Section 1 - Approvals and Certifications

Spill Prevention, Control, and Countermeasure Plan
JBPHH, Hawaii
December 2019

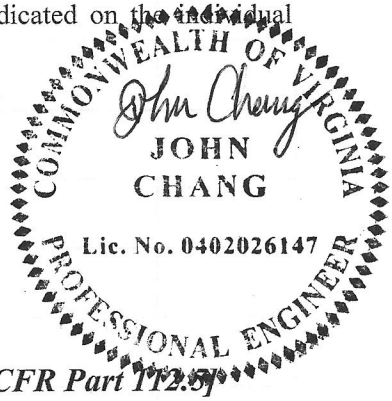
I hereby certify that I am familiar with the provisions of 40 Code of Federal Regulations (CFR) Part 112, Oil Pollution Prevention; either my agent or I have visited and examined the facility; that this Spill Prevention, Control, and Countermeasure (SPCC) Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards and the requirements of 40 CFR Part 112; procedures for required inspection and testing have been established; and that the SPCC Plan is adequate for the facility. This certification is subject to the condition that the recommendations indicated on the individual facility site data sheets will be implemented in a timely manner.

John Chang
Printed Name of Licensed Professional Engineer

John Chang
Signature of Licensed Professional Engineer

31 Dec 2019
Date

License Number: 0402026147 State: Virginia



1.1 Technical Amendment Certification and Review [40 CFR Part 112.5]

In accordance with 40 CFR Part 112.5(b), a review and evaluation of this SPCC Plan must be conducted at least once every five years. As a result of this evaluation, if necessary, the SPCC Plan will be amended within six months of the review to include more effective prevention and control technology if such technology will significantly reduce the likelihood of a discharge event from the facility and if such technology has been field-proven at the time of review.

Pursuant to 40 CFR Part 112.5(c), any technical amendment will be certified by a Professional Engineer (P.E.) within six months after a change in the facility design, construction, operation, or maintenance occurs which materially affects the facility's potential for the discharge of oil into or upon the navigable waters of the United States (U.S.) or adjoining shorelines. Any SPCC Plan amendments will be implemented no later than six months following their acceptance. Completion of the review and evaluation will be documented.

The following page provides documentation of the five-year review and evaluation of the SPCC Plan by the P.E. (or his/her agent). A statement as to whether an amendment to the SPCC Plan is required is also included on the review page.

Technical Amendment Certification and Review Page

JBPHH completed a 5-year review and evaluation of the SPCC Plan on 26 Feb-9 Mar and 11-22 June 2018 and have amended the SPCC Plan as a result.

Technical Amendment Certification and Review				
Review Date	**Reviewer (print name)**	**Reviewer's Signature**	**Is P.E. certification required (Yes/No)?**	**Comments (provide description of changes/revisions)**
26 Feb-9 Mar and 11-22 Jun 2018	John Chang, P.E., PCCI	John Chang	Yes	Complete plan update
09Dec22 and 10Jul2023	Patrick Grandelli, P.E., PCCI	Pat Grandelli	Yes	Tab A Red Hill Pipeline and Drainage Systems To Appendix B-1 Fleet Logistics Center Pearl Harbor (FLCPH)
I hereby certify that I am familiar with the provisions of 40 Code of Federal Regulations (CFR) Part 112, Oil Pollution Prevention; either my agent or I have visited and examined the facility; that this Spill Prevention, Control, and Countermeasure (SPCC) Plan has been prepared in accordance with good engineering practices, including consideration of applicable industry standards and the requirements of 40 CFR Part 112; procedures for required inspection and testing have been established; and that the SPCC Plan is adequate for the facility. This certification is subject to the condition that the recommendations indicated on the individual facility site data sheets will be implemented in a timely manner.				
PATRICK D R GRANDELLI		Patrick Grandelli PG	10 JULY 23 10615-M	HAWAII
28July23	Patrick Grandelli PE	Pat Grandelli	Yes,	MINOR ADDITION TO TEXT ON A-34.

PATRICK D. R. GRANDELLI
LICENSED PROFESSIONAL ENGINEER
No. 10615-M
HAWAII, U.S.A.

Tab A
Red Hill Pipeline and Drainage Systems

To

Appendix B-1
Naval Supply Systems (NAVSUP) Command Fleet Logistics Center Pearl Harbor (FLCPH)/Defense Fuel Supply Point Pearl Harbor (DFSP PH) Bulk Terminal

31 July 2023

FINAL

Prepared For:

Environmental Business Line
400 Marshall Road
JBPHH, Hawaii 96860-3139

Prepared By:

300 North Lee Street, Suite 201
Alexandria, Virginia, 22314

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Acronym List

AFFF	Aqueous Film-Forming Foam
AST	Aboveground Storage Tank
FOR	Fuel Oil Recovery
FORFAC	Fuel Oil Recovery Facility
GPM	Gallons Per Minute
LAT	Lower Access Tunnel
SPCC	Spill Prevention, Control and Countermeasures 40 CFR 112
UGPH	Underground Pump House
UST	Underground Storage Tank 40 CFR 280 and 281

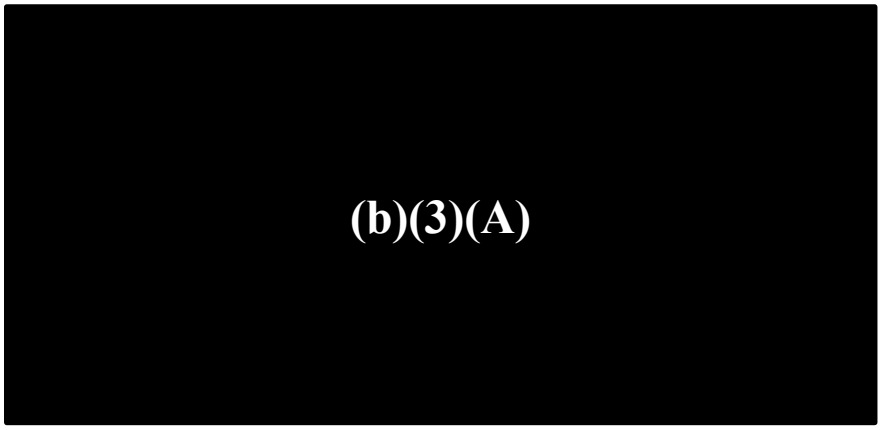
[redacted]

A.1 OVERVIEW: TUNNELS, FUEL PIPES AND DRAINAGE SYSTEMS

The Red Hill Fuel Storage Facility (see Figure 1) comprises (b)(3)(A) large underground fuel storage tanks, facility pipelines and a unique tunnel system leading to an underground fuel pumphouse, as shown in Figure 2 through Figure 5. The tunnels were an integral part of construction and protect the (b)(3)(A) ft pipes from attack and from weathering. For the SPCC program these tunnel systems are defined as the "Lower Access Tunnel" and the "Harbor Tunnel". The (b)(3)(A) pipes connect the Tank Gallery under the (b)(3)(A) tanks, run through the lower Access Tunnel to the Harbor Tunnel and into the UnderGround PumpHouse (UGPH). The tunnels contain myriad auxiliary systems such as sumps, drains, pumps and sensors to manage fuel sampling operations, rainwater, ground water, fire & smoke detection and control, AFFF delivery & drainage, ventilation, potable water, lights, electricity, compressed air and sewage.

Data sheets for the (b)(3)(fuel-carrying systems within the Red Hill Tunnel system provided in the next section. These five systems are listed in Table A-1:

Table A-1: Fuel transfer and collection systems for the Red Hill Tunnel System



The several drainage systems within each tunnel system are summarized in Table A-2. Understanding of these drainage systems is essential to effectively perform oil spill containment and countermeasures. Later sections in this plan describe the drainage systems in more detail, including modifications installed during September to October 2022.

The Lower Access Tunnel runs from Adit 3 up past all (b)(3)(A) underground fuel storage tanks, ending at Tanks (b)(3)(A) . The Lower Access Tunnel was the primary means of removing spoil during construction, is steeper and shorter than the Harbor Tunnel, and contains more systems. In this plan, the Lower Access Tunnel is comprised of the Tank Gallery, the Lower Access Tunnel, and continues to Adit 3. It is shown in purple in Figure 2. The three facility fuel pipes depart the Lower Access Tunnel at its intersection with the Harbor Tunnel.

The long Harbor Tunnel contains the same (b)(3)(A) fuel pipes, the potable water supply pipe, the branch tunnel to Adit 2, and leads down to the Underground Pump House. The Harbor Tunnel

descends smoothly from the LAT at 101 ft elevation, with its final (b)(3)(A) ft remaining only a few feet above sea level. It is shown in black in Figure 2.

Both tunnels comprise a system that can help to manage the fate and distribution of either large or small spills within the facility. Large potential spills are addressed within the Red Hill Facility Response Plan.

Procedures have been planned to manage the currently-operating drainage systems that are present in both tunnels. These include the passive systems such as ground water drains that provide a path for infiltration, and active systems such as pumped sumps that discharge to above-ground facilities.

Further details of drainage systems in the Lower Access Tunnel and the Harbor Tunnel are provided in the sections following the Data Sheets, including drainage modifications installed during September to November 2022. These are followed by a list of references used to create this Technical Amendment.

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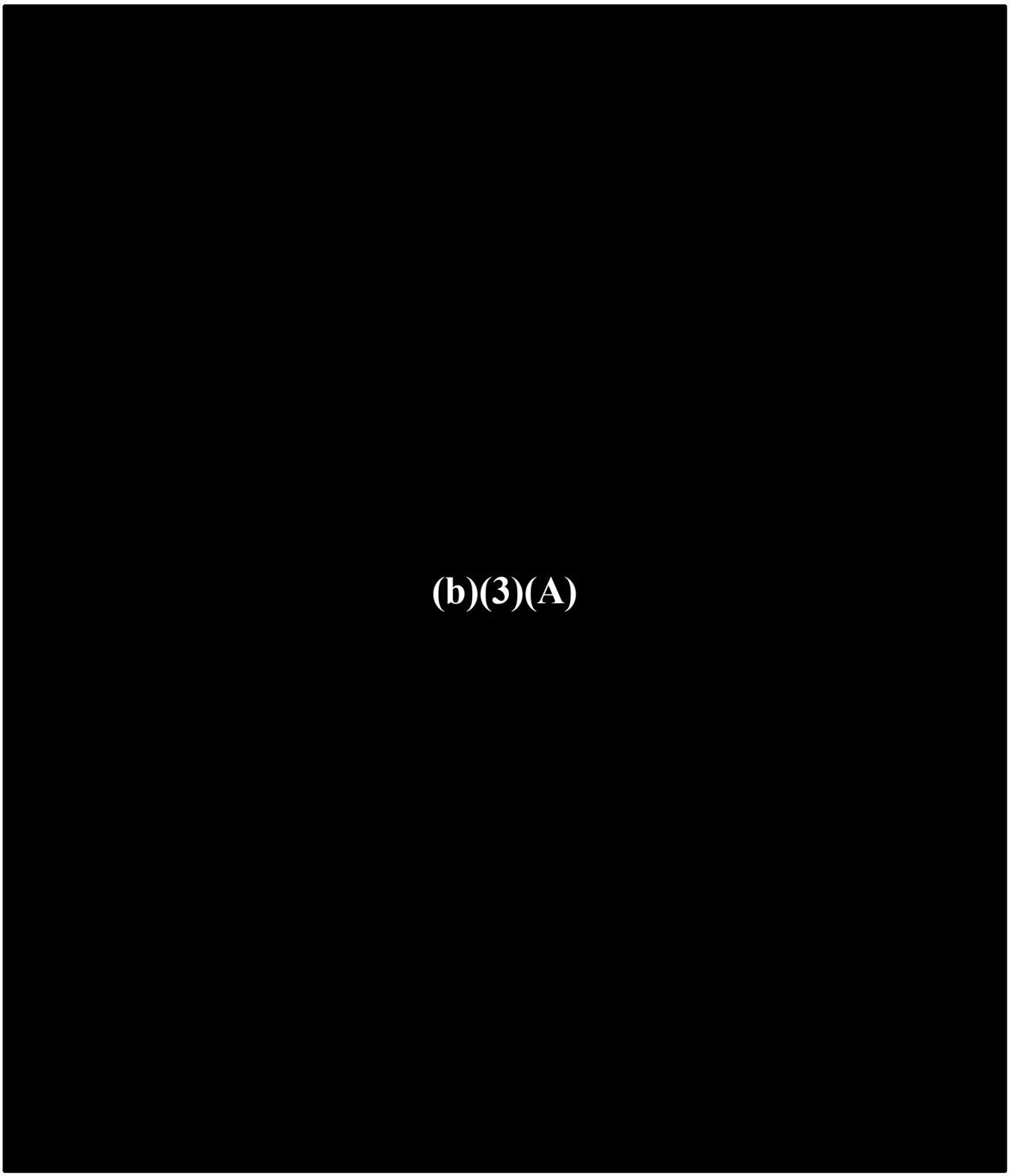
Table A-2: Drainage-related Systems within the Harbor Tunnel and Lower Access Tunnel



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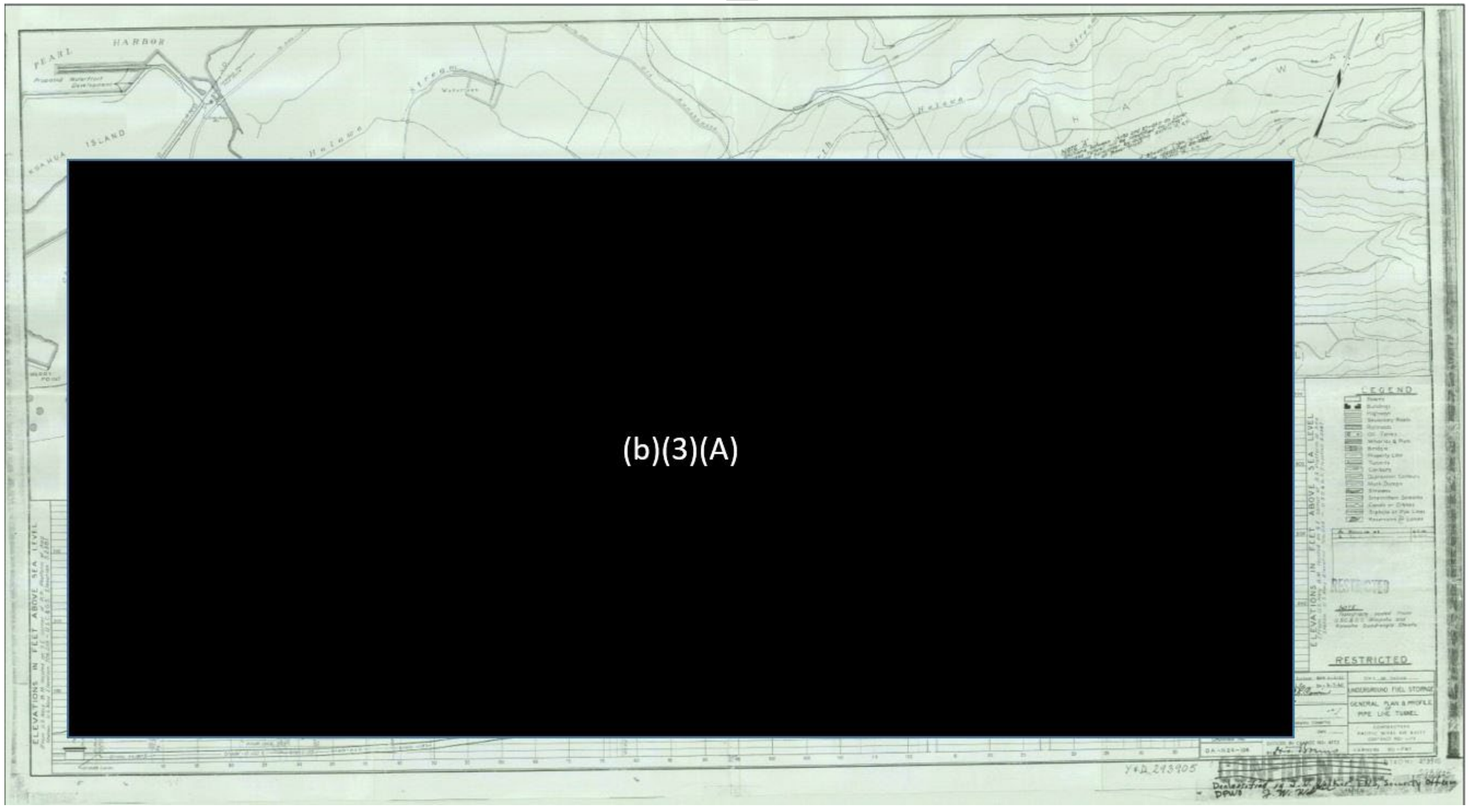

Figure 1: Declassified 1943 Drawing showing Plan & Elevation Views of the Red Hill Tunnels. The elevation view X-axis is not continuous nor cumulative.

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[redacted]

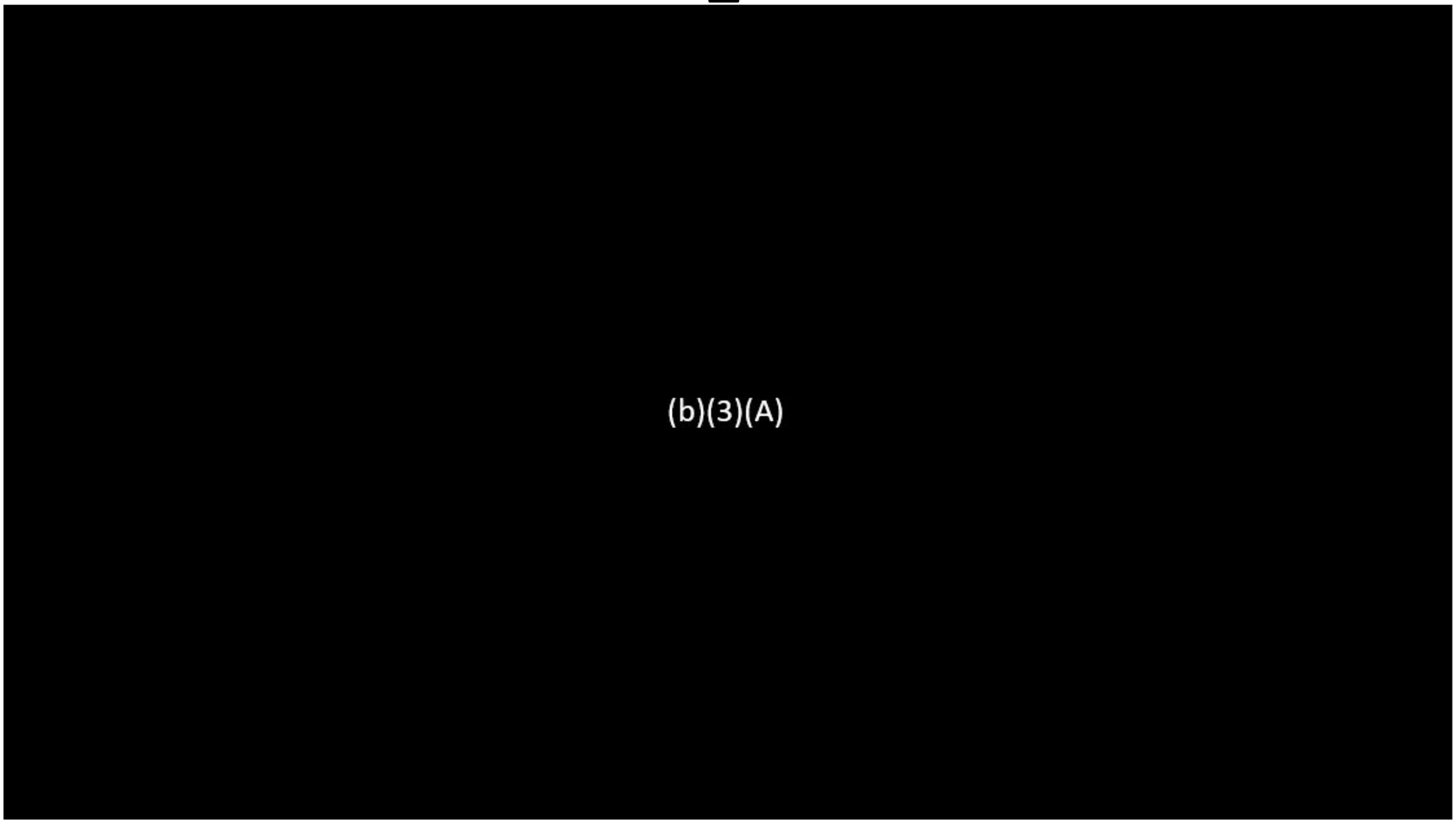

Figure 2: Plan and Elevation Views of the Harbor Tunnel and Lower Access Tunnels, with continuous and cumulative distances shown in green text.

