



Department of Toxic Substances Control (DTSC)
Groundwater U (GWU) Workshop Series
Santa Susana Field Laboratory (SSFL)

Workshop #3: What Treatment Options Have Been Studied at SSFL?
Groundwater Interim Measures, Pilot Tests & Treatability Studies

ONLINE ZOOM MEETING: APRIL 4, 2024, FROM 6:00PM – 8:00PM

If you have difficulty accessing any material presented, please contact us by email, mail, or telephone, and we will work with you to make the information available.

For email Requests: accessibility@dtsc.ca.gov

For written requests: The Office of Civil Rights, Department of Toxic Substances Control, P.O. Box 806
Sacramento, CA 95812-0806

Telephone: +1 916 324-3095 or +1 800 728-6942 (Toll free)



Workshop Agenda & Purpose

- **Workshop Overview**
 - DTSC oversight, RCRA process & Corrective Measures Studies for SSFL cleanup
 - Treatment options studied at SSFL
 - Cleanup document review process & public comment periods
 - To Prepare the public to understand & comment on upcoming groundwater decision documents
- **Q&A**
- **Anticipated Groundwater Decision Documents**
- **Stay Connected & Next Steps**

DTSC Overview



The Department of Toxic Substances Control's (DTSC) mission is to protect California's people, communities, and environment from toxic substances, to enhance economic vitality by restoring contaminated land, and to compel manufacturers to make safer consumer products.

