Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

In 1992, the Navy contracted Willbros Engineers, Inc., to conduct a comprehensive study of the Red Hill Fuel Tunnel Complex and provide a fire, life safety, and environmental risk assessment/analysis. In 1998, the contractor completed the study and made numerous recommendations with construction costs totaling an estimated $1,352,434.00. Over the past seventeen (17) years, the Navy has implemented/completed the vast majority of the recommendations and has committed funds to complete more recommendations.

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
1.	Page 1-4, 1.6 Current Conditions	"None of the oil-tight doors are currently operational."	The oil-tight doors were repaired in October 2009. See Reference A.	Completed
2.	Page 1-5, 1.6 Current Conditions	"The general maintenance of pipelines, pipeline supports, tunnel arch supports and electrical conduits in the tunnel is sub-standard… A drain gutter which runs the length of the Lower Tunnel in the Red Hill tank area contains oil soaked much and free oil and provides an ideal mechanism for spreading a fire from Tank 1 area of the Lower tunnel up to the Tank 16 area. The gutter has laterals to each tank valve and sample area where more fuel can be found in puddles on the floor from dripping valves."	General in-house maintenance has improved since 1998, and numerous construction repair/improvement contracts have been completed. The tank sample lines have all been enclosed and the tank's drain lines have been hard-piped within the drain gutter. See Reference B. The drain gutter has been cleaned, and now only contains water that infiltrates into the tunnel.	Completed
3.	Page 1-5, 1.6 Current Conditions	"The tunnel also has numerous penetrations in the ceilings and at the floor-to-wall joint."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing penetrations and the floor-to-wall joint. See Reference C.	Completed
4.	Page 1-5, 1.6 Current Conditions	"There is currently no fixed fire protection installed in the underground fuel facility."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install fixed fire protection in the underground fuel facility. See Reference D.	Award in 2015
5.	Page 1-6, 1.6 Current Conditions, a.	"No means of secondary containment to contain or prevent the spread of leaking fuel."	The Navy and DLA, in full cooperation with EPA Region 9 and the State of Hawaii Department of Health, are	Estimated study and implementation plan completion in

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
			currently studying secondary containment as required by the Administrative Order of Consent and Statement of Work.	2017.
6.	Page 1-6, 1.6 Current Conditions, b.	"No fixed fire protection."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install fixed fire protection in the underground fuel facility. See Reference D.	Award in 2015
7.	Page 1-6, 1.6 Current Conditions, c.	"Response time and access for fire department personnel/equipment poor. Poor communication and no alarms."	In 2009, the Navy ran an exercise with the Federal and Honolulu Fire Departments. Since 2008, the Navy has run familiarization tours for over 200 Federal and City firefighters. Since 2009 Navy has installed new fire alarms throughout the entire underground fuel storage facility. The Navy has also installed a two-way radio repeater system that allows radio communication in the underground facility. A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a public announcement system and fire alarms throughout the facility. See Reference D.	Completed
8.	Page 1-6, 1.6 Current Conditions, d.	"Sub-standard maintenance of key facilities."	The Navy has completed over $100 million in facility maintenance, repairs and improvements at Red Hill. The facility is currently well maintained and its condition has substantially improved since 1998.	Completed
9.	Page 1-6, 1.6 Current Conditions,	"Lighting and power of questionable reliability under emergency conditions."	An emergency generator was installed outside of Adit 5 that provides	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
	e.		emergency power to the facility. Emergency power and lighting are currently reliable.	
10.	Page 1-6, 1.6 Current Conditions, f.	"Inadequate egress for personnel in the Lower Tank 17-20 area."	An oil-tight door was constructed in the concrete bulkhead of the Lower Access Tunnel that isolated Tanks 17-20. Personnel are now able to egress from the Lower Access Tunnel near Tanks 17-20 and exit out of Adit 3.	Completed
11.	Page 1-6, 1.6 Current Conditions, g.	"Tunnel penetrations that would reduce the capability of containing and recovering spilled fuel."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing penetrations and the floor-to-wall joint. See Reference C.	Completed
12.	Page 1-6, 1.6 Current Conditions, h.	"Vital water aquifers under the Red Hill Complex that would be contaminated by a large fuel spill."	The water well access hatch was sealed in the Water Pumping Station. There is no longer a direct path for spilled fuel to enter the water well.	Completed
13.	Page 1-7, 1.7.2 Fire/Life Safety Assessment, 1.7.2.1 Conclusions	"The overall Fire Protection Program for the Red Hill complex is very fragmented between FISC, PWC, PACDIV, and the Federal Fire Department. It is important that FISC take prime responsibility for this program and improve housekeeping, routine inspections, and preventative maintenance for the fire protection equipment and systems."	FISC, now NAVSUP Fleet Logistics Center Pearl Harbor, has taken the lead to ensure that all Navy and DLA partners come together and ensure the proper maintenance and inspection of Red Hill fire protection and equipment. A Fire Protection maintenance contract has been in place prior to 2009 that requires a contractor to inspect, maintain, and make minor repairs to the fire protection equipment and systems. See Reference E.	Completed
14.	Page 1-7, 1.7.2 Fire/Life Safety Assessment,	"Consideration should be given to contracting with an outside fire protection company to handle detailed inspection of special hazard systems on	A Fire Protection maintenance contract has been in place prior to 2009 that requires a contractor to	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
	1.7.2.1 Conclusions	an annual basis."	inspect, maintain, and make minor repairs to the fire protection equipment and systems. See Reference E.	
15.	Page 1-7, 1.7.2 Fire/Life Safety Assessment, 1.7.2.1 Conclusions	"A strong Fire Prevention Program should be instituted by FISC to improve housekeeping (clean up existing fuel spills and residue on tunnel floors and drain trenches), assure operability of all drop-track doors to provide acceptable fire and/or fuel separation, and assure availability and operability of all fire protection equipment/systems."	The Navy has completed numerous projects/contracts that support fire prevention. General in-house maintenance has improved since 1998. The tank sample lines have all been enclosed and the tank's drain lines have been hard-piped within the drain gutter. See Reference B. The drain gutter has been cleaned, and now only contains water that infiltrates into the tunnel. The drop-track doors were repaired in October 2009. See Reference A. A Fire Protection maintenance contract has been in place prior to 2009 that requires a contractor to inspect, maintain, and make minor repairs to the fire protection equipment and systems. See Reference E.	Completed
16.	Page 1-7, 1.7.2 Fire/Life Safety Assessment, 1.7.2.2 Recommendations, a. 1.	"Install an oil-tight door and bulkhead at Sta. 25+00 just below Tanks 1 and 2 in the Lower Access Tunnel."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D.	Award in 2015
17.	Page 1-7, 1.7.2 Fire/Life Safety Assessment, 1.7.2.2 Recommendations, a. 2.	"Replace the existing drop-track doors."	The drop-track doors were repaired in October 2009. See Reference A.	Completed
18.	Page 1-7, 1.7.2	"There is no fixed fire suppression system in the	A large-scale, congressionally	Award in 2015