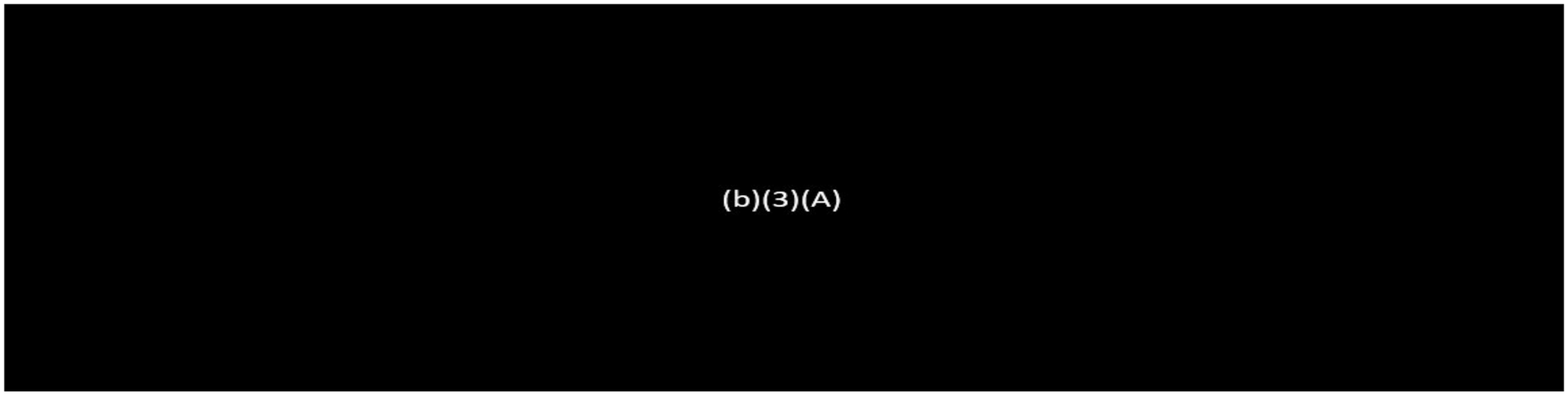

Figure 3: Tunnel Cross-Section (all looking up the tunnel) near UGPH, in Harbor Tunnel, in Lower Access Tunnel and lower end of the Tank Gallery. Note content labels

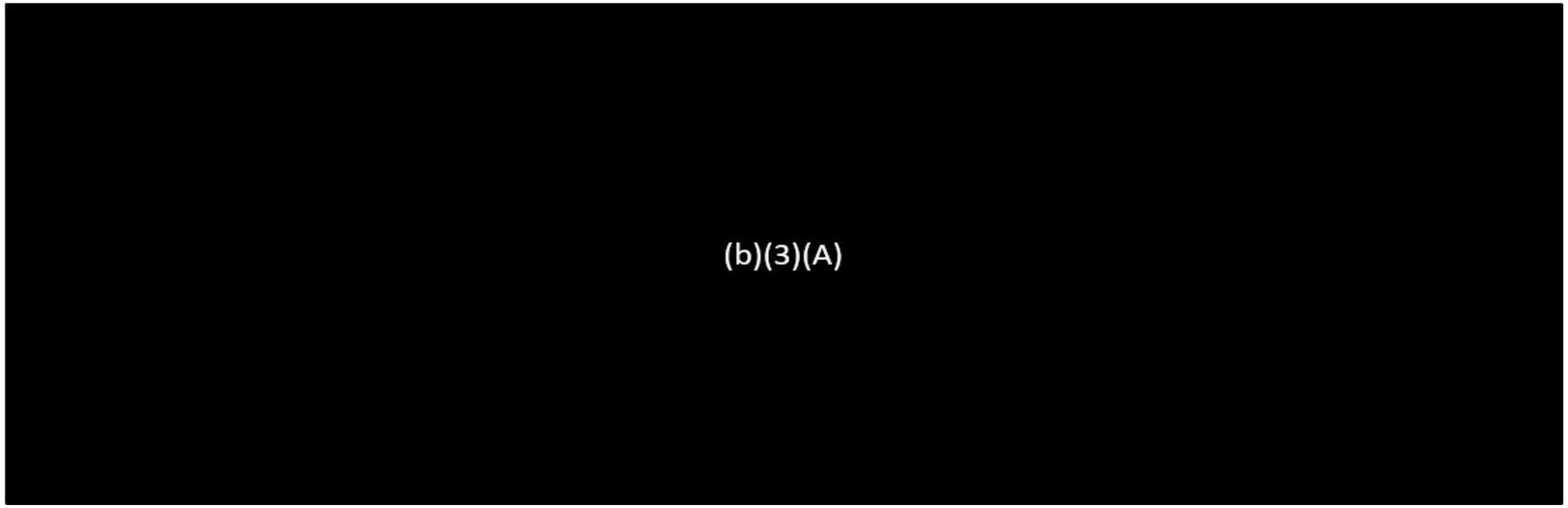

Figure 4: View of typical tunnel, with up-hill to the right. Note also the permeable French drain (green) and potable water pipe (blue)

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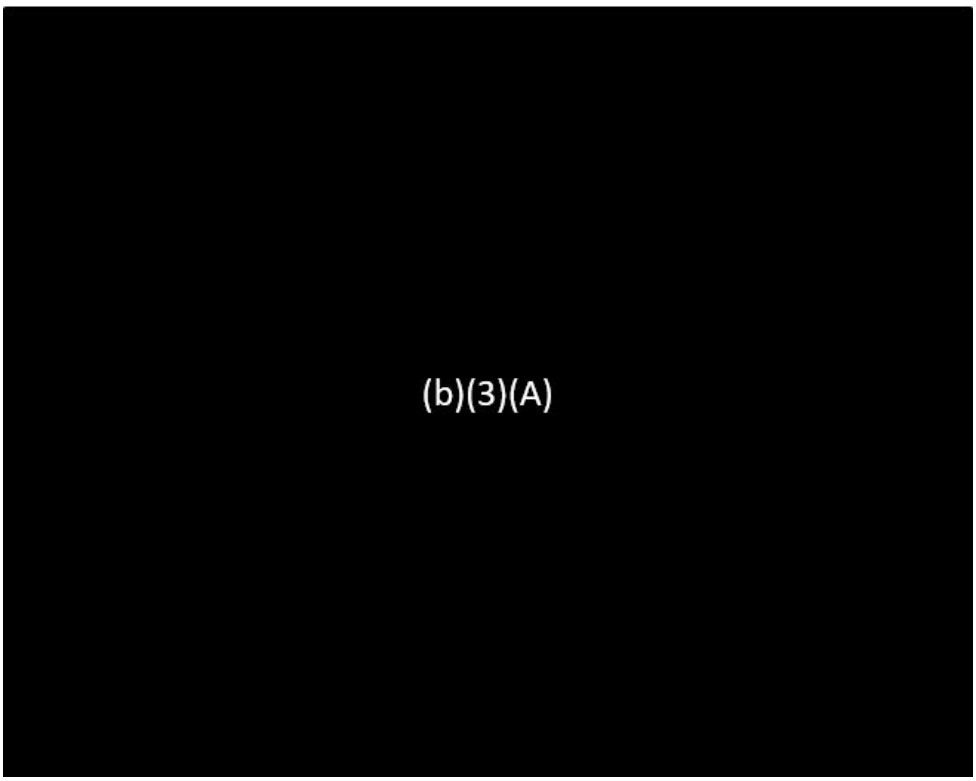

Figure 5: Looking down the Harbor Tunnel, 3 fuel pipes on left, potable water pipe on right.

Figure 6: Sorbent materials available in the tunnel.

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A.2 DATA SHEETS

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JP-5 Pipeline Data Sheet

Organization	JBPHH	[redacted] (b)(3)(A)	
General Information			
Location	Red Hill		
Building No.	Red Hill Lower Access Tunnel and Harbor Tunnel		
Pipeline/Pipeline ID	JP-5 Jet Fuel		
Date of Survey	October 2022		
Surveyed By	PCCI		
Operator or User	DFSP PH Bulk Terminal		
Pipeline POC	[redacted] (b)(6)		
Site Description			
Pipeline connecting Red Hill USTs to the Underground Pumphouse (UGPH), Building 59, at JBPHH.			
Pipeline Data			
Type and Material	Steel	Stored Content	JP-5
Container Compatibility	Yes	Volume	[redacted] (b)(3)(A) gallons
Container Use	Fuel transfer to/from Red Hill USTs	Construction	Welded steel pipeline
Year Constructed	1943	Diameter	18-inch OD
Height	Not applicable	Length	[redacted] (b)(3)(A) feet
Width	Not applicable	Corrosion Protection	Protective coating
Pipeline Support Type	Steel frames @ 25 ft spacing. Concrete thrust blocks ~ 1000 ft spacing	Locked Drain Valves	NA
Normal Vent	See OMES	Interstitial Vent	NA
Emergency Vent	Manual vent valves along pipe crown	Continuous Release Detection Method	Pipeline elevated over concrete tunnel floor
Spill Control	Within Tank Gallery, concrete floor that drains to FOR sump and AFFF diversion sumps. Within Lower Access Tunnel and Harbor Tunnel, concrete floor that drains downhill towards the FOR sump in the UGPH.	Other Notes	Lower tank gallery FOR sump system pumps oily waste to Tank S311 outside Adit 3. Lower harbor tunnel sump system pumps oily waste to Tank B-1 at the FORFAC facility.
Secondary Containment			
Type and Construction Materials	Concrete-lined tunnels were not designed as secondary containment per 40 CFR 112.7(c). Sealing measures implemented during 2022 have improved the tunnel's imperviousness to oil. Sumps, diversion barriers & sorbent materials are pre-staged	Dimensions	Approx [redacted] (b)(3)(A)
Containment Volume	NA	Sealed Closed Drainage Control	The numerous floor drains in the tunnel have been sealed with fuel-resistant caulk or inflatable pipe plugs, see Section A.5.
Transfer Operations			
Buried Piping	NA	Corrosion Protection	NA
Out-of-Service Piping	NA	Capped/Blank Flanged	Periodic 8" blind flanges
Marked – Origin	Yes	Pipe Support Type	Steel frames

[redacted]

Aboveground Valves and Pipeline	18-inch diameter pipeline with associated Motorized Operated Valves (MOV)	Corrosion Protection	Protective coating
Aboveground Piping Protection from Vehicular Traffic	Tunnel is inaccessible to typical vehicles. Tunnel train operation is not authorized. This pipeline is located well above direct contact from small electric work vehicles used within the tunnels.	Truck Rack	NA
Fuel Supplier	DFSP PH Bulk Terminal	Truck Transfer Area	NA
Largest Truck Fuel Compartment	NA	Transfer Rate	NA
Detection and Transfer Equipment/Method and Detection and Shutdown Time	Control room operator monitors transfer operations with AFHE system and security cameras. Personnel patrol and visually inspect pipelines during transfer operations. Estimated time to discover discharge and shut down pumps or close MOV is <20 minutes.	Rack or Transfer Area Secondary Containment Description and Capacity	Spill kits are located throughout lower access and harbor tunnels for use as an active spill containment measure.
Security			
Access Control	Red Hill Facility and associated pipeline tunnels are on a military base with controlled access. DFSP PH requires personnel to obtain security passes, access badges, and control keys to access the Red Hill Facility	Pump Starter Control	The UGPH, Building 59, is a secure facility with personnel manning the control room 24/7.
Lighting	Facility has adequate lighting	Other Notes	

Analysis and Evaluation

Rate, Direction, and Total Quantity of Discharge for Each Reasonable Potential Equipment Failure

Potential Equipment Failure	Discharge Description (Rate and Total)	Containment Description
Pipeline major fitting break, such as May 2021 pressure surge incident.	2000 gpm leak rate over 15 minutes for 30,000 gallons total	(b)(3)(A) path down the Lower Access Tunnel and the Harbor Tunnel, see Section A.5

Most Likely Quantity to be Discharged for the Expected Typical Failure

Expected Typical Failures and Leaks	Most Likely Quantity Discharged	Containment Description
Pipeline flange or other appurtenance leak	One quart per hour	Requires active measures: Spill Kits with > 20 gallons of sorbent containment capacity each are staged throughout the tunnel.
Leaks resulting from maintenance operations on pipeline system	~ 30 gallons (4 cubic feet)	See Note below. Kits with than 20 gallons of containment capacity each are staged throughout the tunnel.
Spills during fuel sampling from pipeline	~ 30 gallons (4 cubic feet)	Concrete tunnel floor with oily water sump systems, spill kits with more than 20 gallons of containment capacity placed throughout the tunnel.

Notes

Spill Risk Analysis and Evaluation –
General Secondary Containment: ~30 gallon spills in Tank Gallery will likely flow to AFFF diversion sumps, then will be transferred to the Fuel Oil Recovery System via 20 gpm pumps. Cleanup with sorbent spill kits.

Drainage of the 30,000 gallon spill can be managed by sealing the tunnel floor with containment measures described in this amendment and by use of Active Measures such as diversion barriers and sealed floor drains to contain the spill along the bottom mile of the Harbor Tunnel. De-energize all tunnel groundwater pumps and other tunnel equipment as suitable for spills within a confined space. Clean up response will use vacuum trucks, pre-staged diaphragm pumps and sorbent spill kits. Personnel to wear appropriate PPE as determined by On-scene coordinator.

Spill will require greater than 1.8 hours to arrive at the UGPH. See Section A.5, Figure 9, Figure 10, Figure 24 and Figure 25 for direction of spills and spill receptors within the tunnel.

[redacted]

F-24 Aviation Fuel Pipeline Data Sheet

Organization	JBPHH	(b)(3)(A)	
General Information			
Location	Red Hill		
Building No.	Red Hill Lower Access Tunnel and Harbor Tunnel		
Pipeline/Pipeline ID	(b)(3)(A)		
Date of Survey	August 2022		
Surveyed By	PCCI		
Operator or User	DFSP PH Bulk Terminal		
Pipeline POC	(b)(6)		
Site Description			
Pipeline connecting Red Hill USTs to the Underground Pumphouse (UGPH), Building 59, at JBPHH.			
Pipeline Data			
Type and Material	Steel	Stored Content	(b)(3)(A)
Container Compatibility	Yes	Volume	(b)(3)(A) gallons
Container Use	Fuel distribution	Construction	Welded steel pipeline
Year Constructed	1943	Diameter	16-inch OD
Height	NA	Length	(b)(3)(A) feet
Width	NA	Corrosion Protection	Protective coating
Pipeline Support Type	Steel frames	Locked Drain Valves	NA
Normal Vent	NA	Interstitial Vent	NA
Emergency Vent	NA	Continuous Release Detection Method	Pipeline elevated over concrete tunnel floor
Spill Control	Concrete floor that drains to oily water sump.	Other Notes	Lower harbor tunnel sump system pumps oil water or other to Tank (b)(3)(A) at the FORFAC facility. Lower tank gallery sump system pumps oily waste to Tank (b)(3)(A) outside Adit 3.
Secondary Containment			
Type and Construction Materials	Concrete-lined tunnels were not designed as secondary containment per 40 CFR 112.7(c). Sealing measures implemented during 2022 have improved the tunnel's imperviousness to oil. Sumps, diversion barriers & sorbent materials are pre-staged	Dimensions	Approx (b)(3)(A)
Containment Volume	NA	Sealed Closed Drainage Control	The numerous floor drains in the tunnel have been sealed with fuel-resistant caulk or inflatable pipe plugs, see Section A.5.
Fail Safe Engineering (Overfill Prevention)			
Device Systems	Rovers patrol pipelines at regular intervals. AFHE system with leak detection.	Telemetry	AFHE system
Transfer Operations			

[redacted]

Buried Piping	NA	Corrosion Protection	NA
Out-of-Service Piping	NA	Capped/Blank Flanged	NA
Marked – Origin	Yes	Pipe Support Type	Concrete buttresses and steel frames
Aboveground Valves and Pipeline	12-inch Motor Operated Valves (MOV)	Corrosion Protection	Protective coating
Aboveground Piping Protection from Vehicular Traffic	Tunnel is inaccessible to typical vehicles. Tunnel train operation is not authorized. This pipeline is located well above direct contact from small electric work vehicles used within the tunnels.	Truck Rack	NA
Fuel Supplier	DFSP PH Bulk Terminal	Truck Transfer Area	NA
Largest Truck Fuel Compartment	NA	Transfer Rate	NA
Detection and Transfer Equipment/Method and Detection and Shutdown Time	Control room operator monitors transfer operations with AFHE system and security cameras. Personnel patrol and visually inspect pipelines during transfer operations. Estimated time to discover discharge and shut down pumps or close MOV is <20 minutes.	Rack or Transfer Area Secondary Containment Description and Capacity	Spill kits are located throughout lower access and harbor tunnels for use as an active spill containment measure.
Security			
Access Control	Red Hill Facility and associated pipeline tunnels are on a military base with controlled access. DFSP PH requires personnel to obtain security passes, access badges, and control keys in order to access the Red Hill Facility	Pump Starter Control	The UGPH, Building 59, is a secure facility with personnel manning the control room 24/7.
Lighting	Facility has adequate lighting at nearly all locations	Other Notes	
Analysis and Evaluation			

Rate, Direction, and Total Quantity of Discharge for Each Reasonable Potential Equipment Failure

Potential Equipment Failure	Discharge Description (Rate and Total)	Containment Description
Pipeline major fitting break, such as May 2021 pressure surge incident.	2000 gpm leak rate over 15 minutes for 30,000 gallons total	(b)(3)(A) path down the Lower Access Tunnel and the Harbor Tunnel, see Section A.5

Most Likely Quantity to be Discharged for the Expected Typical Failure

Expected Typical Failures and Leaks	Most Likely Quantity Discharged	Containment Description
Pipeline flange or other appurtenance leak	One quart per hour	Requires active measures: Spill Kits with > 20 gallons of sorbent containment capacity each are staged throughout the tunnel.
Leaks resulting from maintenance operations on pipeline system	~ 30 gallons (4 cubic feet)	See Note below. Kits with than 20 gallons of containment capacity each are staged throughout the tunnel.
Spills during fuel sampling from pipeline	~ 30 gallons (4 cubic feet)	Concrete tunnel floor with oily water sump systems, spill kits with more than 20 gallons of containment capacity placed throughout the tunnel.

Notes

Spill Risk Analysis and Evaluation –
General Secondary Containment: ~30 gallon spills in Tank Gallery will likely flow to AFFF diversion sumps, then will be transferred to the Fuel Oil Recovery System via 20 gpm pumps. Cleanup with sorbent spill kits.

Drainage of the 30,000 gallon spill can be managed by sealing the tunnel floor with containment measures described in this amendment and by use of Active Measures such as diversion barriers and sealed floor drains to contain the spill along the bottom mile of the Harbor Tunnel. De-energize all tunnel groundwater pumps and other tunnel equipment as suitable for spills

[redacted]

within a confined space. Clean up response will use vacuum trucks, pre-staged diaphragm pumps and sorbent spill kits. Personnel to wear appropriate PPE as determined by On-scene coordinator.

Spill will require greater than 1.8 hours to arrive at the UGPH. See Section A.5, Figure 9, Figure 10, Figure 24 and Figure 25 for direction of spills and spill receptors within the tunnel.

[redacted]

F-76 Diesel Fuel Marine Pipeline Data Sheet

Organization	JBPHH	[redacted]	
General Information			
Location	Red Hill		
Building No.	Red Hill Lower Access Tunnel and Harbor Tunnel		
Pipeline/Pipeline ID	(b)(3)(A)		
Date of Survey	August 2022		
Surveyed By	PCCI		
Operator or User	DFSP PH Bulk Terminal		
Pipeline POC	(b)(6)		
Site Description			
Pipeline connecting Red Hill USTs to the Underground Pumphouse (UGPH), Building 59, at JBPHH.			
Pipeline Data			
Type and Material	Steel	Stored Content	(b)(3)(A)
Container Compatibility	Yes	Volume	(b)(3)(A) gallons
Container Use	Fuel distribution	Construction	Welded steel pipeline
Year Constructed	1943	Diameter	32-inch OD
Height	NA	Length	(b)(3)(A) feet
Width	NA	Corrosion Protection	Protective coating
Pipeline Support Type	Concrete buttresses	Locked Drain Valves	NA
Normal Vent	NA	Interstitial Vent	NA
Emergency Vent	NA	Continuous Release Detection Method	Pipeline elevated over concrete tunnel floor
Spill Control	Concrete tunnel floor that drains to tunnel low points near Adits 1.	Other Notes	Lower harbor tunnel sump system pumps oily waste to Tank (b)(3)(A) at the FORFAC facility. Lower tank gallery sump system pumps oily waste to Tank (b)(3)(A) outside Adit 3.
Secondary Containment			
Type and Construction Materials	Concrete-lined tunnels were not designed as secondary containment per 40 CFR 112.7(c). Sealing measures implemented during 2022 have improved the tunnel's imperviousness to oil. Sumps, diversion barriers & sorbent materials are pre-staged	Dimensions	Approx (b)(3)(A)
Containment Volume	NA	Sealed Closed Drainage Control	The numerous floor drains in the harbor tunnel have been sealed with fuel-resistant caulk or inflatable pipe plugs.
Fail Safe Engineering (Overfill Prevention)			
Device Systems	Rovers patrol pipelines at regular intervals. AFHE system with leak detection.	Telemetry	AFHE system
Transfer Operations			

[redacted]

Buried Piping	NA	Corrosion Protection	NA
Out-of-Service Piping	NA	Capped/Blank Flanged	Periodic 8" Blind flanges tees. Periodic Caps
Marked – Origin	Yes	Pipe Support Type	Concrete buttresses
Aboveground Valves and Pipeline	18" Motor Operated Valves (MOV) Periodic small valves for vent or sampling	Corrosion Protection	Protective coating
Aboveground Piping Protection from Vehicular Traffic	Tunnel is inaccessible to typical vehicles. Tunnel train operation is not authorized. This pipeline is located well above direct contact from small electric work vehicles used within the tunnels.	Truck Rack	NA
Fuel Supplier	DFSP PH Bulk Terminal	Truck Transfer Area	NA
Largest Truck Fuel Compartment	NA	Transfer Rate	NA
Detection and Transfer Equipment/Method and Detection and Shutdown Time	Control room operator monitors transfer operations with AFHE system and security cameras. Personnel patrol and visually inspect pipelines during transfer operations. Estimated time to discover discharge and shut down pumps or close MOV is <20 minutes.	Rack or Transfer Area Secondary Containment Description and Capacity	Spill kits are located throughout lower access and harbor tunnels for use as an active spill containment measure.
Security			
Access Control	Red Hill Facility and associated pipeline tunnels are on a military base with controlled access. DFSP PH requires personnel to obtain security passes, access badges, and control keys in order to access the Red Hill Facility	Pump Starter Control	The UGPH, Building 59, is a secure facility with personnel manning the control room 24/7.
Lighting	Facility has adequate lighting at nearly all locations	Other Notes	Poor lighting in vicinity of valves near Harbor Tunnel groundwater sump

Analysis and Evaluation

Rate, Direction, and Total Quantity of Discharge for Each Reasonable Potential Equipment Failure

Potential Equipment Failure	Discharge Description (Rate and Total)	Containment Description
Pipeline appurtenance fitting leak (e.g. flange, valve)	One quart per hour. Maximum time between visits by Tunnel rover is 8 hours, thus total spill = 0.75 gallon.	Requires active measures: Spill Kits with > 20 gallons of sorbent containment capacity each are staged throughout the tunnel.