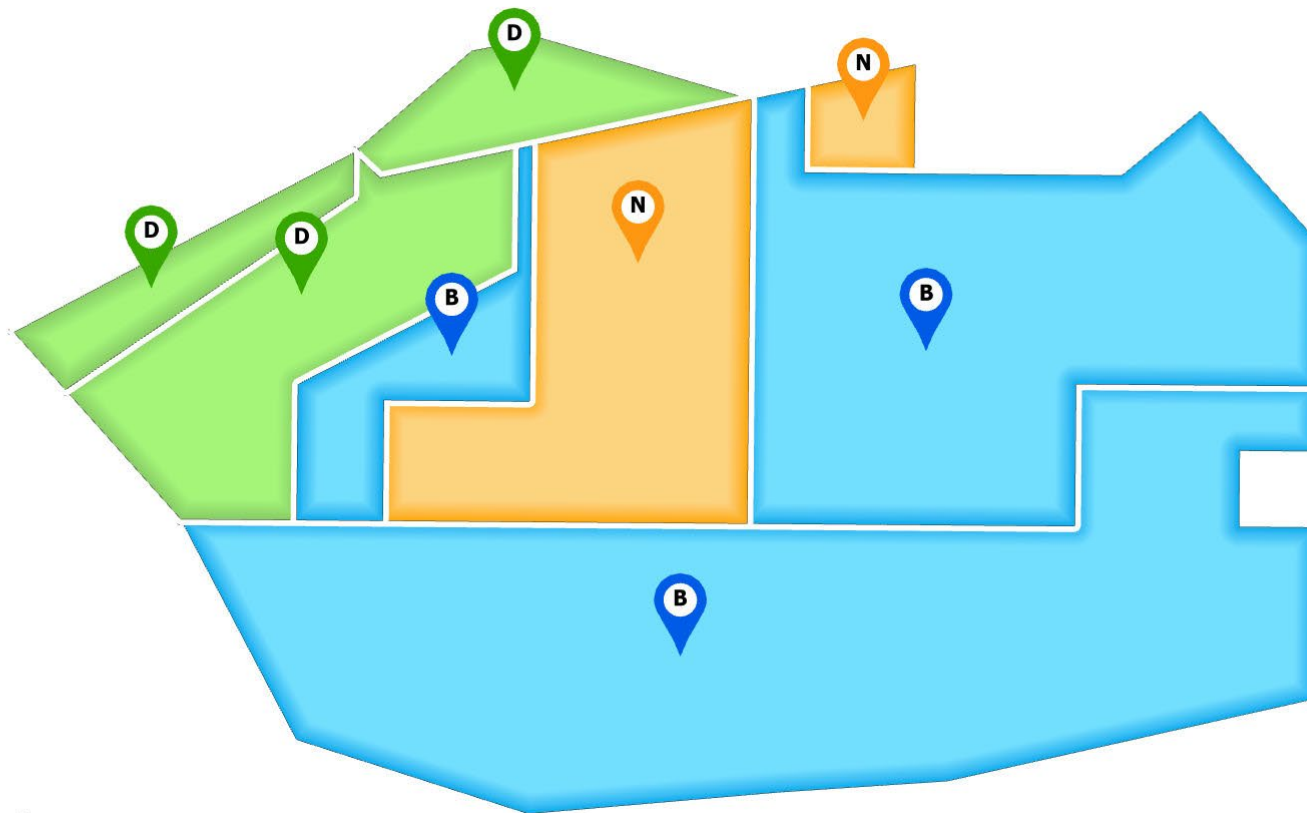
Workshop Agreements



- Please be courteous to your fellow meeting attendees
- By participating in this meeting, you understand this meeting is recorded and you may be muted (Zoom)
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- Use the Q&A section to type questions throughout the presentation (Zoom)



SSFL Responsible Parties (RP) Overview



Legend

Administrative Areas

Responsible Party



Boeing



DOE



NASA

Speaker Introduction (DTSC)

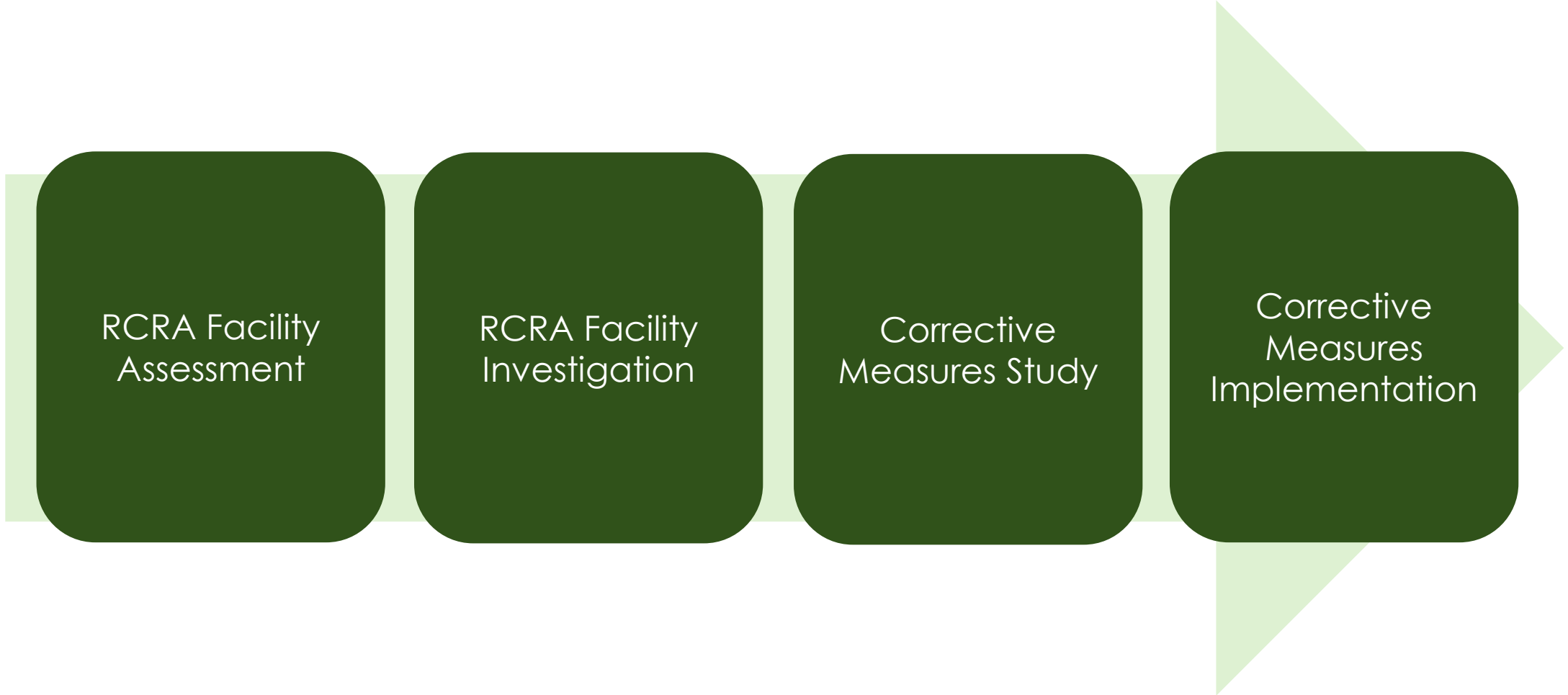
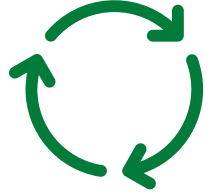


