



# *E Komo Mai*

*Welcome! Mahalo for attending our  
Red Hill Facility Public Meeting.*

*We appreciate your kokua in assuring  
everyone attending this event  
will respect the process and enjoy  
a fair, courteous and respectful event.*

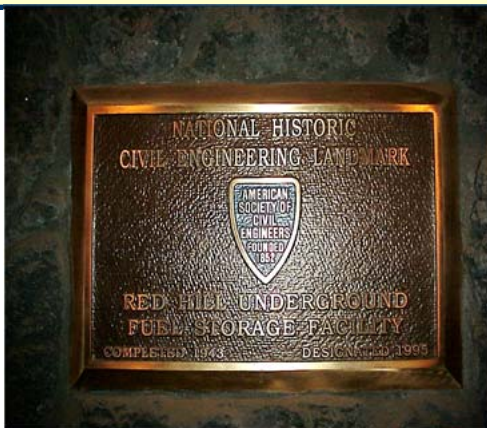
- Please act respectful to one another.
- Please allow us to share our Red Hill history and story.
- Focus on the issues we are here to discuss.
- Let's all work together to keep things pono.

*E Komo Mai*



# National Historic Engineering Landmark

**Transparent - Facility Tours - Public Meetings - Open House - Kukakuka Sessions**

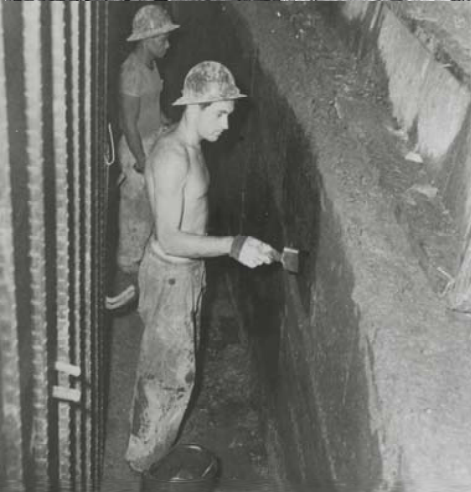
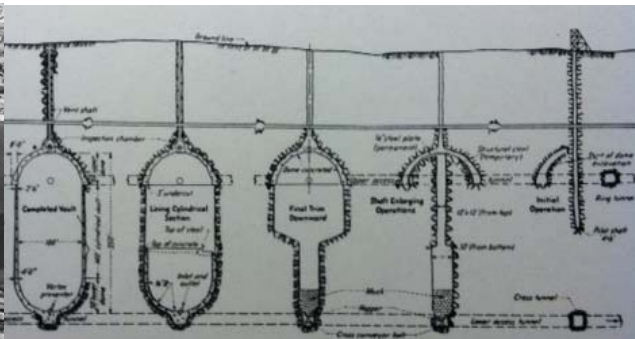
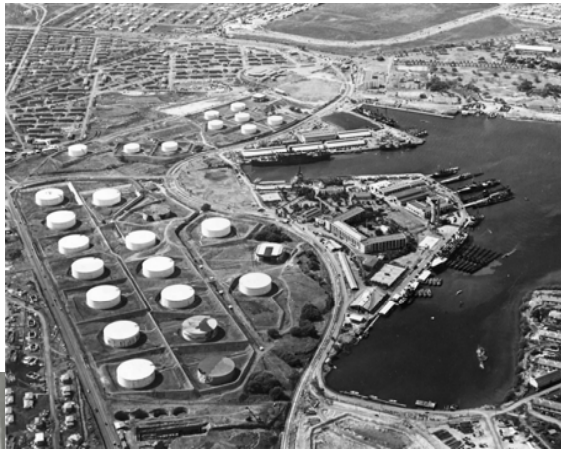


**Red Hill is a modern, secure, and historic facility**  
**Our drinking water is clean & safe – Navy intends to keep it that way**



# Concept of Red Hill

**Safeguard fuel for military, state government and emergency services by constructing the fuel tanks underground and uphill from Pearl Harbor, Hickam, DKI International Airport and Honolulu Harbor**

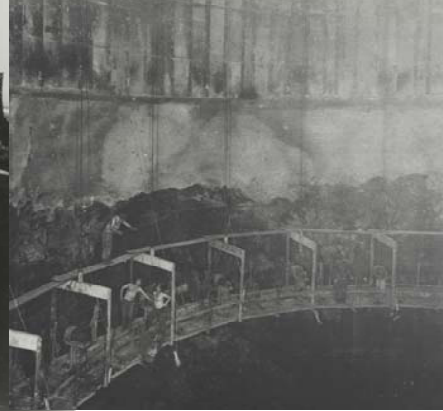
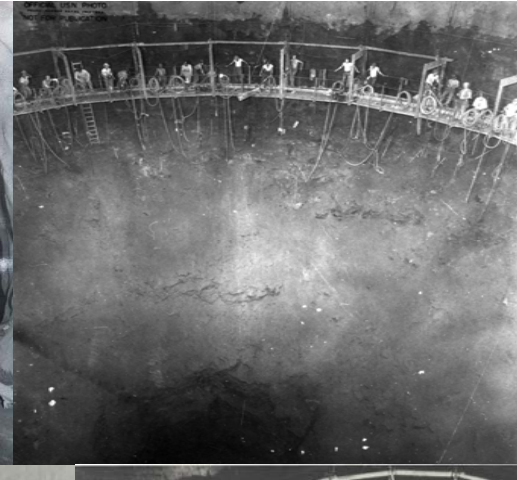
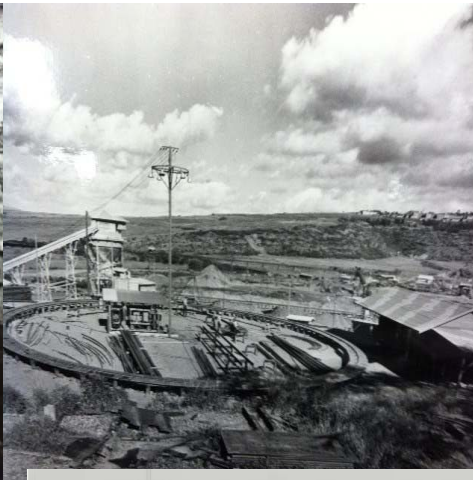


**Tanks are safe from bombs, bullets, sabotage, and can operate without electricity**



# Constructing Red Hill

## An Engineering Marvel Built to Last



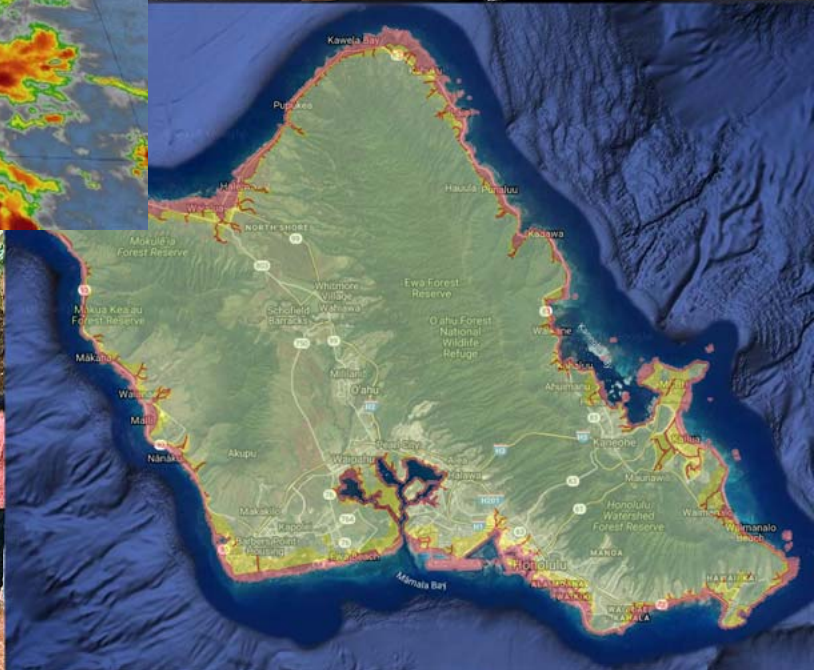
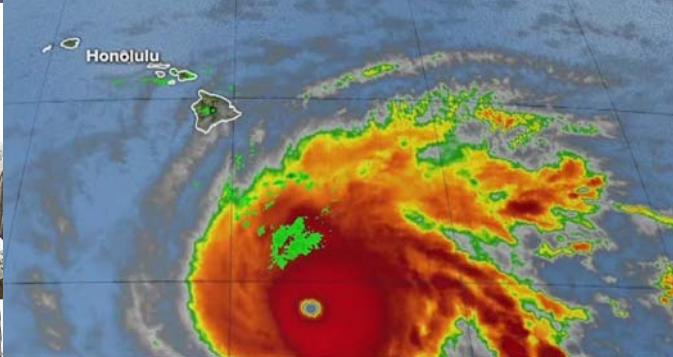
***Tunnels & Tank Vaults were dug out of the basalt rock – The rock surface was sprayed with guniting and a 20-foot concrete foundation was poured. As the steel tank liner was erected, the space between the steel and rock was filled with 2.5-4 feet of reinforced concrete***