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
	Fire/Life Safety Assessment, 1.7.2.2 Recommendations, b. Fire Suppression	tank storage area."	approved military construction contract will be awarded in the near future that will install a fixed fire suppression system in the tank storage area. See Reference D.	
19.	Page 1-8, 1.7.2.2 Recommendations, c. Emergency Power Supply	"A secondary power supply is needed and the following equipment should be connected to an emergency generator: emergency lighting, exit lights, fire alarm panels, elevators."	The Navy is currently studying the feasibility of a second electrical power supply for Red Hill. Emergency lighting, exit lights, fire alarm panels, and elevators have been connected to an emergency generator outside of Adit 5.	Feasibility study estimated completion in 2016, implementation in 2017; Emergency generator connections completed.
20.	Page 1-8, 1.7.2.2 Recommendations, d. Emergency Voice/Alarm Communication	"An approved emergency voice/alarm communication system should be installed throughout the underground facility."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install an emergency voice/alarm communication system throughout the underground facility. See Reference D.	Award in 2015
21.	Page 1-8, 1.7.2.2 Recommendations, e. Preventative Maintenance	"Numerous devices, e.g., drop-track doors, door releases, float valve mechanism have not been properly maintained and were found to be inoperable."	The drop-track doors were repaired in October 2009. See Reference A.	Completed
22.	Page 1-8, 1.7.2.2 Recommendations, f. Fire Department	"Pre-Fire Plans indicating response to different fire/emergency scenarios need to be developed and put into place."	In 2009, the Navy ran an exercise with the Federal and Honolulu Fire Departments. Since 2008, the Navy has run familiarization tours for over 200 Federal and City firefighters. The Navy runs an emergency response drill on a semi-annual basis.	Completed
23.	Page 1-8, 1.7.2.2 Recommendations, g. Egress	"There is only one method of egress from the lower tank level in the new tank section; using the elevator. A secondary method of egress should be provided by installing a man-door in	An oil-tight door was constructed in the concrete bulkhead of the Lower Access Tunnel that isolated Tanks 17-20. Personnel are now able to egress	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
		the lower bulkhead separating the two sections."	from the Lower Access Tunnel near Tanks 17-20 and exit out of Adit 3.	
24.	Page 1-8, 1.7.2.2 Recommendations, h. Manual Firefighting	"Red Hill requires the installation of fire hose stations, 150 lb. Purple K wheeled fire extinguishers, and dedicated self-contained breathing apparatus for their own personnel."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install new firefighting water lines and hose connections in the tunnels as well as at the Adits. The contract will also create a safe zone to shelter in-place in the Lower Access Tunnel behind the bulkhead door to Tanks 17-20. Self-contained breathing apparatus will be stored in the safe zone for emergency shelter in-place until rescue. See Reference D.	Award in 2015
25.	Page 1-9, 1.7.2.2 Recommendations, i. Fire Protection of Pipeline Supports	"Apply sprayed-on fireproofing on the steel pipeline supports to provide a minimum one hour fire resistance rating. Pipe supports in the tank area the most critical."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new AFFF fire suppression system in the tank area, thus making it unnecessary to fire proof the steel pipeline supports. Sprayed-on fireproofing for the steel supports is not recommended as it masks potential corrosion and makes it difficult to identify during inspections.	Award in 2015
26.	Page 1-9, 1.7.2.2 Recommendations, j. Housekeeping	"In the lower access tunnel, the trench area contains considerable accumulation of fuel residue and needs to be thoroughly cleaned."	The tank sample lines have all been enclosed and the tank's drain lines have been hard-piped within the trench. See Reference B. The trench has been cleaned, and now only contains water that infiltrates into the tunnel.	Completed
27.	Page 1-9, 1.7.2.2 Recommendations,	"The ventilation system will need further review to assure adequate ventilation for the lower tank	The Navy has completed the replacement of all ventilation fans in	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
	k. Ventilation	storage area if additional separation is provided. Since doors on any new separation will normally be open, the effect on ventilation should be minimal."	2014, assuring adequate ventilation in the underground facility. See Reference F. A large-scale, congressionally approved military construction contract will be awarded in the near future that will integrate all new fire protection systems, and any new isolation doors, with the upgraded ventilation system. See Reference D.	
28.	Page 1-9, 1.7.2.2 Recommendations, l. Overall Fire Protection Program	"The Fire Protection Program appears to be very fragmented. The Fuel Department (FISC) needs to assume a stronger, more centralized role in overall responsibility for the Fire Protection Program."	FISC, now NAVSUP Fleet Logistics Center Pearl Harbor, has taken the lead to ensure that all partners come together and ensure the proper Fire Protection Programs are in place. The Navy has developed emergency response plans, has conducted joint emergency response drills with Federal and City firefighters, and provided familiarization for hundreds of emergency responders.	Completed
29.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, a.	"Seal the manhole cover of the well in the PWC pump station and install water-tight doors before (upgradient) of the pump station."	The water well access hatch was sealed in the Water Pumping Station. There is no longer a direct path for spilled fuel to enter the water well.	Completed
30.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, b.	"Install doors or thrust block to prevent a release from reaching the PWC pump station."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D.	Award in 2015
31.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, c.	"Install U-clamps on the 16-inch line in tunnel to restrain movement of this line in case of earthquake,…"	The recommendation seemed to be rooted in the questionable structural condition of the tunnel. A large-scale tunnel structural repair project was completed in 2013. Structural integrity	Estimated further evaluation of structural improvements completed in 2016.