Tom Seckington

- Senior Engineering Geologist
 - Department of Toxic Substances Control (DTSC)
 - Site Mitigation & Restoration (SMRP)
 - Santa Susana Field Laboratory Site (SSFL)

Presentation: DTSC Oversight & Regulatory Process for Groundwater Cleanup at SSFL

Resource Conservation & Recovery Act (RCRA) Process





Groundwater Corrective Measures Study (CMS)

Statement of Basis (SB)

Groundwater CMS Purpose

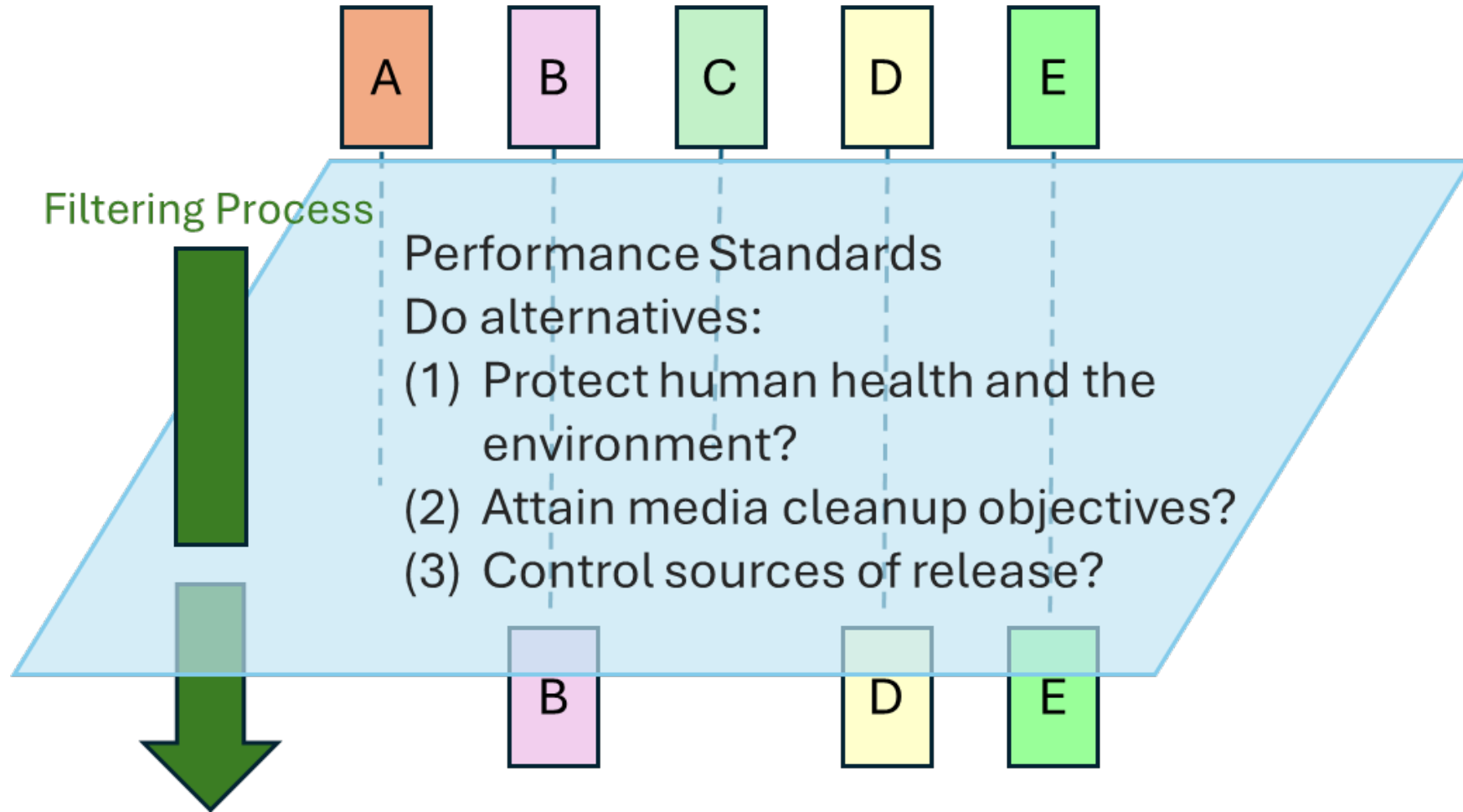
- To identify and evaluate potential remedial alternatives to address contaminant releases

