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SECTION 16

REMEDIAL ACTIONS INTERIM FINAL – JUNE 21, 2009

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16.0 REMEDIAL ACTIONS

If a hazardous substance release substantially endangers public health or the environment, an appropriate response action is required. The Hawai'i State Contingency Plan (SCP) [Hawai'i Administrative Rules (HAR), Title 11, Chapter 451 ([HAR, 1995](#))] defines two response action processes: removal and remediation. The HDOH Hazard Evaluation and Emergency Response Office (HEER Office) may decide remedial action is appropriate for a complex release site, if site-specific data may be difficult to obtain, or when additional scrutiny, review, and feedback by third parties could be beneficial.

For example, the HEER Office may decide on a remedial action approach under the following conditions:

- Groundwater contamination, especially in a drinking water aquifer
- Soil contamination with a direct migration pathway to a nearby drinking water aquifer
- Contamination (soil or groundwater) crosses property boundaries
- Contaminants are present at high levels or consist of complex mixtures
- Soil contamination beyond the reach of conventional excavation equipment, and still presents exposure pathways for identified environmental hazards
- Site is adjacent to current or potential sensitive communities/residences (such as for schools, day care centers, or public recreational areas) and/or may impact sensitive/protected species

The voluntary Fast Track Cleanup Program (see [Section 15](#)), which provides an option for a more streamlined process for site investigations and cleanups, is intended for sites where removal actions, rather than remedial actions, will occur. Sites in the Voluntary Response Program (VRP) (see [Subsection 1.3.2.5](#) and [Section 20.3](#)) for additional information on the VRP) are required to follow the public participation steps of the remedial action process whether the cleanup response is conducted as a removal or a remedial action.

The additional documentation and review steps provided by the remedial action process (see [Section 2, Figure 2-2](#)) are necessary to address the more complex or sensitive nature of

these cleanups. Remedial actions may include physical, biological, or chemical methods to isolate or transform the contamination, as well as measures to protect human health and the environment.

Wherever a release constitutes a threat or potential threat to human health or the environment, the HEER Office will seek to identify a responsible party and request their cooperation in conducting and paying for assessment and/or response action, as appropriate under Hawai'i Environmental Response Law ([HRS 128D](#)). If necessary, the HEER Office may enter into consent agreements or issue orders to require identified responsible parties to conduct any necessary assessments or response actions.

Remedial response actions are intended to:

- Eliminate, reduce, prevent, minimize, mitigate, or control risks to public health or the environment
- Provide for efficient, cost effective, and reliable long-term cleanup remedies which protect human health and the environment

A remedial action consists of four broad phases:

- Remedial investigation
- Remedial alternatives analysis
- Remedy selection
- Remedy implementation

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16.1 CONDUCTING A REMEDIAL INVESTIGATION

Remedial response actions are typically more complex than removal actions and often require additional site investigation to support appropriate decisions. The remedial investigation helps define and evaluate the nature and magnitude of the threat; but its primary goal is to collect data for use in analyzing remedial alternatives and selecting an appropriate alternative for the site.

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16.1.1 REMEDIAL INVESTIGATION SCOPING

The first step in conducting a remedial investigation is investigation scoping. Existing information is assessed and analyzed, and data needs identified. It is not uncommon for additional site investigation to be required to support appropriate decisions in the remedial alternatives analysis.

The following steps should be conducted, as appropriate:

- Assemble and evaluate existing site data
- Identify and characterize the threat

- Develop a conceptual site model to represent the site
- Identify environmental hazards associated with contaminants that exceed State of Hawai'i Department of Health (HDOH) Tier 1 environmental action levels (EALs)
- Identify applicable requirements and guidance to be considered
- Identify data needed to support remedial alternative selection
- Notify natural resources trustees if natural resources are or may be affected
- Develop field sampling plan and quality assurance project plan
- Prepare site-specific health and safety plan

As discussed in [Subsection 3.1](#), project scoping is a critically important step for developing a successful investigation. Inadequate scoping can lead to failures such as:

- Overlooking a significant contaminant
- Overlooking a significant contaminant transport pathway
- Overlooking a significant area of contamination
- Overlooking a sensitive receptor
- Collecting unusable data due to poor sample plan design
- Not collecting the data needed for remedial alternatives analysis
- Selecting an inappropriate cleanup method due to poorly collected data

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16.1.2 PRELIMINARY IDENTIFICATION OF LIKELY AND/OR PRESUMPTIVE CLEANUP ALTERNATIVES

The identification and development of cleanup alternatives starts early and is dynamically revised as new data is collected. Based on the scoping phase and degree of site investigation data available, an initial set of potential remedial actions may be identified based on the type of contaminant, type of contaminated media, etc.

“Presumptive remedies” are available for several typical release scenarios (e.g., typical contaminants or disposal practices, or based on effects on environmental media). United States Environmental Protection Agency (USEPA) provides guidance on presumptive remedies, which are preferred by the HEER Office where appropriate. The USEPA [Presumptive Remedies](#) website.

When reviewing presumptive remedy guidance documents, confirm that cited methods are still considered to be best/good practices. Changes in cleanup technologies, scientific understanding, regulatory requirements, or public acceptance may affect whether a presumptive remedy is considered to be the preferred choice for a particular site.

The USEPA has developed specific presumptive remedy [guidance documents](#) pertaining to wood treatment sites, municipal landfills, volatile organic compounds (VOCs) in soils, and contaminated groundwater for Comprehensive Environmental Response, Compensation & Liability Act (CERCLA) sites. Other organizations such as the Interstate Technology and Regulatory Council (ITRC) also publish documents on the testing, performance, and feasibility of selected remediation technologies and can be good sources of information when selecting or considering remedy alternatives. The ITRC website can be found at: www.itrcweb.org (<http://www.itrcweb.org/>).

A detailed discussion of common cleanup technologies is presented in [Section 17](#).

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16.1.3 REMEDIAL INVESTIGATION AND REMEDIAL INVESTIGATION REPORT

The HEER Office will require submittal of a Remedial Investigation Report for sites following the remedial action process. The report compiles data collected from previous investigations (if relevant and representative of site conditions), plus supplemental investigation data collected to assist in characterizing the site and/or selecting remedial alternatives.

The Remedial Investigation should follow the guidance provided in [Section 3](#) for site investigation design and implementation. The Remedial Investigation Report should be prepared according to the guidance provided in [Section 18](#) on preparing Site Investigation Reports.

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16.2 SETTING REMEDIAL ACTION OBJECTIVES AND CONDUCTING A REMEDIAL ALTERNATIVES ANALYSIS (RAA)

Identifying the primary remedial action objectives is the first step in the RAA process. The objectives are specific goals to be achieved by the selected remedy; these will include fulfilling applicable requirements (See [Subsection 16.2.1.1](#)). The remedial action objectives should identify questions requiring answers, site characteristics, chemicals of potential concern (COPCs), and potential outcomes.

Examples of remedial action objectives for a site with soil contamination are:

- Remove exposure pathways between contaminants and receptors (either human or ecological receptors)
- Achieve cleanup of soil to below applicable HDOH EALs for a residential (unrestricted use) scenario
- Utilize USEPA [presumptive remedies](#) to the extent practicable
- While conducting the cleanup, follow all applicable federal, state, and local regulations pertaining to the site and the response actions
- Minimize potential adverse impacts to the community and the environment during implementation of the remedial action

- Properly dispose of waste streams generated by the remedial action

The Remedial Alternatives Analysis (RAA) Report is a formal presentation of the evaluation of different possible cleanup measures (remedial alternatives) that could be taken in response to a particular release. Therefore, the RAA Report:

- Identifies possible remedial alternatives
- Analyzes each remedial alternative's effectiveness, implementability, and cost
- Recommends a preferred remedial alternative

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16.2.1 THRESHOLD CRITERIA FOR REMEDIAL ALTERNATIVES

All remedial alternatives evaluated must meet certain threshold criteria, described in subsections below. These are minimum requirements for a cleanup measure that may be considered for selection. If a cleanup measure cannot meet the threshold criteria, it is not an acceptable alternative and cannot be included in the remedial alternatives analysis.