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
			of the tunnel was restored, potentially removing the need for additional restraints on the fuel pipeline. See Reference C.	
32.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, d.	"Install tank level monitoring system."	The Navy has installed a tank level monitoring system. The Red Hill Fuel Storage Facility, being one of kind, adapts and uses the most current and available industry monitoring technology. The tanks use a multi-function tank gauge (MTG). MTG is the industry's widely used and accepted mass tank gauging technology that is also the Navy's standard. The MTG takes fuel level readings every 12 seconds, displayed at the control center. The automated fuel handling system (AFHE) logs readings 5 times per minute, or approximately 7200 log readings per day.	Completed
33.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, e.	"Make hourly visual checks of the tanks, tunnels, and pipelines."	The Navy has installed numerous remotely operated and viewed cameras throughout the underground facility to constantly monitor conditions of the tanks, tunnels, and pipelines.	Completed
34.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, f.	"Repair and routinely test the water-tight doors."	The water-tight doors were repaired in October 2009 and are routinely tested and maintained. See Reference A.	Completed
35.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, g.	"Seal off the two former drainage tunnels to Halawa Stream."	The two former drainage tunnels to Halawa Stream have been sealed off. It's unclear if the drainage tunnel were identified in the tunnels in 1998, or if they were only identified in original	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report				
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2		**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**		
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor		Date: 5/28/15		
No.:	**Source:**	**Willbros Engineers, Inc., Recommendation:**	**Navy Evaluation:**	**Recommendation Status:**
			drawings. There is currently no physical evidence of the drainage tunnels to Halawa Stream in the fuel tunnel.	
36.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, h.	"Seal off the doorway to Former Diesel Power Station."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing the doorway to the Former Diesel Power Station. See Reference C.	Completed
37.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, i.	"Install secondary confinement thrust block below Tank 1 (oil-tight door 'D' and bulkhead)."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D.	Award in 2015
38.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, j.	"Repair and clean out french drain in Harbor Tunnel."	The french drain in the Harbor Tunnel was completely replaced in 2008/2009. See Reference G.	Completed
39.	Page 1-10, 1.7.3 Environmental, 1.7.3.1 Conclusion, k.	"Clean out and test product in open trench near sump for tanks."	The tank sample lines have all been enclosed and the tank's drain lines have been hard-piped within the drain gutter. See Reference B. The drain gutter has been cleaned, and now only contains water that infiltrates into the tunnel. The removed product was tested and properly disposed of in accordance with all applicable regulations.	Completed
40.	Page 1-11, 1.7.3 Environmental, 1.7.3.1 Conclusion, l.	"Seal the water riser shaft at Station 31+41.30 to prevent a release from reaching the surface."	The water riser shaft in the Harbor Tunnel has been sealed, preventing a possible release from reaching the surface.	Completed
41.	Page 1-11, 1.7.3	"Emergency evacuation procedures for workers	A large-scale, congressionally	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
	Environmental, 1.7.3.1 Conclusion, m.	in CINCPACFLT, possibly JIGPAC, and workers at Red Hill."	approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D. With this added feature, an evacuation of the Adit 2 area would not be necessary.	
42.	Page 1-11, 1.7.3 Environmental, 1.7.3.1 Conclusion, n.	"Floor drains in the Harbor Tunnel and Pump House should be periodically cleaned out to ensure they are working properly."	The french drain in the Harbor Tunnel was completely replaced in 2008/2009. See Reference G. The Pump House floor drains are maintained.	Completed
43.	Page 1-11, 1.7.3 Environmental, 1.7.3.1 Conclusion, o.	"The tunnel floor has many holes, some of which were formed by water damage and others man made. Efforts to seal the holes in the floor and walls should be undertaken as precautionary measures, but the possibility of sealing all holes in the floor and walls of the tunnel seems unlikely."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing penetrations and the floor-to-wall joint. See Reference C.	Completed
44.	Page 1-12, 1.7.4 Potential Catastrophic Failure and Structural Analysis, 1.7.4.2 Recommendations, a.	"Construct a new oil-tight door bulkhead and door at Station 25+00 just below Tank 1 and 2 in the narrow portion of the tunnel to confine any catastrophic failures to the Tanks 1-16 area."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D.	Award in 2015
45.	Page 1-12, 1.7.4.2 Recommendations, b.	"Refurbish existing drop track doors 'A' and 'C' to act as containment for tunnel pipeline leaks. This will adequately protect Adit 2, as well as the pumphouse, from the fuel leaks in the tunnel pipelines and provide a back-up for the new door for less than full tank failures."	The drop track doors were repaired in October 2009. See Reference A.	Completed
46.	Page 1-12, 1.7.4.2	"Consideration should be given to application of	A large-scale, congressionally	AFFF installation

