Enclosure (2) to

Red Hill Bulk Fuel Storage Facility, Oahu, Hawaii

31 May 2023, Supplement 2

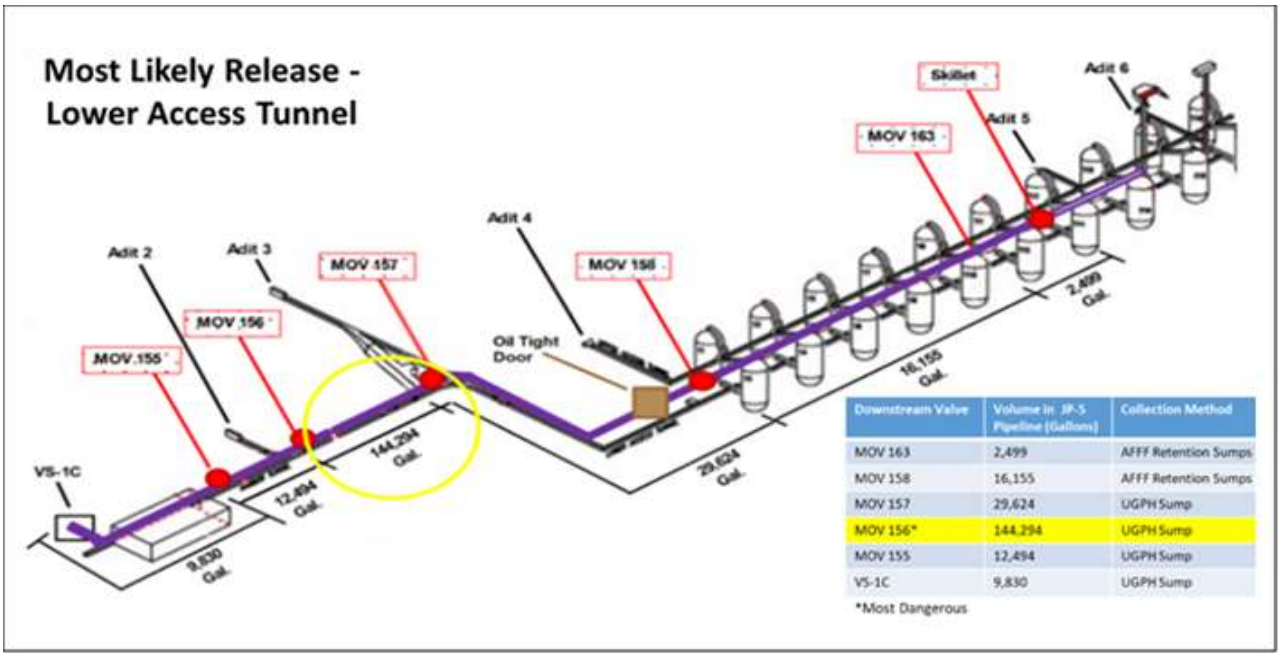
Joint Task Force Red Hill

Spill Release Scenarios

Enclosure 2
Most Likely Release in LAT or HT Piping - Re-Packing/Un-Packing

Executive Overview: This release would likely occur during any of the following events: (1) a pipe rupture (highly unlikely probability); (2) failed repair (moderate probability); or (3) a valve failure (moderate probability). If a rupture occurs in the LAT, the fuel will be directed away from Adit 3 "Wye" (protecting direct pathways to the aquafer) and down the HT by the pre-positioned rigid flood barriers, which is the mitigation measure utilized to prevent the fuel from flowing to the HT. The yellow circle in Figure 4 indicates where the most dangerous rupture can occur. In this scenario, the released fuel will collect at the UGPH and pump out to surge tank B-2, which has a 385K gallon capacity. JTF-RH will conduct a Spill Drill Exercise for this scenario June 8, 2023 as part of the Source Water Protection

Scenario: Pipe rupture occurs along the piping in LAT or HT, downstream of the oil-tight door which is located between the tank gallery and the LAT. Pressure drop is detected by the AFHE system in the UGPH and visually by rovers. If the rupture is in the LAT the fuel will be directed away from Adit 3 "Wye" and down the HT by the pre-positioned rigid flood barriers; otherwise the flow will follow the gradient down the HT uninterrupted. Below is a graphic of Red Hill from the tank gallery to the UGPH including the expected fuel flow for this casualty.