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# Support of Disaster Relief

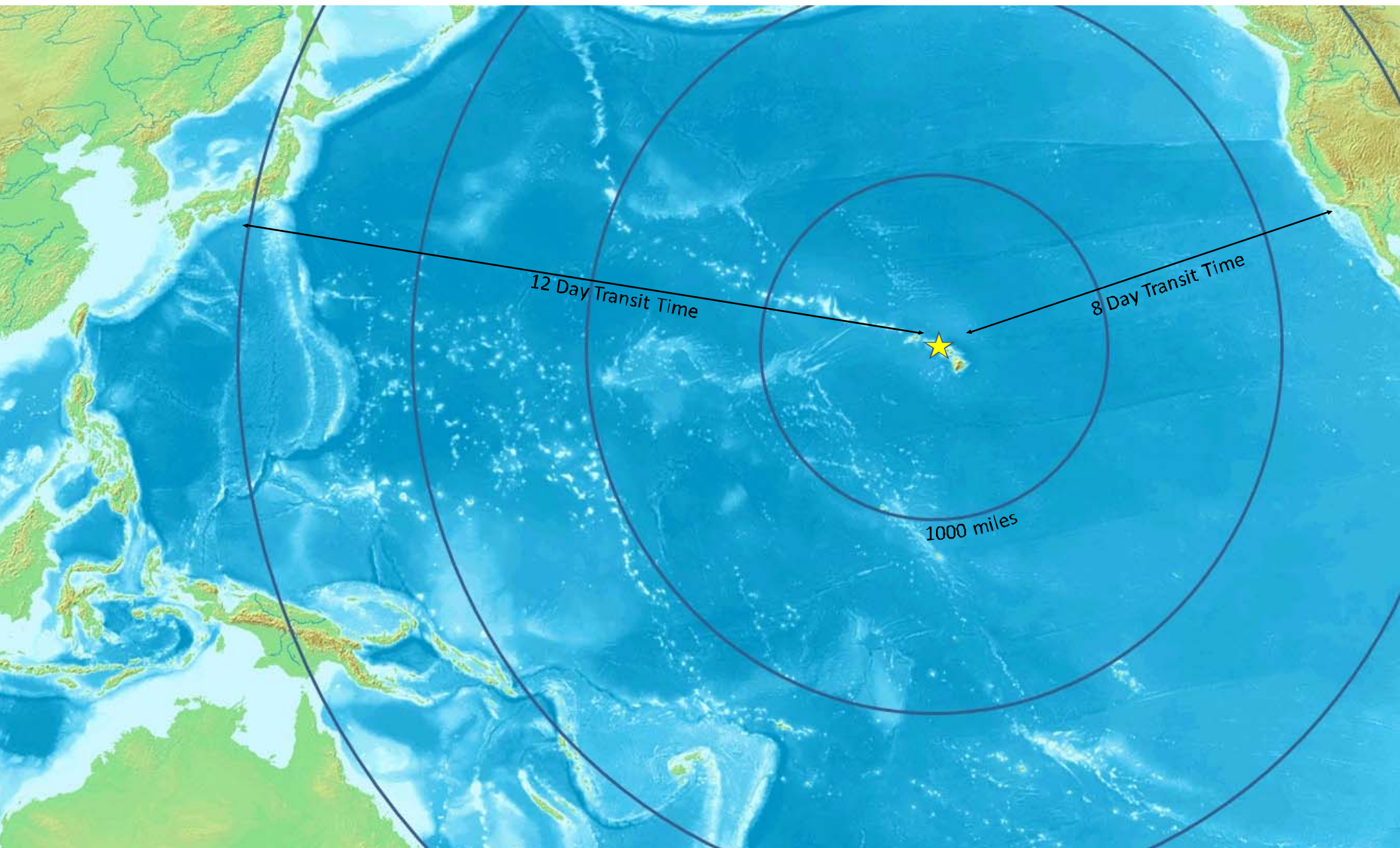




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# Strategic Asset





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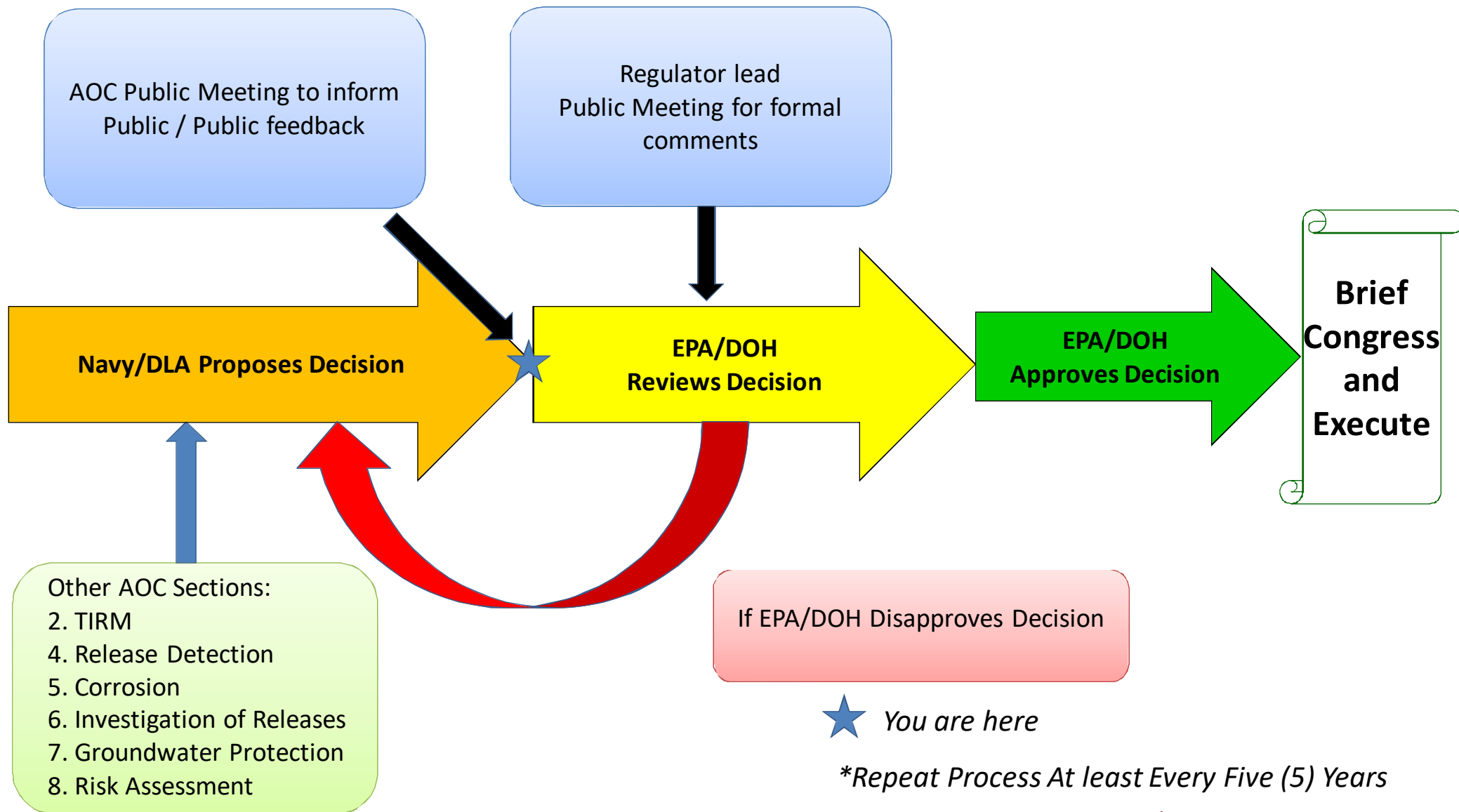
# Fuel Source During Blackout

Elevated location uses gravity to distribute to key sites





# TUA Decision Process





# TUA Decision Layers of Protection

## PREVENTION

1. Improving Tank Inspection Repair and Maintenance Program continuously
2. Recoating tank interior steel liners to prevent corrosion; as specified by coating specialist
3. Decommissioning nozzles (piping at bottom of tank) to reduce risk
4. Enhanced contractor qualification process to improve tank inspection, repairs
5. Updated processes and procedures for inspection, testing, quality control, quality assurance
6. Upgraded procedures for returning tanks to service
7. Revised and standardized operator training

