Tutu Wellfield Superfund Site

Proposed Cleanup Plan for Groundwater Remediation at the Curriculum Center

Pre-Recorded Presentation

July 14, 2021

Meeting Presenters

Caroline Kwan, Remedial Project Manager

Donette Samuel, Community Involvement Coordinator

Presentation Objectives

- Conclusions of the Focused Source Remedial Investigation, Risk Assessment and Feasibility Study
- Revisions to the 2018 Proposed Plan with updated cost-benefit analysis
- Proposed Plan for the cleanup of the contaminant source areas of the Tutu Wellfield site
- Public is encouraged to provide comments until August 13th, 2021

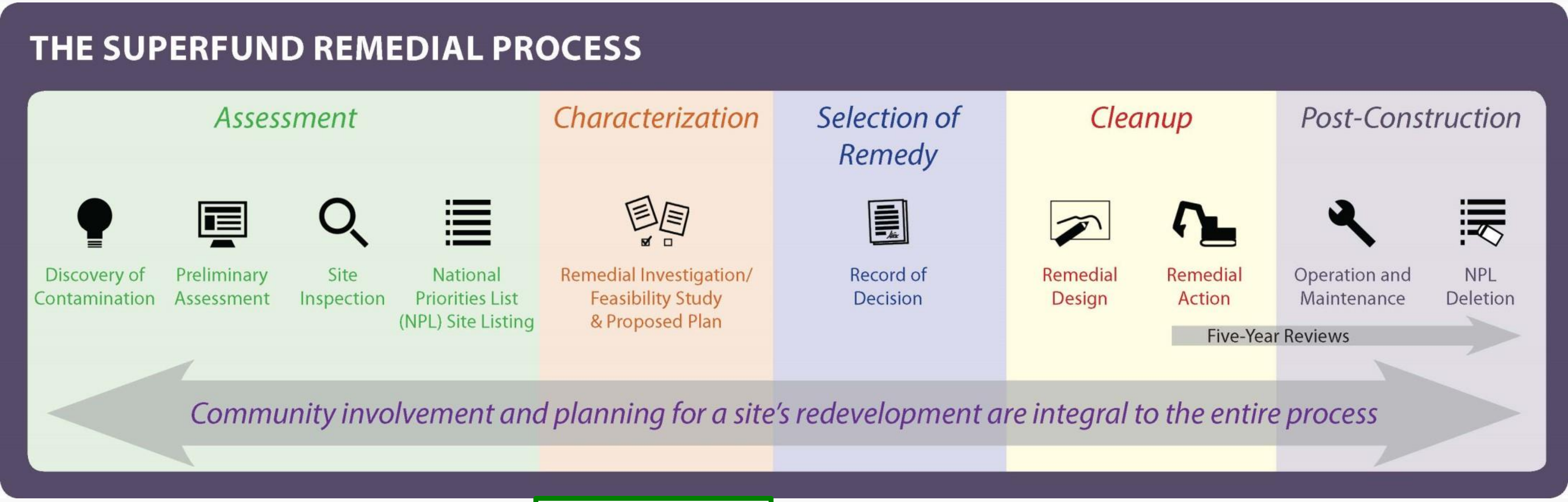
Meeting Agenda

- **Superfund Overview**
- Site Background
- Remedial Investigation
- Risk Assessment
- Feasibility Study
- Preferred Remedy
- Questions/Comments?

Superfund Law

- Toxic waste disposal disasters prompted law passage by Congress in 1980
- Provides Federal funds for cleanup of hazardous waste sites
- Allows EPA to respond to emergencies involving hazardous substances
- Empowers EPA to compel Potentially Responsible Parties to pay for or conduct site clean up

Superfund Cleanup Process



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Location of Tutu Wellfield Superfund Site

Site History

1969: Curriculum Center property owned by LAGA Industries Ltd. (LAGA), a textile manufacturing facility

1970 – 1978: Purchased by Duplan Corporation. Begun dry cleaning operations using Tetra-chloroethene (PCE)

1979 – 1981: Purchased by Panex, sold to Virgin Islands Department of Education (VIDE)

1982 – 2017: Multi-use building by VIDE

Site History

1982 – 1989: Multiple investigations by EPA and Potentially Responsible Parties (PRPs)

1994 – 1995: Remedial Investigation (RI) identified co-mingled plumes with chlorinated volatile organic compounds (CVOCs) and petroleum/gasoline components

1995: Site listed on the National Priorities List (NPL). Studies concluded that the CVOC plume with dichloro-ethene (DCE), tetrachloroethene (PCE), trichloroethene (TCE), and vinyl chloride (VC) originated at or near the Curriculum Center