Most Likely Quantity to be Discharged for the Expected Typical Failure

Expected Typical Failures and Leaks	Most Likely Quantity Discharged	Containment Description
Pipeline flange or other appurtenance leak	One quart per hour	Requires active measures: Spill Kits with > 20 gallons of sorbent containment capacity each are staged throughout the tunnel.
Leaks resulting from maintenance operations on pipeline system	~ 30 gallons (4 cubic feet)	See Note below. Kits with than 20 gallons of containment capacity each are staged throughout the tunnel.
Spills during fuel sampling from pipeline	~ 30 gallons (4 cubic feet)	Concrete tunnel floor with oily water sump systems, spill kits with more than 20 gallons of containment capacity placed throughout the tunnel.

Notes

Spill Risk Analysis and Evaluation –
General Secondary Containment: ~30 gallon spills in Tank Gallery will likely flow to AFFF sumps, then will be transferred to the Fuel Oil Recovery System. Cleanup with sorbent spill kits.
Spills in the Lower Access Tunnel and Harbor Tunnel should be contained via Active Measures. Use sorbent spill kits, and plug drains and water / sewage sumps downhill of spill. De-energize downhill groundwater pumps. Cleanup with sorbent materials.

[redacted]

[redacted]

Drainage – See Section A.5, Figure 9, Figure 10, Figure 24, and Figure 25 for direction of spills and spill receptors within the tunnel.

Future Status of Pipeline: NAVFAC is still coordinating with COMNAVREGION HI on the status of the F-76 pipeline, however, the pipeline will be out of service but not permanently closed.

Fuel Oil Recovery System (in Lower Access Tunnel) Data Sheet

Organization	JBPHH	(b)(3)(A)	
General Information			
Location	Red Hill		
Building No.	Red Hill Lower Access Tunnel		
Pipeline/Pipeline ID	Fuel Oil Recovery (FOR) Sump		
Date of Survey	August 2022		
Surveyed By	PCCI		
Operator or User	DFSP PH Bulk Terminal		
Pipeline POC	(b)(6)		
Site Description			
Photo at right shows operator pit above the FOR sump, see also Figure 7.			
Pipeline Data			
Type and Material	Reinforced concrete	Stored Content	Residual / waste mixed (b)(3)(A)
Container Compatibility	Yes	Volume	(b)(3)(A) gallons
Container Use	Fuel oil recovery	Construction	Field Installed
Year Constructed	1943	Diameter	NA
Height	8 ft	Length	6 ft
Width	4.75 ft	Corrosion Protection	Concrete
Pipeline Support Type		Locked Drain Valves	NA
Normal Vent	~7 ft above tank top	Interstitial Vent	NA
Emergency Vent	NA	Continuous Release Detection Method	NA
Spill Control		Other Notes	Lower tank gallery sump system pumps oily waste to Tank (b)(3)(A) outside Adit 3.
Secondary Containment			
Type and Construction Materials	Reinforced concrete operator pit	Dimensions	(b)(3)(A)
Containment Volume	(b)(3)(A) gallons	Sealed Closed Drainage Control	NA
Fail Safe Engineering (Overfill Prevention)			
Device Systems	Sump overfill will flow upwards to the operator pit above. See also Figure 7.	Instruments	Sump level sensor. Overflow detected by Rover
Transfer Operations			
Buried Piping	Gravity drains are below tunnel floor. The FOR discharge pipeline is (b)(3)(A) feet long. The FOR sump pump discharges to the 6" discharge pipe.	Corrosion Protection	NA
Out-of-Service Piping	NA	Capped/Blank Flanged	NA
Marked – Origin	Yes	Pipe Support Type	NA

[redacted]

Aboveground Valves and Pipeline	Yes	Corrosion Protection	Protective coating
Aboveground Piping Protection from Vehicular Traffic	Tunnel is inaccessible to typical vehicles. Tunnel train operation is not authorized. This pipeline is located well above direct contact from small electric work vehicles used within the tunnels.	Truck Rack	NA
Fuel Supplier	DFSP PH Bulk Terminal	Truck Transfer Area	NA
Largest Truck Fuel Compartment	NA	Transfer Rate	NA
Detection and Transfer Equipment/Method and Detection and Shutdown Time	NA	Rack or Transfer Area Secondary Containment Description and Capacity	NA
Security			
Access Control	Red Hill Facility and associated pipeline tunnels are on a military base with controlled access. DFSP PH requires personnel to obtain security passes, access badges, and control keys in order to access the Red Hill Facility	Pump Starter Control	
Lighting	Facility has adequate lighting	Other Notes	NA

Analysis and Evaluation

Rate, Direction, and Total Quantity of Discharge for Each Reasonable Potential Equipment Failure

Potential Equipment Failure	Discharge Description (Rate and Total)	Containment Description
Pipeline appurtenance fitting leak (e.g. flange, valve)	One quart per hour. Maximum time between visits by Tunnel rover is 8 hours, thus total spill = 0.75 gallon.	Operator pit: Spill Kits with > 20 gallons of sorbent containment capacity each are staged throughout the tunnel.

Most Likely Quantity to be Discharged for the Expected Typical Failure

Expected Typical Failures and Leaks	Most Likely Quantity Discharged	Containment Description
Pipeline flange or other appurtenance leak within operator pit	One quart per hour	Use active measures: Spill Kits with > 20 gallons of sorbent containment capacity each are staged throughout the tunnel.
Leaks resulting from maintenance operations within operator pit	~ 10 gallons (1.5 cubic feet)	Use active measures: Spill Kits with > 20 gallons of sorbent containment capacity each are staged throughout the tunnel.
Spills while discharging to tank 311	~ 30 gallons (4 cubic feet)	Concrete tunnel floor with oily water sump systems, spill kits with more than 20 gallons of containment capacity placed throughout the tunnel.

Notes

Applicability: The FOR sump is located underground but is not completely buried. As per 40 CFR parts 280 and 281 "…only completely buried tanks subject to all of the technical UST program requirements are exempt from the rule. Any tanks that are not completely buried are considered aboveground storage tanks and subject to the SPCC rule."

Spill Risk Analysis and Evaluation –
General Secondary Containment: ~30 gallon spills onto the tunnel floor will flow to the recessed floor at the emergency Oil Pressure Door.
Spills in the Lower Access Tunnel and Harbor Tunnel should be contained via Active Measures. Use sorbent spill kits, and plug drains and water / sewage sumps downhill of spill. De-energize downhill groundwater pumps. Cleanup with sorbent materials.

Drainage – See Figure 9, Figure 10, Figure 24, and Figure 25 for direction of spills and spill receptors within the tunnel.

[redacted]

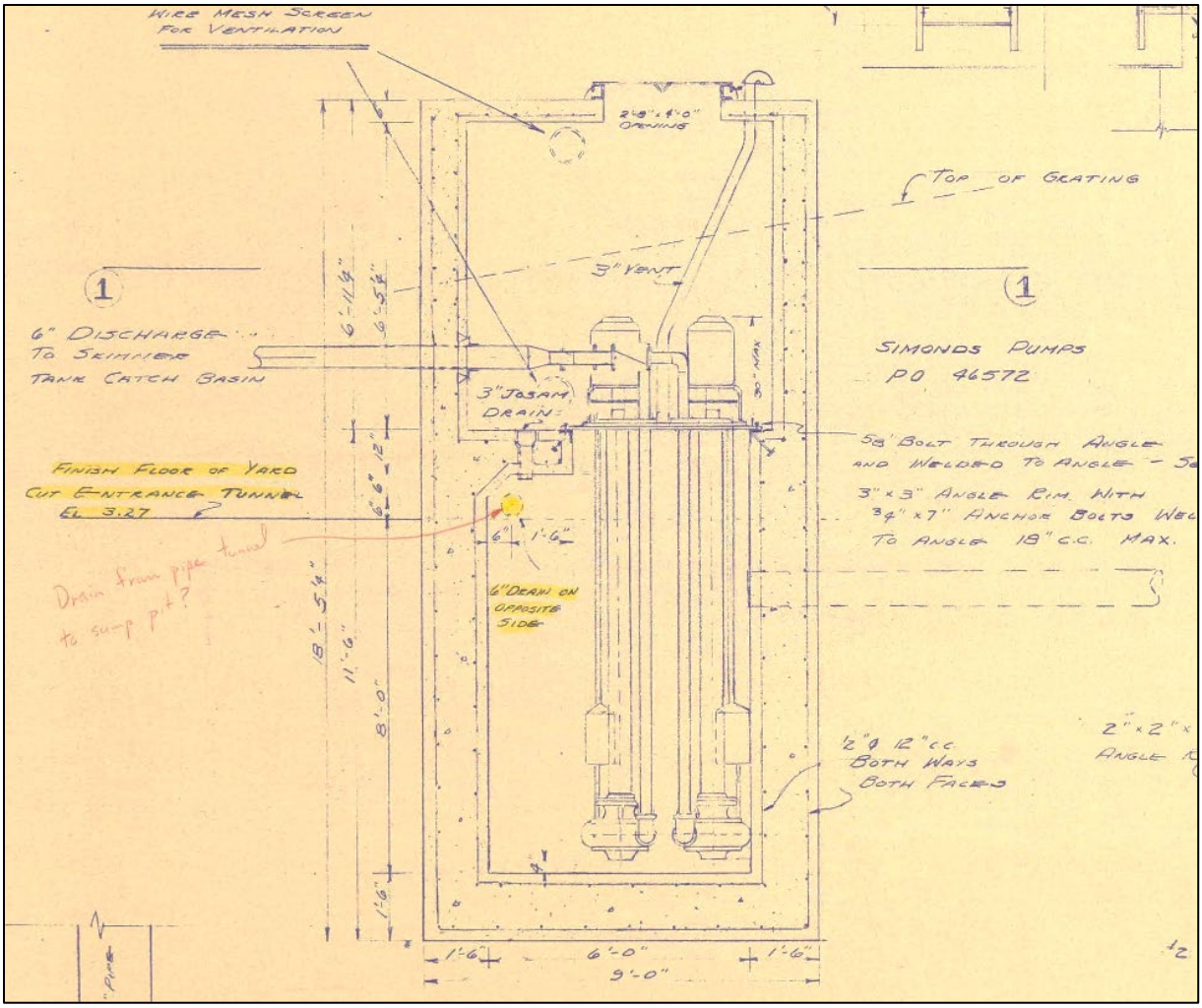

Figure 7: Cross-section of the FOR sump in the Lower Access Tunnel, Y&D Drawing #294047

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Fuel Oil Recovery Sump (in Underground Pumphouse) Data Sheet

	JBPHH	(b)(3)(A)	
General Information			
Location	Red Hill		
Building No.	Adit 1 Underground Pumphouse		
Pipeline/Pipeline ID	Fuel Oil Recovery Sump System		
Date of Survey	August 2022		
Surveyed By	PCCI		
Operator or User	DFSP PH Bulk Terminal		
Pipeline POC	Shaun Hayasaka, Ph. (808) 473-7807		
Site Description			
The FOR sump in the base of the Underground Pumphouse is an AST that collects fuel and water which is discharged to the FORFAC for processing. The Underground Pumphouse transfers fuel between the Red Hill tanks, JBPHH ASTs and piers, truck rack, 4 surge tanks, Hickam AFB, and refinery.			
Pipeline Data			
Type and Material	Reinforced Concrete	Stored Content	Residual / waste mixed (b)(3)(A)
Container Compatibility	Yes	Volume	(b)(3)(A) gallons
Container Use	Fuel and water recovery	Construction	
Year Constructed	1943	Diameter	NA
Height	7 ft	Length	7.75 ft
Width	4.17	Corrosion Protection	Protective coating
Pipeline Support Type		Locked Drain Valves	NA
Normal Vent	NA	Interstitial Vent	NA
Emergency Vent	NA	Continuous Release Detection Method	Pumphouse operators on site 24/7. Alarms and electronic monitoring 24/7.
Spill Control	Concrete floor that drains to oily water sump.	Other Notes	System pumps oily waste to FOR Tank located in the pumphouse
Secondary Containment			
Type and Construction Materials	Concrete	Dimensions	(b)(3)(A)
Containment Volume	Bottom 3 ft of the UGPH (b)(3)(A)	Sealed Closed Drainage Control	NA
Fail Safe Engineering (Overfill Prevention)			
Device Systems	NA	Telemetry	AFHE system
Transfer Operations			
Buried Piping	NA	Corrosion Protection	NA
Out-of-Service Piping	NA	Capped/Blank Flanged	NA
Marked – Origin	Yes	Pipe Support Type	
Aboveground Valves and Pipeline	Yes	Corrosion Protection	Protective coating

[redacted]

[redacted]

Aboveground Piping Protection from Vehicular Traffic	NA	Truck Rack	NA
Fuel Supplier	DFSP PH Bulk Terminal	Truck Transfer Area	NA
Largest Truck Fuel Compartment	NA	Transfer Rate	NA
Detection and Transfer Equipment/Method and Detection and Shutdown Time	Control room operator monitors operation operations with AFHE system and security cameras.	Rack or Transfer Area Secondary Containment Description and Capacity	Spill kits are located in the pumphouse.
Security			
Access Control	Adit 1 Underground Pumphouse is on a military base with controlled access. DFSP PH requires personnel to obtain security passes, access badges, and control keys to access the pumphouse and adjoining tunnel.	Pump Starter Control	The UGPH, Building 59, is a secure facility with personnel manning the control room 24/7.
Lighting	Facility has excellent lighting	Other Notes	NA

Analysis and Evaluation

Rate, Direction, and Total Quantity of Discharge for Each Reasonable Potential Equipment Failure

Potential Equipment Failure	Discharge Description (Rate and Total)	Containment Description
Pipeline appurtenance fitting leak (e.g. flange, valve)	One quart per hour	Concrete pumphouse floor with oily water sump systems, spill kits with more than 20 gallons of containment capacity available in the pumphouse.

Most Likely Quantity to be Discharged for the Expected Typical Failure

Expected Typical Failures and Leaks	Most Likely Quantity Discharged	Containment Description
Pipeline flange or other appurtenance leak within operator pit	One quart per hour	Use active measures: Spill Kits with > 20 gallons of sorbent containment capacity each are staged throughout the tunnel.
Leaks resulting from maintenance operations	~ 10 gallons (1.5 cubic feet)	Use active measures: Spill Kits with > 20 gallons of sorbent containment capacity each are staged throughout the tunnel.
Spills while discharging to FORFAC	~ 30 gallons (4 cubic feet)	Concrete tunnel floor with oily water sump systems, spill kits with more than 20 gallons of containment capacity placed throughout the tunnel.

Notes

General Secondary Containment – Use Active Measures
The FOR sump is much less volume than the capacity of the lower section of the UGPH. Sump leakage or overflow into the lower level of the UGPH shall be contained with active measures including sorbent materials and use of diaphragm pumps to send oil to the FORFAC.

Drainage – The UGPH is below grade. It is located on flat land near Sierra Pier area.

Details of the complex piping network and high-horsepower pumps within the UGPH are described in the OMES plan.

Because the UGPH has a history of pressure surges, it would be good engineering practice to install flange shields to capture possible atomized spray from a leaking flange gasket.

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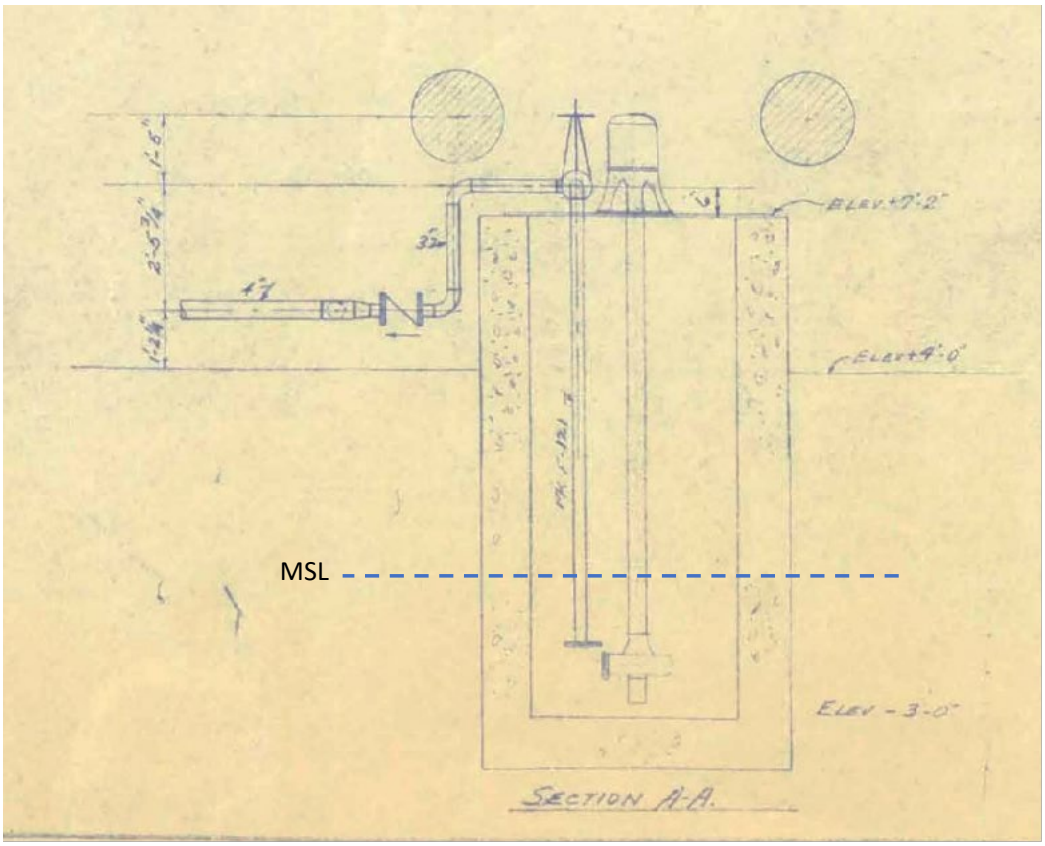

Figure 8: Cross-section of FOR sump in the UGPH, from Y&D Drawing# 294075.

[redacted]

A.3 DRAINAGE SYSTEMS WITHIN LOWER ACCESS TUNNEL

The tank gallery and Lower Access Tunnel contain the (b)(3)(A) fuel pipes, the Fuel Oil Recovery system, plus four other drainage systems. These are the AFFF Retention/drainage system, the groundwater/fuel system using the same AFFF sumps, the sewage system, and the Hume Pipe groundwater system under the Adit 3 tunnel. These systems are listed in Table A-3.

Figure 9 is a plan view of the Lower Access Tunnel, including a representation of the relevant drainage tanks and also the direction of surface flow from Adit 3. Figure 10 plots the elevation and distance throughout the Lower Access Tunnel, including the elevations of the various drainage system sumps. In event of a fuel spill, this elevation information should be used so responders can properly manage the drainage.