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
	Recommendations, c.	fireproofing material to the critical pipe supports to provide a one hour fire resistance rating to prevent overhead 32" pipes from failing and breaking the lines at the point where they enter the concrete under each tank… To further reduce the environmental risk it is recommended that defective areas of the tunnel gunite, especially the wall to floor joint be repaired, openings in the gunite be plugged, clean outs in drain lines be installed and drains opened up, fuel and muck be removed from open drain gutters, and corroded arches be replaced. Unsafe corroded gratings over drain gutters should be replaced."	approved military construction contract will be awarded in the near future that will install an AFFF system in the Lower Access Tunnel tank gallery. See Reference D. The foam firefighting system is more effective application than spray-on fire proofing. A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing penetrations and the floor-to-wall joint. See Reference C. The drain gutter has been cleaned, and now only contains water that infiltrates into the tunnel. The drain grating has been replaced.	is part of large MILCON project with Award in 2015 Tunnel structural repairs completed. Drain gutter cleaning completed. Drain grating replacement completed.
47.	Page 1-12, 1.7.4.2 Recommendations, d.	"Install secondary containment at Adit 4 and a 3' high diversionary wall at Adit 5 tunnel tie-in. Both these projects are considered low priority to be done only after all above work is accomplished."	Since the time of this Study, the Navy has lowered the normal fill height in all tanks. This has lowered the fuel level above the Upper Access Tunnel level. With this reduced risk, coupled with the lack of any fuel piping, secondary containment and a diversionary wall at Adits 4 & 5 are not necessary.	Completed
48.	Page 1-12, 1.7.4.2 Recommendations, e.	"Construct 18" high diversionary wall at PWC pump station entrance to prevent relatively small pipeline leaks from entering the pump station."	The water well access hatch was sealed in the Water Pumping Station. There is no longer a direct path for spilled fuel to enter the water well. The elevation of the Water Pumping Station is higher than the elevation of the fuel pipeline tunnel running down to Pearl Harbor.	Completed
49.	Page 1-12, 1.7.4.2 Recommendations,	"Inspect/seal all penetrations/pipes in the lower tunnel valve galleries to prevent a massive fuel	A large-scale tunnel structural repair project was completed in 2013.	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
	f.	spill from migrating to the area outside the steel tank liner and thereby collapsing the liner."	Structural integrity of the tunnel was restored, including sealing penetrations. See Reference C.	
50.	Page 1-12, 1.7.4.2 Recommendations, g.	"If secondary containment in the upper tunnel between tanks 15/16-17/18 is not capable of retaining fuel, consider reducing the filling height in tank 17-20 to about elevation 376.85. This is equivalent to the 225' level or 288,241 BBL capacity in tank 20 and will prevent fuel from entering the upper tunnel in case of catastrophic leak in any of the four upper tanks."	The Navy has lowered the normal fill height of Red Hill tanks to less than 225 feet of fuel.	Completed
51.	Page 1-13, 1.7.4.2 Recommendations, h.	"Strongly recommend that pipelines not be relocated out of the tunnel to an underground right-of-way but FISC should maintain existing pipelines, pipeline supports, valves and tunnel structure, drains and drain gutters in good state of repair and cleanliness. The Harbor Tunnel and LAT have served as a conduit for the 3 large fuel lines connecting Red Hill to Pearl Harbor for over 50 years. The purpose of the tunnels was probably to provide bomb-proof and sabotage-proof protection for these vital pipelines. The tunnels have done an outstanding job of protecting the pipelines from corrosion… The lines installed in the tunnel allow visual and ultrasonic inspection and, therefore, have some advantages of aboveground pipelines. The lines remain in excellent condition… Although war conditions are now remote, unfortunately, terrorism is not dead. The three Red Hill lines are far better protected from terrorism in the tunnels than if they were installed near and under public roads enroute to Pearl Harbor."	The Navy has left the fuel pipelines in the underground tunnel as recommended.	Completed
52.	Page 1-13, 1.7.4.2 Recommendations,	"Provide oil-tight door/bulkhead in Adit 6 to provide secondary containment for Tanks 17-20	The Navy has conducted independent measurements and calculations of	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
	i.	(if lower tunnel bulkhead between Tanks 17-20 and Tanks 1-16 remains as is)."	Tanks 17-20, the Lower Access Tunnel, and the elevation of the Adit 6 tunnel. Based on the calculations, the fuel height would only reach up to 126 feet. This is lower than the elevation of the Adit 6 tunnel at 143 feet. The oil-tight door/bulkhead in Adit 6 is not applicable.	
53.	Page 1-14, Table 1-1, Summary of Estimated Construction Costs	"Total $1,352,434."	The Navy has completed the vast majority of the Study recommendations, and has completed or committed in facility improvements and repairs.	Completed
54.	Page 3-2, 3.3 Lower Access Tunnel (LAT) and Harbor Tunnel	"One door is in the lower access tunnel just before the wye intersection at the PWC water pump station, at Station 13+71 Door 'A' on Fig. 3-1. Door 'C' is at the Makalapa wye at Station 8+39. These doors are automatic self-closing, but the release devices on all of the doors were found to be inoperative at the time of the survey."	The oil-tight doors were repaired in October 2009. See Reference A.	Completed
55.	Page 4-5, 4.3 Fire, Life Safety, Electrical Risk Assessment, 4.3.1 Fire Protection, 4.3.2.1 General	"Communications throughout the underground facility for operations and/or fire department personnel is totally lacking. The existing telephone system is not in service."	The Navy has installed a two-way radio repeater system that allows radio communication in the underground facility for emergency responders. The telephone system is currently functional and provides a backup means of communication within the tunnels to outside parties.	Completed
56.	Page 4-6, 4.3.1.2 Red Hill Fuel Storage Area	"AFFF is the recommended agent of choice for use in suppressing hydrocarbon fires due to its swift control time. This system will reduce potential damage to the facility, reduce potential environmental concerns, and improve the overall life safety concerns."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new AFFF system. See Reference D. The AFFF collection/containment also doubles as a fuel release recovery system.	Award in 2015

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
57.	Page 4-11, 4.3.1.5.5 Fire Alarm System	"It is recommended that the fire alarm system, as proposed, be utilized for automatic actuation of the AFFF systems to be provided for the lower access tunnel areas."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new AFFF system that will be integrated with the fire alarm system. See Reference D.	Award in 2015
58.	Page 4-12, 4.3.2 Lifesafety	"At the end of the survey, the entrance to Adit 3 (Makalapa Adit Tunnel) was barricaded and padlocked. Provision should be made to be able to evacuate from this adit during an emergency. It should also be available for egress of fire fighting personnel."	The entrance being referred to is actually Adit 2. The Adit 2 entrance has been unbarricaded and emergency egress was restored.	Completed
59.	Page 4-12, 4.3.2 Lifesafety	"The only means of egress from the lower tunnel for Tanks 17-20 is the existing elevator shaft. A second means of egress should be provided for this area by installing a man-door in the existing bulkhead separating Tanks 1-16 and Tanks 17-20."	An oil-tight door was constructed in the concrete bulkhead of the Lower Access Tunnel that isolated Tanks 17-20. Personnel are now able to egress from the Lower Access Tunnel near Tanks 17-20 and exit out of Adit 3.	Completed
60.	Page 4-12, 4.3.2 Lifesafety	"The Westerly elevator (serving access tunnels for Tanks 1-16) requires a vestibule (horizontal fire separation) at each tunnel level for the protection of workers while waiting for the elevator in case of fire or other emergency."	A vestibule was constructed in the Lower Access Tunnel when the Westerly elevator was replaced. A large-scale, congressionally approved military construction contract will be awarded in the near future that will install fixed fire sprinklers in the Upper Access Tunnel. See Reference D. This relieves the need to have a vestibule in the Upper Access Tunnel.	Lower Access Tunnel completed. Upper Access Tunnel will have fire sprinklers installed per large MILCON with award in 2015
61.	Page 4-13, 4.3.2 Lifesafety	"Emergency lighting and exit signs shall be connected to the emergency power supply as discussed in Sections 4.3.3.3 and 4.6.2.3."	All emergency lighting and exits signs are connected to back up electrical generators.	Completed
62.	Page 4-13, 4.3.2 Lifesafety	"It is recommended that an early warning emergency voice/alarm communication system be installed throughout the underground facility."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install emergency voice/alarm	Award in 2015