Statement of Basis

- Summarizes information contained in the CMS
- Solicits public comment on all possible alternatives, including alternatives that may not have been identified
- Serves as a public participation document
- Documents and communicates the proposed and selected final remedy to the public
- Describes the proposed remedy, but does not select the final remedy



Threshold Criteria





Balancing Criteria

1. Long-term reliability & effectiveness
2. Reduction of toxicity mobility, or volume of wastes
3. Short-term effectiveness
4. Implementability
5. Cost
6. Community Acceptance
7. State Acceptance

Interstate Technology Regulatory Council (ITRC) Characterization and Remediation of Fractured Rock (2017)

Table 6-2. Remediation Technology Screening Matrix for Fractured Bedrock Environments

Representative Rock Types/Origin			Hydrogeology			Physical					Containment		Chemical/Biological							
			Transmissivity (Flow)		Matrix Storage	Removal	Thermal	Air Sparge	Vapor & Multiphase Extraction	Surfactant Flushing ¹	LNAPL Recovery	Pump & Treat	Permeable Reactive Barrier	In Situ Chemical Oxidation		In Situ Chemical Reduction		In Situ Bioremediation		MNA
			Matrix	Fracture										Short-Lived Oxidant	Long-Lived Oxidant	Short-Lived Reductant	Long-Lived Reductant	Short-Lived Carbon Substrate	Long-Lived Carbon Substrate	
Sedimentary Rocks	Chemical	Coal	Bituminous	H	L	H	Y	U	U	Y	U	Y	N	N	N	N	N	Y	Y	
		Anthracite	L	L	L	Y	U	U	Y	U	Y	Y	N	N	N	N	N	Y	Y	
	Carbonates	Limestone (including Karst)	H	L or H	H	Y	Y	U	Y	U	Y	Y	Y	N	Y	N	Y	N	Y	Y
		Dolomite & Recrystallized Limestone	L	L or H	L	Y	Y	U	Y	U	Y	Y	Y	Y	Y	N	Y	Y	Y	Y
	Clastics	Cemented Sandstone, Conglomerate, & Other Coarse-Grained Rocks	L	H	L	Y	Y	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
		Uncemented Sandstone, Conglomerate, & Other Coarse-Grained Rocks	H	L	H	Y	Y	U	Y	N	Y	Y	N	N	Y	N	N	Y	Y	
		Shale & Mudstone	H	H	H	Y	Y	U	Y	Y	Y	Y	Y	N	Y	N	Y	N	Y	Y
Igneous & Metamorphic Rocks	Extrusives	Tuff/Scoria/Pumice	H	L	H	U	U	U	Y	N	Y	Y	N	N	Y	N	N	Y	Y	
		Basalt/Rhyolite	L	H	L	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	Intrusives	Granites & Other Crystalline Intrusives	L	H	L	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
		Foliated Metamorphics (such as Gneiss & Schist)	L	H	L	U	U	U	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	
	Metamorphics	Unfoliated Metamorphics (such as Quartzite, Amphibolite)	L	L	L	U	U	U	Y	N	Y	Y	N	N	Y	N	N	N	Y	Y
Treatment Zone and Phase Considerations	Vadose Zone	NAPL	Y	Y	N	Y	Y	N	N	N	N	N	Y	Y	N	N	N	N	N	
		Matrix Storage (sorbed mass)	Y	Y	N	Y	N	N	N	N	N	N	N	N	Y	N	N	N	N	Y
		Vapor phase	Y	Y	N	Y	N	N	N	N	N	N	N	N	Y	N	N	N	N	Y
	Saturated Zone	NAPL	U	Y	N	N	N	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	N
		Matrix Storage (sorbed mass)	U	Y	N	N	N	N	N	N	N	N	N	Y	N	Y	N	N	Y	Y
		Dissolved phase	U	Y	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
		Vapor phase (dissolved gas)	U	Y	N	N	N	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	

* This table is for general technology screening only. Technology selection must be based upon careful review of site-specific conditions.

1. Surfactant use in bedrock presents a high degree of uncertainty and was not recommended as a fractured bedrock remediation technology in previous ITRC guidance (ITRC 2003). However, some case studies have demonstrated success with fractured bedrock sites in some scenarios.