Downstream Valve	Volume in JP-5 Pipeline (Gallons)	Collection Method
MOV 163	2,499	AFFF Retention Sumps
MOV 158	16,155	AFFF Retention Sumps
MOV 157	29,624	UGPH Sump
MOV 156*	144,294	UGPH Sump
MOV 155	12,494	UGPH Sump
VS-1C	9,830	UGPH Sump

The following additional mitigations will be in place prior to packing/defueling operations:

1. Booms around YON fuel barges and fuel tanker vessels at all times to contain any releases that could occur during repacking/defueling.
2. Flood barriers will be placed at the Adit 3 "Wye" and the Adit 2 Spur Tunnel to direct flow down the Harbor Tunnel in the event of a leak or rupture.
3. Adit 2 will be sealed prior to defueling operations.

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4. Surface water will be inspected regularly to identify any sheen that might appear in the harbor to allow for rapid response.
5. Vacuum trucks will be located at Hotel Pier and outside Adit 3 to quickly respond to any releases at those locations.
6. Spill kits will be staged near the Adit 3 "Wye", Adit 2, UGPH, and throughout the facility.
7. 5-plex Sump System will be aligned to discharge to the B-1 and B-2 tanks at FORFAC.
8. Verification of sufficient ullage in the B-1 and/or B-2 Tanks will be completed prior to commencement of packing or defueling operations.

Response Actions:

1. CRO immediately ceases defueling operations and shuts all Motor Operated Valves (MOVs), limiting fuel spill to the volume in the pipe upstream of the rupture (144,29 4gallons).
2. A small size spill will likely pool in the vicinity of the rupture and will be cleaned up in the tunnel by responders with absorbents and small portable pumps.
3. Fuel flow reaches the Lower HT and begins to be collected in the sumps. The 5plex Sump System (1000gpm) in the Lower HT and the UGPH Sump System (280gpm) will pump the fuel directly to the B-1 and B-2 Tanks at FLCPH FORFAC, 385,000gal capacity each.

Follow-up Actions:

1. Fuel and fuel residue remaining on the LAT/HT deck will be removed manually with absorbents or small portable pumps.
2. Fuel in the FLCPH FORFAC Tanks will be removed by Vacuum Trucks or pumped elsewhere (i.e. to Hotel Pier barges or other FLCPH tanks).
3. Fuel remaining in the fuel piping and will be unpacked and piping repaired.

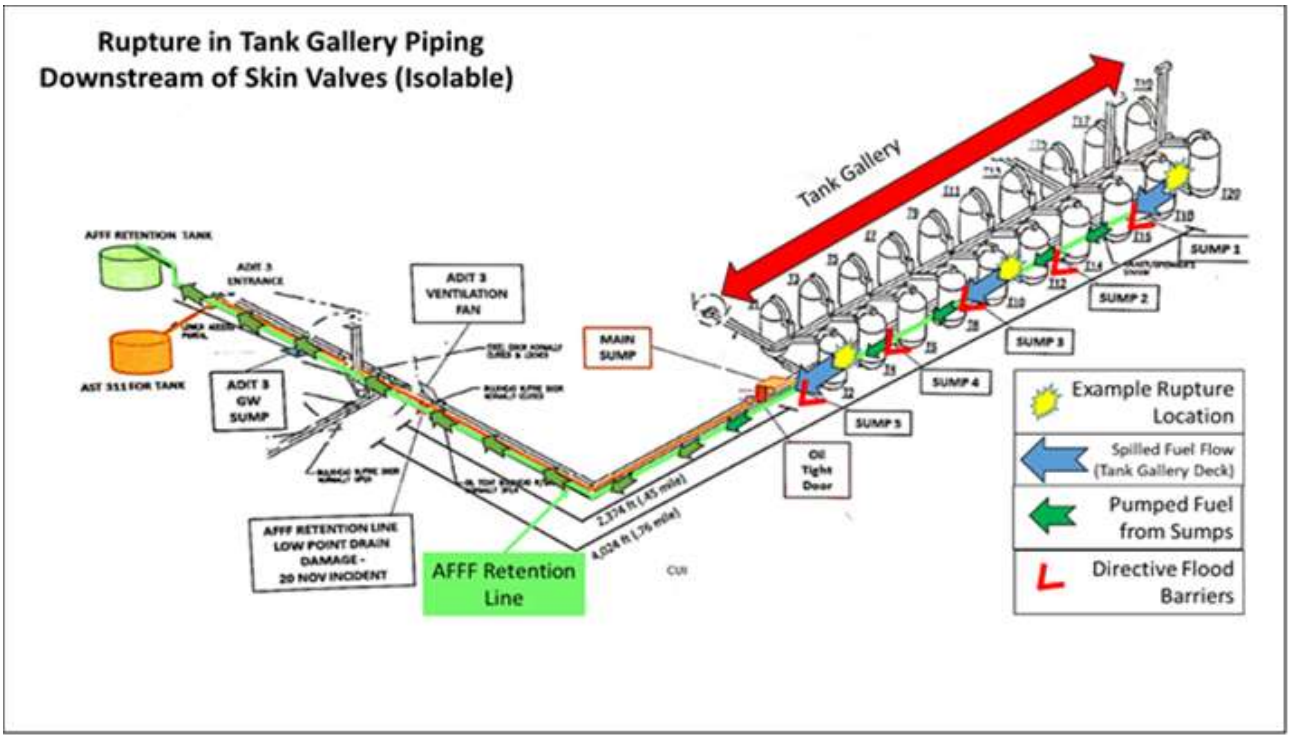
Stakeholder Response Actions:

- Additional response actions are contained in the CNRH RHFSF Response Plan. Actions are subject to modification pending HAZOPs finalized plan. Entities involved include, but are not limited to: FEDFIRE, FLC, PORT OPS, USCG, EOC, JBPHH, and CNRH/ROC.

Enclosure 2
Most Likely Release in the Tank Gallery - Defueling / Flowable Tank Bottoms

Executive Overview: This release could occur as a result of the following events: a pipe rupture (highly unlikely); a failed repair (moderate probability); failure of a valve (moderate probability) in the Tank Gallery on a length of pipe downstream of tank skin-valves (Double-Block and Bleed Valves). JTF-RH will utilize AFFF retention pumps (rated at 1,000 gallons per minute - maximum three pumps active at one time for a total of 3,000 gallons per minute pumping capacity) to recover up to 20K gallons of released fuel in approximately 7 minutes. DOH's letter dated January 13, 2023 recommended evaluating the AFFF Retention Line.

Scenario: Pipe rupture occurs in the Tank Gallery on a recently repaired length of pipe downstream of tank skin-valves (Double-Block and Bleed Valves) causing a discharge very similar to 06 May 21 Incident. Pressure drop is detected by Automated Fuel Handling Equipment (AFHE) system in the Underground Pump House (UGPH) and visually by rovers. Below is a graphic of Red Hill from the Tank Gallery to Adit 3 overlayed with a schematic of the AFFF system and the expected movement of fuel during this casualty.



The following additional mitigations will be in place prior to repacking/defueling operations:

1. Booms around Yard Oiler Non-Propelled (YON) fuel barges and fuel tanker vessels at all times to contain any releases that could occur during packing/defueling
2. Surface water will be inspected regularly to identify any sheen that might appear in the harbor to allow for rapid response.
3. Vacuum trucks will be located at Hotel Pier and outside Adit 3 near the AFFF Retention Tank to quickly respond to any releases at those locations.

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Most Likely Release in the Tank Gallery - Defueling / Flowable Tank Bottoms

4. Spill kits will be staged near the AFFF Retention Tank, the Adit 3 "Wye", and throughout the facility.
5. AFFF Retention Tank will be emptied prior to beginning the packing/defueling operations.

Response Actions:

1. Control Room Operator (CRO) immediately ceases defueling operations and shuts all Motor Operated Valves (MOVs), limiting fuel spill to the volume in the pipes (16,155 gallons).
2. Fuel rapidly spills out of rupture and flows towards nearest sump(s) where it is collected.