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
			communication system throughout the underground fuel facility. See Reference D.	
63.	Page 4-18, 4.3.3.3 Emergency Lighting	"Therefore, to insure the safety of personnel in the underground facility it is required that an emergency generator be provided to supply backup power to emergency lighting, elevators, the emergency voice/alarm communication systems, and the drop-track door release devices."	The Navy installed an emergency electrical generator was installed outside of Adit 5 that provides backup power to emergency lighting, elevators, the emergency voice/alarm communication systems, and the drop-track door release devices.	Completed
64.	Page 4-19, 4.3.4 Ventilation	"Provision should be made (if it doesn't currently exist) for the mechanical ventilation system to have manual override capability such that fire department personnel can restart the system under emergency conditions."	The Navy has completed the replacement of all ventilation fans in 2014, assuring adequate ventilation in the underground facility. The ventilation system now has remote override capability. See Reference F.	Completed
65.	Page 4-34, 4.6.1 Conclusions	"A strong Fire Prevention Program should be instituted by FISC to improve housekeeping (clean up existing fuel spills and residue on tunnel floors and drain trenches), assure operability of all drop-track doors to provide acceptable fire and/or fuel separation, and assure availability and operability of all fire protection equipment/systems."	General in-house maintenance has improved since 1998, and numerous construction repair/improvement contracts have been completed. The tank sample lines have all been enclosed and the tank's drain lines have been hard-piped within the drain gutter. See Reference B. The drain gutter has been cleaned, and now only contains water that infiltrates into the tunnel. In 2012 the entire lower tunnel was pressure washed.	Completed
66.	Page 4-34, 4.6.1 Conclusions	"FISC, in conjunction with the Federal Fire Department, should develop Pre-Fire Plans for use by FISC and fire department personnel in responding to fire and other emergency conditions."	A Red Hill Fire Response Plan was written in 2008 and In 2009, the Navy ran an exercise with the Federal and Honolulu Fire Departments. Since 2008, the Navy has run familiarization tours for over 200 Federal and City firefighters. Since 2009 Navy has installed new fire alarms throughout	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
			the entire underground fuel storage facility. The Navy has also installed a two-way radio repeater system that allows radio communication in the underground facility.	
67.	Page 4-35, 4.6.2.1 Secondary Containment of Fuel and Fire Separation	"This containment would require a new bulkhead and automatic door (Door D) capable of withstanding the fuel static pressure and with the provision for retrieving the fuel similar to the method used on existing Door C near the Makalapa wye."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D.	Award in 2015
68.	Page 4-35, 4.6.2.2 Fire Suppression	"There is no fixed fire suppression in the tank storage area."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install fixed fire protection in the underground fuel facility. See Reference D.	Award in 2015
69.	Page 4-36, 4.6.2.3 Emergency Power Supply, a.	"Install the 125KV generator outside of Adit #5."	In 2012, the Navy installed a 275KW electrical generator outside of Adit 5.	Completed
70.	Page 4-36, 4.6.2.3 Emergency Power Supply, b.	"Install a new power feed from the utility company into Adit #5. This will become the primary power for the upper and lower Tunnel."	The Navy is currently evaluating a way to increase the electrical power supply to Red Hill.	Feasibility study estimated completion in 2016, implementation in 2017; Emergency generator connections completed.
71.	Page 4-36, 4.6.2.3 Emergency Power Supply, c.	"Install an automatic transfer switch to start the generator when the primary A.C. power is lost. The switch should automatically transfer to the primary source when the power is restored."	In 2012, the Navy installed an automatic transfer switch to the start the new emergency electrical generator when commercial power is lost. The automatic transfer switch automatically transfers back to commercial power when restored.	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
72.	Page 4-36, 4.6.2.3 Emergency Power Supply, e.	"Install a new lighting transformer and lighting panel in Adit #5. The transformer and panel would service elevators 1 and 2, lighting receptacles, fan, etc. in the upper tank area."	The Navy is currently evaluating a way to increase the electrical power supply to Red Hill. The concept will provide additional 480V power to the Upper and Lower Tunnels. This additional power will reduce the electrical load and increase the reliability of the existing electrical system.	Feasibility study estimated completion in 2016, implementation in 2017; Emergency generator connections completed.
73.	Page 4-36, 4.6.2.3 Emergency Power Supply, f.	"Install a new 480V circuit in the shaft of elevator #1 to supply the lower tank area."	The Navy is currently evaluating a way to increase the electrical power supply to Red Hill. The concept will provide additional 480V power to the Upper and Lower Tunnels by using Elevator No. 73' shaft to connect to a new transformer on the top of the facility. The new transformer will be supplied by new overhead high voltage lines.	Feasibility study estimated completion in 2016, implementation in 2017; Emergency generator connections completed.
74.	Page 4-36, 4.6.2.3 Emergency Power Supply, g.	"Install a new 480V A.C. manual transfer switch with the primary source from the upper tank level and a backup source from the PWC water pump station area. The backup source will be from power panel "P" located in the transformer room. As described in an earlier section the power feed is from the 13.8 KV feed from the PWC water pump station."	The Navy is currently evaluating a way to increase the electrical power supply to Red Hill. The concept will provide additional 480V power to the Upper and Lower Tunnels. This additional power will reduce the electrical load and increase the reliability of the existing electrical system.	Feasibility study estimated completion in 2016, implementation in 2017; Emergency generator connections completed.
75.	Page 4-36, 4.6.2.3 Emergency Power Supply, h.	"Install 480V lighting panel in the lower tank area. This panel will feed the following: 1. An existing 30 KVA transformer, which is currently being feed from Panel "P". This transformer provides for lighting and receptacles in the area for tanks 17-20. 2. Existing motor operators in the area for tanks 17-20. The current feed is from Panel "P". 3. Existing power panel for 480V circuits in the area for tanks 1-16. This feed would replace the current feed from the	The Navy is currently evaluating a way to increase the electrical power supply to Red Hill. The concept will provide additional 480V power to the Upper and Lower Tunnels. This additional power will reduce the electrical load and increase the reliability of the existing electrical system.	Feasibility study estimated completion in 2016, implementation in 2017; Emergency generator connections completed.