H = High
L = Low
Y = Yes, generally applicable remediation technology
U = Unlikely to be applicable remediation technology
N = No, generally not applicable remediation technology

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Groundwater Remedial Approaches for Fractured Sedimentary Rock

Remediation Technology For Sedimentary Rocks

Physical

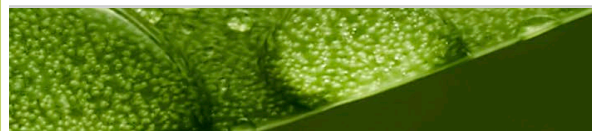
- Removal of contaminated soil/rock
- Thermal
- Vapor & Multiphase Extraction including sparging
- Surfactant Flushing

Containment

- LNAPL Recovery
- Pump & Treat
- Permeable Reactive Barrier

Chemical/Biological

- In Situ Chemical Oxidation
- In Situ Chemical Reduction
- In Situ Bioremediation
- Monitored Natural Attenuation



Groundwater Remedial Approaches for Fractured Sedimentary Rock

PHYSICAL

- Removal
 - Removal through excavation and hauling offsite
- Thermal
 - Applying heat by using steam, electric heaters, or resistance, high frequencies and causing volatilization of organic contaminants and increase reaction rates
- Vapor & Multiphase Extraction
 - Vacuum applied to subsurface to extract volatile organic compounds (VOCs) vapors from above and within the groundwater
- Surfactant Flushing
 - Surfactant Flushing where detergents are used to dissolve contaminants and extract them downgradient. May not be applicable for SSFL

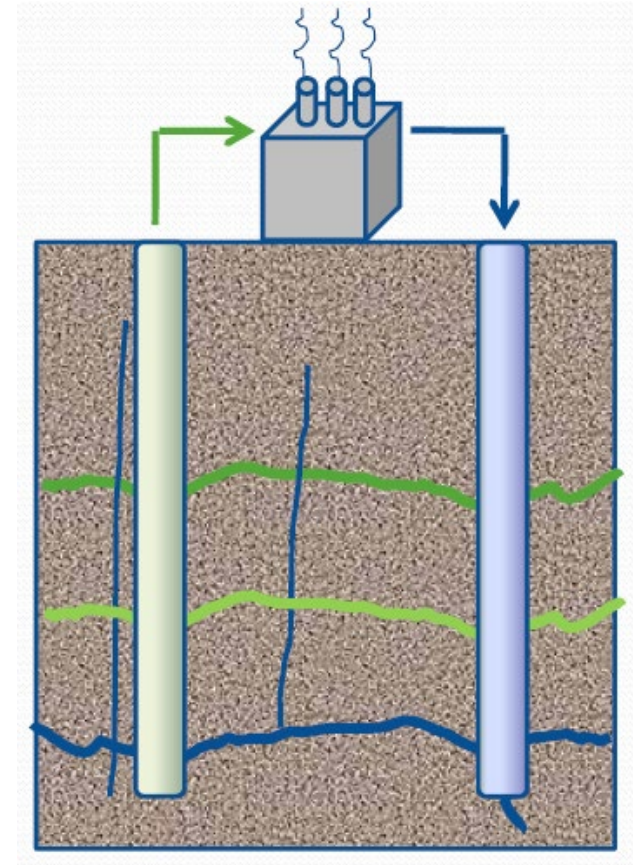


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Groundwater Remedial Approaches for Fractured Sedimentary Rock