3. Fuel is pumped from the sump(s) through the 14" diameter Retention Line (~41,583gal capacity) to the AFFF Retention Tank (153,000gal capacity) for a combined ullage of 194,583gal**.
    a. Each sump has four pumps, with a design max of three pumps operating at a time (Single capacity - 1000gpm, Total capacity - 3000gpm)
    b. With three pumps operating simultaneously in a single sump the largest potential spill volume for this scenario (16,155gal) could be removed in 5.4 minutes.
        i. Due to slope of the retention line the fuel will most likely remain in the retention line (as occurred during the 06 May 21 incident).
    c. For a larger spill volume, the time to fill the combined ullage in the AFFF Retention Line and Tank (194,583gal) is dependent on the number of sumps are that are filled with fuel, the higher up the tank gallery the rupture is located, the more sumps will be filled:
        i. 1 sump: ~65min
        ii. 2 sumps: ~45min
        iii. 3 to 5 sumps: ~40min
4. Fuel and fuel residue remaining on the Tank Gallery deck will be remediated with absorbents and small portable pumps as applicable.

Follow-up Actions:

1. Fuel in the AFFF Retention Tank will be removed by vacuum trucks and taken to storage facilities outside of Red Hill (i.e. FLCPH Tanks or barges on Hotel/Sierra Piers).
2. Fuel remaining in the AFFF retention line and will be unpacked and taken to storage facilities outside of Red Hill (i.e. FLCPH Tanks or barges on Hotel/Sierra Piers).
3. Tank Gallery Piping will be unpacked and rupture location repaired.

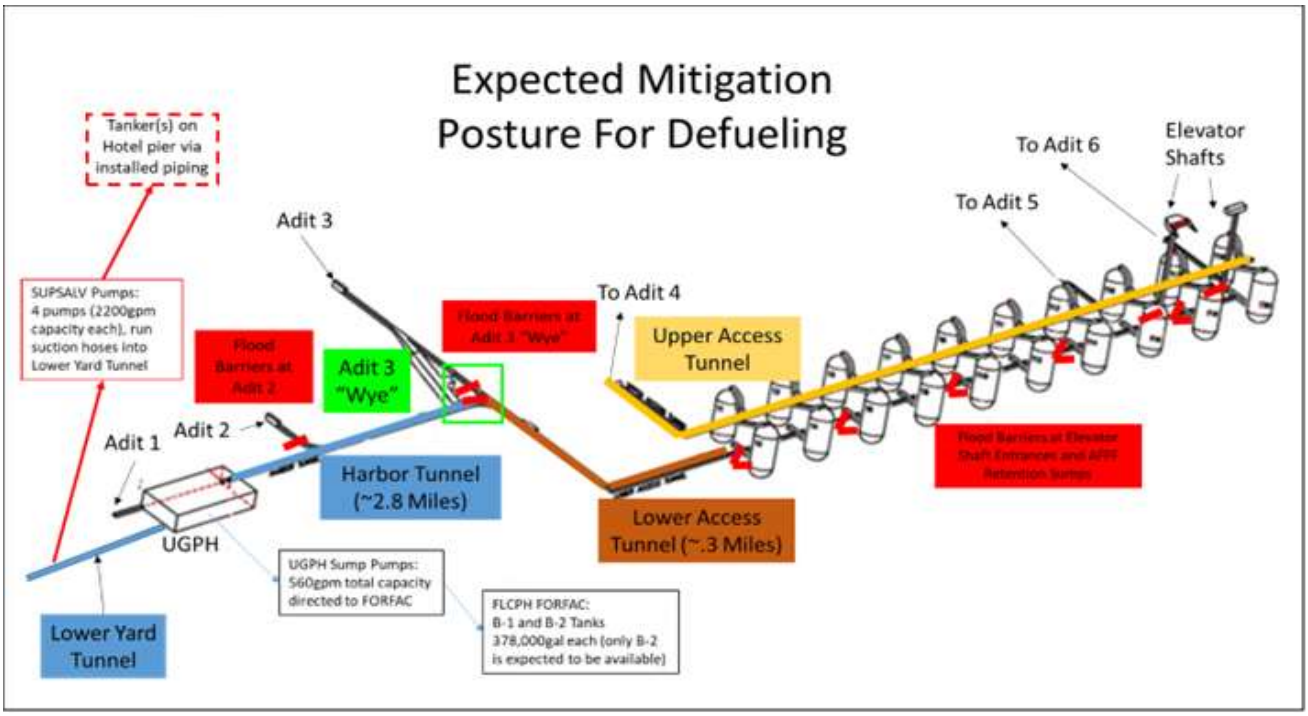
Stakeholder Response Actions:

- Additional response actions are contained in the CNRH RHFSF Response Plan. Actions are subject to modification pending HAZOPs finalized plan. Entities involved include, but are not limited to: FEDFIRE, FLC, PORT OPS, USCG, EOC, JBPHH, and CNRH/ROC.