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16.2.1.1 APPLICABLE REQUIREMENTS

Remedial alternatives must comply with all applicable requirements, which are: any federal, state, or local requirements that are legally applicable to a hazardous substance, the response action, location, or other circumstance at a particular site. Examples of applicable requirements are:

- Air pollution emission limits on an on-site incineration process – regulated by the United States (U.S.) Clean Air Act and [HRS 342B](#).
- Effluent discharge limits on wastewater discharges from an on-site treatment process – regulated by the U.S. Clean Water Act and [HRS 342D](#).
- Grading, stockpiling, trenching – regulated by various county ordinances.

However, these actions may not require state or county permits if the activity controlled by an applicable requirement will be conducted entirely on site, and if the response action involving the activity is being conducted in compliance with [HRS 128D](#). In these cases, the remedial alternative being applied must comply with all substantive requirements of the law authorizing the actions (e.g. grading permits), since the law is an applicable requirement.

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16.2.1.2 HUMAN HEALTH AND ECOLOGICAL RISK LEVELS

All remedial alternatives considered must use cleanup levels meeting the following criteria:

Systemic toxicants: Cleanup levels must represent concentrations to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime (as appropriate), incorporating an adequate margin of safety. Refer to the EALs provided in Evaluation of Hazards at Sites with Contaminated Soil and Groundwater ([HDOH, 2016](#)).

Known or suspected carcinogens: Cleanup levels should be concentrations that represent an excess upper bound lifetime cancer risk to an individual of between 10E-4 and 10E-6, using information on the relationship between dose and response. The 10E-6 risk level will be used as the point of departure for determining acceptable cleanup levels for remedial alternatives in most situations, and when (1) individual chemical-specific federal or state cleanup levels are not available, or (2) individual chemical-specific federal or state cleanup levels are not sufficiently protective due to the presence of multiple contaminants or multiple pathways of exposure. Refer to the EALs provided in Evaluation of Hazards at Sites with Contaminated Soil and Groundwater ([HDOH, 2016](#)).

Ecological receptors: Where these concerns are identified, cleanup levels should address impacts to ecological receptors. For example, on sites that have significant ecological risk concerns, the applicable HDOH Tier 1 EAL may be 200 mg/kg in soil rather than 400 mg/kg in soil for those sites where only human health concerns are being addressed. Alternatives for sites with ecological risk concerns must incorporate findings of any natural resource assessments conducted to address such impacts.

The HEER Office has developed an environmental hazard evaluation (EHE) process, presented in [Section 13](#), to address these protectiveness criteria. Remedial actions that reduce contaminants below the appropriate HDOH Tier 1 EALs for the site will meet these criteria for protection of health and the environment. Information and lookup tables regarding HDOH EALs for specific contaminants is available in the guidance document ([HDOH, 2016](#)), and may be accessed quickly through the use of the on-line HDOH EAL "[Surfer](#)" tool

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16.2.2 DEVELOPMENT OF REMEDIAL ALTERNATIVES

If possible, a preliminary list of likely cleanup alternatives developed earlier in the remedial action process should be used as a starting point for the detailed development of remedial alternatives (see [Subsection 16.1.2](#)).

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16.2.2.1 HIERARCHY OF REMEDIAL ALTERNATIVE SELECTION

A primary objective of any remedial action is to reduce the toxicity, mobility, volume, and extent of released hazardous substances. As noted in the Hawai'i SCP [HAR 11-451-8(c)] ([HAR, 1995](#)), all removal and remedial response actions should consider a hierarchy of response action alternatives in this descending order:

1. Reuse or recycling
2. Destruction or detoxification

3. Separation, concentration, or volume reduction
4. Immobilization of hazardous substances
5. On-site or off-site disposal, isolation, or containment
6. Institutional controls or long-term monitoring

When selecting and analyzing remedial action alternatives, this general hierarchy of response actions should be considered to help prioritize the alternatives.