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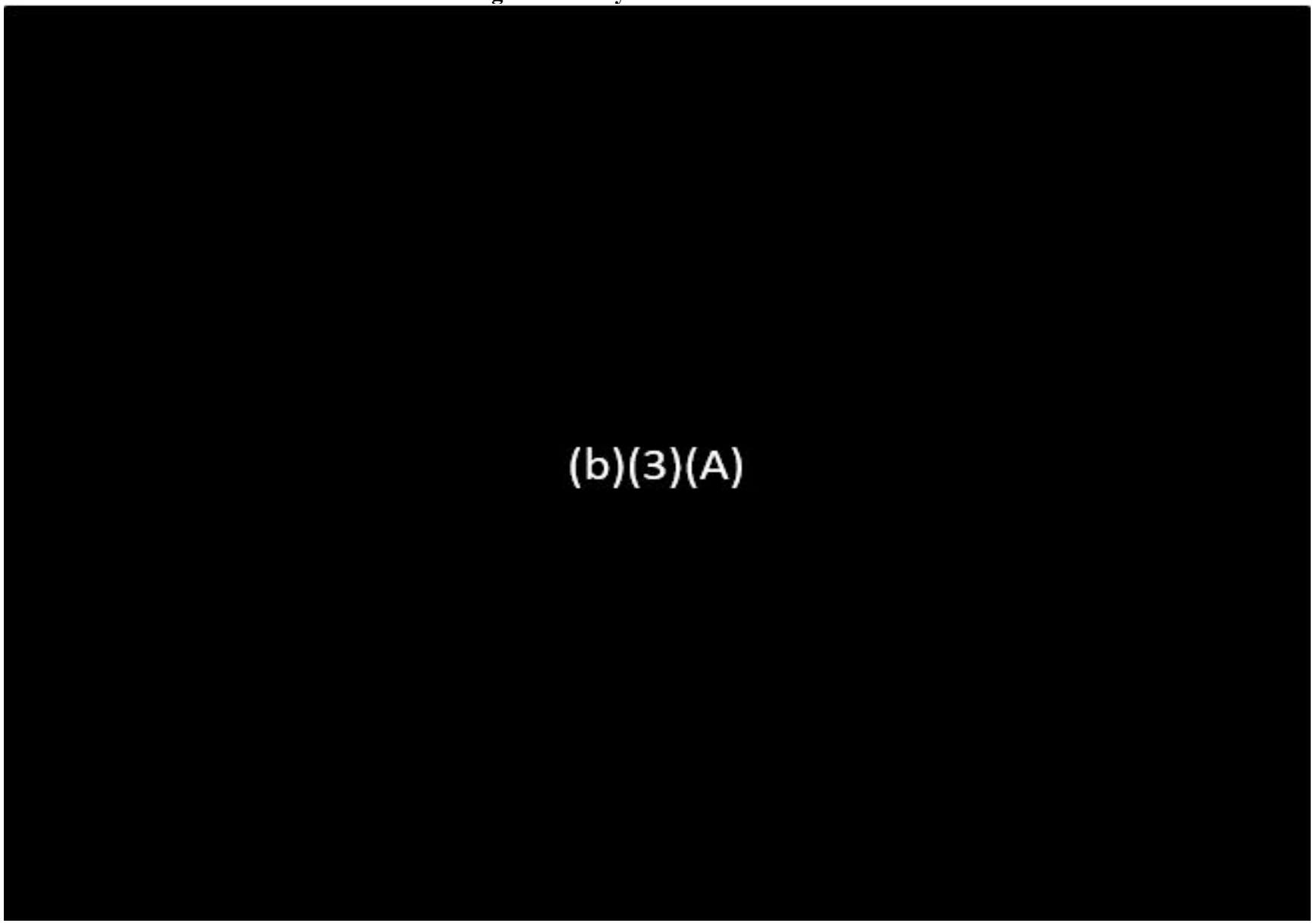
Table A-3: Drainage-related Systems within the Lower Access Tunnel



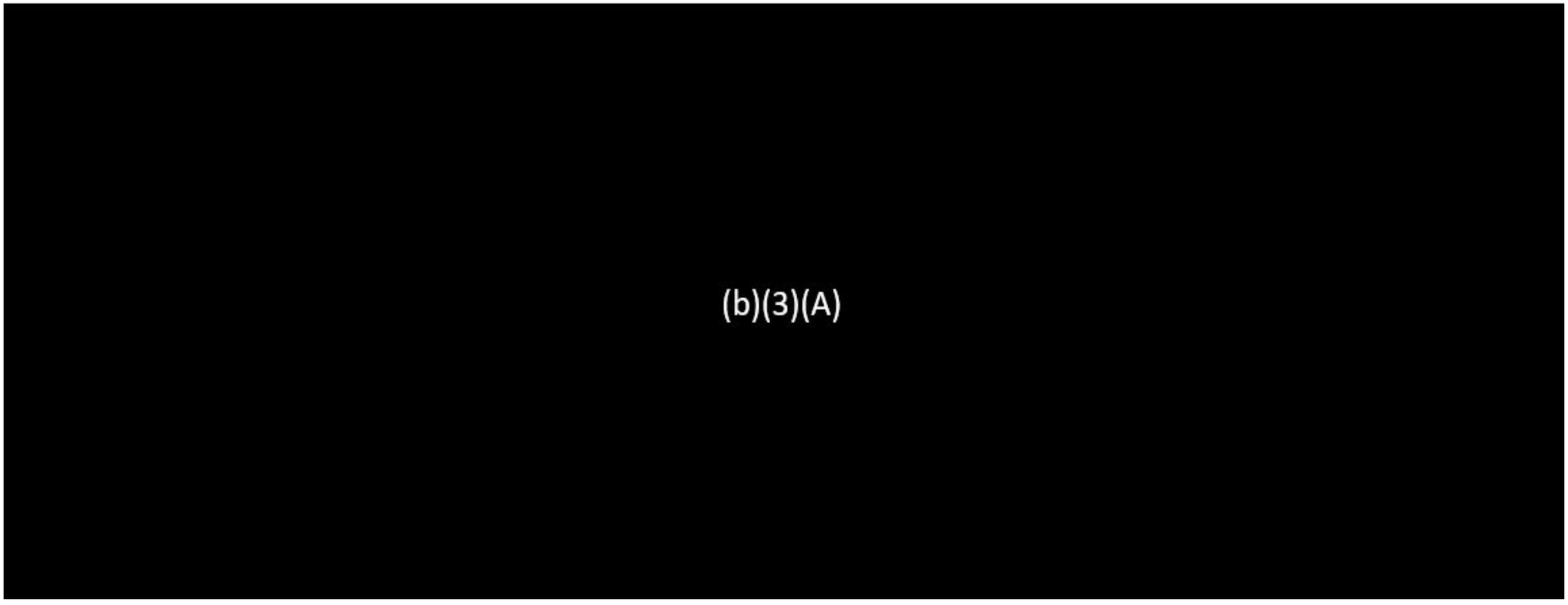


Figure 9: Plan view of Lower Access Tunnel System including drainage systems.

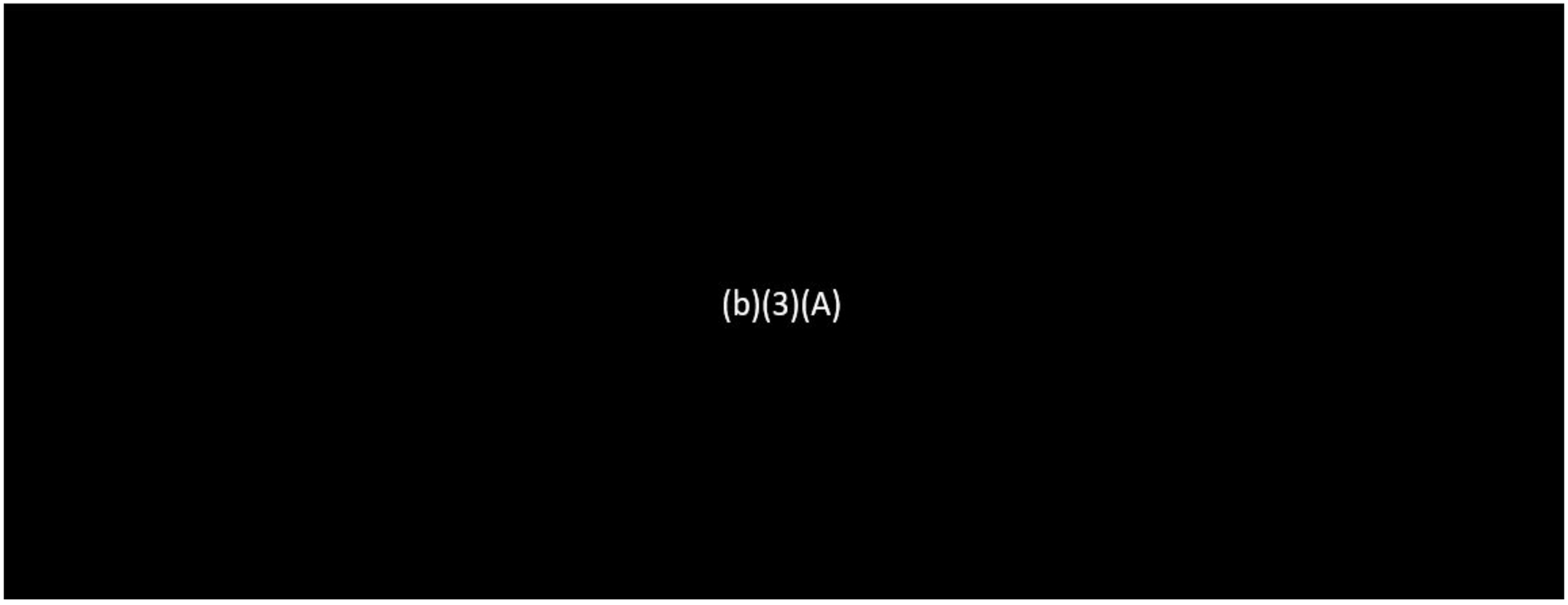


Figure 10: Elevation view of Lower Access Tunnel. Note compressed horizontal scale.

Fuel Oil Recovery Oil Drain System to the Main FOR Sump

Each of the twenty fuel tanks has a fuel sampling manifold to allow test samples of fuel to be extracted at various heights within the 250-ft-tall tanks. The sample piping and the single FOR drain pipe is shown in Figure 11: One of the twenty Fuel Sampling manifolds that drain to the FOR System.Figure 11. Fuel needed to flush the sample piping is collected by the FOR drain system, which flows by gravity to the Main FOR sump, which is shown on the FOR Data Sheet. The location of the FOR main sump is shown on Figure 10.

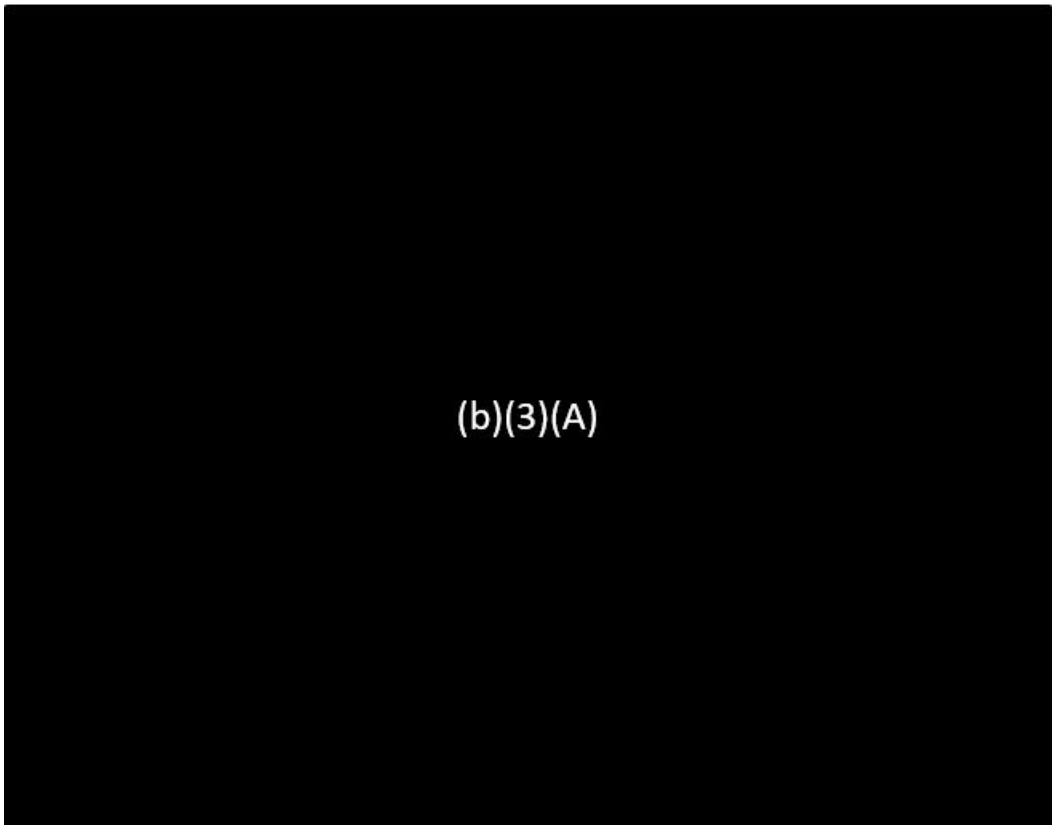


Figure 11: One of the twenty Fuel Sampling manifolds that drain to the FOR System.

AFFF Diversion Sump Low-Flow System to the FOR Main Sump

Six 20 gpm sump pumps (see Figure 13) co-located in the AFFF sumps and the emergency Oil Pressure Door sump also discharge to the FOR main sump via a 2" copper pipe header. The FOR Main Sump is not a UST.

Tank Gallery Monitoring Wells

Numerous monitoring wells (approximately 2" diameter) have been drilled through the tank gallery tunnel floor. Each well is closed with a ~2" diameter stainless steel cap. COMNAVREGION Hawai'i has sealed the caps of these wells using Sikaflex-1A jet-fuel-

[redacted]

resistant polyurethane sealant. On top of each well they have also placed a disc of rubber sheeting weighted down with a sandbag.

AFFF Retention System and Oil Pressure Door

The AFFF Retention System consists of five open-top diversion sumps in the tank gallery, each with four 1000-gpm sump pumps. Installed in 2016, the system was intended to remove fire-fighting foam and fuel from the tank gallery and discharge it to a tank outside of Adit 3. Components of the system are shown in Figure 12, Figure 13, and Figure 15. This system helped to contain a fuel spill in May 2021. Capacity of each sump is 2297 gallons.

As of October 2022, it was verified that the twenty 1000-gpm sump pumps have been de-activated via lock-out/tag-out as directed by COMNAVREGION Hawaii so that fuel is not re-introduced into the PVC discharge header pipe.

During the similar construction timeframe an emergency Oil Pressure Door, see Figure 14, was installed to contain fuel spilled within the Tank Gallery Tunnel from flowing further into the Lower Access Tunnel. The high strength door system is designed to lower the tunnel train tracks and then close, achieving an oil-tight seal along its entire perimeter.

As of October 2022, COMNAVREGION Hawaii has directed that the Oil Pressure Door shall remain open so that potential spilled fuel can flow down the tunnel away from the aquifer. Numerous temporary diversion barriers, illustrated in Figure 16 can be installed to further direct fuel away from Adit 3 and down the Harbor Tunnel.

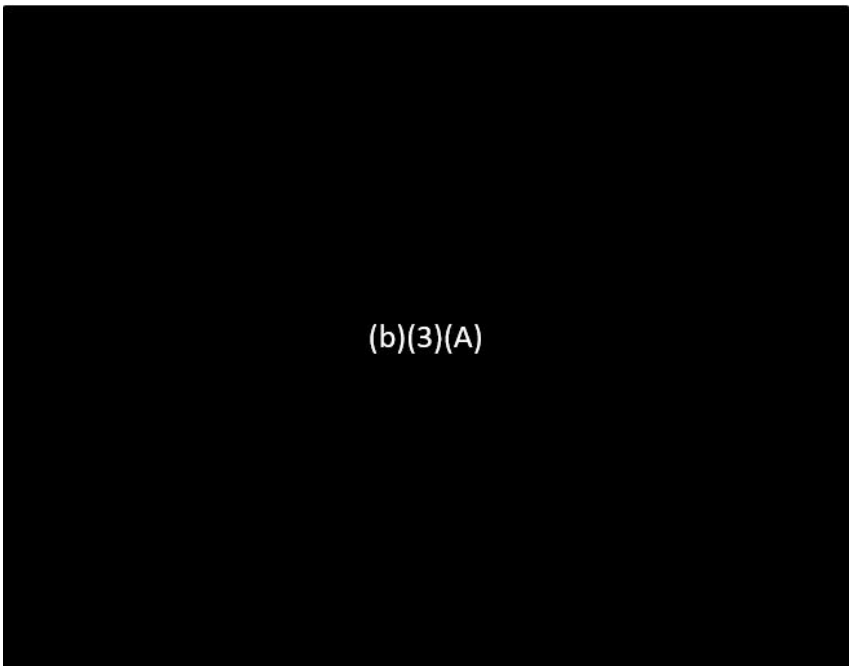


Figure 12: One of five AFFF sumps along the tank gallery tunnel.

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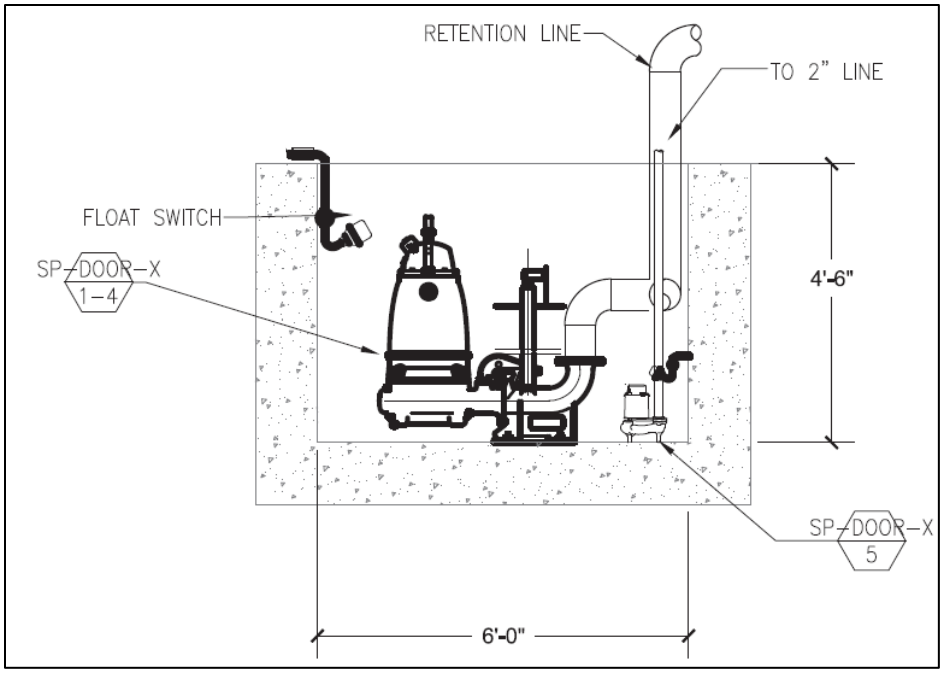

Figure 13: Each AFFF diversion sump has four de-activated 1000-gpm pumps and one active20-gpm pump

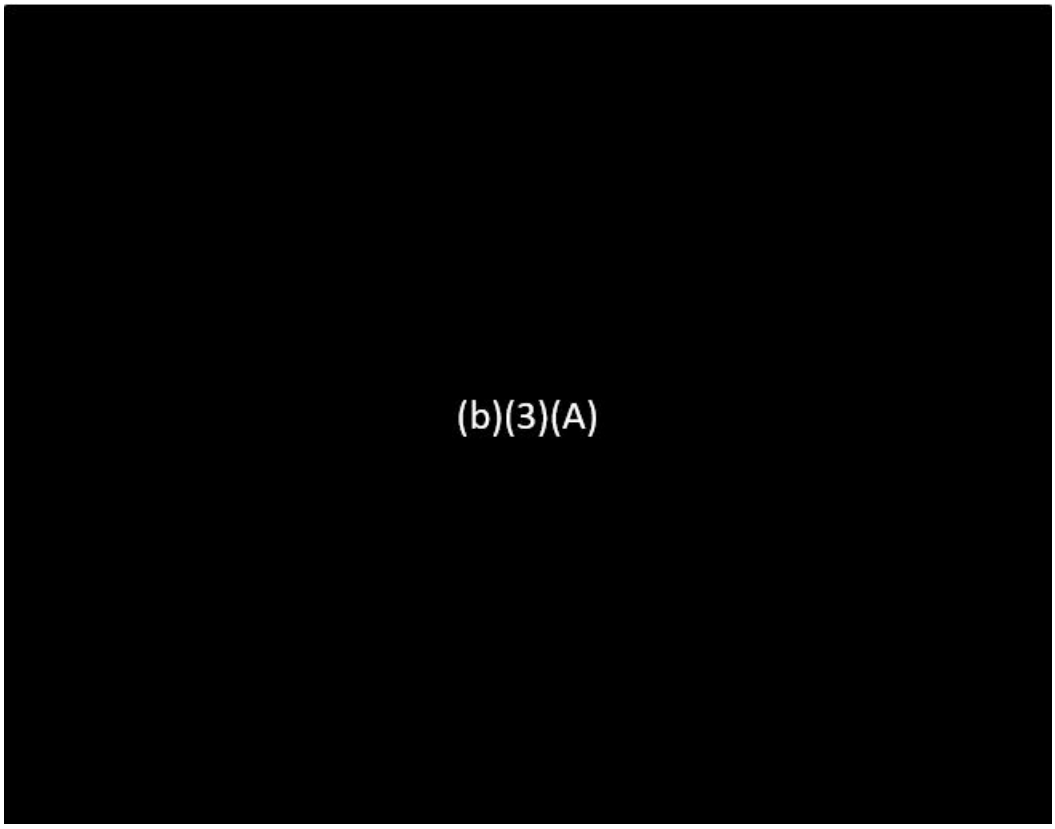

Figure 14: Looking down the tunnel through the Oil Pressure Door. Note retractable floor.