Enclosure 2
Most Dangerous Least Likely Discharge Scenario - Defueling

Executive Overview: In this scenario, a possible release could occur if the fuel hammer and vacuum cause a 5-inch fracture to the section of piping just North of the Double Blocking Blow Valve. The released fuel would flow from the tank gallery and into the LAT. After approximately 18 minutes, the released fuel would reach Adit 3 "Wye," where the pre-installed rigid flood barriers would redirect the fuel to the HT. It is estimated that 4.3 M gallons of fuel will be discharged over 6 hours. This scenario responds to an escalating situation which tests the most likely release in the Tank Gallery (initially handled by the AFFF Retention sumps); then exceeds the capacity and flows down the LAT all the way to the HT reaching the UGPH. The modeled flow rate would be approximately 13,800 gallons/minute (which would overwhelm the pumps & exceed B-2's Surge Tank Capacity of 385K gallons). JTF-RH is working with Oil Spill Response Organizations to augment the UGPH pumps. These four pumps will augment the UGPH pumps and provide an additional 8.8K gallon per minute capacity (pumping directly to the tanker at Hotel Pier). This response action will minimize environmental impacts in the event of a spill. JTF-RH will conduct a Spill Drill Exercise to test this scenario on July 13, 2023 as part of the Source Water Protection

Scenario: A fuel hammer and vacuum caused a 5-inch fracture to the section of piping just North of the Double Blocking Blow Valve. Fuel begins flowing down from the tank gallery and into the LAT. Fuel Flow reaches Adit 3 "Wye" after 18 minutes and is directed down the HT by pre-installed rigid flood barriers. In roughly 6 hours a total capacity of 4.3 million gallons is discharged. Below is a schematic of the major mitigation efforts to include expected fuel recovery/spillage for a full tank (10.8 million gallon) spill.



Enclosure 2
Most Dangerous Least Likely Discharge Scenario - Defueling

SOPs and Mitigating Factors in place:

1. Booms around YON fuel barges are in place to contain any discharges that could occur during unpacking.
2. Surface water will be constantly monitored to identify any sheen that might appear in the harbor to allow for rapid response.
3. Vacuum trucks will be located at Hotel Pier and VS-1C to quickly respond to any discharges at those locations.
4. Hotel Sump will be emptied prior to beginning the unpacking evolution.
5. A CRO and an assistant Control Room Operator will be in the control room throughout the entire operation.
6. Rovers and supervisors will be on site to verify valve operations, configurations, and pipeline monitoring.
7. Spill kits are pre-staged at various locations in the tunnel.
8. Primary and secondary containment boom of 24" is in place across Halawa Stream. 48" boom will be pre-staged on site at Halawa Stream.

Immediate Response Actions:

IAW TAB A - Worst Case Discharge Scenario, in the RHTFSF Response Plan.

Action 1:

- Flood Barriers at Adit 3 "Wye" to increase containment capability to 20" tall.
- Flood Barriers at Adit 1 to direct flow to the swale.
- Flood Barriers at elevators in LAT to direct flow down LAT.

Action 2:

- Keep Adit 2 sealed to direct fuel out Adit 1.

Action 3: Additional pump support outlined in NAVSUPFLC response actions.

Stakeholder Response Actions:

NAVSUPFLC - The following information is the primary response to the WCD of oil.

- Utilize existing ground water sump pumps at end of the harbor tunnel and in the Adit 1 fan building to pump as much oil as possible to FORFAC (Fig 3).
- Install SUPSALV supplemental pumps (4 x 2,200 gpm = 8,800gpm) to move oil to Maersk Peary at Hotel Pier and YON's/barges at Sierra Pier (Fig 2,3 and Picture 3).
- Install 6" valves at the South End of VS-1C to tie into F76 which is offline. From here the product can be pumped to the upper tank farm and secondary containment. Supplemental pumps will be located outside at the end of the lower yard tunnel (Fig 2, 3 and Picture 2).
- Discharge hoses/piping from the supplemental pumps may be connected to any or all of the product pipelines at VS-1C. Any desired destination can be reached from VS-1C (Fig 2, 3 and Picture 2).
- Two 32-inch diameter F-76 lines penetrate the bulkhead that separates the pumphouse from the lower yard tunnel. These sections of the lines are no longer needed. These lines will be cut off on both sides of the bulkhead to allow oil to flow freely into the lower yard tunnel. This would reduce the depth of oil retained in the pumphouse to just over 14" (Fig 4,5 and Picture 1).