1. **Reuse or recycling.** Released hazardous substances may sometimes be directly reused or recycled after recovery, depending on the quality of the recovered materials. Examples include:
 1. Reuse or recycling of recovered petroleum “free product” as motor fuel or boiler fuel
 2. Recycling of metallic lead fragments as recycled scrap metal
2. **Destruction or detoxification.** Organic hazardous substances can be destroyed or detoxified by altering their molecular structures, and, in principle, may be converted into carbon dioxide, water, and inorganic salts. Hazardous substances that pose a threat due to corrosivity or reactivity often can be neutralized. Examples include:
 1. Biodegradation of organic hazardous substances
 2. Combustion or incineration of organic hazardous substances
 3. Neutralization of extremely acidic (low pH) or basic (high pH) corrosive substances
 4. Detonation of unexploded ordnance or other explosive substances
3. **Separation, concentration, or volume reduction.** Contaminated material may be completely or partially separated from material that is not contaminated, or contamination may be reduced in a large volume of material by concentrating the contaminant in a smaller volume. Examples include:
 1. Soil vapor extraction to extract volatile contaminants from subsurface soils
 2. Groundwater extraction, filtration by activated carbon, and disposal of the carbon in an approved landfill
 3. Soil particle size separation to reduce contaminated soil volume
4. **Immobilization of hazardous substances.** The physical state of a contaminant may be changed so it is no longer mobile in the natural environment. Examples include:
 1. Binding of mobile heavy metals into low-mobility phosphates, sulfides, etc.
 2. Chemical additives to reduce the bioavailability of contaminants
 3. Vitrification of contaminated soil
5. **On-site or off-site disposal, isolation, or containment.** Contaminated material may be placed in an engineered facility or feature designed to minimize future release of hazardous substances and in accordance with applicable requirements. Examples include:
 1. Off-site disposal at permitted landfills

2. On-site isolation of contaminated soil by covering the soil with a concrete cap
3. On-site containment of soil gas with vapor barriers or active ventilation systems
4. On-site containment of contaminated groundwater with sheet piles or slurry walls
5. Reducing mobility of free phase petroleum in soil or groundwater by removing petroleum to residual saturation or less

6. **Institutional controls or long-term monitoring.** Site uses may be restricted through administrative methods and/or long-term monitoring to assess changes in contaminant distribution over time. Examples include:

1. Environmental covenant to prohibit disturbance of contaminated soil
2. Establishment of a monetary trust to fund environmental response efforts if contamination left in place is disturbed in the future.
3. Long-term monitoring of a “stable” groundwater contaminant plume
4. Public notices and advisories against consumption of contaminated foodstuffs

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16.2.2.2 PRELIMINARY SCREENING OF ALTERNATIVES

Initial identification of all potentially applicable remedial alternatives should be fairly broad. This initial list of alternatives can be narrowed by ruling out those alternatives that, while applicable in theory, will not work at the site due to factors such as site conditions or technology limitations. Typically, a minimum of five alternatives are considered initially, one of which is the null or “no action” alternative to use as a baseline.

A comparison table depicting the various alternatives considered, practicality of implementation at the site, and costs associated with each option will assist in clearly documenting the advantages and disadvantages of each alternative considered. Generally, at least 3 alternatives that have been screened and judged potentially feasible and practical for the site are carried forward for more in-depth review and analysis (see [Subsection 16.2.3](#)). In some cases, the remedy eventually selected will be a combination of remedial actions that are required to achieve the remedial action objective.

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16.2.2.3 SOURCE CONTROL ACTIONS

A “source control action” prevents the continued release of hazardous substances into the environment, primarily from a source on top of or within the ground, or in buildings or other structures.