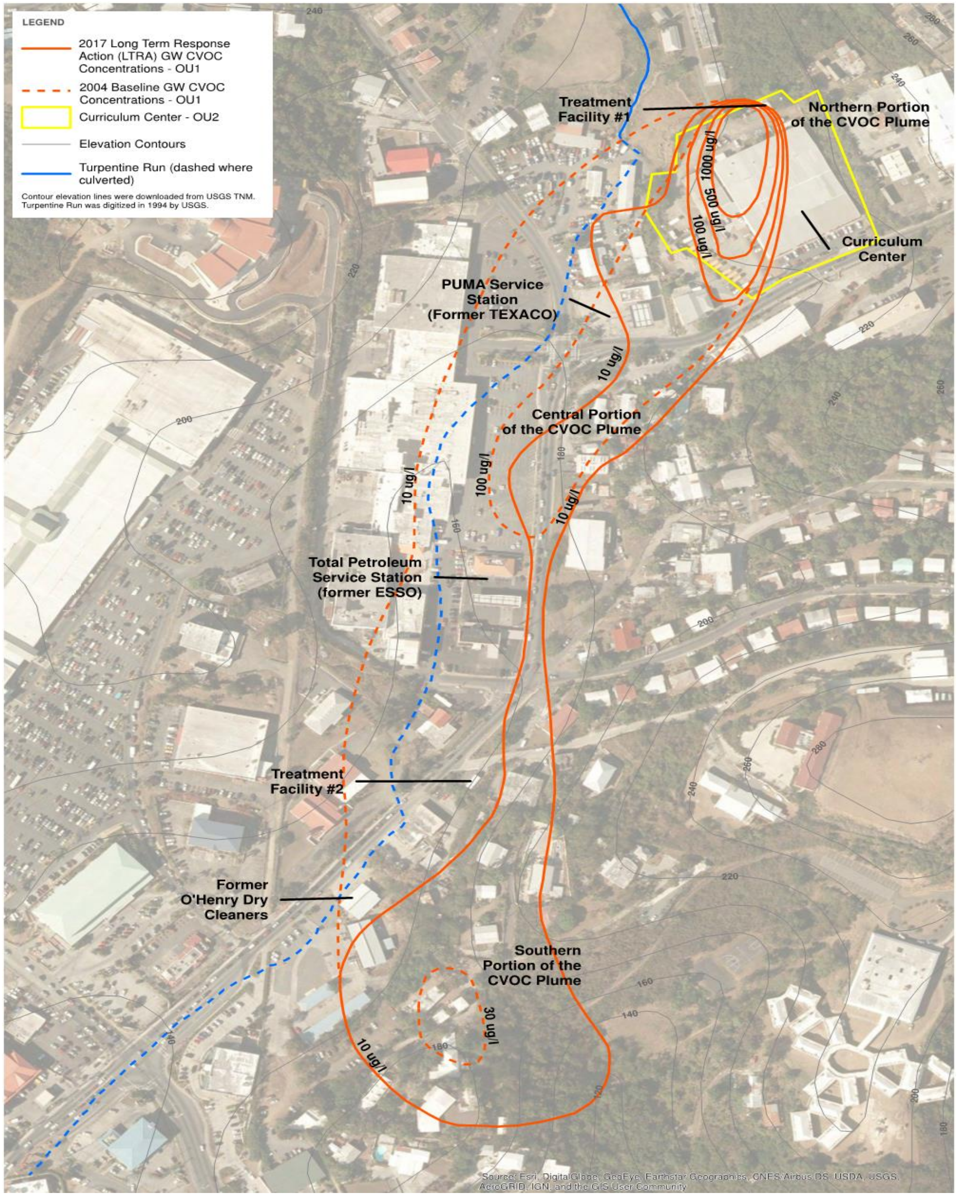
Site History

1996: Record of Decision (ROD) for sitewide remediation selected groundwater extraction and treatment to restore groundwater

2004-2013: Construction of the remedy completed and included two groundwater treatment systems to treat the CVOC plume. Groundwater treatment facilities operated by EPA; transferred to USVI in 2013

April 2015: EPA's Operable Unit 2 (OU2) investigates potential additional contaminant source areas

Status of Sitewide Remediation



- Current Remedy: Groundwater extraction, ex-situ treatment, discharge to Turpentine Run, and institutional controls
- Groundwater treatment systems installed at the Curriculum Center property and near O’Henry Dry Cleaners
- SVE system installed at the Curriculum Center and operated from 2004 to 2006; vapor contamination was reduced significantly
- Insufficient reduction of groundwater contamination at the Curriculum Center area