## DETECTION

1. Conducting continuous (versus monthly) soil vapor monitoring
2. Conducting daily visual inspection of pipeline
3. Conducting manual fuel inventory trend analysis
4. Installing permanent enhanced release detection system in each tank
5. Increased tank tightness testing from annual to semi-annual, twice the state requirement
6. Improved fuel inventory monitoring using automated fuel handling equipment
7. Increased groundwater monitoring wells from eight to 15 since 2014; add eight more by 2021

## MITIGATION

1. Determining feasibility for potential construction of water treatment plant
2. Improving release response procedures continuously



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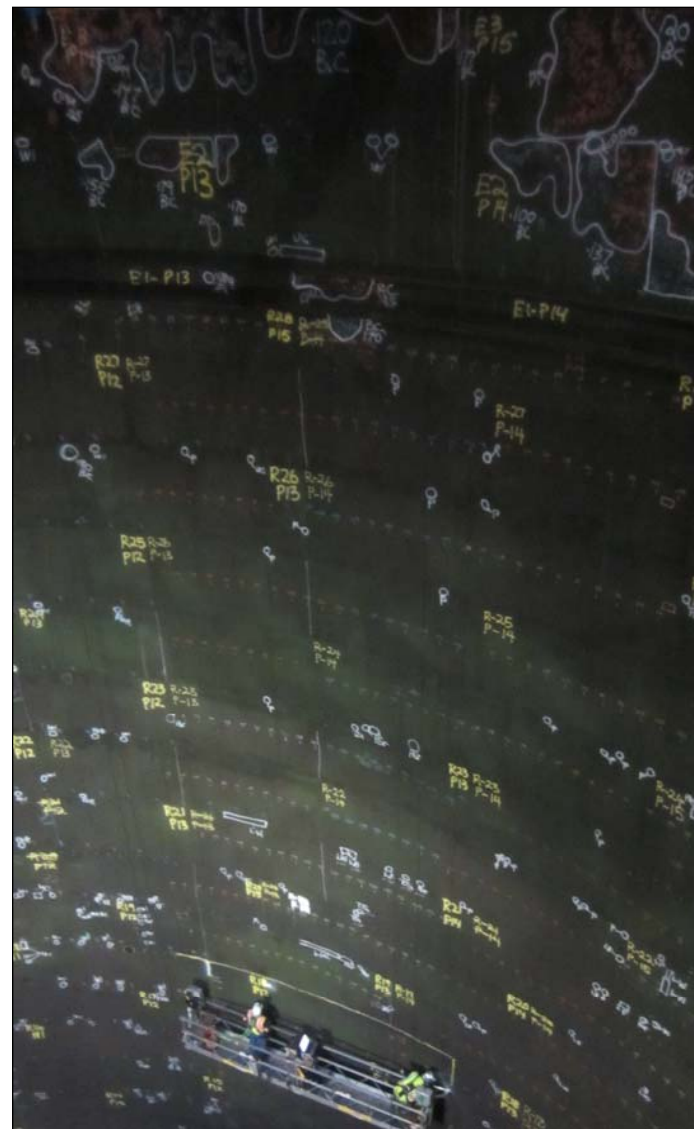
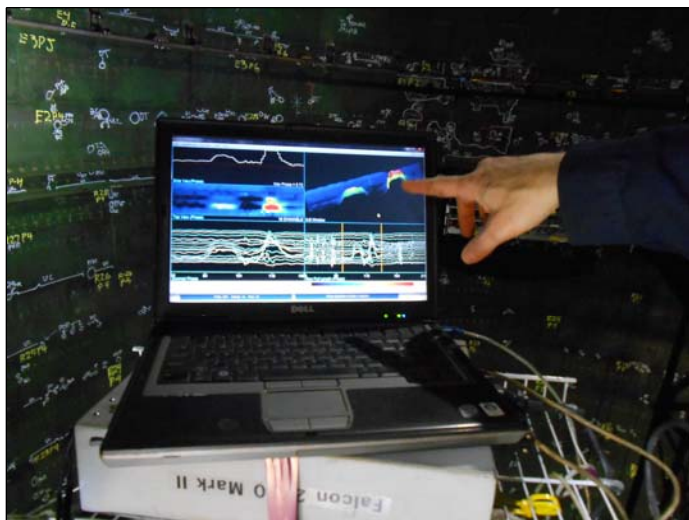
# Tank Inspection

The Regulatory Agencies have approved a Tank Inspection Repair and Maintenance (TIRM) Process for Red Hill.

Detailed marking of a tank allows for a more precise/thorough inspection. This results in higher quality control and quality assurance.

This state-of-the-art technology identifies the difference between:

- Aesthetics – dents, etc. (non-actionable)
- Defects – welds, pits, etc. (actionable)
- Corrosion – depending on plate thickness (actionable/non-actionable)
- Redundancy – redundant measures in place



LAYER OF PROTECTION - PREVENTION

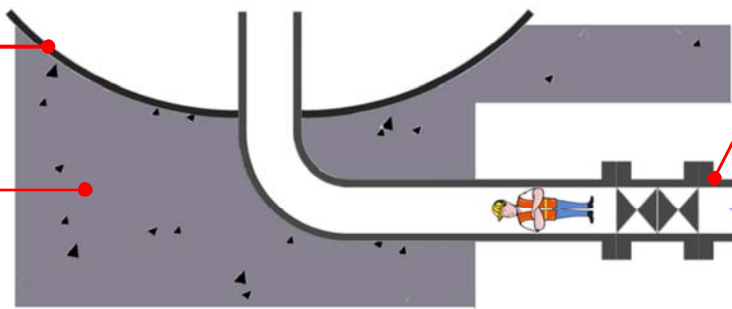


# Tank Nozzles

## Nozzles are Inlets/Outlets of the Tank.

Tank Liner/Lower  
Dome

Reinforced Concrete



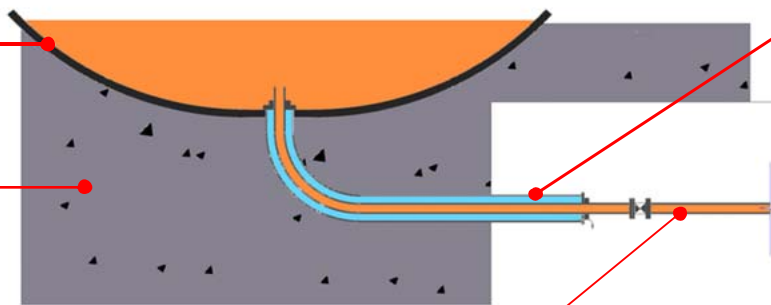
Fully Inspectable,  
Maintainable, and  
Interior Coated Existing  
32-in Nozzle with Valve

**Risk Assessments show the majority of the potential risk of a larger release is from the nozzles and not the tanks. To reduce this risk, all non fully inspectable nozzles are being converted to double-wall piping.**

Tank Liner/Lower  
Dome

Reinforced Concrete

New Nozzle with Valve



16-in and 18-in Nozzles  
Converted to a Double-  
walled Carrier Pipe

*\*not to scale\**

**LAYER OF PROTECTION - PREVENTION**



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# Red Hill Control Room



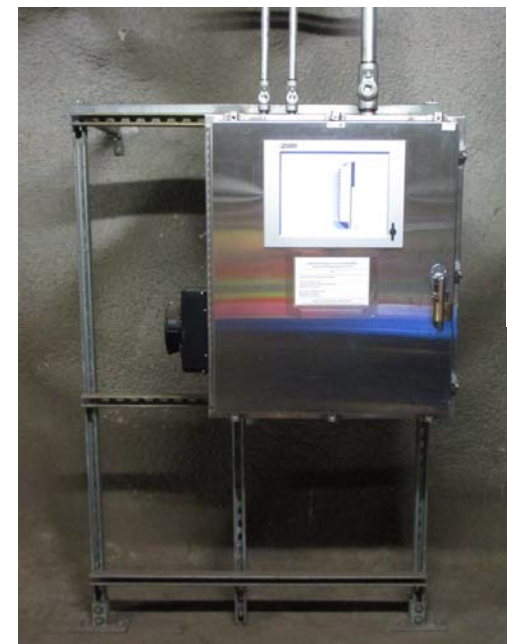
**“The Red Hill Facility control system ... *is by far* exceeding industry standards”  
- As per the EPA “Evaluation Report [on the] Red Hill Bulk Fuel Storage Facility”**

**LAYER OF PROTECTION – PREVENTION, DETECTION, AND MITIGATION**



# Release Detection

- Leak Detection Systems (LDS) are certified by the National Working Group for Leak Detection
- Currently tank tightness testing is achieved at Red Hill via a service contract.
- Since 2009 when tank tightness testing began, every tank in service has been tested and successfully passed tank tightness testing.
- In 2018, tank tightness testing increased frequency to semi-annual.
- Red Hill tank tightness testing is independent of the automated fuel handling equipment currently monitoring levels in each tank in service
- The Navy plans to permanently install LDS equipment which will allow tank tightness testing to occur on demand, should there be any indirect indications of a potential release