Typical source control actions include:

- Removal of hazardous substances from drums, tanks, or pipelines to prevent leakage into the ground

- Removal of floating petroleum “free product” from the water table to prevent continued contamination of soil and groundwater
- Cleanup of contaminated soil to prevent direct exposure to the public
- Cleanup of contaminated soil to prevent leaching impacts to groundwater

When remedial alternatives for source control actions are developed, the remedial alternatives analysis should present:

- At least one alternative where the principal element is treatment that reduces the toxicity, mobility, or volume of the hazardous substances. As appropriate, a range of treatment alternatives should be presented, including:
 - An alternative that removes or destroys hazardous substances to the maximum extent feasible, eliminating or minimizing the need for long-term management.
 - Alternatives that vary in the degree of treatment used and the residuals and untreated wastes that must be managed.
- At least one alternative where protection is provided primarily by preventing or controlling exposure through engineering controls and, as necessary, institutional controls.

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16.2.2.4 GROUNDWATER REMEDIAL ACTIONS

Analysis of remedial alternatives for groundwater contamination must assess varying restoration time periods utilizing different cleanup technologies.

16.2.3 EVALUATION OF CLEANUP ALTERNATIVES

Once all potential remedial alternatives are identified and screened to eliminate those that are not practical or technologically feasible at the site, the remaining alternatives are further evaluated relative to each other. The additional evaluation is based on three criteria:

- Effectiveness
- Implementability
- Cost

As noted previously, the evaluation of selected remedial alternatives should be presented in a table format. The table should be supplemented with detail provided in narrative form. For example, the narrative text could present the criteria used for detailed evaluation of remedial alternatives, and a table could summarize the main considerations in the detailed analysis of remedial alternatives selected. Concise summary presentation of remedial alternative comparisons is very helpful with respect to public participation requirements (see [Subsection 16.3.2](#))

Based on the evaluation of these criteria, a preferred alternative (or combination of remedial actions) that meets the site’s remedial objectives is selected by the responsible party/site consultant

and identified in the results or summary portion of the RAA report (see [Subsection 16.2.4](#))

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16.2.3.1 EFFECTIVENESS

Effectiveness means the degree to which an alternative:

- Reduces toxicity, mobility, and volume through treatment
- Minimizes residual risks
- Affords reliable long-term protection
- Complies with applicable requirements
- Minimizes short-term impacts
- Quickly achieves protection

Effectiveness must consider both short-term and long-term elements.

16.2.3.2 IMPLEMENTABILITY

Implementability means the technical and administrative feasibility of the alternative:

Technical feasibility includes:

- Availability of equipment, facilities, and specialists needed
- Compatibility of the technology with site conditions

Administrative feasibility includes:

- Availability of necessary approvals
- Degree of community acceptance

16.2.3.3 COSTS

Each alternative must be considered in terms of total life-cycle cost, not just the up-front capital cost. This is especially important when evaluating alternatives that involve long-term operation and maintenance or other long-term costs that may be incurred by current or future responsible parties. Costs evaluated should include:

- Capital costs
 - Direct construction costs
 - Indirect costs
 - Opportunity costs imposed by the remedial alternative (for example, reduction in property value due to activity and use limitations)

- Annual cost of operation and maintenance (O&M)
 - Sampling and analysis, equipment maintenance, labor
 - Oversight costs (HEER Office or private consultant)
 - Opportunity cost (for example, reduction in annual revenue due to activity and use limitations)
- Contingency costs – possible cost of repairs / restoration in case of remedy failure

Costs should be presented in two formats: (1) as a lump-sum dollar amount in current dollars, with future costs amortized; and (2) as a graph showing projected costs over time.

16.2.4 REMEDIAL ALTERNATIVES ANALYSIS REPORT

The RAA report presents a concise discussion of the remedial alternatives identification and evaluation process for the site, including rationale for the preferred alternative. The content and level of detail in the RAA report will vary depending on the nature and extent of the release, as well as the remedial action or combination of remedial actions selected. The completed report is submitted to the HEER Office for review and comment. See [Section 18](#) for an example outline of a RAA report.

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16.3 SELECTION OF A CLEANUP REMEDY FOR THE REMEDIAL ACTION

Once the RAA has been completed adequately, and sufficient information has been gathered for public review and a remedy selection decision, the HEER Office will solicit public review and comment on the preferred remedy selection decision prior to making a final remedy selection. The final remedial alternative selection is approved by or chosen by the HEER Office.