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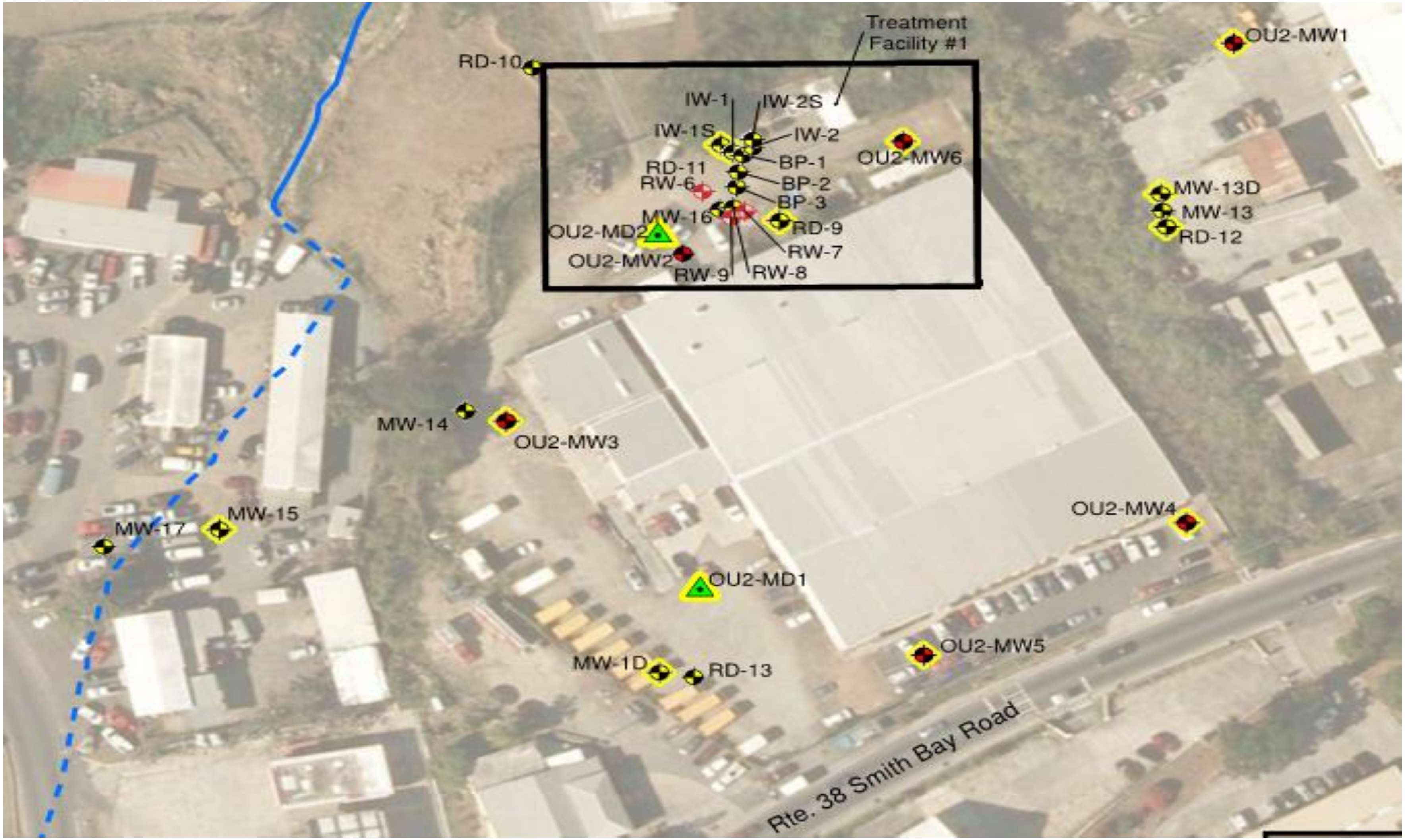
Source Area - Curriculum Center Property