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
		PWC water pump station. 4. New 480V/208V transformer to feed the existing 208V power panel. This panel powers lights and receptacles in the area for tanks are 1-16 and the Harbor Tunnel."		
76.	Page 4-37, 4.6.2.4 Emergency Voice/Alarm Communication	"An approved emergency voice/alarm communication system must be installed throughout the underground facility… In addition a two-way telephone communication service should be provided for the use of operating and fire department personnel."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install fixed fire protection and an approved emergency voice/alarm communication system in the underground fuel facility. See Reference D.	Award in 2015
77.	Page 4-37, 4.6.2.5 Preventative Maintenance	"Numerous devices, e.g., drop-track doors, door releases, float valve mechanism have not been properly maintained and were found to be inoperable. This area needs to improved attention. In addition it is recommended that more frequent monitoring of tank levels be conducted; i.e., on an hourly basis rather than once per shift. Also Operations personnel should conduct periodic walk throughs of the tank storage area to receive any early notification of a problem area."	The oil-tight doors were repaired in October 2009. See Reference A. The Navy has installed a tank level monitoring system. The Red Hill Fuel Storage Facility, being one of kind, adapts and uses the most current and available industry monitoring technology. The tanks use a multi-function tank gauge (MTG). MTG is the industry's widely used and accepted mass tank gauging technology that is also the Navy's standard. The MTG takes fuel level readings every 12 seconds, displayed at the control center. The automated fuel handling system (AFHE) logs readings 5 times per minute, or approximately 7200 log readings per day. The Navy has installed numerous remotely operated and viewed cameras throughout the underground facility to constantly	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
			monitor conditions of the tanks, tunnels, and pipelines.	
78.	Page 4-37, 4.6.2.5 Preventative Maintenance	"Fire protection system maintenance is conducted by PWC on a monthly and semi annual basis. This covers fire suppression and fire alarm equipment systems. However, during interviews with PWC personnel, it appears that special hazard systems such as the UV flame detection system has never been properly serviced. Also the AFFF concentrate should be sampled on an annual basis and there was no evidence that this is being done. Consideration should be given to bring in an outside contractor on an annual basis with expertise in these specific areas."	A Fire Protection maintenance contract has been in place prior to 2009 that requires a contractor to inspect, maintain, and make minor repairs to the fire protection equipment and systems. See Reference E.	Completed
79.	Page 4-37, 4.6.2.6 Fire Department	"However, site interviews indicate that there are no prepared Pre-Fire Plans indicating response to different fire/emergency scenarios."	In 2009, the Navy ran an exercise with the Federal and Honolulu Fire Departments. Since 2008, the Navy has run familiarization tours for over 200 Federal and City firefighters. The Navy runs an emergency response drill on a semi-annual basis.	Completed
80.	Page 4-38, 4.6.2.7 Egress	"There is only one method of egress from the lower tank level in the new tank section, using the elevator. It is strongly recommended that a secondary method of egress by provided by installing a man-door in the lower bulkhead separating the two sections."	An oil-tight door was constructed in the concrete bulkhead of the Lower Access Tunnel that isolated Tanks 17-20. Personnel are now able to egress from the Lower Access Tunnel near Tanks 17-20 and exit out of Adit 3.	Completed
81.	Page 4-38, 4.6.2.7 Egress	"At present the entrance to Adit 3 (Makalapa Adit Tunnel) is barricaded and padlocked. Provisions should be made to be able to evacuate from this adit during an emergency. It should also be available for egress of fire-fighting personnel."	The entrance being referred to is actually Adit 2. The Adit 2 entrance has been unbarricaded and emergency egress was restored.	Completed
82.	Page 4-38, 4.6.2.7 Egress	"Emergency lighting and exit signs shall be connected to the emergency power supply as	All emergency lighting and exits signs are connected to back up electrical	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
		discussed in Sections 4.3.3.3 and 4.6.2.3."	generators.	
83.	Page 4-39, 4.6.2.7 Egress	"As noted in Section 4.6.2.8, self-contained breathing equipment should be provided to allow personnel in the complex breathable air during the evacuation period. Dedicated units should be provided in the gauger station, Receiving Pumphouse control room, and at Adits 1, 3, 5, and 6."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install new fire protection and life safety systems throughout the underground facility. The contract will create a safe zone to shelter in-place in the Lower Access Tunnel behind the bulkhead door to Tanks 17-20. Self-contained breathing apparatus will be stored in the safe zone for emergency shelter in-place until rescue. With all the fire protection and life safety upgrades, additional self-contained breathing equipment will not be required. See Reference D.	Award in 2015
84.	Page 4-39, 4.6.2.8 Manual Firefighting	"The Red Hill Complex requires the installation of fire hose stations, 150 lb. Purple K wheeled fire extinguishers, and dedicated self contained breathing apparatus for the usage of their own personnel."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install new firefighting water lines and hose connections in the tunnels as well as at the Adits. The contract will also create a safe zone to shelter in-place in the Lower Access Tunnel behind the bulkhead door to Tanks 17-20. Self-contained breathing apparatus will be stored in the safe zone for emergency shelter in-place until rescue. See Reference D.	Award in 2015
85.	Page 4-40, 4.6.2.9 Fire Protection and Pipeline Supports	"In view of the potential of this worst case scenario, consideration should be given to the application of a sprayed-on fireproofing material on steel supports to provide a minimum of one-hour fire resistance rating. Pipe supports in the	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new AFFF fire suppression system in the tank area,	Award in 2015