- Run temporary discharge piping or hose from the pumps to VS-1C to any desired product pipeline(s), just over 112 feet away at VS-1C (Fig 2 and Picture 2).
- Minor modifications to a line at the upper tank farm will allow pumping up to the UTF tanks secondary containment areas, either to bladders or into the berms directly.
- Line the sides of the ramp with sandbags or other barricades that direct any oil that exits the Adit 1 door into the lower yard tunnel. This oil will be picked up by the pumps (Fig 2,3).

PORT OPS (CNRH Spill Management Team)

- IAW TAB C - On Water Spill Containment and Recovery Strategies, RHTFSF Response Plan.

QI/OSRO - QI will make necessary notifications, and contracted OSROs will respond within a reasonable amount of time with personnel and equipment that is previously identified and discussed in the contract.

USCG - The Federal On-Scene Coordinator Representative (FOSCR) attached to JTF Red Hill will be on call 24/7 to offer expert advice and recommendations to facilitate a unified operational response.

- The National Response Center will contact Sector Honolulu Incident Management Division. If necessary, Pollution Responders and Federal On-Scene Coordinator Representatives will be available to assist with facilitating divisional groups. The National Strike Force coordination center will also be notified to determine if the Pacific Strike Team needs to deploy assets to assist.

- Additionally, the Sector Emergency Management Force Readiness shop has the capability to recall a Type I Incident Response Team from Sector Honolulu to implement the Incident Command System and organize a Unified Command.

Additional response actions are contained in the CNRH RHFSF Response Plan. Actions are subject to modification pending HAZOPs finalized plan.

Discharge Analysis:

Most Dangerous Least Likely Discharge (4.3 million gallons)

The following is based on the most-probable worst-case discharge. In this scenario it is assumed the spill will be unsecured for approximately 6 hours. The analysis also assumes Adit 2 is sealed.
Without supplemental pumps from Navy SUPSALV, the only method for removing fuel from the tunnels would be the UGPH Sump Pumps (Single capacity - 280 gpm; Total capacity - 560 gpm) which are in turn limited by the ullage available in the B-1 and B-1 FORFAC tanks, of which only B-2 is expected to be available. The total discharge from the tank will be 4,305,787 gallons based on engineering analysis conducted by PCCI. The product will reach Adit 1 in approximately 1 hour and begin to fill the entire space. The UGPH sump will send fuel to the B-1 and/or B-2 FORFAC tanks. Approximately 6 hours after the initiation of the rupture the fuel will overflow into the UGPH and begin spilling out of Adit 1. Over the next 18 hours: 1,049,187 gallons will spill out Adit 1 into the drainage swale and potentially impact

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Most Dangerous Least Likely Discharge Scenario - Defueling

Halawa Stream, the UGPH sump will pump 378,000 gallons to B-2 FORFAC tank, and 2,878,600 gallons will accumulate in the UGPH/Lower HT and will need to be removed via supplemental pumps and remediation.

With four Navy SUPSALV supplemental pumps (Single capacity - 2,200 gpm; Total capacity - 8,800 gpm) in place, they can be utilized to move oil to the tanker vessels or the UTF containment. The following scenario is expected to occur:

The total discharge from the tank will be 4,305,787 gallons based on engineering analysis conducted by PCCI. The product will reach Adit 1 in approximately 1 hour and begin to fill the entire space. The UGPH sump will send fuel to the B-2 FORFAC tanks; which has a 378,000 gallon capacity. Once the flow reaches their suctions, the SUPSALV pumps will direct flow to tanker vessels at Hotel Pier of the barges at Sierra Pier (both located on Joint Base Pearl Harbor). Roughly 7 hours after the rupture, a peak accumulation of 936,187 gallons is expected in the UGPH/Lower Harbor Tunnel. Due to the small gradient of the Harbor Tunnel the oil volume will cover the deck of the Lower Harbor Tunnel a few hundred feet past Adit 2 (sealed). It will not breach the UGPH Deck grating however, and it will not be discharged to the environment through Adit 1.