Source Area Remedial Investigation

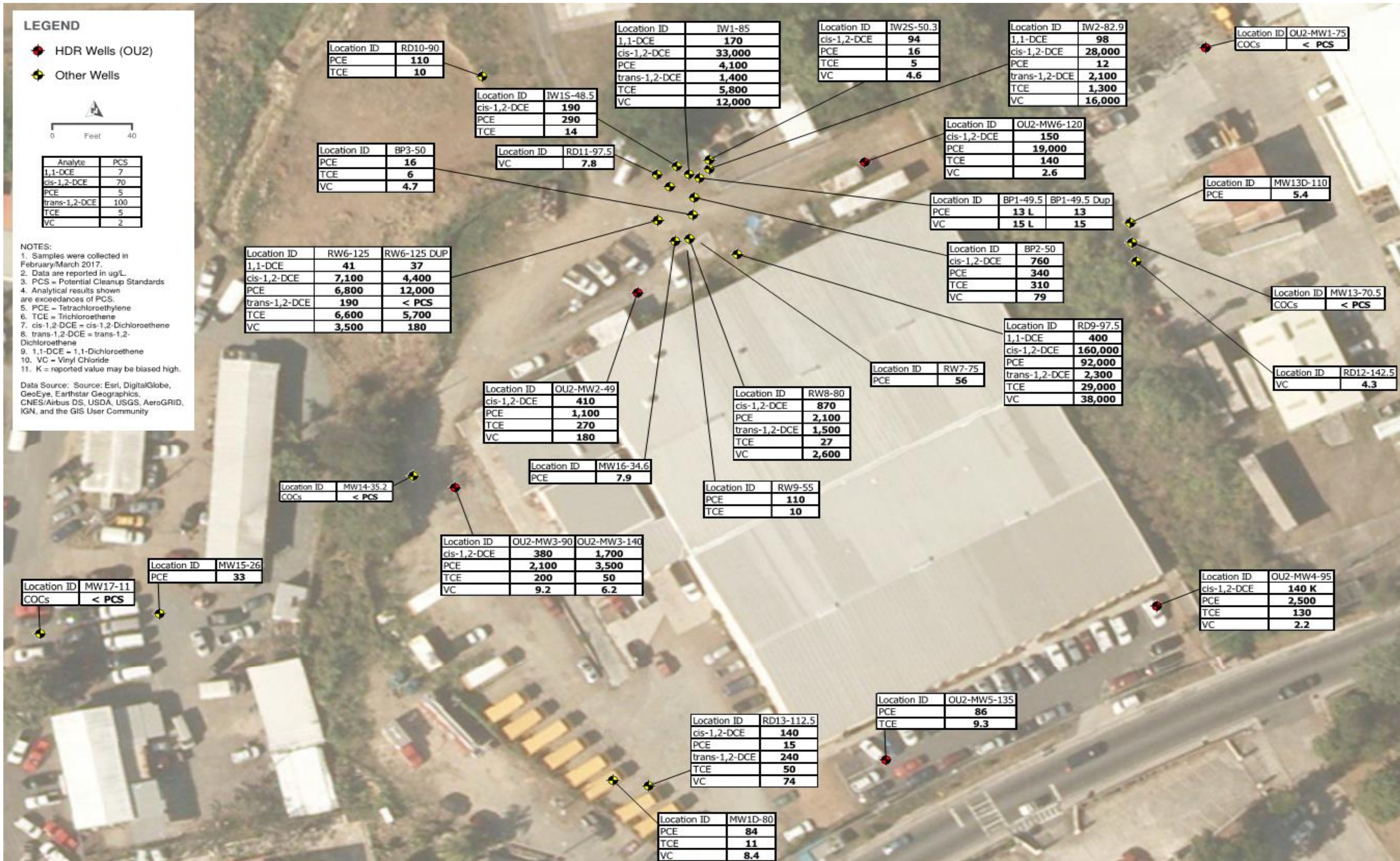
Activities conducted at the Curriculum Center property
April 2016 to June 2017

- Surface geophysical survey
- Rock matrix diffusion sampling and analysis
- Monitoring well installation
- Borehole geophysical investigation
- Packer testing and sampling
- Groundwater sampling
- Groundwater level monitoring
- Dense non-aqueous phase liquid (DNAPL) monitoring

