT TO LEPC

Currently, there is no wide spread and ready access to EPCRA data reported by facilities and information about the LEPC and its activities. The vast majority of the public knows little or nothing about the LEPC and chemical information about facilities in their back yards due to the lack of funding for LEPC outreach activities. Public access via the Internet to LEPC information will greatly enhance the public's awareness of chemicals in their community, and ultimately make the community a safer one to live and work in.

GRANT REQUIREMENTS

This proposal satisfies the State of Hawaii priority of providing for public outreach and education to ensure a successful EPCRA program. It will allow the Honolulu LEPC to more fully implement

HEPCRA for the City and County of Honolulu and satisfy public disclosure policy as outlined in the LEPC Hazmat Plan, ensuring that timelines and established milestones are accomplished.

Proposal 3

HONOLULU LOCAL EMERGENCY PLANNING COMMITTEE
HMEP PLANNING GRANT PROPOSAL

PROJECT DESCRIPTION

The Honolulu LEPC proposes the acquisition of an automation system including computer hardware and software to enhance planning efforts and EPCRA data management capabilities. The system includes a Pentium processor, laser printer, and software package.

This automation system will exponentially enhance the maintenance of the LEPC Hazmat Plan and greatly facilitate handling of EPCRA data reported by over 475 facilities on Oahu. Risk analyses and vulnerability assessments can be conducted in great detail by interfacing with the City GIS, and detailed profiles of facilities can be prepared.

BUDGET

Projected costs:

Price Schedule 1383

Line	Item		Price
163	IBM 658779T PC, P133, 16MB, 1.26B, WIN3.1/95		$1991.60
165	PROTEON P1394+ ADAPTOR, TOKEN RING, 16/4, 15A		208.00
166	NEC CKR-1350A DRIVE, CD ROM 6X		99.84
139	IBM 6544403 MONITOR, 17"COLOR, 28DP		842.40
66	MS 1356395V200 MOUSE, SEV, PS2		78.00
39	IBM 6339098		28.08
	ADDITIONAL 16MB RAM		1000.00
		TOTAL	$4197.92

Price Schedule 1423

12	CABLE, PARALLEL PRINTER, 10', BELKIN FA032-10		$ 10.40
46	MEMORY, 2MB SIMM		144.56
58	PRINTER, LU 600DPI, 12PPM, HP4+C2037A#ABA		1472.64
		TOTAL	$1627.60

Price Schedule 1504

1	ATTACHMATE EXTRA FOR WINDOWS, PART #P8200	$ 315.00

Separate

MICROSOFT OFFICE PROFESSIONAL, CD ROM VER	$ 600.00
GRAND TOTAL	$6740.52

BENEFIT TO LEPC

The Honolulu LEPC currently utilizes a computer shared with the Oahu Civil Defense Agency. The machine is an old, updated 286 with a 13" monitor, utilizing slow network software. The computer is incapable of interfacing with the City's GIS and cannot fully run CAMEO Windows. Since the computer is used by the Oahu Civil Defense Agency for an automated call system, the LEPC must time share computer usage.

A dedicated Pentium system described in this proposal will vastly enhance the maintenance of the Honolulu LEPC Hazmat Plan. The ability to interface with the City GIS will allow for detailed risk analyses and vulnerability assessments to be conducted. CAMEO Windows will be able to be fully utilized for data management and preparation of detailed facility profiles.

The LEPC will greatly enhance its capabilities to plan and conduct business with this automation system.

GRANT REQUIREMENTS

This proposal satisfies several of the State of Hawaii priorities for a successful EPCRA program. EHS facilities can be fully characterized, hazard analyses can be prepared and the LEPC Hazmat Plan can be fully updated. Enhanced management of facility databases will ensure the public up to date information, and detailed plume modelling will enhance exercise planning.

Proposal 4

REQUEST FOR A HAZARDOUS MATERIALS EXERCISE FOR MAUI COUNTY LEPC BY: JOSEPH G. BLACKBURN, MAUI LEPC CHAIRPERSON

(1) Detailed Description of the Project:

Developing, Coordinating, Conducting and Evaluation of a Full Scale Hazardous Materials Exercise. Work to Include the Following:

1. Meet State and Federal Requirement in order to obtain exercise credit from FEMA and EPA
2. Coordinate and conduct exercise design meetings.
3. Proposed exercise scenario plans based on input from exercise design committee.
4. Conduct, Facilitate, Coordinate and Evaluate Scenario as designed in exercise scenario.
5. Conduct a post exercise critique.
6. Submit a draft written report.
7. Submit a final written report.

(2) Detailed Budget

ESTIMATED COSTS:
Hourly Fee: 50.00 per hour X 160 hours = $8,000.00

(3) Description of How the Project Will Benefit the LEPC:

A Full Scale Hazardous Materials Exercise will benefit the County of Maui, by testing the latest version of Annex P, in the County of Maui Emergency Operations Procedures. Participant agencies will also benefit from the exercise by learning from the exercise. The public will be provided a more efficient and effective response capability by agencies involved in hazardous materials response.

Respectfully Submitted:

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