LAYER OF PROTECTION - DETECTION



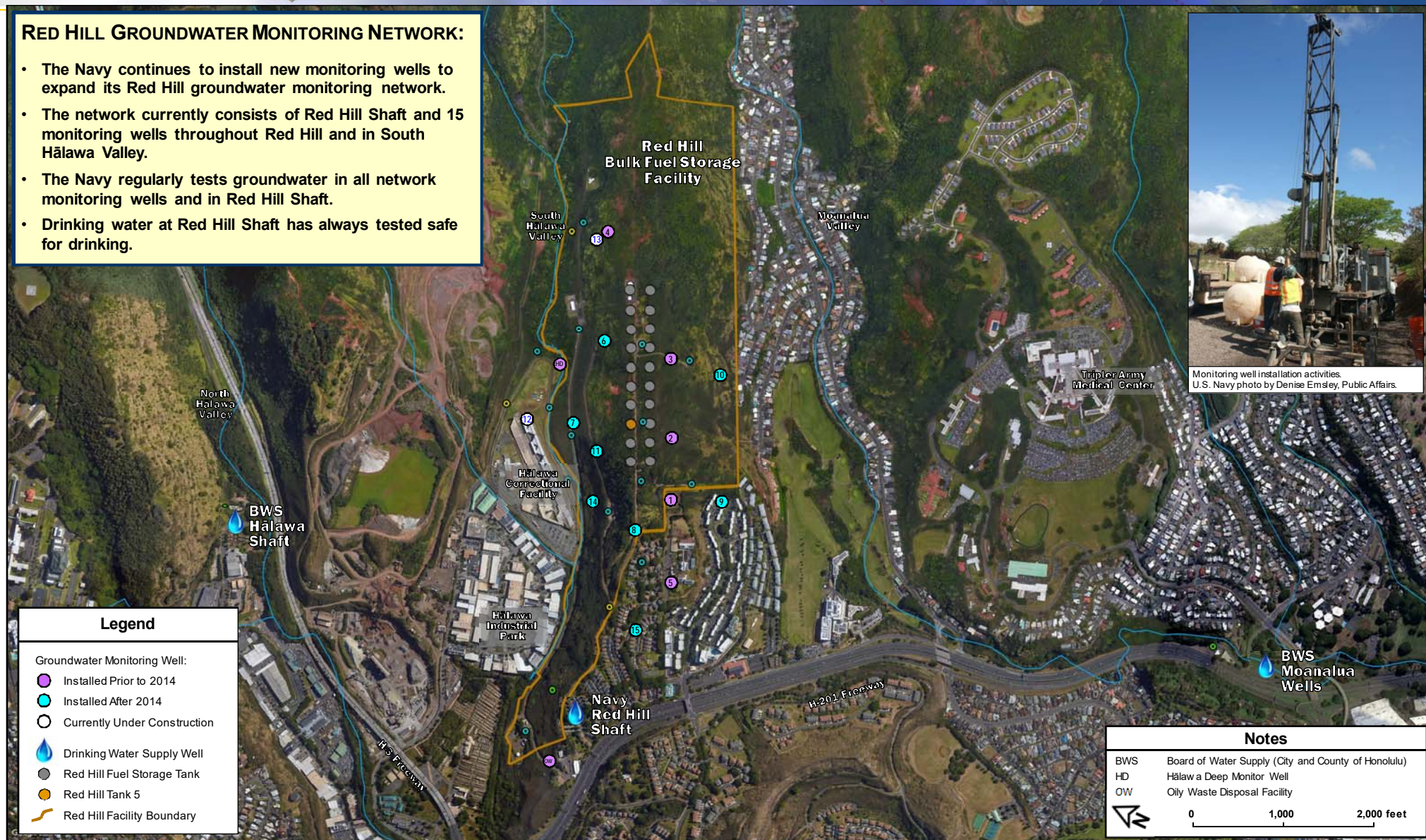
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# Red Hill Groundwater Monitoring Network

## RED HILL GROUNDWATER MONITORING NETWORK:

- The Navy continues to install new monitoring wells to expand its Red Hill groundwater monitoring network.
- The network currently consists of Red Hill Shaft and 15 monitoring wells throughout Red Hill and in South Hālawā Valley.
- The Navy regularly tests groundwater in all network monitoring wells and in Red Hill Shaft.
- Drinking water at Red Hill Shaft has always tested safe for drinking.

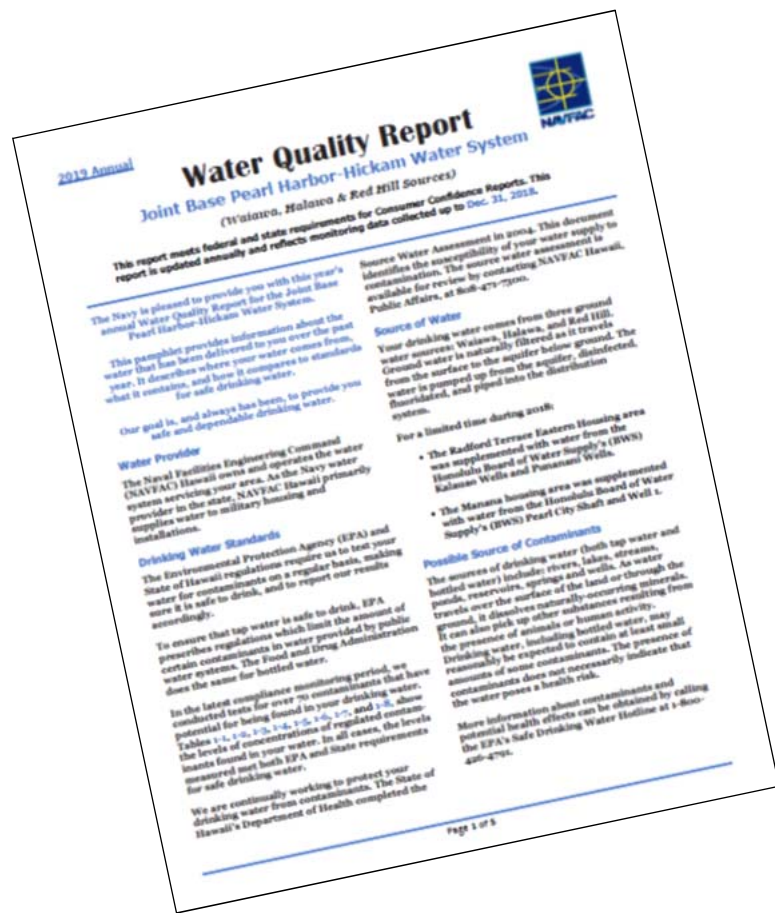


LAYER OF PROTECTION – DETECTION-MITIGATION



# Drinking Water Remains Safe & Clean

“[W]e conducted tests for over 70 contaminants that have potential for being found in your drinking water.....In all cases, the levels measured met both EPA and State Requirements for **safe drinking water**.”  
-Joint Base Pearl Harbor-Hickam Water 2019 Water Quality Report



2019 CCR Special Notice for Waipahu Wells IV Pump #2

Water quality test results for Waipahu Wells IV Pump #2

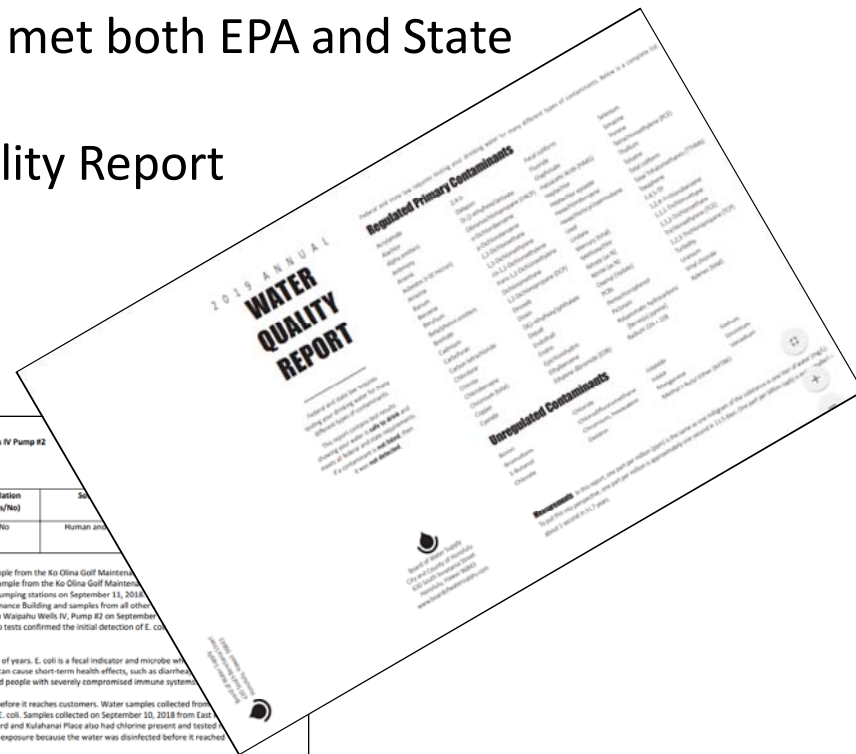
Contaminant	MCL (Allowed)	MCLG (Goal)	E. coli found	Sample Year	Violation (Yes/No)	Source
E. coli	0	0	Positive	2018	No	Human waste