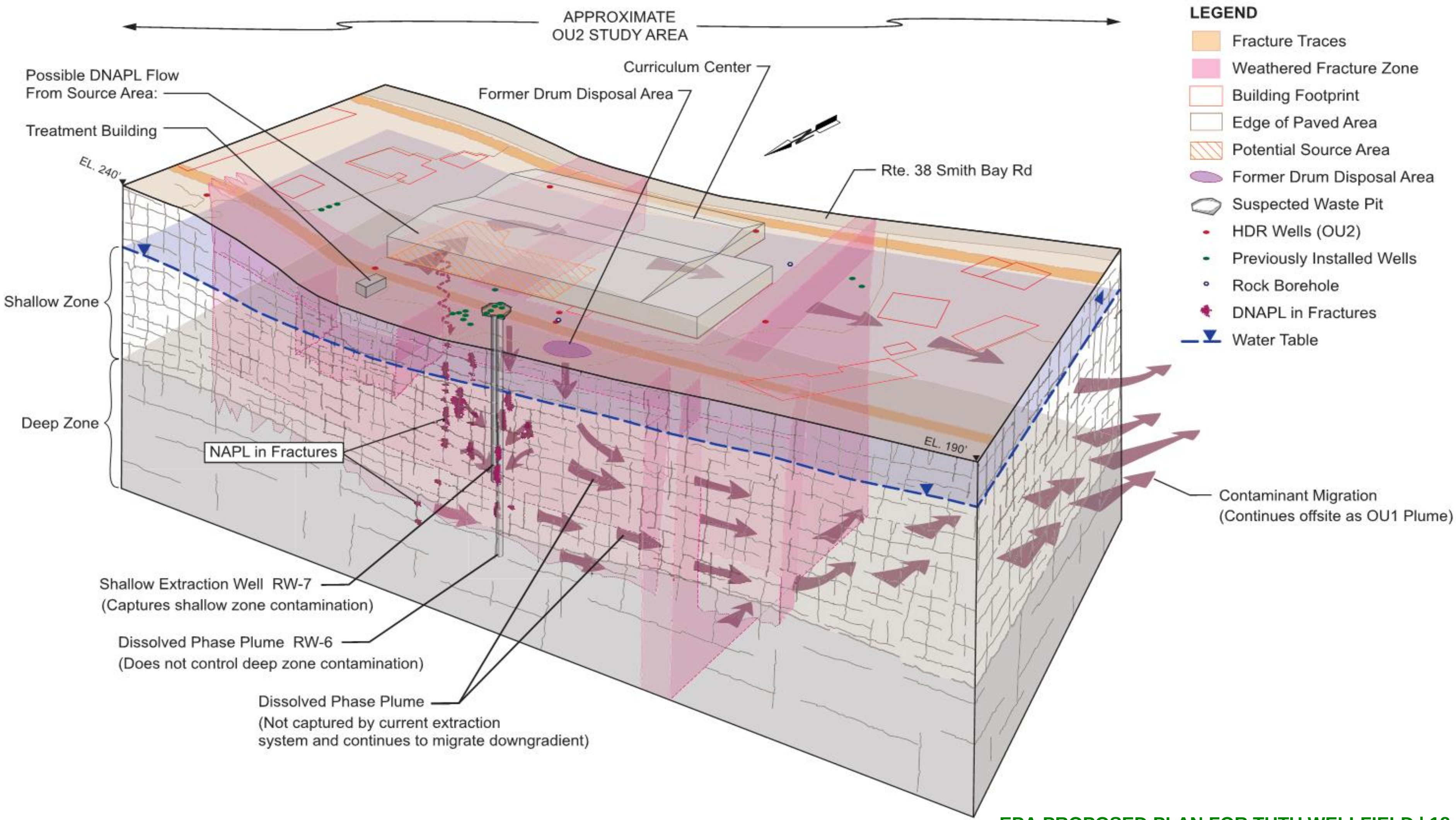
Source Area Groundwater Sampling Results

- Characterized bedrock aquifer; defined two possible zones for contaminant migration
- DNAPL is present and will act as an ongoing source
- Dissolved phase CVOC contamination is present
- Contaminants present in the rock matrix will continue to leach out into groundwater
- The degree of natural degradation varies throughout the Curriculum Center area
- The capture zone of the existing extraction system does not extend far enough in a downgradient direction