CONTAINMENT

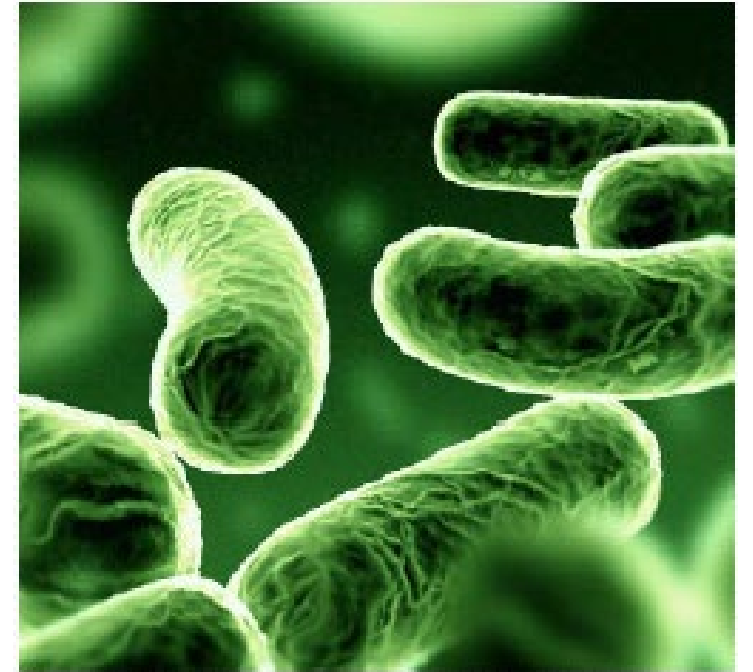
- LNAPL Recovery
 - LNAPL Recovery is not applicable as there is no LNAPL at SSFL
- Pump & Treat
 - Pump & Treat – groundwater well pumping and treatment followed by clean water reinjection or disposal offsite
- Permeable Reactive Barrier
 - A Permeable Reactive Barrier involves installing reactive media within a trench, series of overlapping borings, or grouped injection points to create a permeable 'wall' positioned perpendicular to groundwater flow



Groundwater Remedial Approaches for Fractured Sedimentary Rock

CHEMICAL/BIOLOGICAL

- In Situ Chemical Oxidation
 - Injection of "oxidants" to cause a chemical reaction that breaks down contaminants
- In Situ Chemical Reduction
 - Injection of "reductants" to cause a chemical reaction that destroys contaminants and produces harmless by-products.
- In Situ Bioremediation
 - Introduction of microbes and nutrients to stimulate growth of native microbes that break down contaminants.
- Monitored Natural Attenuation
 - Relies on naturally occurring and demonstrable processes in the groundwater which reduce the mass and concentration of contaminants; requires source removal and/or control





Groundwater Remedial Approaches for Fractured Sedimentary Rock

Remediation Technology For Sedimentary Rocks

Physical

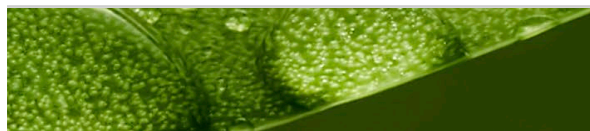
- Removal through excavation
- Thermal
- Vapor & Multiphase Extraction including sparging

Containment

- Pump & Treat
- Permeable Reactive Barrier

Chemical/Biological

- In Situ Chemical Oxidation
- In Situ Chemical Reduction
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Boeing

Mike Bower

Presentation: Boeing groundwater treatment options



NASA

Pete Zorba

Presentation: NASA groundwater treatment options



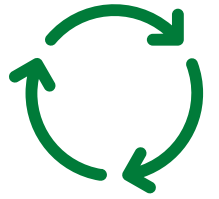
U.S. Department of Energy (DOE)

Josh Mengers

Presentation: DOE groundwater treatment options



DTSC Oversight of Responsible Parties for SSFL Cleanup



U.S. DEPARTMENT OF
ENERGY



Groundwater Corrective Measures Study (CMS)

Statement of Basis (SB)

Groundwater CMS Purpose

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Public Comment Period & Public Meeting

Public Participation (as outlined in the SB)

- Dates of public comment period
- Date, time, & location of public meeting(s)
- Location & availability of information repositories & administrative files
- Regulatory agency personnel contact information, including who will receive comments or provide additional information

Final Decision Document & Response to Comments

- Response to comments (RTCs) is prepared at conclusion of the public comment period
- RTCs Purpose
 - Identifies selected remedy
 - Indicates community preference
 - Demonstrates how public concerns were included in the final remedy
 - Provides a written record

Workshop Agreements



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Open Forum Instructions for Providing Input

Computer and Phone Instructions:

- Please click the “raise hand” button or enter your input in the Q&A section
- Phone Callers, press *6 to mute/unmute and *9 to raise/lower hand

When called on from raised hands:

- Please unmute yourself
- State who your question is directed to
- Ask your question

Please send additional questions and topics of interest to us through the GWU Listening Session Survey link below or on the DTSC SSFL web home page