On September 11, 2018, Board of Water Supply (BWS) detected coliform bacteria in a routine water sample from the Ko Olina Golf Maintenance Building on September 10, 2018. In accordance with the federal Ground Water Rule, BWS staff collected a repeat sample from the Ko Olina Golf Maintenance Building on September 11, 2018. The repeat sample from the Ko Olina Golf Maintenance Building and samples from all other wells tested negative. As required by Rule, the BWS immediately collected five (5) additional follow up samples from Waipahu Wells IV, Pump #2 on September 12, 2018. The follow up tests confirmed the initial detection of E. coli. The BWS reported the incident in press releases dated September 12 and 13, 2018.

E. coli bacteria can exist in tropical, sub-tropical, and temperate soil and may persist in soil for a number of years. E. coli is a fecal indicator and microbe which indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes can cause short-term health effects, such as diarrhea and other symptoms. They may pose a special health risk for infants, young children, some of the elderly, and people with severely compromised immune systems.

During the time Waipahu Wells IV, Pump #2 was operating chlorine was being added to the well water before it reaches customers. Water samples collected from the Golf Maintenance Building on September 10 and 11, 2018 had chlorine present and tested negative for E. coli. Samples collected on September 10, 2018 from East Station, Nanihuli Fire Station, Puhi Bay Beach Park, Waianae Fire Station, BWS Waianae Corporation Yard and Kulaehaui Place also had chlorine present and tested negative for E. coli. For this reason, the water from this source is safe to drink and the public was not at risk of E. coli exposure because the water was disinfected before it reached customers. BWS reported the incident in press releases dated September 12 and 13, 2018.

The BWS received Hawaii Department of Health (DOH) approval on December 28, 2018 to resume well operations after completing an investigation and the necessary corrective measures on Pump #2 in consultation with DOH. BWS will monitor and disinfect the well water before it reaches our customers.

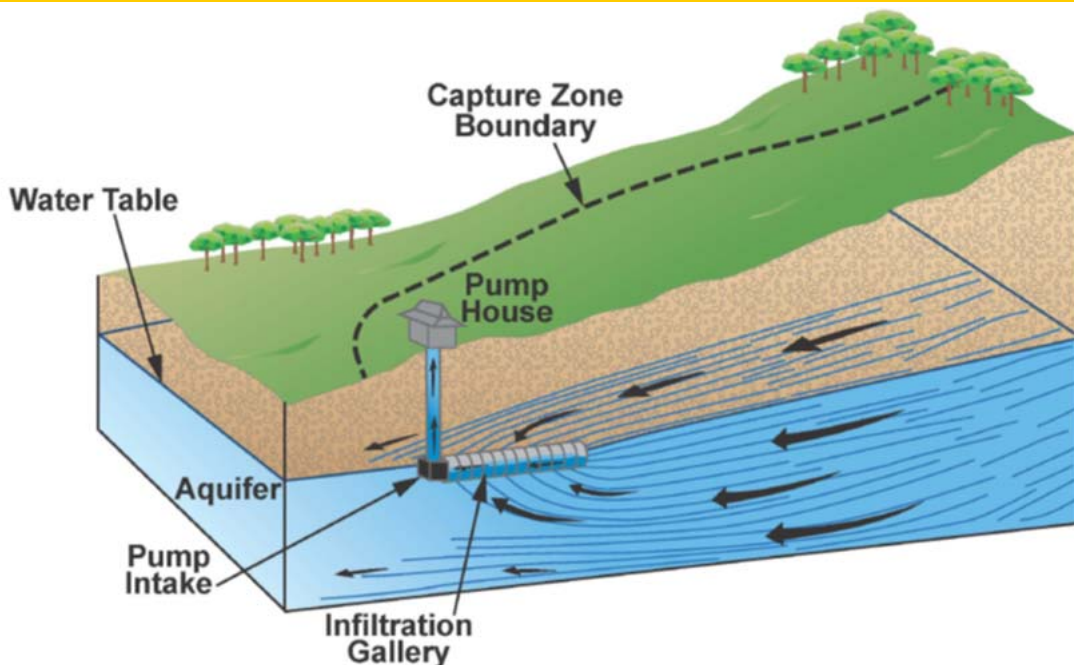


“The water serving Halawa Shaft and Moanalua Wells has been tested and meets all Federal and State standards.”  
-Board of Water Supply 2019 Water Quality Report

LAYER OF PROTECTION - DETECTION

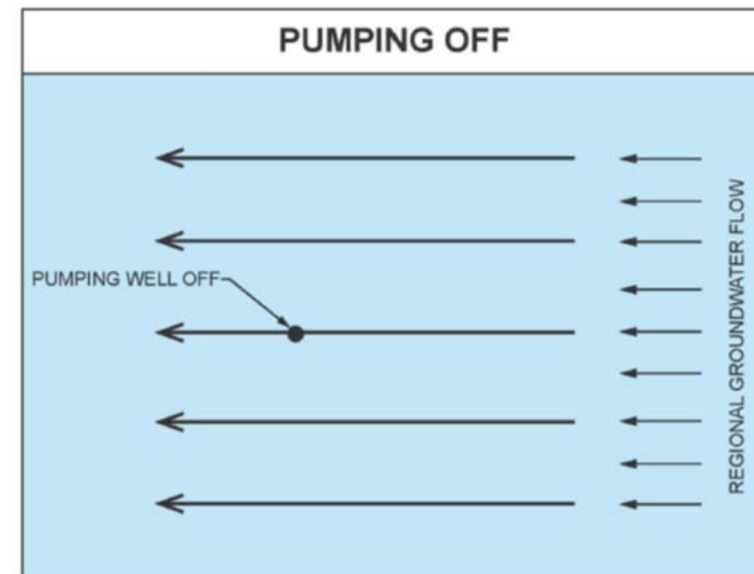
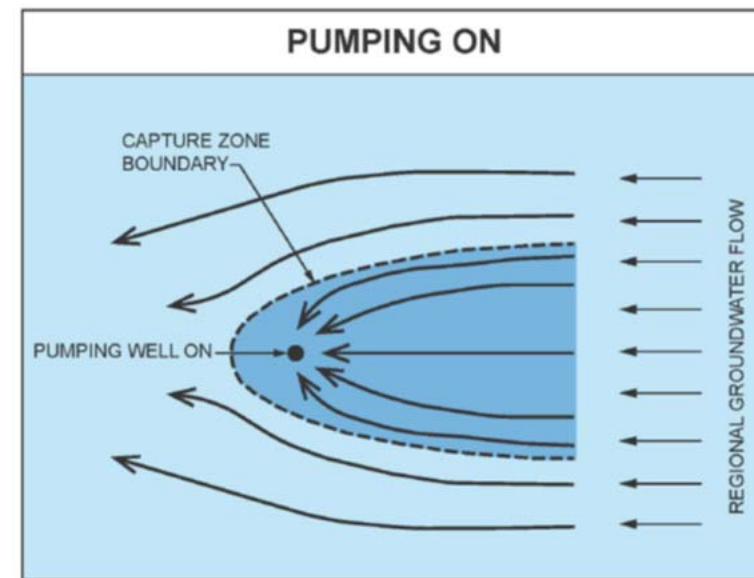


# Groundwater Capture Zone



## Groundwater Capture Zone Development:

- A capture zone is the area around a well or infiltration gallery in which groundwater is contained and extracted during pumping.
- Pumping a well or infiltration gallery in an aquifer creates a groundwater capture zone.
- If pumping continues, all groundwater within that capture zone is expected to be extracted from the aquifer.
- In general, chemicals dissolved in groundwater move with groundwater.
- Dissolved chemicals in groundwater within a capture zone are removed from the aquifer as pumping continues.