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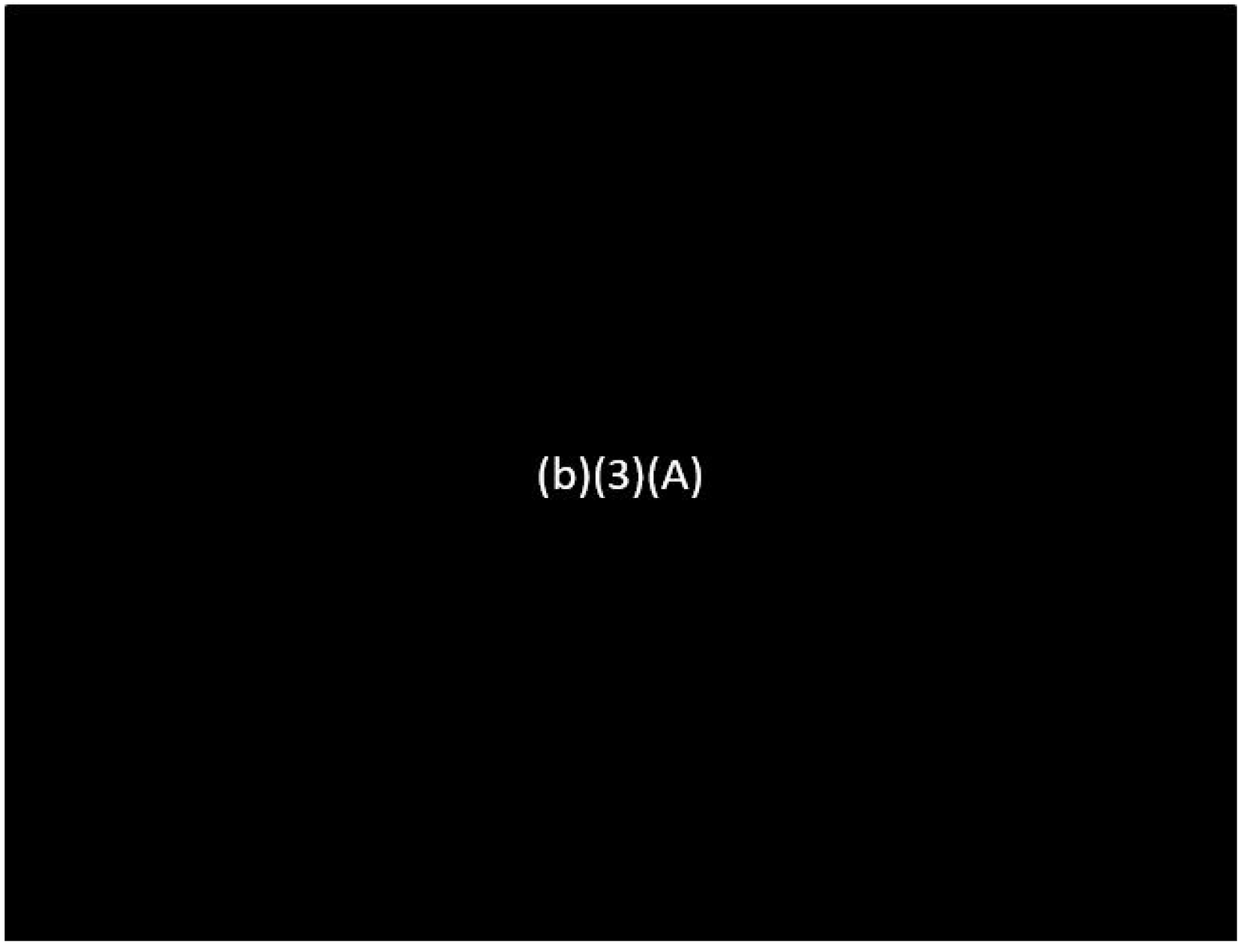

Figure 15: AFFF Retention piping plan & elevation views near Adit 3, from RFI #069.1

[redacted]

Groundwater Drains and Sump NearAdit 3

A permeable French-drain of "Hume" reinforced concrete pipe is installed underneath the Adit 3 entrance tunnel. This pipe is shown by the dashed line on Figure 10 and on Figure 16. This pipe collects groundwater from under the tunnel floor and conveys it to the Adit 3 groundwater sump where its sump pump discharges it to a holding tank outside of Adit 3. A floor drain adjacent to the Navy well also drains to the Hume pipe, as circled in orange on Figure 16.

In the event of a fuel spill along the tunnel or into the groundwater sump, the Hume pipe is/was a passive path for fuel to be released into the soil under the tunnel. COMNAVREGION Hawaii has added countermeasures for the Hume pipe:

- All drains have been sealed closed with Sikaflex-1A jet-fuel-resistant polyurethane sealant or with removable pipe plugs.
- At the ground water sump, Elastomer check valves were inserted into the two Hume pipes so that sump contents do not backflow into the pipe.
- The surface of the ground water sump and its pipe / conduit penetrations have all been sealed with rubber sheeting and Sikaflex-1A jet-fuel-resistant polyurethane sealant. Figure 18, Figure 19 and Figure 22 show these sumps prior to being sealed.

[redacted]

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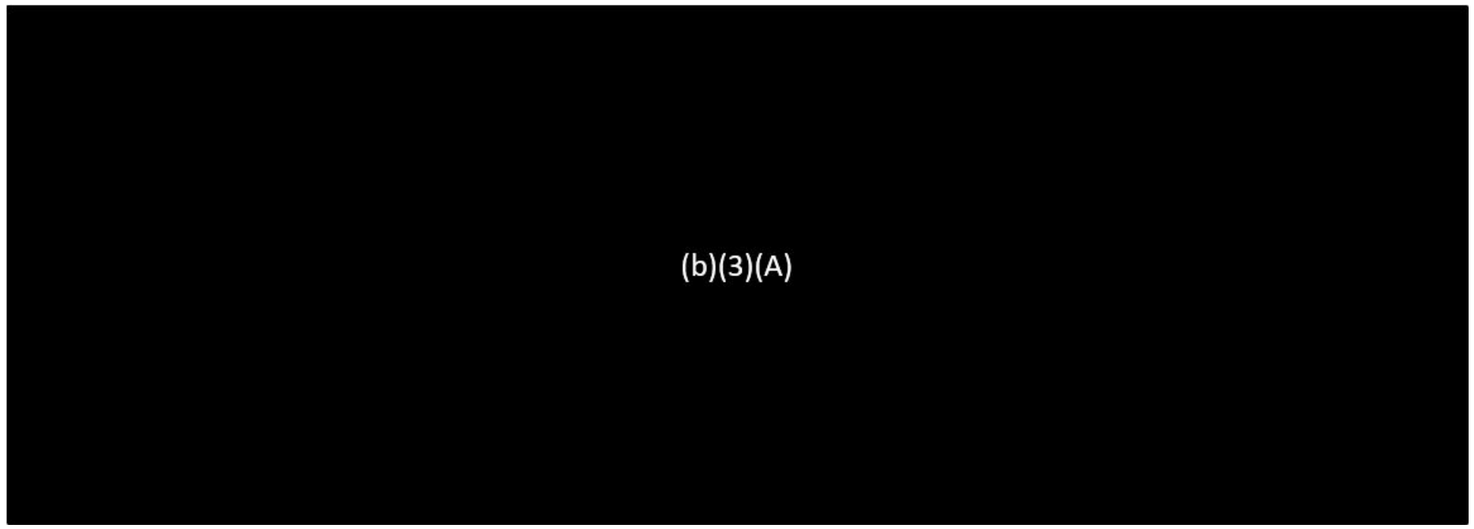

Figure 16: Plan view showing installed diversion water barriers detail of the 6" Hume pipe under the Adit 3 tunnel, Y&D Drawing #294181.

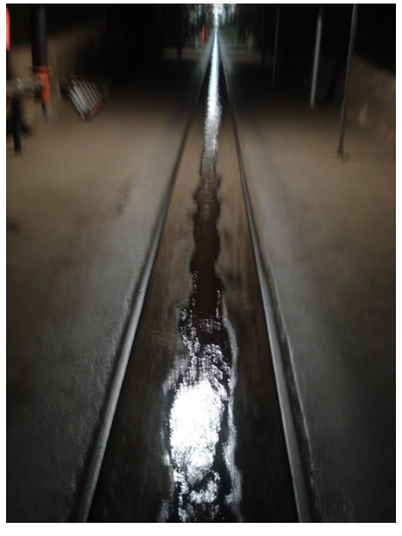

Figure 17: Standing puddle within the Adit 3 tunnel.

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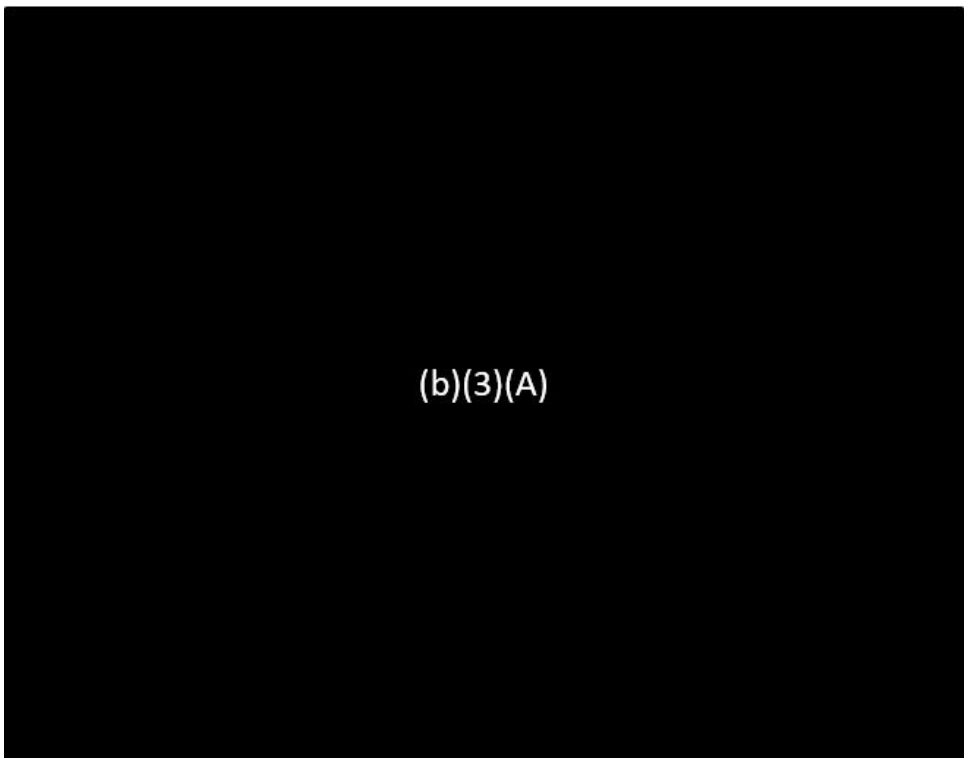

Figure 18: This sump cover has been sealed with rubber sheeting and caulk.

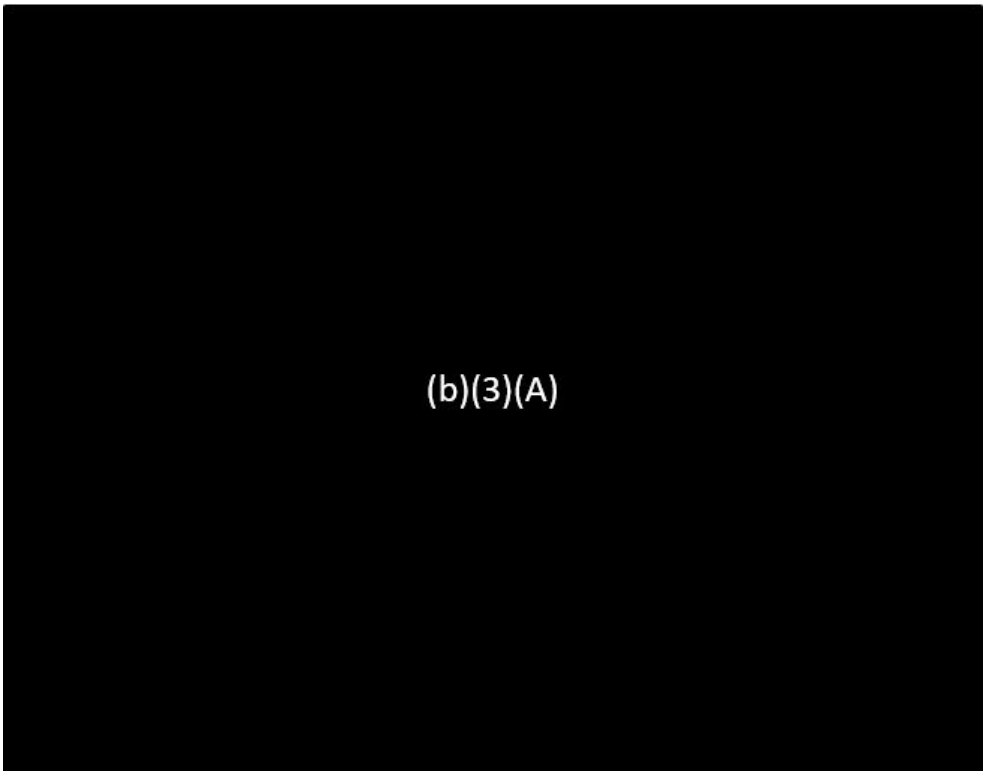

Figure 19: These ground water sumps have been sealed with rubber sheeting & caulk

Sewage Sump at Adit 3

A septic tank and septic pump sump are located nearby the Adit 3 groundwater sump, as shown in Figure 20. The septic pump discharges to the holding tank shown in Figure 21. The tank overflow pipe to its previous leach field was removed during 2022.

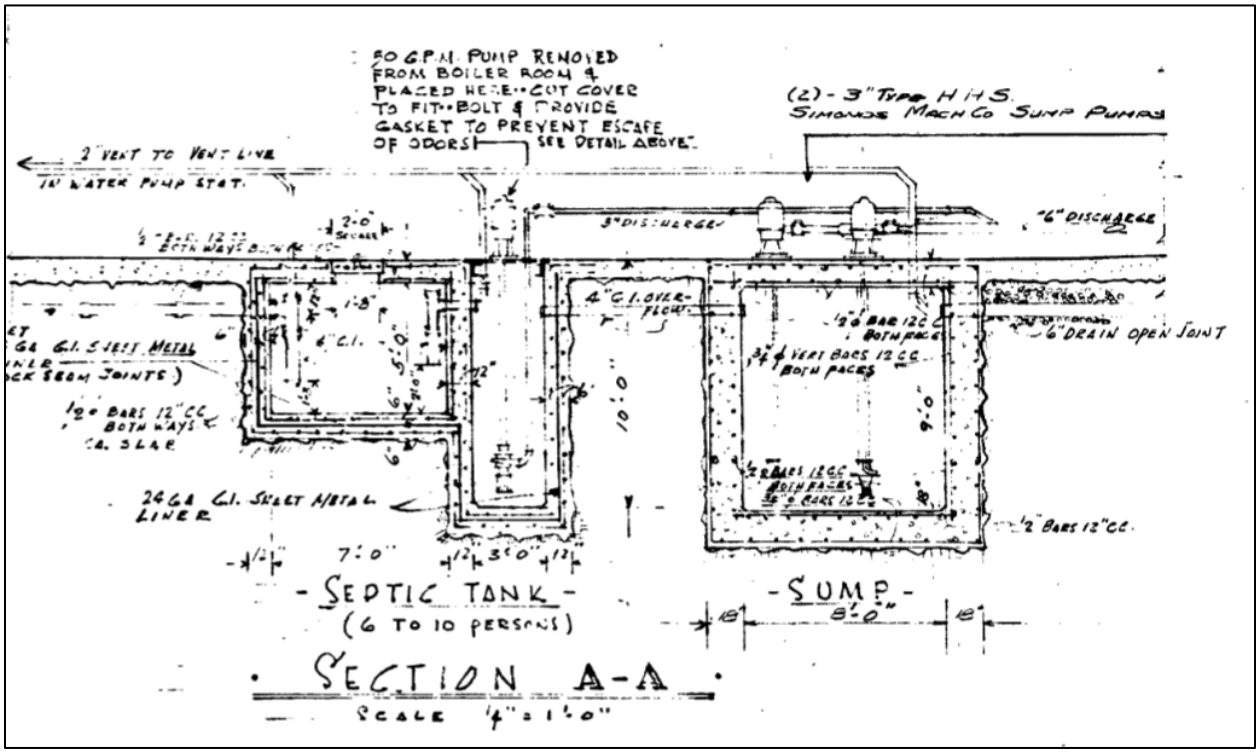

Figure 20: Adit 3 septic & groundwater sumps are now sealed w/ rubber sheeting & caulk

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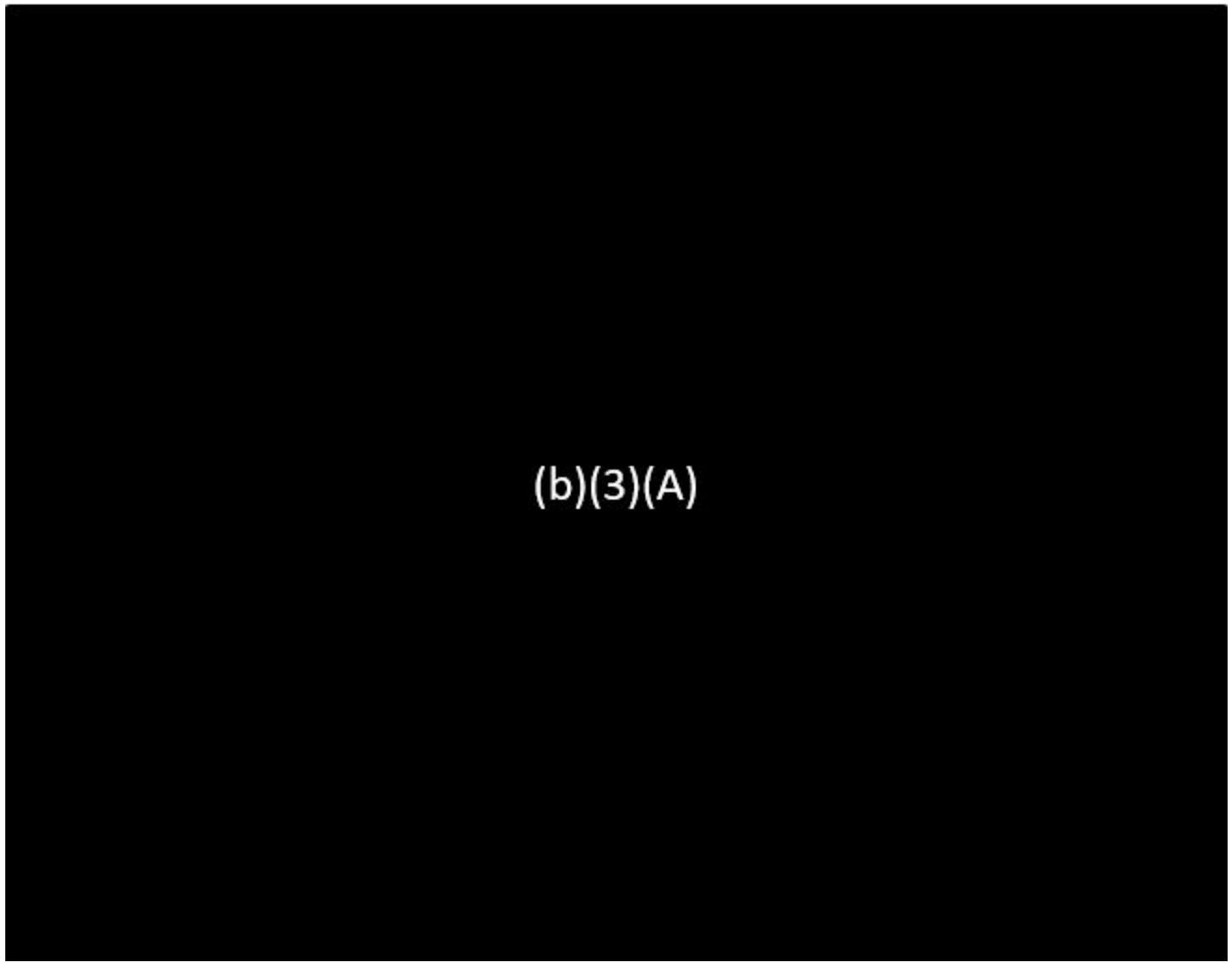


Figure 21: Location of sewage holding tank, frac tank, AST S-311, AFFF tank, with Halawa Stream to north of Adit 3. Credit: NAVFAC HI EV

[redacted]

Figure 22: Sump and its vertical pipes have been sealed with rubber sheeting and caulk

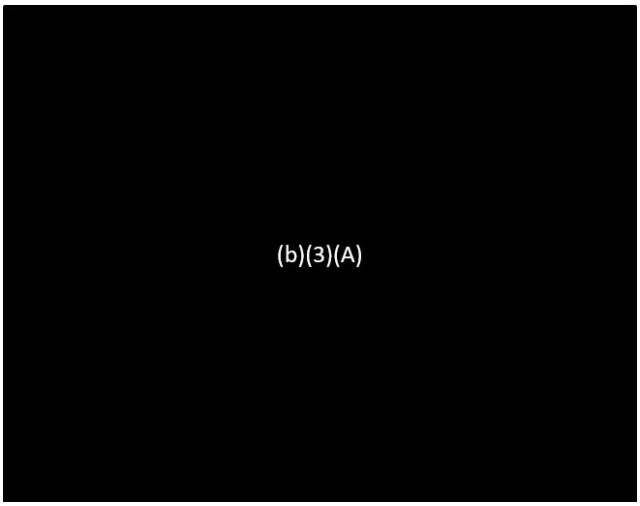


Figure 23: Left: Typical fire door

A.4 DRAINAGE SYSTEMS WITHIN THE HARBOR TUNNEL

There are three drainage systems within the Harbor Tunnel and Adit 2 tunnel, listed in Table A-4 and discussed in the subsequent sections.