<https://www.surveymonkey.com/r/GWUListening>

Groundwater U Workshops

<https://dtsc.ca.gov/santa-susana-field-laboratory-meetings/>



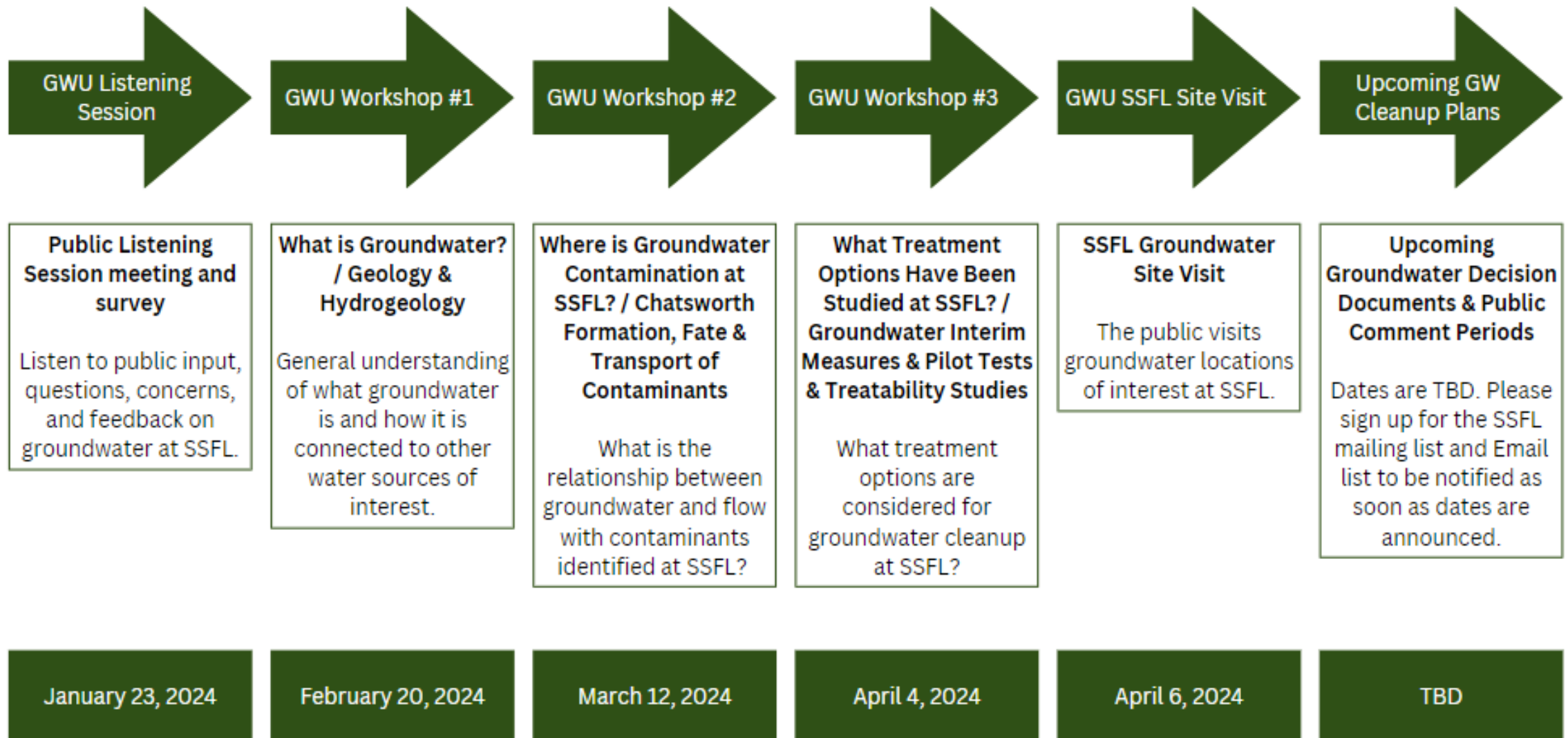
Previous Workshops

- **GWU Listening Session**
 - January 23, 2024
- **GWU Workshop #1**
 - February 20, 2024
- **GWU Workshop #2**
 - March 12, 2024