LAYER OF PROTECTION - MITIGATION



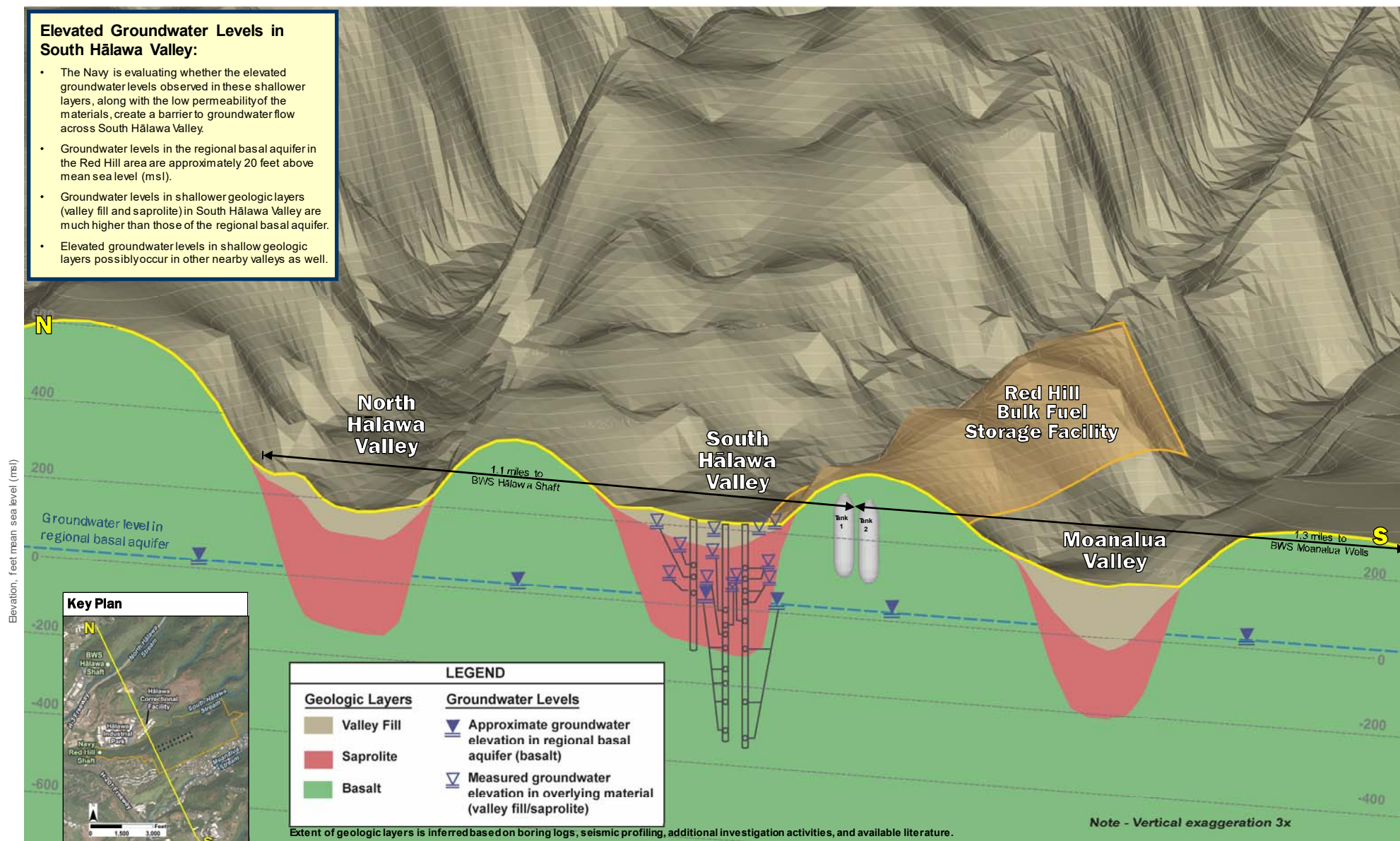
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# Understanding Groundwater in Red Hill

## Elevated Groundwater Levels in South Hālawā Valley:

- The Navy is evaluating whether the elevated groundwater levels observed in these shallower layers, along with the low permeability of the materials, create a barrier to groundwater flow across South Hālawā Valley.
- Groundwater levels in the regional basal aquifer in the Red Hill area are approximately 20 feet above mean sea level (msl).
- Groundwater levels in shallower geologic layers (valley fill and saprolite) in South Hālawā Valley are much higher than those of the regional basal aquifer.
- Elevated groundwater levels in shallow geologic layers possibly occur in other nearby valleys as well.



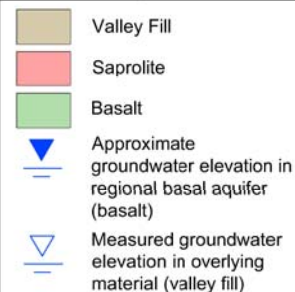


# Understanding Groundwater in Red Hill

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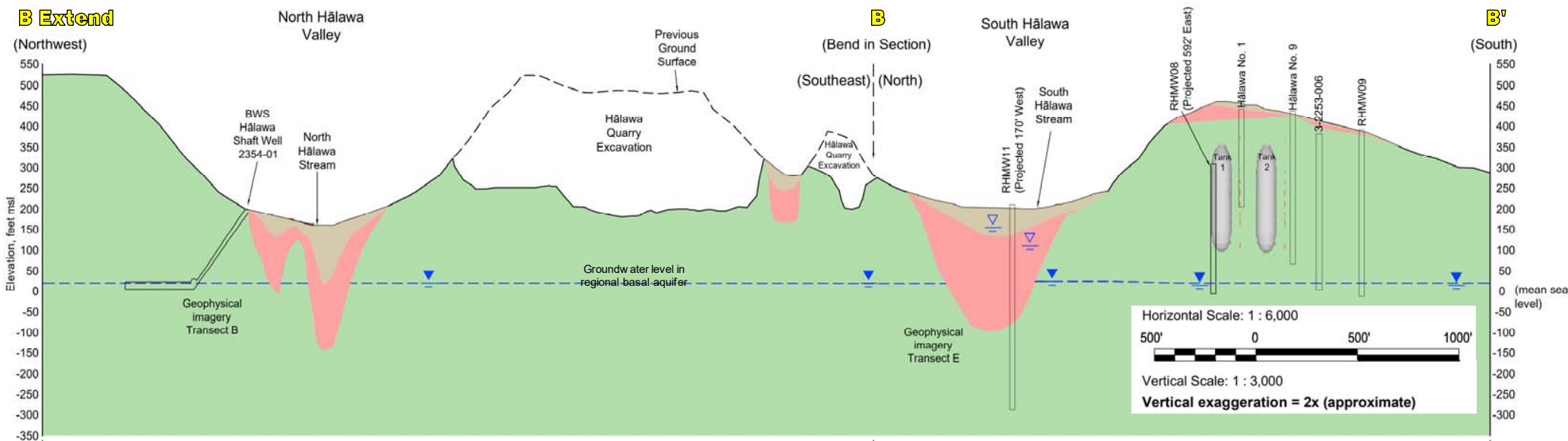
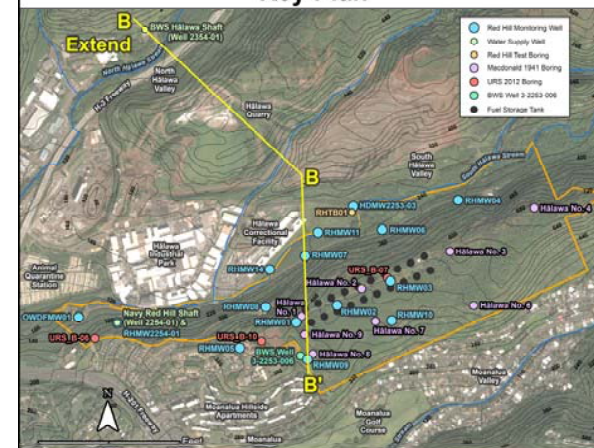
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### Legend



Extent of geologic layers is inferred based on boring logs, seismic profiling, additional investigation activities, and available literature.