Figure 24 shows the tunnel's plan view curving under the rim of Makalapa crater. Figure 25 provides the essential elevation view, vital for observing the minimal height of the tunnel above the water table. Figure 25 also shows the 3-ft high sill at the Underground Pump House and the elevation of the Adit 2 sill.

The primary drainage system is the mile-long French Drain system under the last mile of the Harbor Tunnel, in Figure 25. It is a porous drain pipe that conveys ground water towards the ground water sump. During times of a very high water table, the floor drains allow ground water to slightly flood upward into the Harbor Tunnel, preventing the ground water pressure from cracking the tunnel floor.

Sealing of the tunnel floor drains increases the risk of cracking to the tunnel floor through pressure build-up, the extent to which has not been quantified. To mitigate this risk, while at the same time interrupting potential pathways to the environment during defueling of the RHBFSF, floor drains above the Underground Injection Control (UIC) Line will be sealed with adhesive prior to fuel movement. Drains below the UIC line will remain unsealed allowing for pressure equalization. During periods of inactivity between repacking operations and defueling operations every 10th drain above the UIC line will be unsealed allowing for further pressure equalization.

The Harbor Tunnel French drain pipe conveys groundwater to a (b)(3)(A) sump system in the lower Harbor Tunnel just outside the Underground Pump House (UGPH). Valve alignment for the (b)(3)(A) sump system can be configured to direct groundwater to the drainage swale outside of UGPH that has a direct connection to Pearl Harbor in the vicinity of lower Halawa Stream or to the UGPH sump. The UGPH sump has the capability of directing contents to the Fuel Oil Recovery Facility (FORFAC). Prior to repacking of fuel pipelines and defueling of the RHBFSF, valves at the (b)(3)(A) sump system will be aligned to direct fuel to the UGPH sump. In the event of a release during fuel movement, product entering the drainage system will be conveyed to the (b)(3)(A) sump system, directed to the UGPH sump, and finally directed to FORFAC. During periods of inoperability, valves for the 5-plex sump system will be aligned to direct groundwater to the drainage swale. The drainage swale contains an isolation valve that has been recently tested that can interrupt the connection of the drainage swale to Pearl Harbor. Additionally, an underflow dam with isolation valve has been constructed to interrupt the connection of the drainage swale to Pearl Harbor.

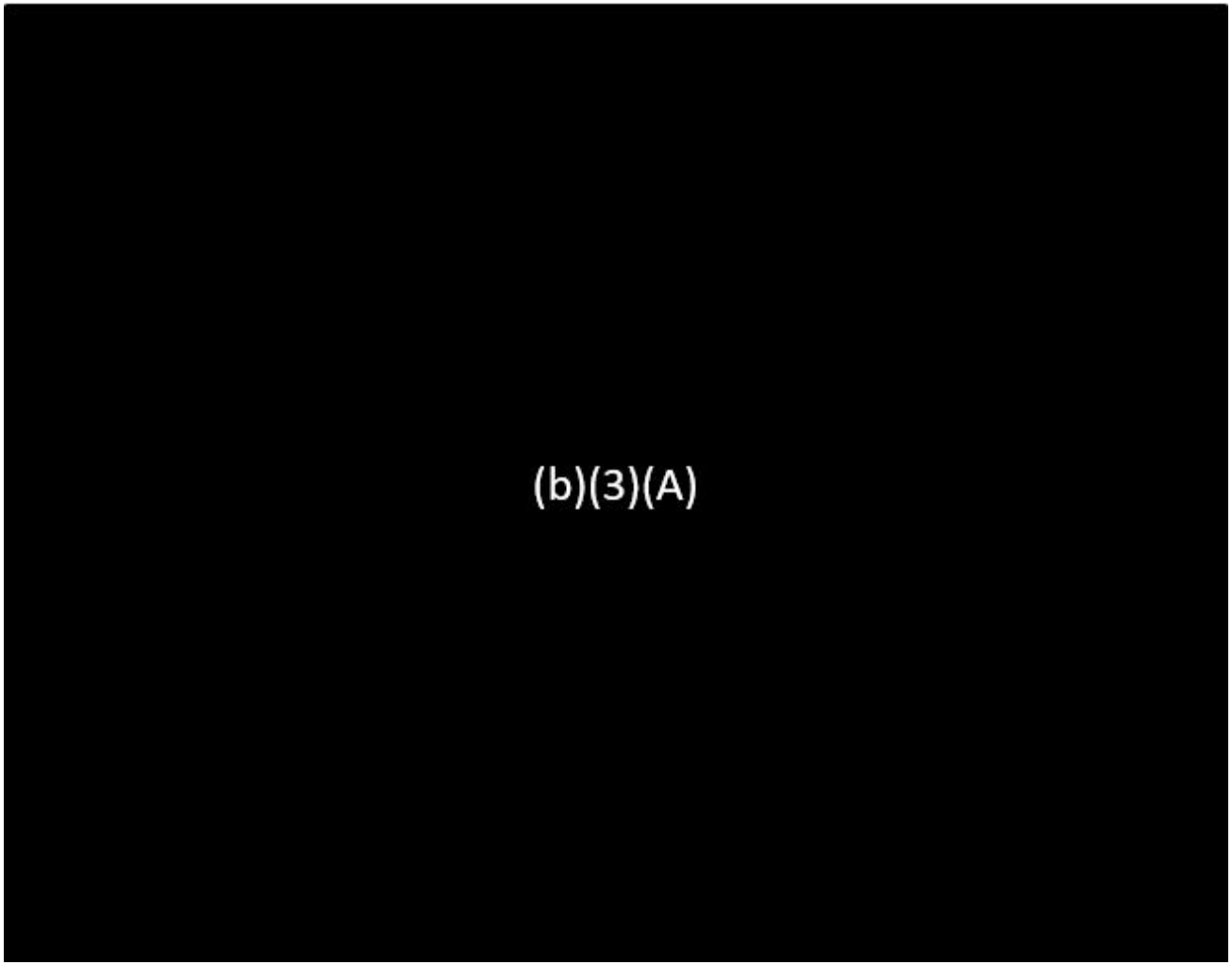
The third drainage system is a small groundwater sump and pump within the Adit 2 tunnel entrance, which have been recently sealed. This sump is connected to a French drain pipe under the Adit 2 tunnel. The drain pipe tees to the French drain under the harbor tunnel.

Discussion of these drainage systems follow after Figure 26 through Figure 32. These figures show the (b)(3)(A) main facility fuel pipes within the Harbor Tunnel, as well as puddles of standing water discussed above.

[redacted]

[redacted]

Table A-4: Drainage-related Systems within the Harbor Tunnel



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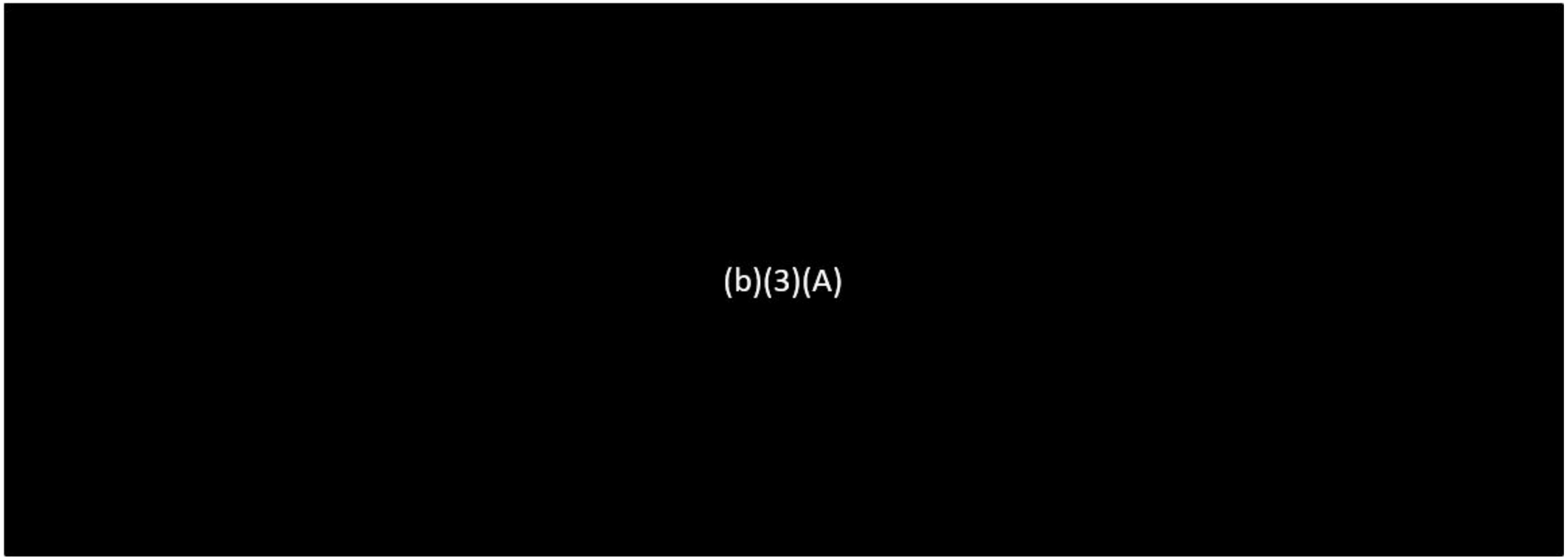

Figure 24: Plan View of Harbor Tunnel System. Distance from the UGPH to junction of the LAT is (b)(3)(A) ft.

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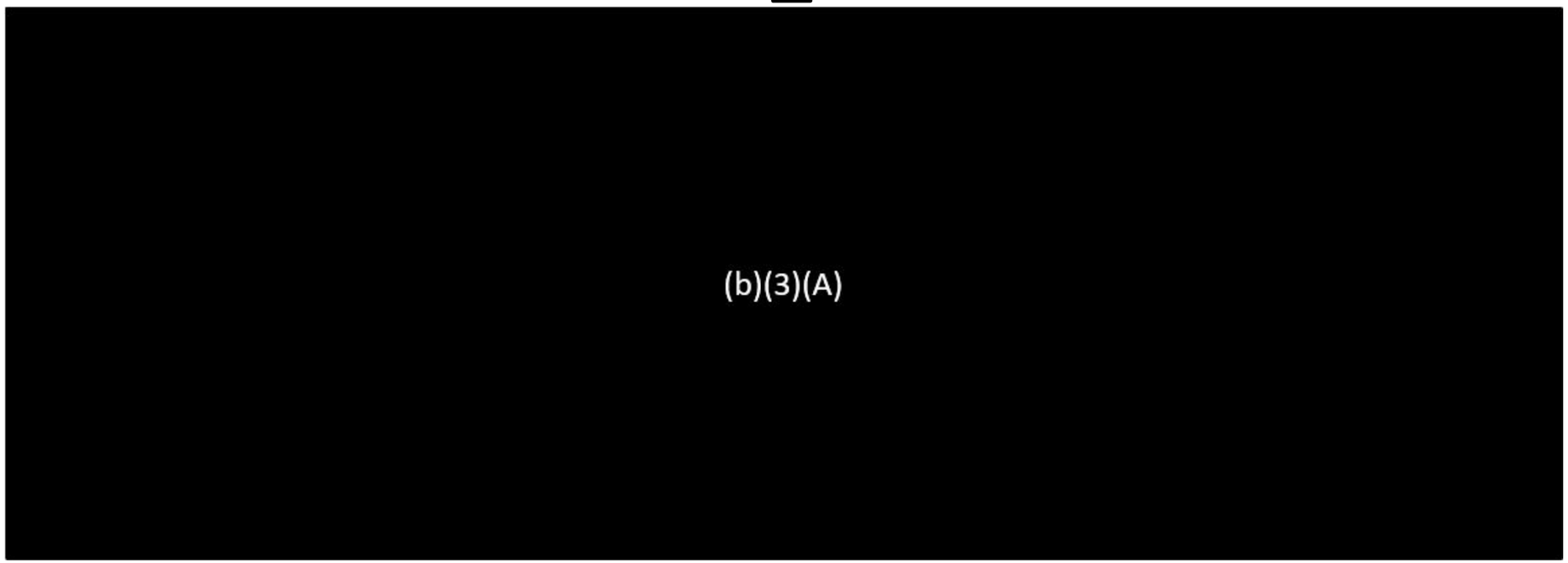

Figure 25: Elevation view of the bottom half of the Harbor Tunnel and Underground Pump House. Note compressed horizontal scale and the mile-long French drain.

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Fuel Pipes at Locations Within the Harbor Tunnel

The figures below are for general awareness and illustrate the pipelines at locations described in the captions.

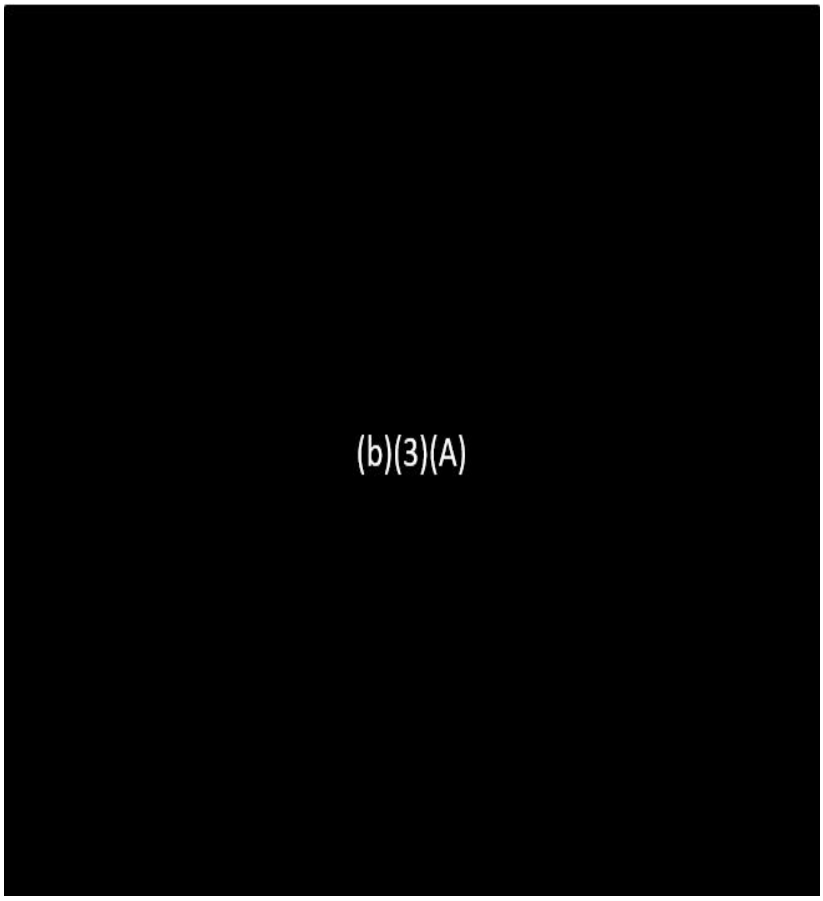

Figure 26: (b)(3)(A) main fuel pipes in the Harbor Tunnel.

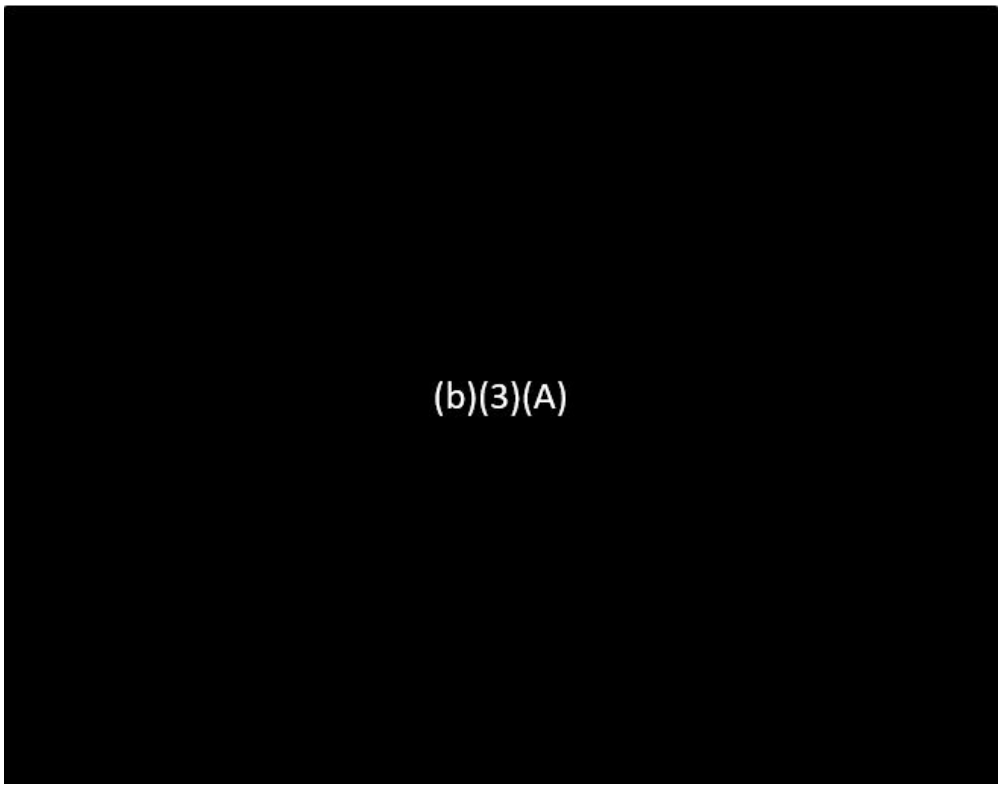

Figure 27: Looking uphill near the top of the Harbor Tunnel, with Potable water pipe (Left) and Fuel Pipes (Right).

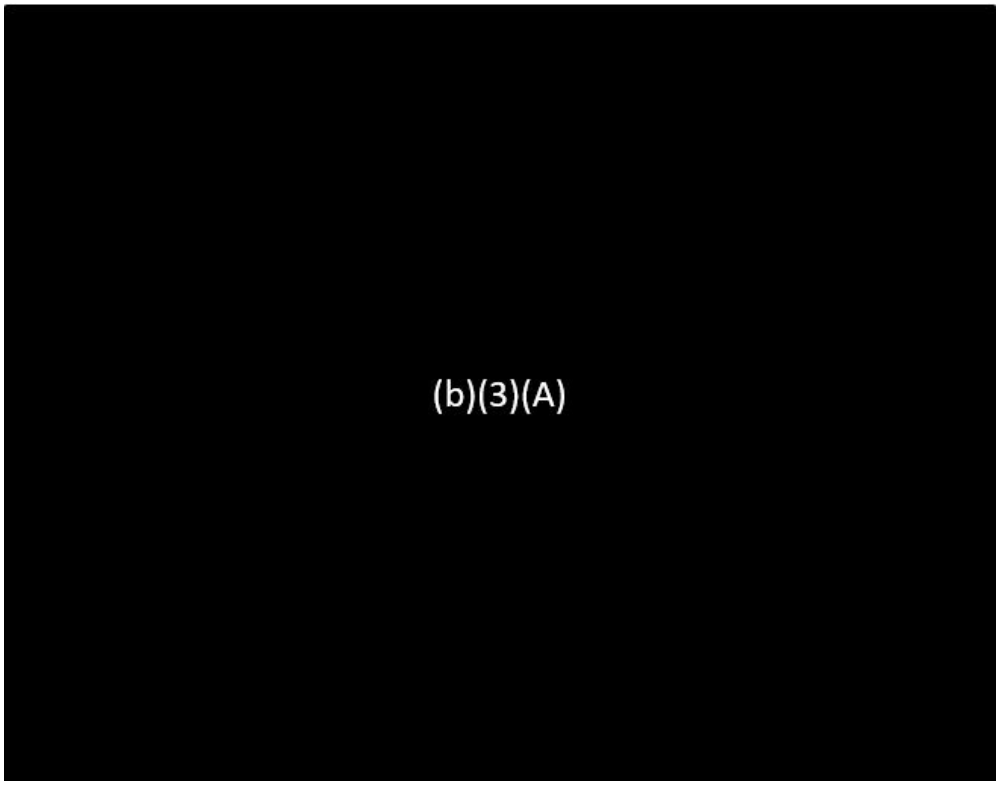

Figure 28: The main fuel valves are 18" or 12", smaller than the long runs of pipe.