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16.3.1 PREPARING A DRAFT RESPONSE ACTION MEMORANDUM (RAM)

The Draft Remedial Action Memorandum (RAM) is a concise summary of site investigation and environmental hazard data, supplemental remedial investigation data (if applicable), the remedial alternatives analysis, and the preliminary remedial alternative selected for the site.

The Draft RAM is used to solicit public review and comment on the proposed remedial action. The Draft RAM may be assembled and finalized by the HEER Office, or alternately, the HEER Office may request or offer the responsible party/site environmental consultant an opportunity to prepare a “preliminary” Draft RAM. In this case, the preliminary Draft RAM would be carefully reviewed and edited, as necessary, for use as the HEER Office Draft RAM for public review.

[Subsection 18.5.13](#) presents detailed content recommendations for the Final RAM, and all but the last several elements of these recommendations would also be applicable for the Draft RAM.

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16.3.2 PUBLIC PARTICIPATION AND PUBLIC NOTICES

For remedial response actions, public notice and a minimum 30-day public comment period to review the Draft RAM and associated documents and provide comment are required under the Hawai'i SCP. This public notice and comment period must be completed prior to adopting the Final RAM and implementing the selected remedial alternative. A public meeting may also be held to review and discuss the Draft RAM, at the discretion of the HEER Office. VRP sites must follow the public participation steps of the remedial action process (see [Subsection 20.3](#), VRP).

In some cases, public participation and community involvement activities should be started long before the Draft RAM is prepared. Site assessment and remedial investigation activities can identify the presence of off-site contamination, and potentially affected human and ecological receptors. Early contact with adjacent property owners as well as affected and interested groups, such as neighborhood boards, community groups, and environmental or public interest organizations, may be valuable in helping to identify site-specific issues relevant to the remedial action that otherwise might be overlooked. At a minimum, it is recommended that a public participation plan be developed concurrent with, or as soon as the Draft RAM is completed.

As part of the public participation process, a 2-page fact sheet typically is made available for interested parties. This fact sheet, which summarizes contaminants in the release, site environmental conditions, site environmental hazards, and the preferred remedial action selected for the site, can be posted on the HEER Office website and sent to interested parties via postal mail or e-mail. If the degree of public interest in the site is sufficient, the HEER Office may also decide to hold a public meeting. A public meeting generally would be scheduled in the evening on a weekday at a public meeting space near to the remediation site. The public meeting also generally would be held in the middle of the public comment period (e.g. two weeks from time notice published in the newspaper) to allow time for the public to review additional site information both before and after the meeting. A record of the public meeting, in the form of a transcript, recording, or minutes is prepared and made available to the public.

Public notices, where required or provided at the discretion of the HEER Office, primarily advertise availability of the administrative record for a particular site, the proposed response action, and the opportunity to review the record and submit public comment on the proposed response action within a specified comment period (at least 30 days). When a decision has been made by the HEER Office to hold a public meeting regarding the proposed response action, the meeting is also advertised in the public notice. Generally, public notices provide the following type of information:

- Location and size of site
- Hazardous substances and media being addressed
- Availability of key site documents such as the Draft RAM for a remedial response action – these key documents are made available in a local library, on the HEER Office website, and/or at the HEER Office in Honolulu
- Availability of the full administrative record for the site in the Honolulu HEER Office
- Availability of a “fact sheet” or an executive summary document containing concise summary information on the site and response action proposed, with contact number/e-mail

to request

- Solicitation of written or oral comments on the proposed response action within the specified public comment period of at least 30 days, the address and e-mail to send comments; who to call for questions
- If a public meeting scheduled – date, time, and location of the meeting

Note: Publication date of the public notice is the official start of the public comment period (at least 30 calendar days).

Public notices are typically posted for one or two days in the “Public Notices” section of a general circulation newspaper in the county affected by the response action. An example Public Notice for a Draft RAM is provided in [Subsection 18.5.13](#).