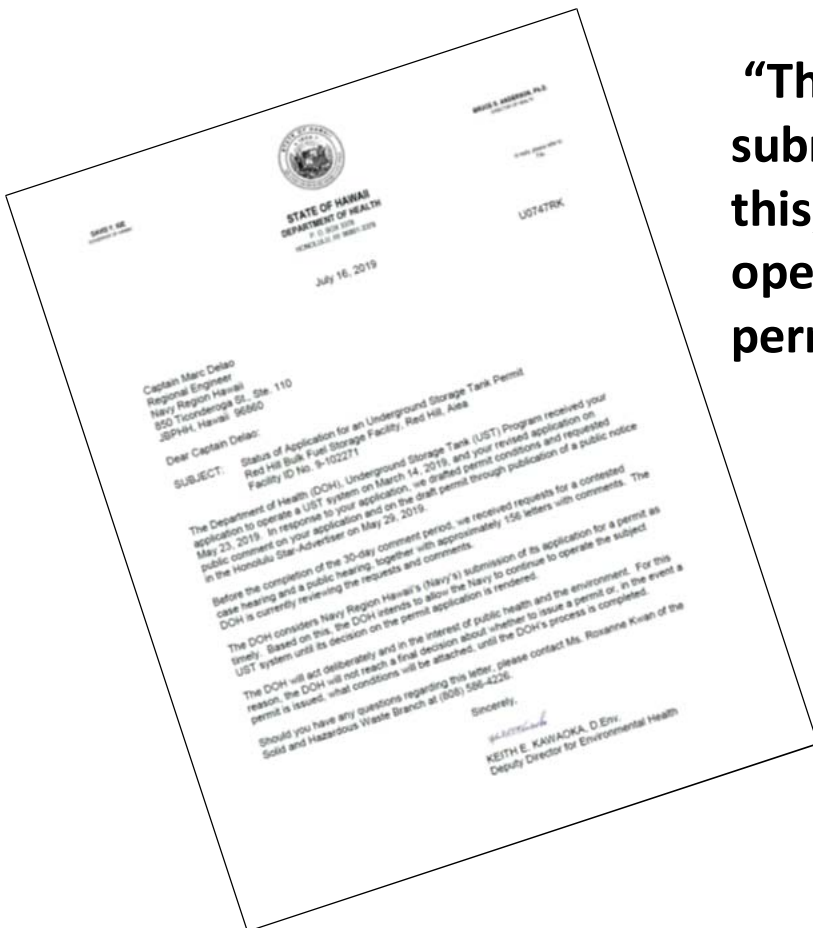
### Key Plan





# Permit Status

**“The DOH considers Navy Region Hawaii’s (Navy’s) submission of its application for a permit as timely. Based on this, the DOH intends to allow the Navy to continue to operate the subject UST system until its decision on the permit application is rendered.”**



Tank ID No.	Capacity	Content
F-1	12,000,000 gallons	Empty
F-2	12,000,000 gallons	F-24
F-3	12,000,000 gallons	F-24

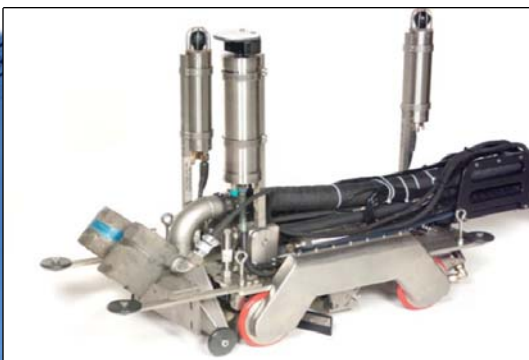
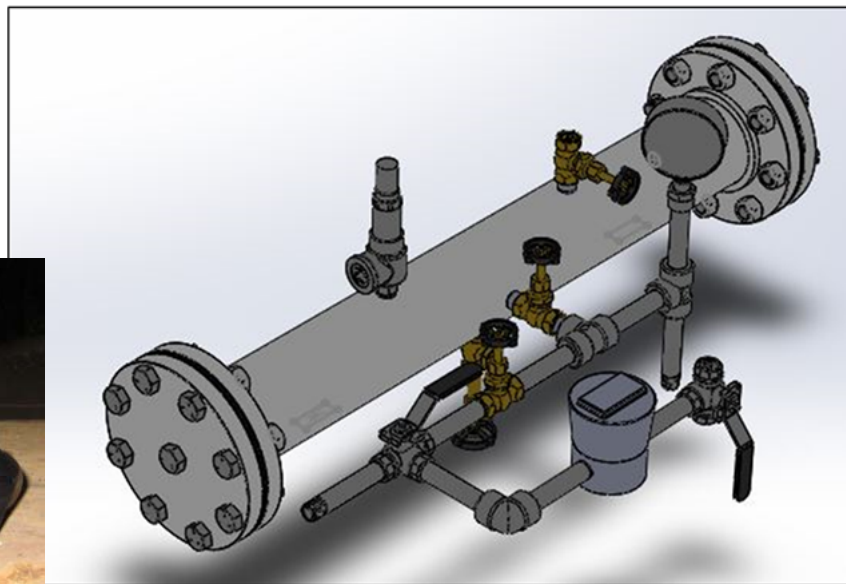
**“Perform semi-annual tank tightness testing ...in accordance with the description provided under the heading “Tanks – Release Detection” ... of the permit application received by DOH on May 23, 2019 for any and all tanks storing product.”**



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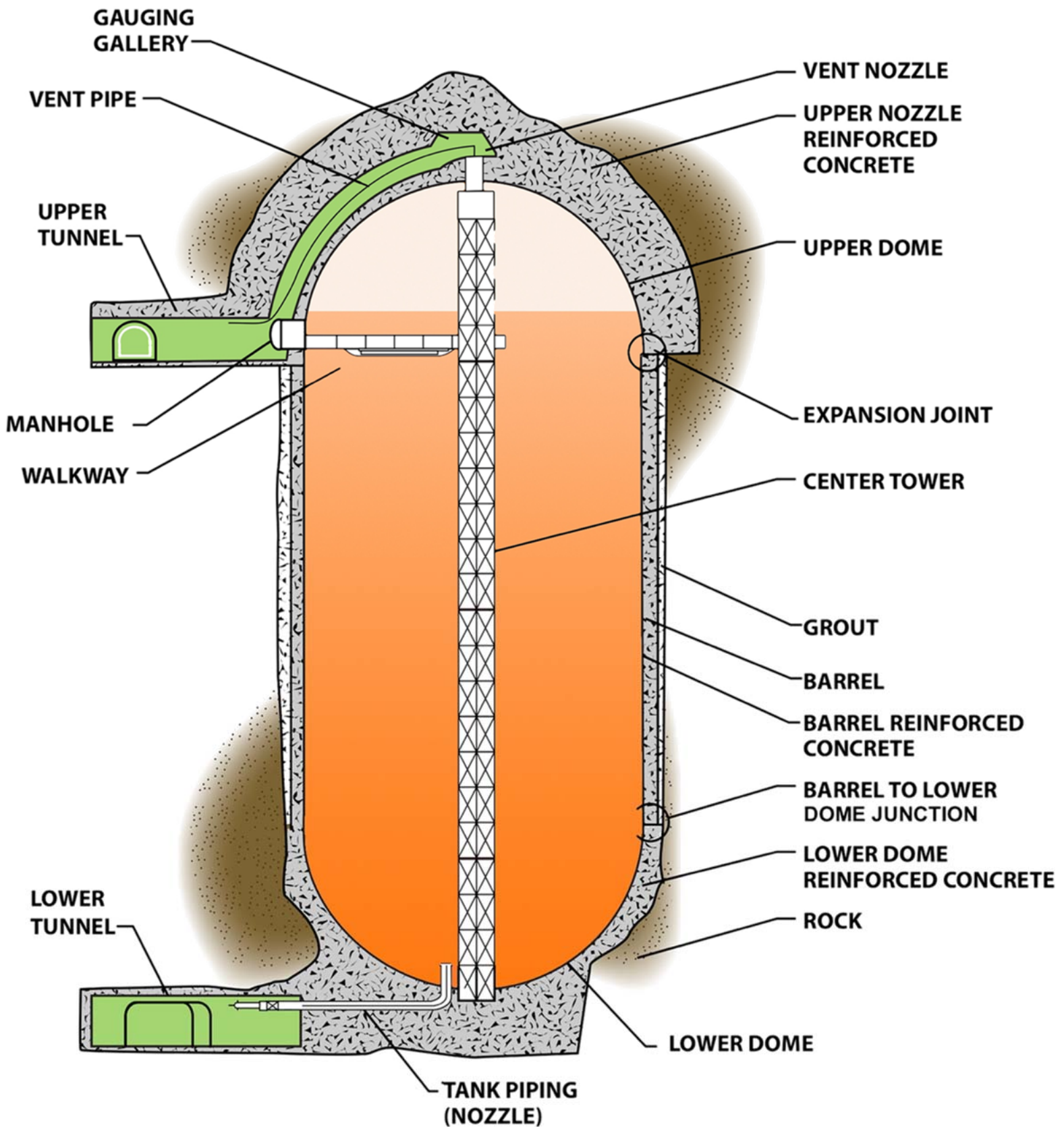