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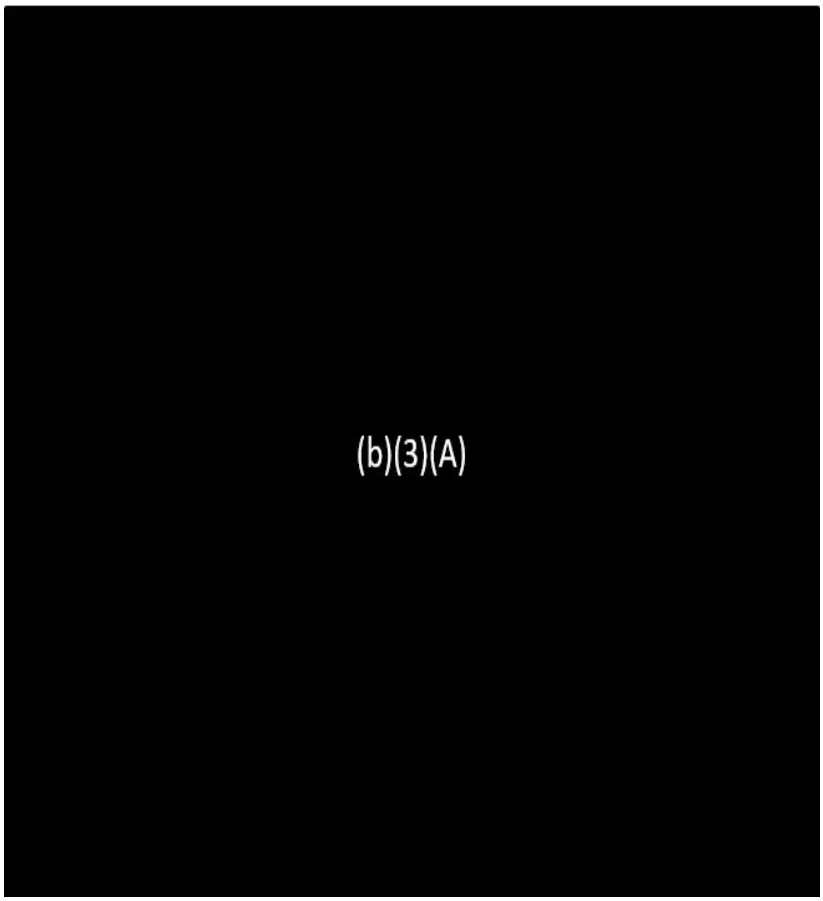

Figure 29: Standing water in the Harbor Tunnel uphill of Adit 2.

[redacted]

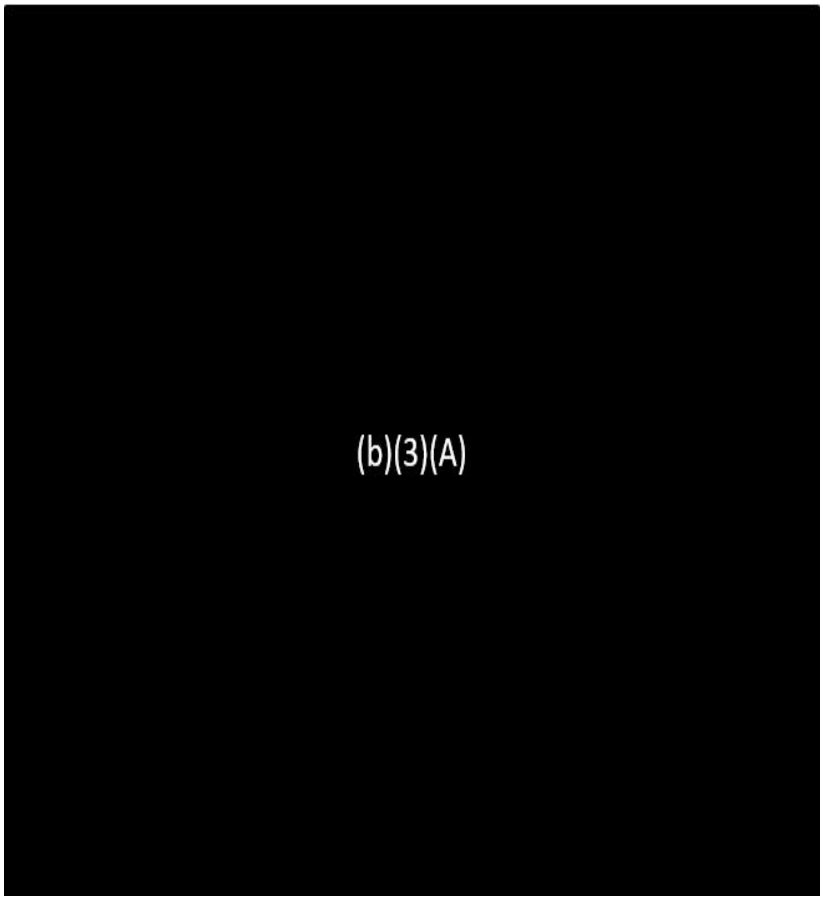

Figure 30: Harbor Tunnel near intersection with Adit 2.

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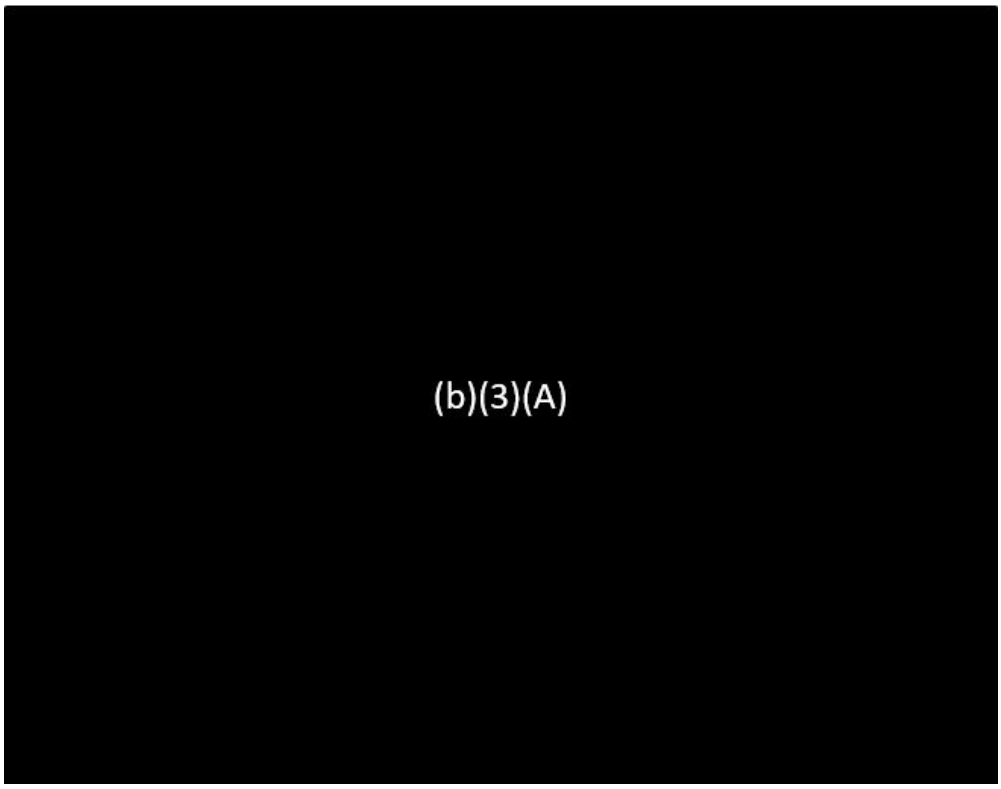

Figure 31: [redacted] pipes (L to R) entering the UGPH.

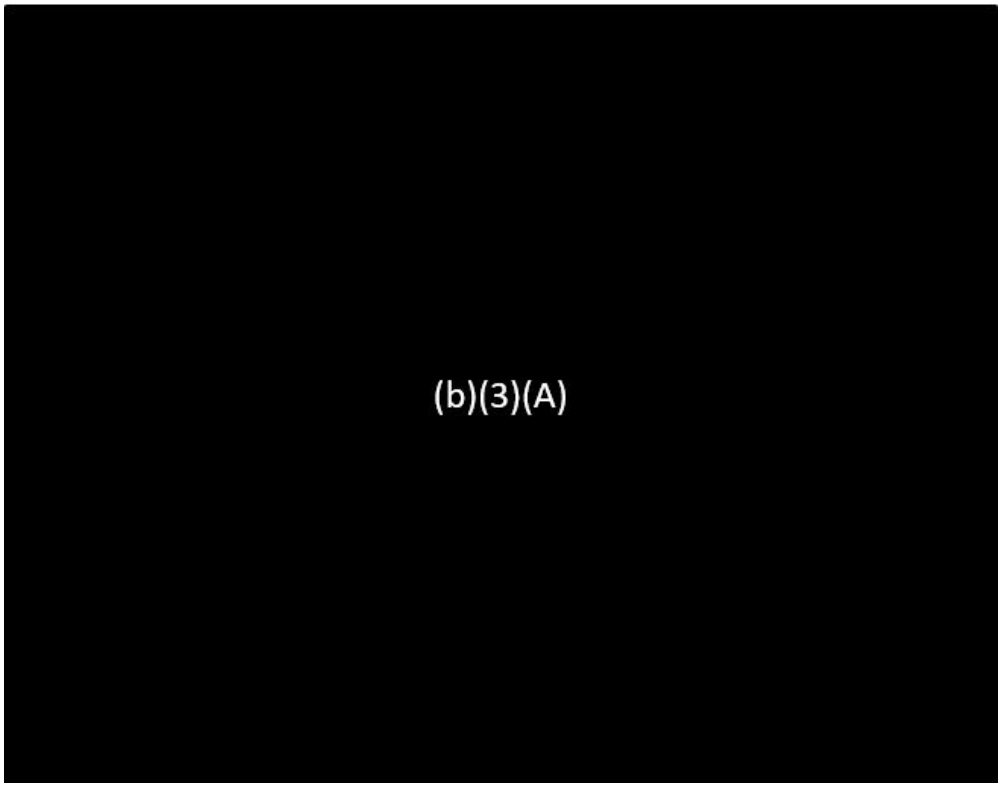

Figure 32: Fuel Pipes immediately within the UGPH. Harbor Tunnel is to the right.

Dresser Couplings

When the fuel pipelines were built in the early 1940's, one dresser pipeline coupling per lateral was installed to precisely join each pipe mainline to one per pair of tanks. Red Hill's Dresser couplings have been modified several times both in type and location. There is also at least one coupling on the out of service (b)(3)(A) mainline in the tank gallery. The most recent known modification was circa 2004 to couplings at Tanks (b)(3)(A). Petroleum industry standards have evolved so that Dresser couplings are no longer considered to be good engineering practice.

Dresser couplings at (b)(3)(A) and (b)(3)(A) laterals were damaged during the May 2021 event. In response, couplings at Tanks (b)(3)(A) were replaced during EPRC [Emergency Pipe Repair Contract] work. The coupling at Tank (b)(3)(A) was not replaced and a dummy (not for fluid use) pipe was constructed to restore lateral stability to the JP5 mainline. There was a coupling on the JP5 mainline in the tank gallery which was removed and replaced with straight welded fuel pipe as part of EPRC work. The EPRC design for coupling restraint rods (at 18 and 20) was much more robust than what was damaged in 2021, and is similar to what currently exists at Tanks 2-16.

To replace each Dresser coupling would require isolating each coupling, then temporarily opening the pipeline to remove it. For this reason, replacing each Dresser coupling underneath a full Red Hill Fuel Storage tank presents a spill risk during removal, correction and leak-testing. This risk is considered greater than keeping the current dresser couplings in place. In order to minimize the potential risk of using the dresser couplings during the defueling operations the following actions have been taken:

1) Revised Surge Analysis: A revised surge analysis was performed by Simpson Gumpertz & Herger (SGH) to validate that the piping system, including the dresser couplings, is capable of withstanding a pressure surge under the expected gravity drain defueling operation. The consensus with technical groups within Joint Task Force (JTF) Red Hill is that the system is capable of handling the expected pressures expected in the modified gravity draining of the tanks.

2) Facility Repairs and Quality Validation: The Navy conducted two third-party independent assessments of the Red Hill Facility in 2022. These assessments were intended to provide recommendations for the continued safe operation of the Red Hill Facility and were used to generate a list of 253 repairs recommended to safely defuel the facility with dresser couplings in place. This list of 253 was vetted with the regulatory agencies for implementation and as of the 28 June 2023, all 253 of those repairs were completed (contractor executed and government accepted). The repairs are now undergoing an independent Quality Validation (QV) process with an anticipated completion date of July 2023.

Concurrent to the QV, a reassessment based on the current conditions with the 253 completed repairs and planned upgrades has been completed (SGH, May 2023). The reassessment incorporated the following items:

- Reconnection of open pipelines
- Providing additional lateral and axial restraints
- Repairs of all pipe cradles and shimming to ensure friction and vertical support.

[redacted]

- Installation of Pressure Indicating Transducers
- Installation of pressure rated blind flanges

3) Improved System Processes: NAVSUP FLC Pearl Harbor has implemented lessons learned and taken corrective actions to improve processes for the safe and effective operation of the Red Hill Facility. Process improvements include:

- Increasing the detail of operations orders (OPORDs) to specify sequence of valve operations and providing a start-to-finish script for each fueling evolution.
- Increasing the number of watch personnel and assuring compliance with OPORDs during fueling evolutions.
- Increasing operator walk-throughs, briefings, and training on fueling evolutions based on the new OPORDs. FLC Pearl Harbor assures established baseline system OPORDs are completed prior to the start of and at the completion of every fueling evolution and are double-checked by an independent validator; this ensures all valves adjusted during a fueling evolution are returned to their "safe" positions required to prevent an environmental release between fueling evolutions.
- FLC Pearl Harbor has contracted with third-party experts to advise and assist on OPORDs, hazard analyses, the lock-out/tag-out program, and the training program.
- Providing additional supervision, particularly in the control room, and established a second Control Room Operator to assist and provide dual concurrence while executing an Operations Order.
- Establishing a Supervisor of the Watch position for fuel operations. The duties of the Supervisor of the Watch as delineated in the draft Operations, Maintenance, Environmental, and Safety Plan (OMES) and approved OPORDS are as follows:
  - Supervise Fuel Distribution Workers, Control Room Operators, Tank Gaugers, and Rovers.
  - Conduct muster and perform the operations brief for all fueling operations.
  - Remain in the Control Room during operations start-up, shut-down and critical transitions (i.e. Tank receipt switches).
  - Verify and oversee the overall execution of daily operations.
  - Ensure the watch team complies with all Operation Orders and OMES Plan, Response and Communications Plans.
- Local stakeholder commands have conducted coordinated spill response drills to ensure any potential spill response efforts are swift to stop, contain, and quickly remove the product from the environment.

Groundwater Sump near Underground Pump House

A (b)(3)(A) long permeable French drain is installed under the Harbor Tunnel. Because of its low elevation, local groundwater height sometimes causes flooding through the drains into the tunnel floor. Drains are spaced every 25 feet. Cast iron drain covers, shown in Figure 33, were intended to allow groundwater up into the tunnel to relieve pressure during times when the water table is elevated.

Conversely, the floor drains constitute a path for spilled oil to be released to the environment. To prevent this occurring, nearly all of these drain covers have been caulked down to seal the floor drain, using Sikaflex-1A jet-fuel-resistant polyurethane sealant. It is NAVFAC's intent to temporarily remove some inflatable drain plugs during rainy season. Each removed plug will be stored nearby its drain, ready to be re-inserted in event of a fuel spill.

During October 2022, drains at frames 654, 662, 670 and 677 were closed by an inflatable pipe plug and five floor drains located at frames 681 – 685 were open.

Groundwater is discharged from the sump by the pumps shown in Figure 35 and discussed in Table A-4. A hand-operated valve five ft inland of the groundwater sump can be closed to isolate it from the French drain pipe.

The ground water sump has not been enclosed under rubber sheeting. During October 2022, approximately thirty sandbags were staged the sump to be quickly deployed to form a diversion barrier if needed.

Figure 33: Drain covers with machined flat seal were caulked closed in Oct 2022.

[redacted]

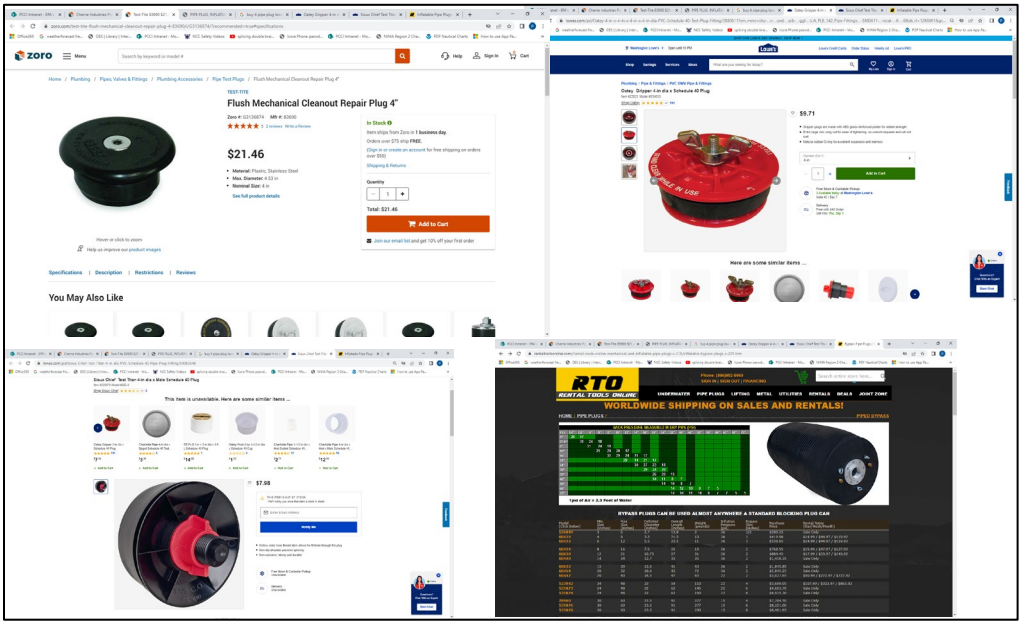

Figure 34: Several plug types considered for sealing tunnel floor drains

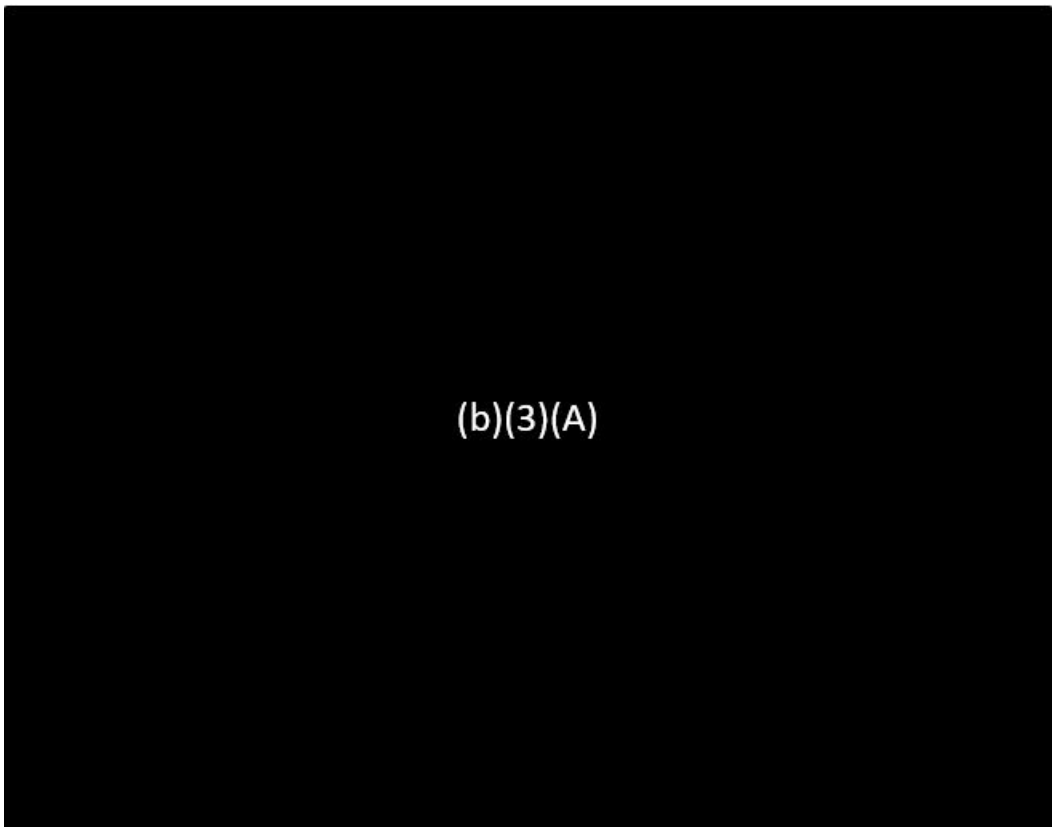

Figure 35: (b)(3)(A) sump pumps can drain the ground water sump near the UGPH

[redacted]

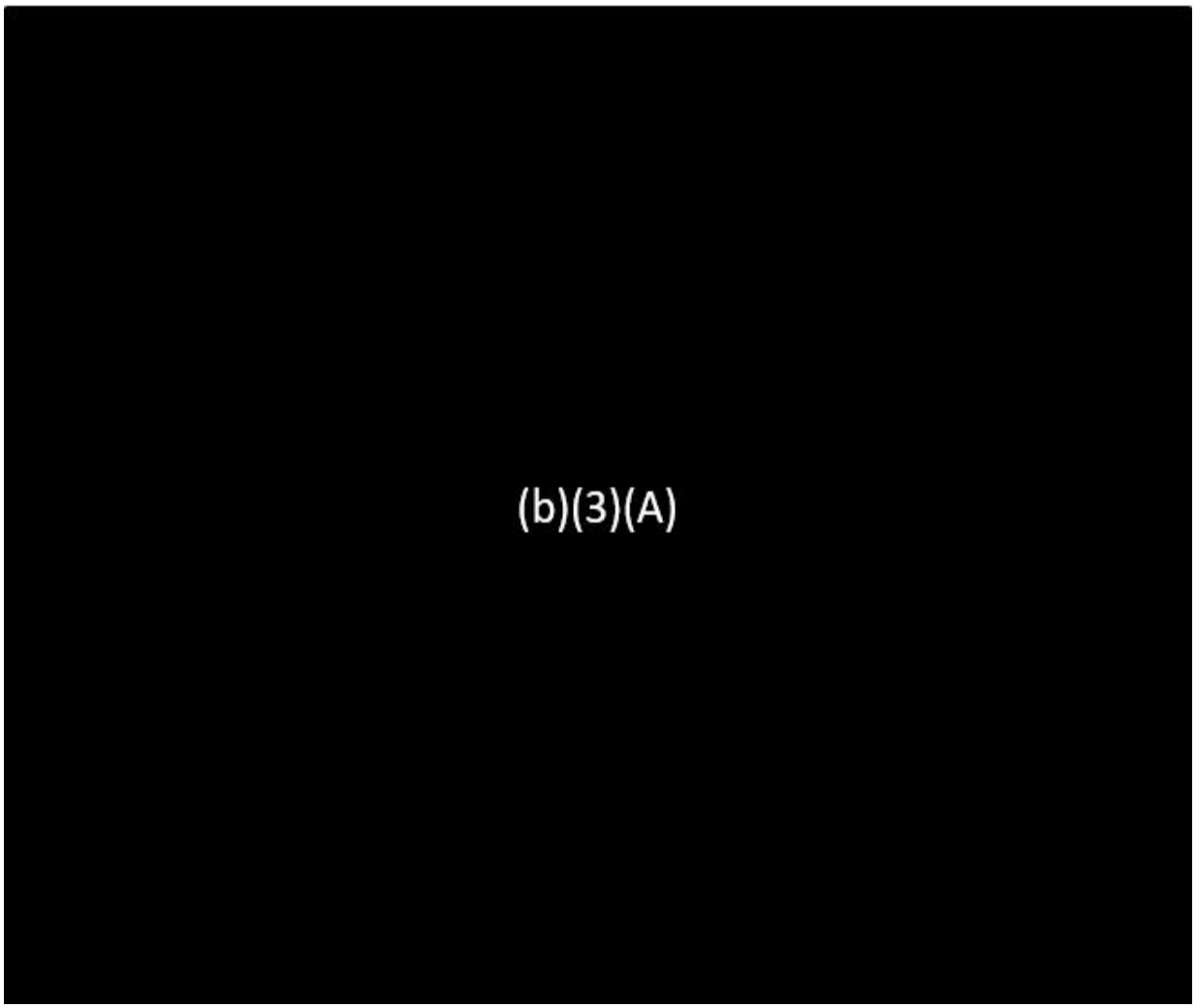

Figure 36: View from the UGPH looking towards the groundwater sump

[redacted]

Groundwater Sump near Adit 2

There is a French drain system located under Adit 2, as evidenced by floor drains and a small groundwater sump located inside the entrance to Adit 2. In August 2022 this sump was visually dry.
In October 2022, all floor drain covers within Adit 2 were glued closed using Sikaflex-1A sealant. The groundwater sump had also been sealed with rubber sheeting and Sikaflex-1A.