Monitoring Well Exceedances Summary

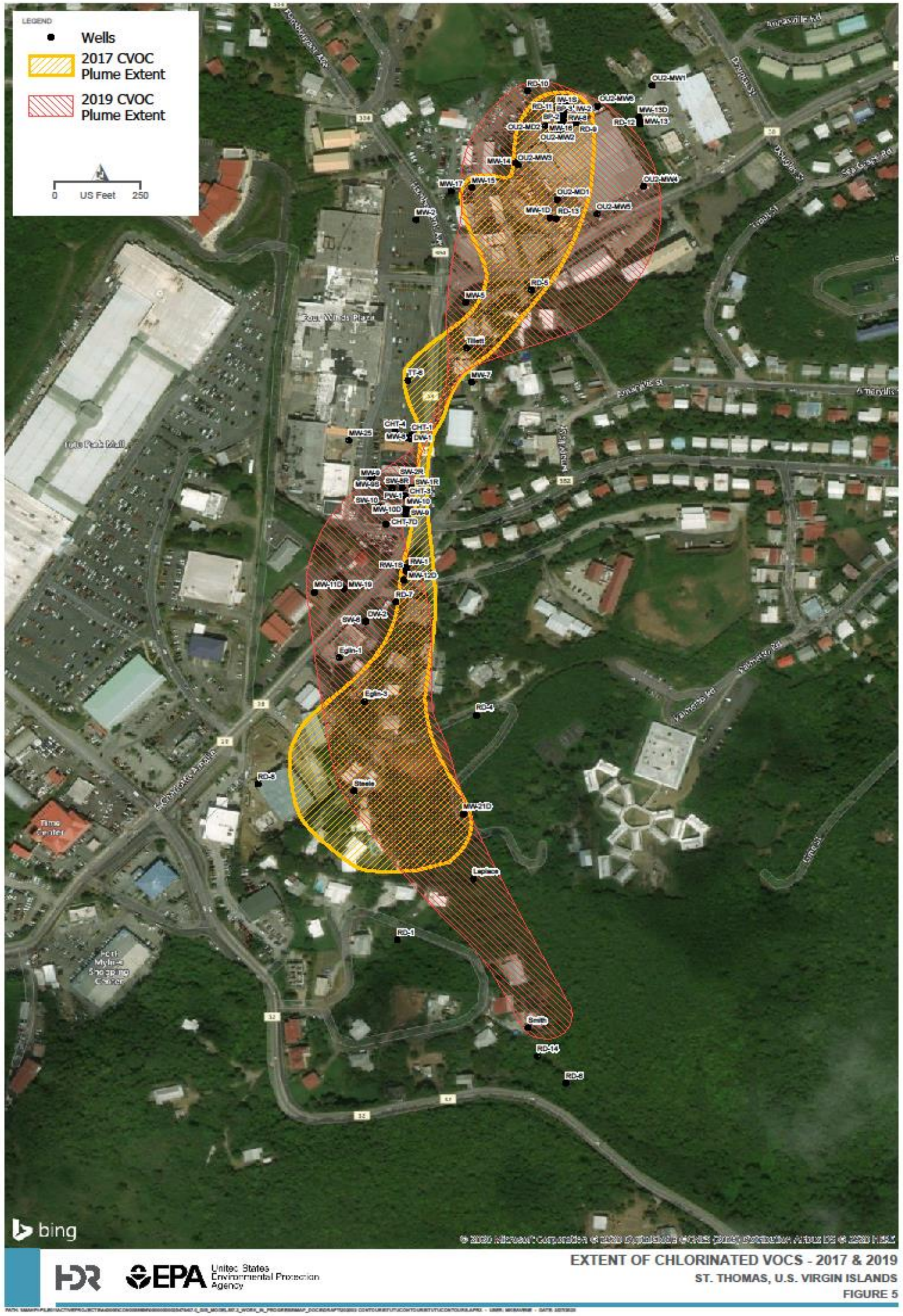


Conceptual Site Model



Hurricane Irma and Maria Impacts

- The two sitewide groundwater (GW) treatment systems were damaged during hurricanes Irma and Maria and remained shut down due to electrical problems
- Repairs were completed in 2020 and the system were placed in operation in June 2021
- Contamination continue to migrate downgradient
- To assess the impact of the treatment systems shutdown, supplemental GW sampling was performed in June and October 2019 and the findings are:
  - Analytical results confirmed the extent of chlorinated compounds in GW.
  - Concentrations in samples from Curriculum Center wells were generally lower than those established in the 2017 Remedial Investigation (RI).
  - Concentrations detected in residential wells were generally below MCLs. One sample exceeded an MCL for TCE and that well is used for irrigation purposes only.
  - Comparison of the 2017 & 2019 GW Sampling Data, is presented on the next figure:


LEGEND
Wells
2017 CVOC Plume Extent
2019 CVOC Plume Extent
0 US Feet 250
EXTENT OF CHLORINATED VOCS - 2017 & 2019
ST. THOMAS, U.S. VIRGIN ISLANDS
FIGURE 5

Meeting Agenda

- Superfund Process Overview
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- **Risk Assessment**
- Remedial Alternatives
- Preferred Remedy
- Questions/Comments

Source Area Risk Assessment Process

Step 1
- Hazard Identification

Step 2
- Exposure Assessment

Step 3
- Toxicity Assessment

Step 4
- Risk Characterization

Drinking Water Use Pathway

Source: Thinkstock Photos

Source Area Risk Assessment Summary

- Contaminated groundwater presents an unacceptable exposure risk
- VC, TCE, PCE and *cis*-1,2-DCE pose a lifetime cancer risk exceeding 1×10^{-4}
- Vapor intrusion from PCE and TCE are also of potential concern to workers
- Future use of the building is currently unknown