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
		tank area and galleries would be a higher priority that pipe racks in the tunnels."	thus making it unnecessary to fire proof the steel pipeline supports. Sprayed-on fireproofing for the steel supports is not recommended as it masks potential corrosion and makes it difficult to identify during inspections.	
86.	Page 4-40, 4.6.2.10 Housekeeping	"The floor around outlet valves in the tank valve gallery shows periodic fuel spill/leakage and needs to be cleaned."	General in-house maintenance has improved since 1998, and numerous construction repair/improvement contracts have been completed. The tank sample lines have all been enclosed and the tank's drain lines have been hard-piped within the drain gutter. See Reference B. The drain gutter has been cleaned, and now only contains water that infiltrates into the tunnel.	Completed
87.	Page 4-40, 4.6.2.11 Ventilation	"The ventilation system will need further review to assure adequate ventilation for the lower tank storage is provided when additional bulkhead separation is provided between the tank area and the main tunnel. However, the door in this bulkhead will normally be open (and provided with an automatic closure device), as is the case with the existing doors so the ventilation will only be marginally affected."	The Navy has completed the replacement of all ventilation fans in 2014, assuring adequate ventilation in the underground facility. See Reference F. A large-scale, congressionally approved military construction contract will be awarded in the near future that will integrate all new fire protection systems, and any new isolation doors, with the upgraded ventilation system. See Reference D.	Ventilation system replacement/ upgrade completed. Installation of new fire protection systems and integration award in 2015
88.	Page 4-41, 4.6.2.12 Overall Fire Protection Program	"Then Fuel Department (FISC) needs to take a centralized role in the Fire Protection Program for the Red Hill Complex."	FISC, now NAVSUP Fleet Logistics Center Pearl Harbor, has taken the lead to ensure that all partners come together and ensure the proper Fire Protection Programs are in place. The Navy has developed emergency response plans, has conducted joint emergency response drills with	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
			Federal and City firefighters, and provided familiarization for hundreds of emergency responders.	
89.	Page 5-14, 5.5.2.2 Potential Contamination of Drinking Water Sources	"As previously mentioned, the water pump station contains an unsealed manhole above the water well. The fuel could seep into the manhole and flow directly to the drinking water."	The water well access hatch was sealed in the Water Pumping Station. There is no longer a direct path for spilled fuel to enter the water well.	Completed
90.	Page 5-15, 5.5.2.2 Potential Contamination of Drinking Water Sources	"It is likely that there are openings (cracks, holes, etc.) in the bottom of the LAT, Adit 3 tunnel, and the Red Hill portion of the Harbor Tunnel that will facilitate migration of fuel into the drinking water aquifer."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing penetrations and the floor-to-wall joint. See Reference C.	Completed
91.	Page 5-16, 5.5.2.3 Potential Surface Water Contamination	"Also of concern is the 4 ft. by 6 ft. riser shaft at Station 31+41.30 which daylights in a residential neighborhood close to Makalapa Elementary School."	The water riser shaft in the Harbor Tunnel has been sealed, preventing a possible release from reaching the surface.	Completed
92.	Page 5-16, 5.5.2.3 Potential Surface Water Contamination	"Fuel entering the former diesel power station could also flow down the hillside and into South Halawa Stream, if the doors on the outside of the power station are not water tight."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing the doorway to the Former Diesel Power Station. See Reference C.	Completed
93.	Page 5-23, 5.6.2 Recommendations	"Seal the manhole cover of the well in the PWC pump station and install water tight doors before (upgradient) of the pump station."	The water well access hatch was sealed in the Water Pumping Station. There is no longer a direct path for spilled fuel to enter the water well. A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D.	Seal water well access hatch completed. Installation of new oil-tight door award in 2015
94.	Page 5-23, 5.6.2	"Install doors or thrust block to prevent a release	A large-scale, congressionally	Award in 2015

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
	Recommendations	from reaching the PWC pump station."	approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D.	
95.	Page 5-23, 5.6.2 Recommendations	"Install U-clamps and 16-inch line in tunnel to restrain movement of this line in case of earthquake"	The recommendation seemed to be rooted in the questionable structural condition of the tunnel. A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, potentially removing the need for additional restraints on the fuel pipeline. See Reference C.	Under further evaluation
96.	Page 5-23, 5.6.2 Recommendations	"Install a tank level monitoring system."	The Navy has installed a tank level monitoring system. The Red Hill Fuel Storage Facility, being one of kind, adapts and uses the most current and available industry monitoring technology. The tanks use a multi-function tank gauge (MTG). MTG is the industry's widely used and accepted mass tank gauging technology that is also the Navy's standard. The MTG takes fuel level readings every 12 seconds, displayed at the control center. The automated fuel handling system (AFHE) logs readings 5 times per minute, or approximately 7200 log readings per day.	Completed
97.	Page 5-23, 5.6.2 Recommendations	"Make hourly visual checks of the tanks, tunnels, and pipelines."	The Navy has installed numerous remotely operated and viewed cameras throughout the underground facility to constantly monitor conditions	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
			of the tanks, tunnels, and pipelines.	
98.	Page 5-23, 5.6.2 Recommendations	"Repair and routinely test the water-tight doors."	The water-tight doors were repaired in October 2009. See Reference A.	Completed
99.	Page 5-23, 5.6.2 Recommendations	"Repair cracks and open holes in the tunnel."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing cracks and holes. See Reference C.	Completed
100.	Page 5-23, 5.6.2 Recommendations	"Seal off the two former drainage tunnels to Halawa Stream."	The two former drainage tunnels to Halawa Stream have been sealed off. It's unclear if the drainage tunnel were identified in the tunnels in 1998, or if they were only identified in original drawings. There is currently no physical evidence of the drainage tunnels to Halawa Stream in the fuel tunnel.	Completed
101.	Page 5-23, 5.6.2 Recommendations	"Seal off the doorway to Former Diesel Power Station."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing the doorway to the Former Diesel Power Station. See Reference C.	Completed
102.	Page 5-23, 5.6.2 Recommendations	"Install secondary confinement thrust block below tank 1 (oil-tight door 'D' and bulkhead)."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D.	Award in 2015
103.	Page 5-24, 5.6.2 Recommendations	"Repair and clean out french drain in Harbor Tunnel."	The french drain in the Harbor Tunnel was completely replaced in 2008/2009. See Reference G.	Completed
104.	Page 5-24, 5.6.2 Recommendations	"Clean out and test product in open trench near sump for tanks."	The tank sample lines have all been enclosed and the tank's drain lines have been hard-piped within the drain	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
			gutter. See Reference B. The drain gutter has been cleaned, and now only contains water that infiltrates into the tunnel. The removed product was tested and properly disposed of in accordance with all applicable regulations.	
105.	Page 5-24, 5.6.2 Recommendations	"Clean out drains beneath Harbor Tunnel."	The drains in the Harbor Tunnel was completely replaced in 2008/2009. See Reference G.	Completed
106.	Page 5-24, 5.6.2 Recommendations	"Seal the water riser shaft at station 31+41.30 to prevent a release from reaching the surface."	The water riser shaft in the Harbor Tunnel has been sealed, preventing a possible release from reaching the surface.	Completed
107.	Page 5-24, 5.6.2 Recommendations	"Emergency evacuation procedures for workers in CINCPAC Fleet, possible JIGPAC, and workers at Red Hill."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D. With this added feature, an evacuation of the Adit 2 area would not be necessary.	Completed
108.	Page 5-24, 5.6.2 Recommendations	Floor drains in the Harbor Tunnel and Pump House should be periodically cleaned out to ensure they are working properly."	The french drain in the Harbor Tunnel was completely replaced in 2008/2009. See Reference G. The Pump House floor drains are maintained.	Completed
109.	Page 5-24, 5.6.2 Recommendations	"The tunnel floor has many holes, some of which were formed by water damage and others man made. Efforts to seal the holes in the floor and walls should be undertaken as precautionary measures, but the possibility of sealing all holes in the floor and walls of the tunnels seems unlikely."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing penetrations and the floor-to-wall joint. See Reference C.	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
110.	Page 6-4, 6.4 Potential Catastrophic Failure of Current Conditions, General	"The potential for catastrophic failure of a steel lined Red Hill tank encased in concrete and rock is extremely remote. Any potential failure would more likely occur in the piping or valves serving these tanks… Improved maintenance of facilities, where piping and supports are not allowed to be weakened by corrosion and fuel is not allowed to accumulate on floors and in gutters where it can contribute, spread and exacerbate any fire, area ways to prevent a small failure from becoming catastrophic... Emphasis should be placed on primary containment as the first line of defense to prevent spills. This includes inspection and upkeep of the steel tank lining and its coating, repair/replacement of valves, upkeep of pipe supports and piping, maintaining a fully operational and accurate gauging system and providing adequate fire protection."	The Navy fully concurs that the potential for catastrophic failure of a steel lined Red Hill tank encased in concrete and rock is extremely remote. The Navy has completed the vast majority of the Study recommendations, and has completed or committed facility improvements and repairs. The facility is maintained in a good state of repair and cleanliness. The inspection and upkeep of the steel tank lining is an on-going and continuous process. The tank gauging system is state-of-the art. A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new fire protection system. See Reference D.	Completed facility improvements and repairs. Large-scale MILCON award in 2015
111.	Page 6-15, 6.7.2 Recommendations	"1. Construct a new oil-tight bulkhead and door at Station 25+00 just below tanks lands in the narrow portion of the tunnel to confine any catastrophic failures to the Tanks 1-16 area."	A large-scale, congressionally approved military construction contract will be awarded in the near future that will install a new oil-tight door and bulkhead in the Lower Access Tunnel below Tanks 1 & 2. See Reference D.	Award in 2015
112.	Page 6-15, 6.7.2 Recommendations	"2. Refurbish existing drop track doors 'A' and 'C' to act as containment for tunnel pipelines leaks. This will adequately protect Adit 2, as well as the pumphouse, from the fuel leaks in the tunnel pipelines."	The drop track doors were repaired in October 2009. See Reference A.	Completed
113.	Page 6-15, 6.7.2 Recommendations	"3. Provide oil-tight door/bulkhead in Adit 6 to provide secondary containment for Tanks 17-20."	The Navy has conducted independent measurements and calculations of Tanks 17-20, the Lower Access Tunnel, and the elevation of the Adit 6 tunnel. Based on the calculations, the	Completed