Concrete patches have been applied to tunnel cracks within Adit 2.

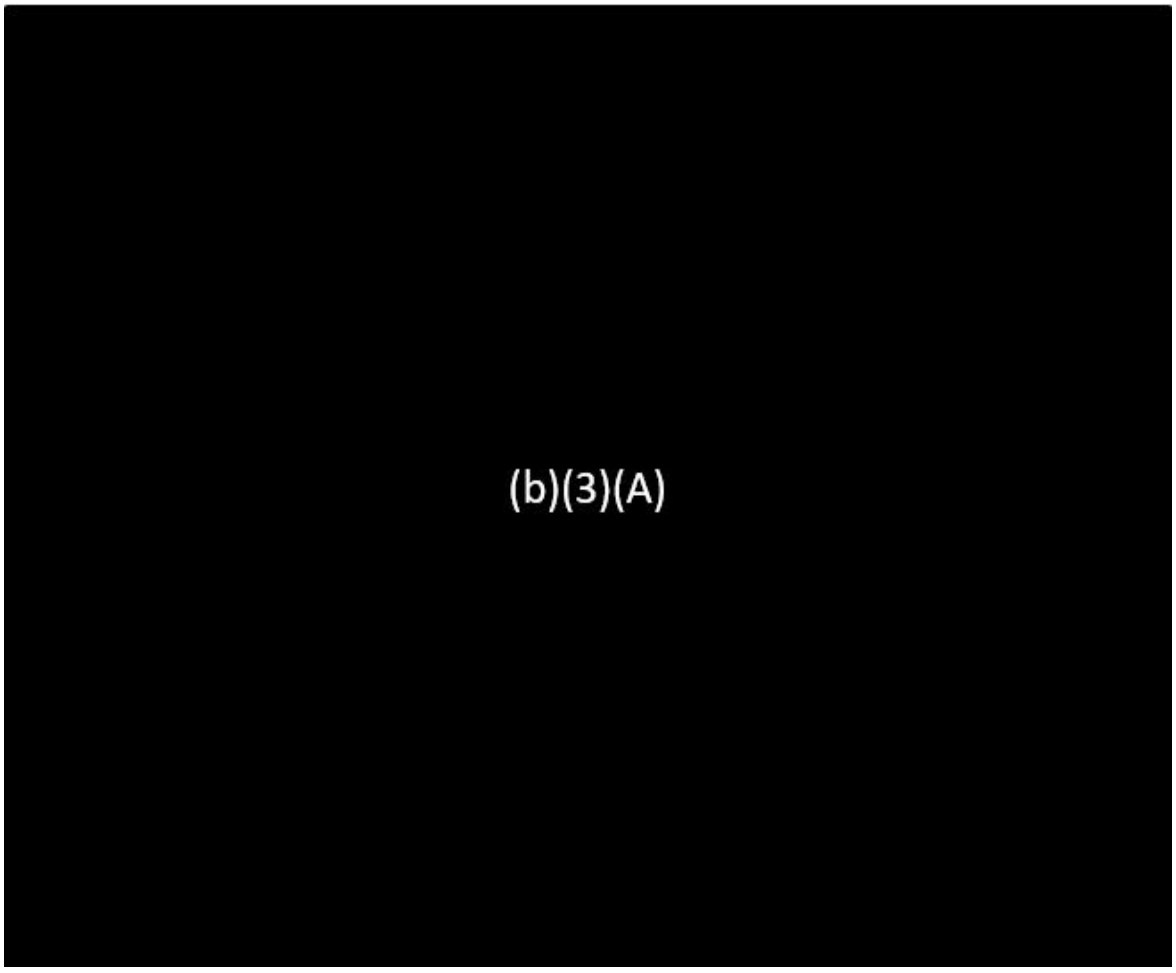

Figure 37: Adit 2 groundwater sump in Aug 2022, w/ potable water pipe at top of photo.

[redacted]

A.5 SUPPORTING INFORMATION: 30,000 GALLON JP-5 FUEL RELEASE

This scenario describes the likely path taken by a notional 30,000 gallon spill. The cause is assumed to be a pressure surge similar to the 18,000 gallon spill of May 2021.

Since the May and November 2021 incidents, the following systems and procedures have changed within the tunnels:

1. The monitoring wells in the tunnel floor have been sealed with Sikaflex-1A jet fuel-resistant urethane adhesive and each covered with a rubber sheet and a sandbag.
2. Visible cracks in the concrete floor and tunnel walls are being patched with cement grout.
3. The AFFF diversion/retention pumps have been deactivated so that spilled fuel is not pumped from the floor-width diversion sumps into the 14" PVC pipeline.
4. The Oil Pressure Door has been de activated so that fuel can flow down the lower access tunnel instead of being inadequately contained within the tank gallery.
5. The ground water drain systems (Hume pipe, French drain) under the Adit 3 and Adit 2 tunnels have been sealed.
6. The extensive French drain pipe under the lower Harbor Tunnel has been mostly sealed, contingent upon occurrence of heavy rain events.
7. Sandbags, sorbents and large water-filled diversion barriers were placed to guide a spill away from Adit 3 and down the Harbor Tunnel

Figure 38 illustrates the path of the notional 30,000 gallon spill.

1. The spill occurs near tanks 15/16 and begins flowing down the tank gallery tunnel.
2. The flow encounters four AFFF diversion sumps, each of which retains 2297 gallons. See Figure 39 and Table A-5.
3. Approximately 278 gallons of fuel will dampen the Tank Gallery floor
4. The flow then encounters the Oil Pressure Door sump which retains 1300 gallons. These five sumps will be slowly drained by their five 20-gpm pumps that discharge to a single 2" copper tube that discharges into the FOR sump.
5. Approximately 203 gallons of fuel will dampen the Lower Access Tunnel floor
6. The flow will travel from the LAT into the Harbor Tunnel if the diversion barriers are in place as shown in Figure 40.
7. The flow will continue down the harbor tunnel, using 1569 gallons to dampen the floor.
8. As the tunnel slope becomes nearly level, long shallow puddles totaling 4444 gallons will be retained by the concrete foundation blocks that support the two large pipes, shown in Figure 41.
9. 4454 gallons and 450 gallons will be retained as regional puddles as shown on Figure 39.
10. Assuming that all of the few open French floor drains have been plugged during the fuel's travel duration, the remaining 8032 gallons will arrive at the tunnel side of the underground pumphouse approximately 1.8 hours after the spill occurred.

Spill response and countermeasures are listed in the (b)(3)(A) facility pipeline datasheet.

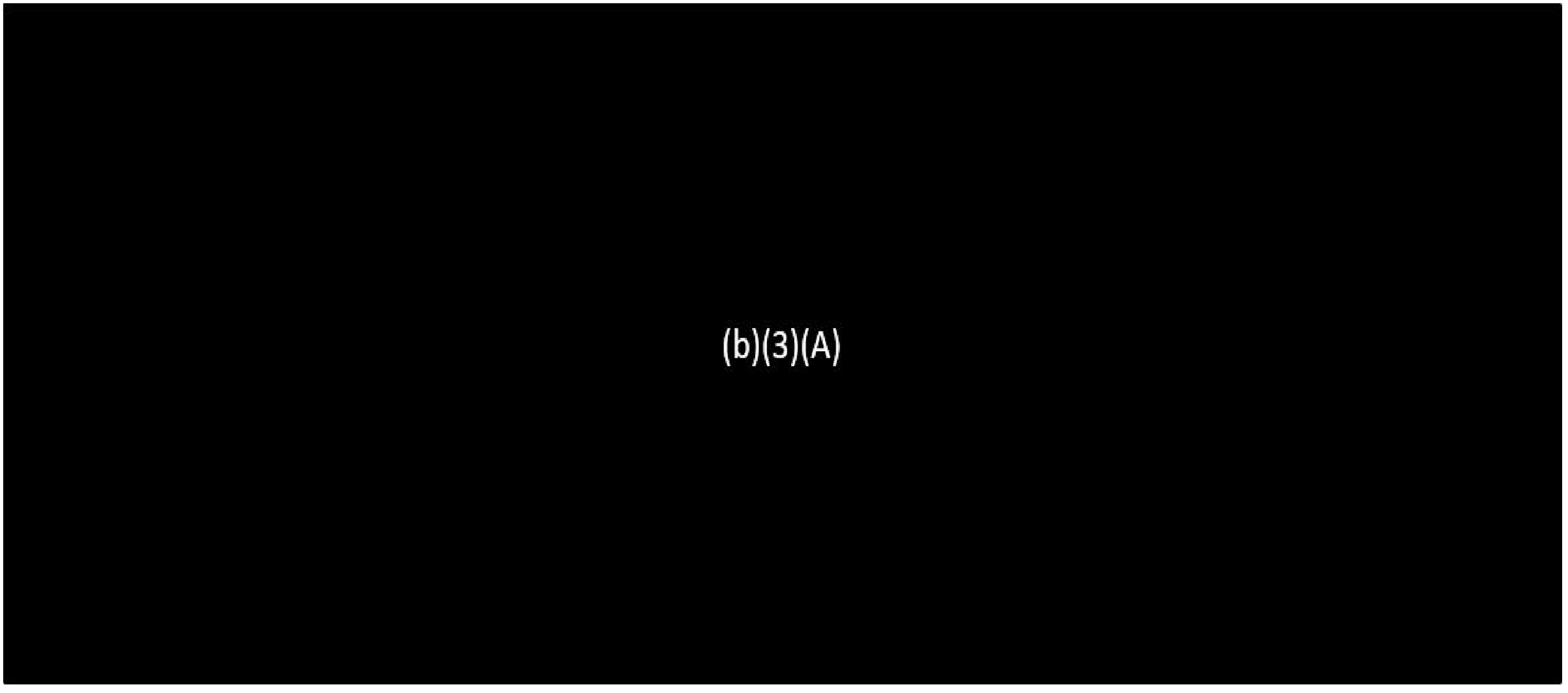

Figure 38: Potential three-mile drainage path of a 30,000 gallon fuel release from tanks 15/16 to the UGPH

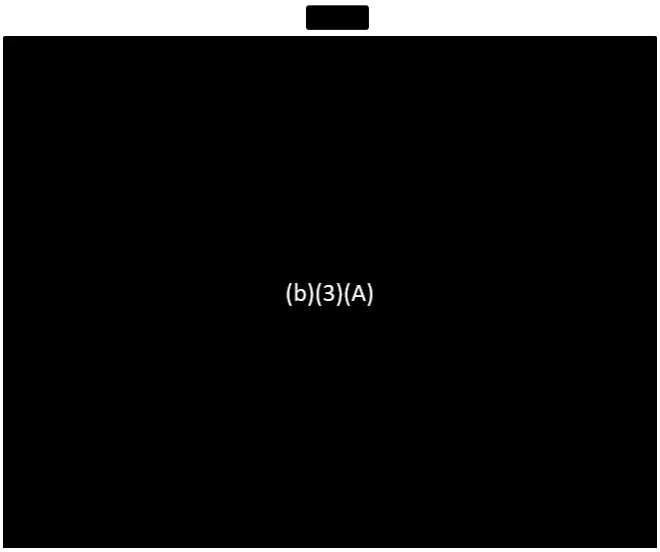

Figure 39: Section view of an AFFF diversion sump (gold) in the Tank Gallery Tunnel

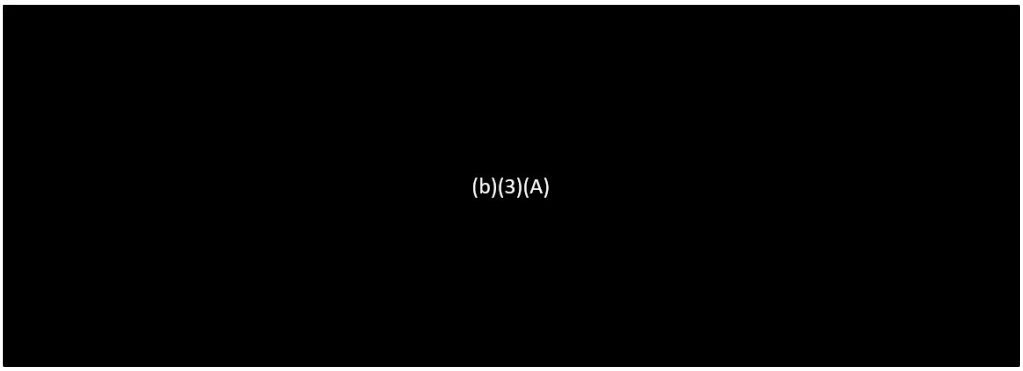

Figure 40: Plan view of diversion barriers (yellow) at the top of the Harbor Tunnel

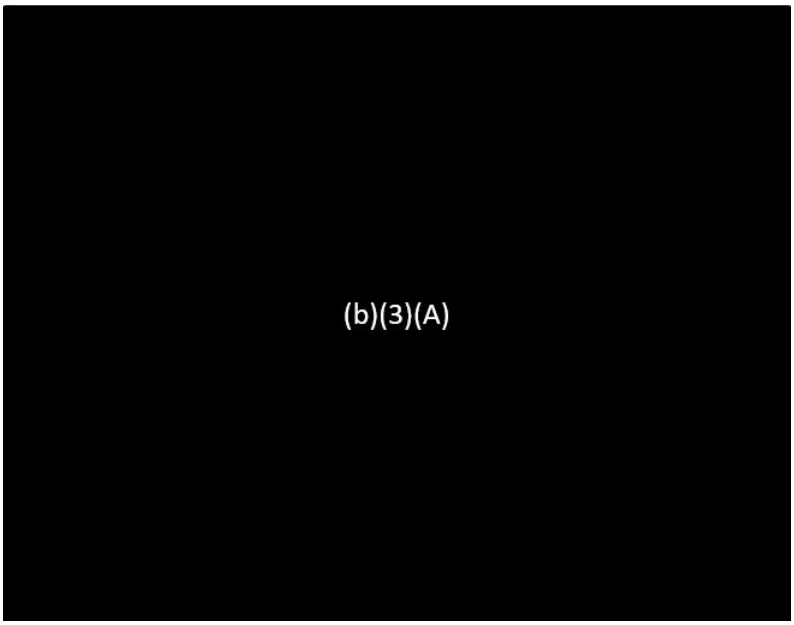

Figure 41: Dimensions of two shallow puddles in lower region of the Harbor Tunnel

[redacted]

Table A-5: Volume of fuel retained within tunnel Features

Red Hill SPCC Spill Scenario				PCCI Inc.			22-Nov-22	
							2-Dec-22	
Spill occurs near Tank 15-16				Spill Qty		30,000	gallons	
Lower Access Tunnel								
"AFFF Sump" Dimensions	Lemgth	Width	Depth			Remaining		
Pump Sump	9	6	4.5			27,703	Sump 2	
Fill Trough	3	14	1.53			25,406	Sump 3	
Total (cu ft)	307					23,109	Sump 4	
Total (gallons)	2,297					20,812	Sump 5	
						19,454	OPD Sump	
Oil Pressure Door Sump	Length	Width	Depth			19,176	Tank Gallery Floor	
Pump Sump	5.5	8.25	4			18,974	LAT Floor	
Total (cu ft)	182					17,405	Harbor Tunnel Floor	
Total (gallons)	1358					12,961	Shallow Puddles	
						8,507	Puddle: Frame 552 -567	
Dampened Tunnel Floor	Length	Width	Gallons			8,032	Puddle: Frame 596 - 600	
Tank Gallery	1400	20	278			**8,032**	**Arrives near UGPH**	
Lower Access Tunnel Floor	1613	12.7	203					
HarborTunnel	12481	12.7	1569					
						Travel Time		
Last 4600ft Shallow Puddles	Length	Width	Depth			16500	Distance	ft
Under F-76 pipe	4600	2.17	0.021			136	Rise	ft
Under Pot. Water pipe	3974	2.33	0.042			10.7	Avg Width b	ft
Total (cu ft)	594					0.02	Roughness n	
Total (gallons)	4444					2000	Spill Flowrate Q	gal/min
						0.126	Q	m3/sec
Puddle: Frame 552 -567	Length	Width	Depth			0.0082	slope	
Pump Sump	375	12.7	0.125			3.26	Avg Width b	m
Total (cu ft)	595					0.05	D Depth of fluid	m
Total (gallons)	4454					0.015	D/b	
						75	K from table interp	
Puddle: Frame 596 - 600	Length	Width	Depth					
Pump Sump	80	12.7	0.063			**0.12**	Calc Q	m3/sec
Total (cu ft)	64							
Total (gallons)	475					0.16	Face area	m2
						0.77	speed	m/sec
All dimensions in feet								
						6,508	Travel time	sec
						1.8	**Travel time**	**hours**
7.481	gallons/cu ft							
						Ref: Handbook of Hydraulics, 7th ed.		
Fuel Dampens Tunnel Floor	Length	Width				Brater et al, McGraw Hill, 1996		
20 Oz Water	3.5	4.5					Page 7.24	
1 gallon wets	101	sqft						

[redacted]

[redacted]

A.6 REFERENCES

- Drawing Y&D 293905 General Plan & Profile of Pipe Line Tunnel, 07 Apr 1941
- Drawing Y&D 294124 Drain Line Detail at Pump House, 21 Sep 1943
- Drawing Y&D 294181 Groundwater Sump Location in Lower Access Tunnel near Adit 3, 27 Mar 1943
- Drawing Y&D 294047 Details of Sump Pit, Receiving Pump House, 01 Sep 1943
- Modernization of POL Fuel Facility, P-060-000197FE, 27 Feb 1985
- Cameron Hydraulic Data, 19th Edition, Flowserve Corporation, 2002
- Handbook of Hydraulics, 7th Edition, Brater, King et al, McGraw Hill, 1996
- RFI #069.1 Elevation Conflict at AFFF Waste Line Between Sump and Tank, 28 July 2016
- RED HILL FIRE SUPRESSION SYSTEM ISOMETRIC DIAGRAM_000D2160
- Draft Commissioning Report, Red Hill Tunnel Upgrades 2018.01.25
- OMES_DFSP PH Bulk Terminal OMES Plan_Sept 2018
- RH Root Cause Analysis Memo and Report, 07 Sept 2021
- Report of "Investigation into the 6 May 2021 and November 2021 Incidents at Red Hill Bulk Fuel Storage Facility", Commander United States Pacific Fleet, 20 Jan 2022
- RFI #069.1, "Elevation Conflict at AFFF Waste Line Between Sump and Tank" Contract N62742-15-C-1308, 28 July 2016.

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