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Remedial Alternatives – Cleanup Options

- **Alternative 1** – No Action
- **Alternative 2** – Expand Existing Pump and Treatment System
- **Alternative 3** – In Situ Thermal Treatment and Pump and Treat
- **Alternative 4** – In Situ Steam Injection and Pump and Treat

Alternative 1 – No Action

- No Action to remediate the contaminated groundwater
- No Institutional Controls

Pros – Basis for comparison with other process options

Cons – Contaminants in groundwater will continue to spread. Human health and environmental risks remain

Costs-

- *Capital Cost:* $0
- *Operations and maintenance (O&M) Costs:* $0
- *Present-Worth Cost:* $0

Alternative 2 – Expand Existing Pump and Treat System

- **Alternative 2A** – Reinjection
- **Alternative 2B** – Air Sparging/Soil Vapor Extraction (AS/SVE)
- **Alternative 2C** – In Situ Chemical Oxidation (ISCO)
- **Alternative 2D** – Surfactant Flushing

Alternative 2 – Expand Existing Pump and Treat System

- Expand existing system, add two new extraction wells downgradient
- Upgrade current system capacity
- Replace existing equipment
- Alternate pumping from source area wells
- Dual-phase extraction (DPE) / enhanced fluid recovery (EFR) from source area wells

Pros - containment of plume; removal of DNAPL

Cons - remedial timeframes are long

Timeframe-

- Estimated to be in excess of 30 years;
- Pump and treat (P&T) and long term monitoring (LTM) costs estimated for 30 years.

Costs-

- *Capital Cost:* $4,802,538
- *Operations and maintenance (O&M) Costs:* $8,481,677
- *Present-Worth Cost:* $13,340,565

Alternative 2A – Reinjection

Enhancement of Alternative 2 with reinjection of treated water downgradient through two new injection wells

Pros- better hydraulic control and maintaining water balance

Cons - additional hydrogeological analysis needed; reinjection wells will need maintenance; long remedial timeframes

Timeframe -

- Estimated to be in excess of 30 years;
- P&T and LTM costs estimated for 30 years.

Costs-

- *Capital Cost:* $437,053
- *O&M Costs:* $51,364 plus Alt 2
- *Present-Worth Cost:* $488,417

Alternative 2B – AS/SVE

Enhancement of Alternative 2 with air sparging and soil vapor extraction (AS/SVE) in source areas; add 25 SVE and 30 AS wells

Pros- mobilize residual DNAPL within the zone influenced by air sparging; may increase the mass removal rate reducing the timeframe of the P&T system

Cons- air flow may not be uniform, depends on how well the injected air permeates from injection point, connectivity of fractures and groundwater mounding

Timeframe-

- The AS/SVE system at source area for 5 years;
- Based on calculations, downgradient area will reach drinking water standards in 25 years;
- LTM costs estimated for 30 years

Costs -

- *Capital Cost:* $1,739,745
- *O&M Costs:* $205,461 plus Alt 2
- *Present-Worth Cost:* $1,945,206

Alternative 2C – ISCO

Enhancement of Alternative 2 with in situ chemical oxidation (ISCO) cylinders in select source area wells; 64 cylinders in 12 monitoring wells; replaced yearly

Pros- passive treatment for source area concentrations; less expensive

Cons - will affect the bioactivity in the aquifer

Timeframe -

- ISCO at source area for 5 years;
- Based on calculations, downgradient from treated source area will reach drinking water standards in 25 years;
- LTM estimated for 30 years

Costs-

- *Capital Cost:* $99,364
- *O&M Costs:* $117,110 plus Alt 2
- *Present-Worth Cost:* $216,474

Alternative 2D – Surfactant Flushing

Enhancement of Alternative 2 with surfactant flushing in source areas; two deep injection wells, five shallow injection wells

Pros - removal of source area concentrations and DNAPL

Cons- effective only if there is contact; ability of the formation to accept a sufficient volume of surfactant solution is unknown

Timeframe -

- Surfactant flushing at source area for 1 year;
- Based on calculations, downgradient from treated source area will reach drinking water standards in 25 years;
- LTM estimated for 26 years.

Costs -

- *Capital Cost:* $1,265,756
- *O&M Costs:* Same as Alt 2
- *Present-Worth Cost:* $1,265,756

Alternative 3 – In Situ Thermal Treatment and Pump and Treat System

In situ thermal treatment to target DNAPL in source areas and pump and treat for hydraulic control; 260 to 270 heater wells, co-located with 260 to 270 vacuum extraction points

- Add two downgradient extraction wells and upgrade the current treatment system capacity and equipment

Pros - ability to penetrate fractured rock matrix and to treat DNAPL and CVOCs

Cons - high capital costs

Timeframe -

- Thermal at source area for 2 years;
- Based on calculations, downgradient from treated source area will reach perimeter P&T wells in 10 years;
- LTM estimated for 12 years.