The HEER Office project manager for the site also will send a copy of the public notice to the HDOH Office of Environmental Quality Control (OEQC) bulletin editor for publication in The Environmental Notice. The OEQC publishes this bulletin every two weeks to inform the public of all projects being proposed in the State that are subject to public review and comment.

In some cases, the HEER Office project manager may send notice or request notice information be sent via direct mail or e-mail to directly inform known interested parties about the proposed response action, and to solicit their review and input.

- Known community groups in the site area (e.g., community/neighborhood associations or councils)
- Property owners surrounding the site
- Political representatives of the site area (i.e., City or County Council member(s), Legislative Senator/Representative from the site area)
- Public interest groups, if known and likely to have interest
- Other interested parties, if known

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16.3.3 PREPARING A FINAL RESPONSE ACTION MEMORANDUM (FINAL RAM)

The HEER Office will consider all written, verbal, and e-mail comments on the Draft RAM and assess whether the preferred remedy selection decision is appropriate, make a final remedy selection decision, and document the decision by preparing a Final RAM for inclusion in the site administrative record. The Final RAM is HDOH’s official decision on how the site is to be cleaned up. If the HEER Office decides there will be no changes to the preferred remedy identified in the Draft RAM, the Final RAM will be the same as the Draft RAM with the exception of the addition of the “Responsiveness Summary,” a summary of HEER Office responses to public comments received on the Draft RAM.

In some cases, new information could be collected in the public comment period, after publication of the Draft RAM but before the HEER Office's final remedy selection decision that may substantially change the consideration of the performance or costs associated with the preferred remedy. In such cases, the HEER Office's choice of a final remedy may differ from the preferred remedy presented in the Draft RAM. If the changes to a Draft RAM selected by the HEER Office could be reasonably anticipated based on the information in the Draft RAM, the HEER Office may simply amend the Final RAM to include a discussion of the changes and the reasons for such changes.

If the selected remedy is significantly different from the preferred remedy in the Draft RAM, the HEER Office will provide additional public notice, and seek additional public comment on a revised Draft RAM, which includes a discussion of the changes and the reasons for such changes, before making a final remedy selection.

Additional public notice is not required when a final remedy selection decision is made. However, it is recommended that notice be given to interested parties as a courtesy.

[Subsection 18.5.13](#) presents detailed contents recommendations for the Final RAM, which includes a "Responsiveness Summary" that provides specific HEER Office responses to the public comments received.

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16.4 IMPLEMENTING THE CLEANUP REMEDY SELECTED

The issuance of a Final RAM only means that a decision has been reached as to how the cleanup of the site should be completed. The next step is to actually implement the selected remedy in the Final RAM. Typically, a responsible party conducts the remedial action voluntarily or under a VRP agreement with HDOH (see [Subsection 1.3.2.5](#) and [Subsection 20.3](#)). In some cases, the responsible party may conduct the cleanup under a formal consent agreement or an order from HDOH. Although rare, a remedial action cleanup may also be conducted by the HEER Office if a responsible party to perform necessary work cannot be identified.

In some cases, a remedial action can be implemented and completed in a relatively short time (e.g. less than a year). In these instances a concise Remedial Action Work Plan (see [Subsection 18.5.14](#) and a final Remedial Action Report (see [Subsection 18.5.15](#)) approved by the HEER Office may be sufficient documentation for the cleanup. If the remedy did not involve continued long-term monitoring or engineering/institutional controls, an environmental hazard management plan (EHMP) for the site may be unnecessary (see [Subsection 19.6](#) and [Subsection 18.5.16](#)).

However, depending on the nature and extent of the release as well as other factors, it could take multiple years to implement a remedial action after the Final RAM is issued. Complex cleanups may require construction and installation of specialized remedial systems, or collection of additional site data to optimize remedial design prior to remedial action implementation. In some cases, such as at groundwater cleanup sites, once the remedial system has been constructed and installed, it may operate for multiple years before the cleanup is completed.

Since it may be years before a final “no further action” or “letter of completion” may be issued for the more complex cleanup sites, the HEER Office recommends interim milestone documents to report the progress and completion of key remedial actions, in addition to the initial Remedial Action Work Plan (see [18.5.14](#)) and the final Remedial Action Report (see [18.5.15](#)). Interim milestone actions and associated documents should be identified in the Final RAM.