Detailed Status & Evaluation of Willbros Engineers, Inc., 1998 Report	
Project Title: Red Hill Complex Fire, Life Safety and Environmental Risk Assessment/Analysis, Amendment 3, Volume 1 of 2	**Regional Study of Military Bulk POL Distribution Systems and Storage Facilities Project for: Pacific Division, Naval Facilities Engineering Command**
Reviewer: NAVSUP Fleet Logistics Center Pearl Harbor	Date: 5/28/15

No.:	Source:	Willbros Engineers, Inc., Recommendation:	Navy Evaluation:	Recommendation Status:
			fuel height would only reach up to 126 feet. This is lower than the elevation of the Adit 6 tunnel at 143 feet. The oil-tight door/bulkhead in Adit 6 is not applicable.	
114.	Page 6-15, 6.7.2 Recommendations	"4. Install secondary containment at Adit 4 and 3' high diversionary wall at Adit 5 tunnel tie-in. Both these projects are considered low priority to be done only after all above work is accomplished."	Since the time of this Study, the Navy has lowered the normal fill height in all tanks. This has lowered the fuel level above the Upper Access Tunnel level. With this reduced risk, coupled with the lack of any fuel piping, secondary containment and a diversionary wall at Adits 4 & 5 are not necessary.	Completed
115.	Page 6-15, 6.7.2 Recommendations	"5. Construct 18" high diversionary wall at PWC pump station entrance to prevent relatively small pipeline leaks from entering the pump station."	The water well access hatch was sealed in the Water Pumping Station. There is no longer a direct path for spilled fuel to enter the water well. The elevation of the Water Pumping Station is higher than the elevation of the fuel pipeline tunnel running down to Pearl Harbor.	Completed
116.	Page 6-15, 6.7.2 Recommendations	"6. Inspect/seal all penetrations/pipes in the lower tunnel valve galleries to prevent a massive fuel spill from migrating to the area outside the steel liner and thereby collapsing the liner."	A large-scale tunnel structural repair project was completed in 2013. Structural integrity of the tunnel was restored, including sealing penetrations. See Reference C.	Completed
117.	Page 6-15, 6.7.2 Recommendations	"7. If secondary containment in the upper tunnel between tanks 15/16-17/18 is not capably of retaining fuel, consider reducing the filling height in tank 17-20 to about elevation 376.85. This is equivalent to the 225' level or 288,241 BBL capacity in tank 20 and will prevent fuel from entering the upper tunnel in case of a catastrophic leak in any of the four upper tanks."	The Navy has lowered the normal fill height of Red Hill tanks to less than 225 feet of fuel.	Completed
118.	Page 6-15, 6.7.2	"8. Strongly recommend that pipelines not be	The Navy has left the fuel pipelines in	Completed

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	Recommendations	relocated out of the tunnel to an underground right-of-way but FISC should maintain existing pipelines, pipeline supports, valves and tunnel structure, drains and drain gutters in a good state of repair and cleanliness."	the underground tunnel as recommended. The Navy has completed the vast majority of the Study recommendations, and has completed or committed facility improvements and repairs. The facility is maintained in a good state of repair and cleanliness.	

References:

A. Repair Red Hill Tunnel Oil Tight Doors, $713,000.00. Construction completed October 2009.
B. Replace Red Hill Slopline, $1,950,000.00. Construction completed 2013.
C. Red Hill Tunnel Structural Repairs, $30,000,000.00. Construction completed 2014.
D. FY15 DLA MILCON P-1551, Red Hill Fire Suppression and Ventilation Improvements, Cost Estimate $49,900,000.00. Status - Contract is ready to award pending transfer of funding.

E. National Fire Protection contract, $400,000.00/year. Provides routine maintenance, testing, inspection, and repair of Red Hill fire protection systems.
F. Repair Red Hill Ventilation, $8,700,000.00. Construction completed 2014.
G. Improve Red Hill Tunnel Drainage and Rails, $7,100,000.00. Construction completed 2009.