# Cutting Edge Technology





# Tank Components



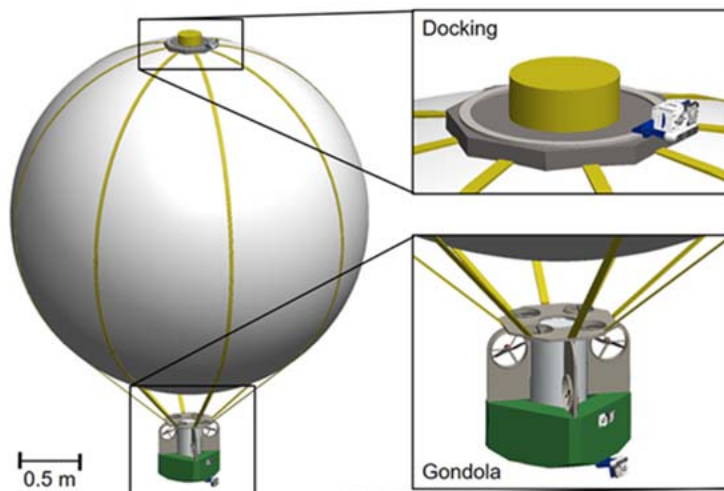


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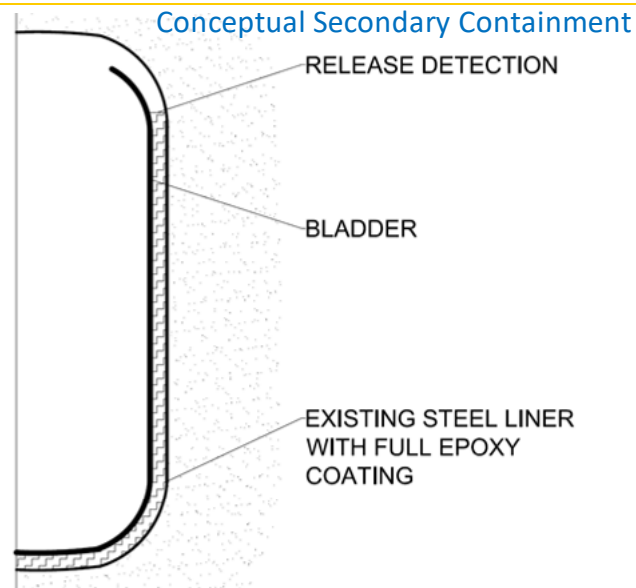


# Pursuing Future Tech

## Robotic Inspection of Tanks (RIOT)



Robotic Inspection of Tanks (RIOT)



**DARPA** **DARPA SUBTERRANEAN CHALLENGE**

Tunnel Environment      Urban Environment      Cave Environment

Artist's Concept

**3 Sub-Domains**  
Tunnel Systems • Urban Underground • Cave Networks

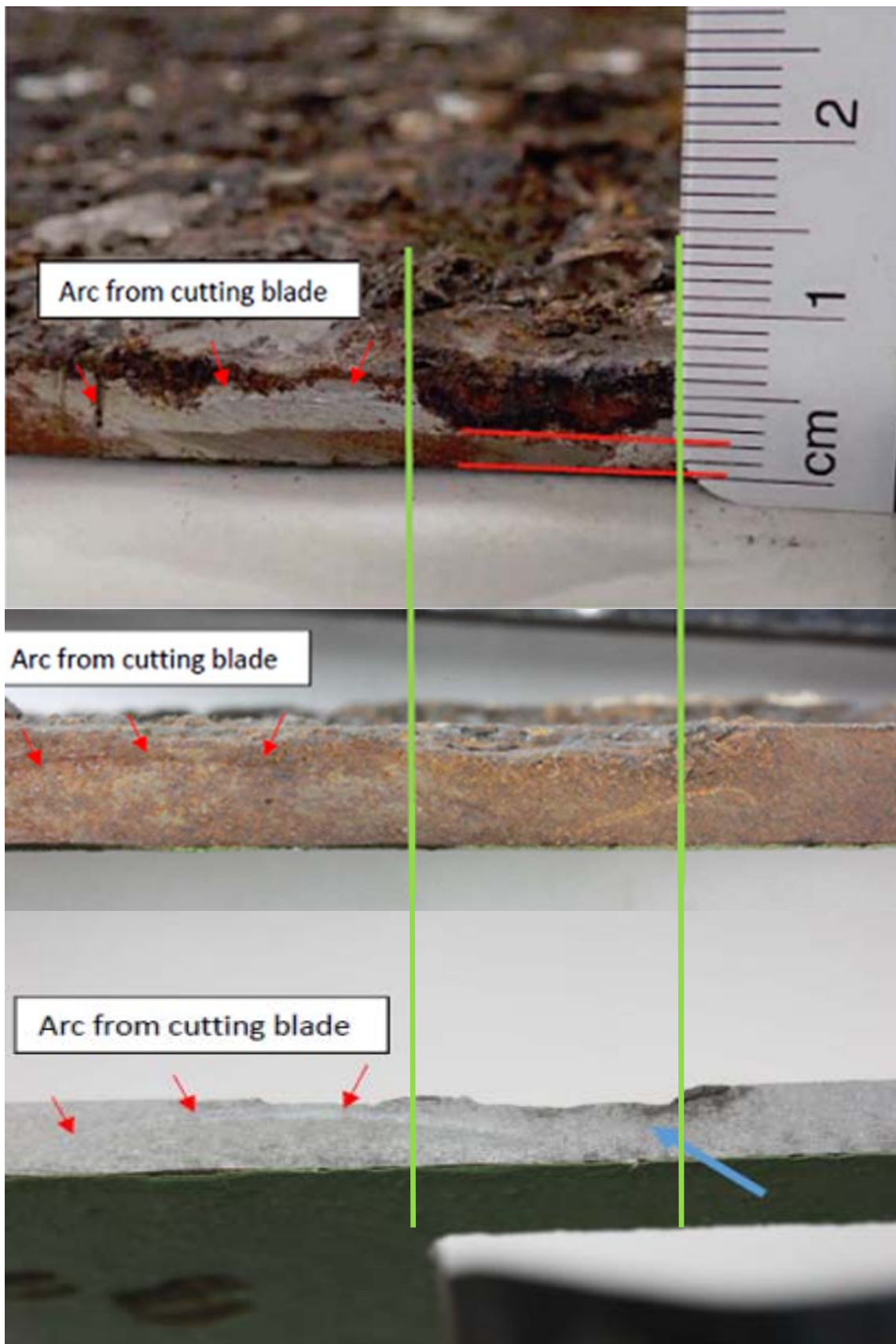
**2 Competition Tracks**  
Systems Track • Virtual Track

**1 Revolutionary Vision**  
Create breakthrough technologies and capabilities for underground operations

Learn More at [www.darpa.mil](http://www.darpa.mil)



# Coupons



Navy Scanning  
Measurements:  
135 mil

As Reported by  
Non-Navy Entities:  
79 mil

As Received at  
the Lab:  
163.8 mil

After CO<sub>2</sub> Dry Ice  
Blasting at the  
Lab: 163.8 mil



# Red Hill

## Minimum Wall Thickness

¼ Inch Thick Steel Liner

2.5 - 4 Feet Thick Reinforced Concrete  
20 Feet Thick Beneath the Tank

Pressurized Grout

Red Dirt

6 Inch Thick Gunitite

Basalt Rock

\*not to scale\*



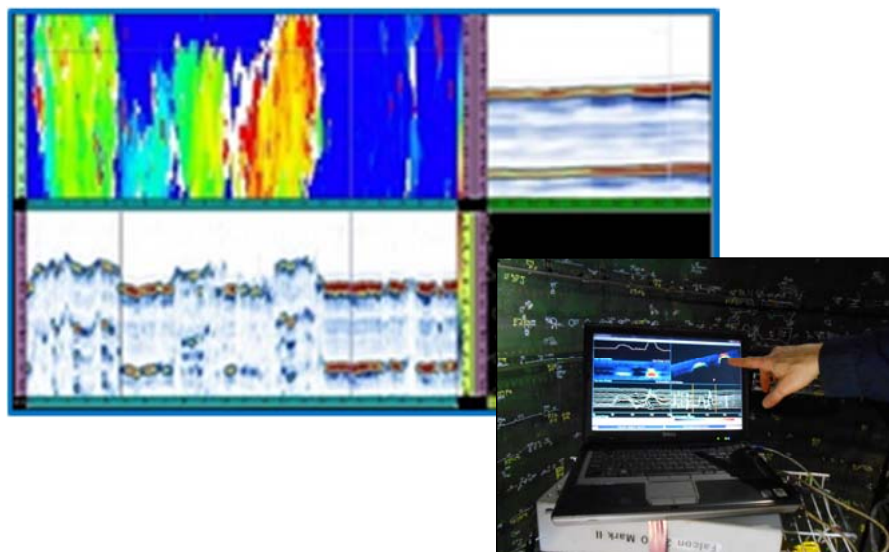
**NAVFAC**  
Naval Facilities Engineering Command  
NAVFAC HAWAII

# Tank Inspection and Repair

**NAVSUP**  
NAVAL SUPPLY SYSTEMS COMMAND  
FLEET LOGISTICS CENTER  
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The Regulatory Agencies have approved the Tank Inspection Repair and Maintenance (TIRM) Process for Red Hill.



Tank is scanned with multiple cutting-edge technologies



For safety, holes are drilled, tested for gas, and repaired



Patch plates are welded on, inspected, and tested for integrity

LAYER OF PROTECTION - PREVENTION