The initial Remedial Action Work Plan describes how the remedial action will be implemented. An important element of this work plan is a detailed description of representative confirmation testing to be conducted when remedial actions are complete, including the selection of appropriate decision units and the collection of field replicates to demonstrate the precision of confirmation testing.

The final Remedial Action Report presents detailed documentation of the completed remedial action(s), including documentation that remedial action objectives have been achieved and that representative confirmation testing has demonstrated that the remedy has been successful. Environmental hazards that had been identified on the site should no longer be present, or should be controlled through the remedial action and implementation of an EHMP.

For sites where the selected remedy involves the design, construction, and long-term operation of remedial systems, recommended “interim” documents include:

- Remedial design completed: Documents that the remedial system’s design has been satisfactorily planned and completed. This report is the basis for HEER Office concurrence to initiate construction of the remediation system.
- Remedial construction completed: Documents that the remedial system’s physical construction has been satisfactorily completed. This report is the basis for HEER Office concurrence to initiate operation of the remedial system.
- Remedial operation initiated: Documents that the remedial system has been demonstrated to be operating satisfactorily.

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16.4.1 REMEDIAL DESIGN DOCUMENTATION

Remedial design documentation should be presented in a work plan for implementing the remedy selected in the Final RAM. For some types of remedies or in some circumstances, the description of the remedial action provided in the Remedial Action Work Plan may be adequate to develop the specific work plan for carrying out the remedy. However, in some cases the selected remedial action approach described in the Remedial Action Work Plan may not be detailed enough to ensure that the design is optimized. The remedial design work plan would provide the appropriate level of information and detail to initiate the remedy, and include procedures and criteria for determining that the site-specific remedial action objectives have been achieved.

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16.4.2 REMEDIAL CONSTRUCTION DOCUMENTATION

A report may be prepared to document the actual work performed on site to implement the remedy: excavation of contaminated soil; installation and operation of extraction wells; construction of containment structures; etc. This data, as well as operations and maintenance data, if applicable, will be used to assess the performance of the remedy and determine whether and when the remedial action objectives have been achieved.

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16.4.3 OPERATIONS AND MAINTENANCE (O&M) DOCUMENTATION

Operations and Maintenance (O&M) documentation is generated at sites where long-term cleanup or monitoring activities are planned, such as groundwater treatment and monitoring, or periodic inspections of engineered controls such as soil caps. Sites with on-going O&M activities may require periodic reporting to and review by the HEER Office. Long-term monitoring activities generally require the submission of periodic reports.

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16.5 SITE CLOSURE FOR REMEDIAL ACTIONS

The goal of the entire remedial action is to achieve the remedial action objectives established in the Final RAM and the Remedial Action Work Plan. Upon documentation that the remedial action objectives have been achieved, the HEER Office can make a determination that no further action (NFA) is necessary (or provide a letter of completion [LOC] for VRP sites). In the case of remedies that employ on-going engineering or institutional control measures, the NFA or LOC determination will be contingent upon continued compliance with the activity and use limitations imposed by the designated engineering and/or institutional controls. See [Section 19](#) for a detailed discussion on Site Closures, and [Subsection 19.1.2](#) for guidance regarding remedy selection and site closure implications.

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16.5.1 CONFIRMING ATTAINMENT OF REMEDIAL OBJECTIVES

The Remedial Action Work Plan should establish, and the HEER Office should approve, the procedures and criteria to be used for confirming that remedial action objectives are attained. Confirmation data is evaluated based on the data generated in the remedial construction and operations and maintenance stages, and summarized in the final Removal Action Report for the site.

After the cleanup has been completed, the environmental hazard evaluation (see [Section 13](#)) conducted as part of the Remedial Investigation should be updated. The initial environmental hazard evaluation documented the threat posed prior to cleanup activities; the updated environmental hazard evaluation documents the threats (if any) posed after cleanup activities.