Costs-

- *Capital Cost:* $89,628,605
- *O&M Costs:* $4,569,283
- *Present-Worth Cost:* $94,309,778

Alternative 4 – In Situ Steam Injection and Pump and Treat

- In situ steam injection in source areas to release DNAPL with pump and treat for hydraulic control, 60 steam injection wells and 30 multi-phase extraction wells
- Add two downgradient extraction wells and upgrade the current treatment system capacity and equipment

Pros - mobilize DNAPL which will be captured by the extraction wells

Cons - effectiveness of steam injection relies on its ability to contact, heat, and physically displace contaminants; high capital costs

Timeframe-

- Steam treatment at source area for 2 years;
- Based on calculations, downgradient from treated source area will reach drinking water standards in 25 years;
- LTM estimated for 27 years

Costs-

- *Capital Cost:* $25,568,569
- *O&M Costs:* $8,539,451
- *Present-Worth Cost:* $34,171,200

Remedial Alternatives – Common Elements for Alternatives 2, 3 and 4

- Pre-Design Investigation (PDI)
- Institutional Controls
- Upgrade the current system
- Long-term monitoring until clean up levels are achieved
- Site Management Plan
- Five Year Reviews

EPA's Nine Criteria for Selecting Cleanup Plans

EPA uses nine criteria to evaluate remedial alternatives presented in the Feasibility Study and choose which to implement. The nine criteria are organized into 3 groups:

1. Threshold Criteria
2. Balancing Criteria
3. Modifying Criteria

Threshold Criteria

1. Overall Protection of Human Health and the Environment: Will the plan protect people and the plant and animal life on and near the site? EPA cannot and will not choose a plan that does not meet this basic criterion.

2. Compliance with Applicable or Relevant and Appropriate Requirements: Does the alternative meet all federal and state environmental statutes, regulations and requirements? The chosen cleanup plan must meet this criterion.

Balancing Criteria

3. Long-Term Effectiveness and Permanence: Will the effects of the cleanup last or could it be ineffective and cause future risks?
4. Reduction in Toxicity, Mobility or Volume through Treatment: Does the alternative reduce the harmful effects, spread of, and amount of the contaminated material?
5. Short Term Effectiveness: How soon will site risks be reduced? Could the cleanup cause short-term hazards to workers, residents or the environment?
6. Implementability: Is the alternative technically feasible? Are the right goods and services (i.e. treatment machinery, space at an approved disposal facility) available to complete the plan?
7. Cost: What is the total cost of an alternative over time? EPA must choose a plan that gives necessary protection at reasonable cost.

Modifying Criteria

8. State/Territory Acceptance: Do state/territory environmental agencies agree with EPA's proposal?

9. Community Acceptance: Acceptance of preferred alternative by the impacted community will be assessed following the public comment period. Provide your comments.

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Preferred Remedy - Alternative 2 , Expand Existing Groundwater Extraction and Ex-Situ Treatment (Pump and Treat) with Alternative 2A, Reinjection

- Expand existing pump and treat system to include downgradient extraction wells;
- Upgrade pump and treat system to higher flow rate;
- Upgrade all treatment equipment to accommodate additional flow and improve efficiency;
- Reinject treated water;
- Alternate pumping from existing monitoring wells with high contaminant concentrations;
- Dual phase extraction from source area wells; and,
- Long-term groundwater monitoring.

Contingency Remedy - Alternative 2 , Expand Existing Groundwater Extraction and Ex-Situ Treatment (Pump and Treat) with Alternative 2B, AS/SVE

- Expand existing pump and treat system to include downgradient extraction wells;
- Upgrade pump and treat system to higher flow rate;
- Upgrade all treatment equipment to accommodate additional flow and improve efficiency;
- Air Sparging/SVE at source areas; and,
- Long-term groundwater monitoring.

Questions and Comments?

To request a copy of the Proposed Plan or subscribe to the Tutu Wellfield Superfund site's email list for the latest updates, contact:

Donette Samuel
Community Involvement Coordinator
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Questions and Comments?

Please address written comments no later than **August 13, 2021,** to:

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Thank You!

Thank you for watching the Tutu Wellfield Superfund site Pre-Recorded Presentation.

For more information about the site, visit:

https://www.epa.gov/superfund/tutu-wellfield