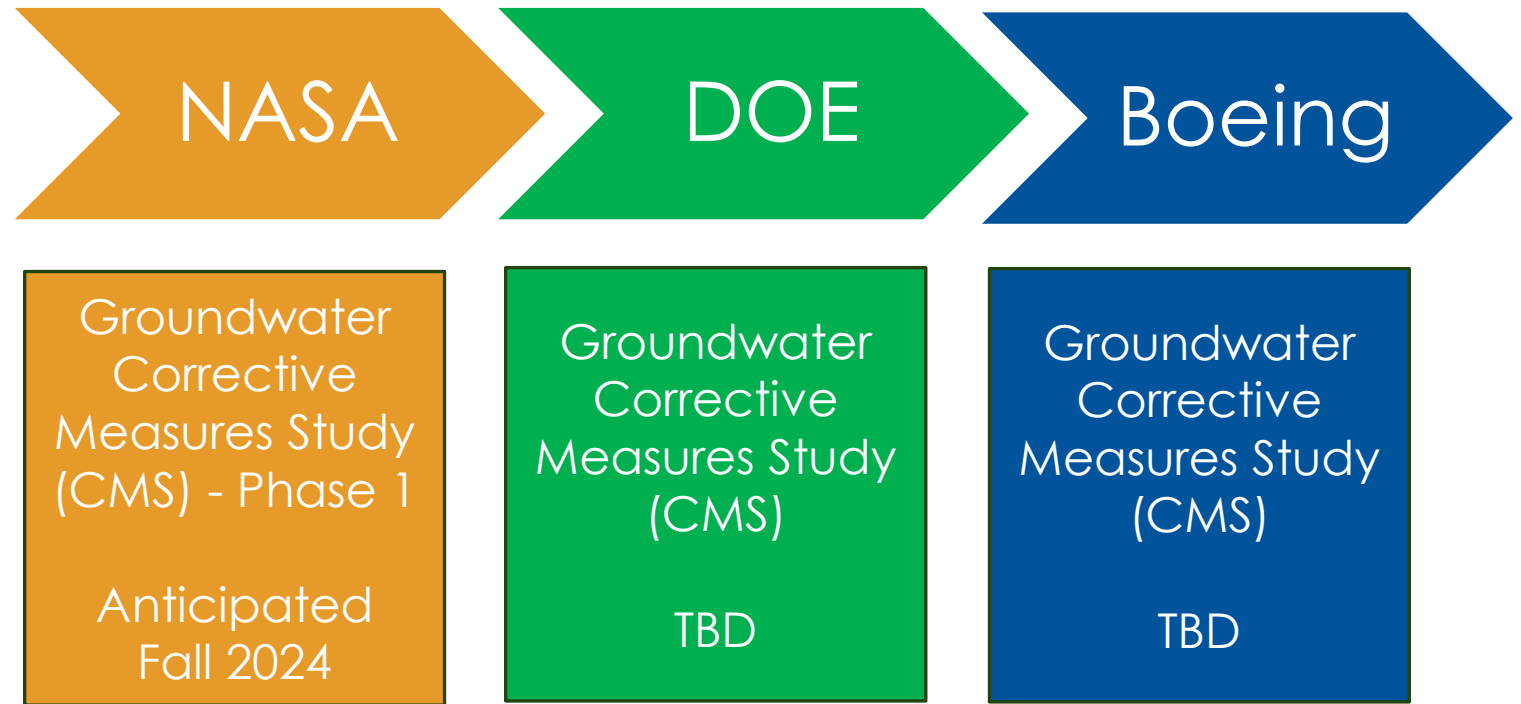
Upcoming Dates in the Series

- **GWU Site Tour**
 - April 6, 2024 (Deadline to register was Friday, March 29th)
 - 9a-12 noon at the SSFL site

Groundwater U Review



Anticipated Groundwater Public Comment Periods



Stay Connected

DTSC SSFL Web Home Page

https://dtsc.ca.gov/santa_susana_field_lab/

- Site documents
- Project contact information
- Community Survey
- SSFL e-List
- SSFL FAQ's

Envirostor

<https://www.envirostor.dtsc.ca.gov/public/>

- SSFL project documents



https://dtsc.ca.gov/santa_susana_field_lab/

Groundwater Questions

Groundwater Listening Survey

<https://www.surveymonkey.com/r/GWUListening>

- Submit additional GW questions
- Elevate additional GW topics of interest
- Share GW concerns



<https://www.surveymonkey.com/r/GWUListening>

Groundwater U Feedback

GWU Workshop Series Feedback

<https://www.surveymonkey.com/r/GWUPostSurvey>

- Submit your feedback about the workshops and the SSFL site visit



<https://www.surveymonkey.com/r/GWUPostSurvey>



DTSC Project Contacts for SSFL

For Technical or Site Cleanup related questions, please contact:

- **Boeing Related Areas:** Patrick Movlay, Senior Environmental Scientist / Project Manager, Patrick.Movlay@dtsc.ca.gov, (818) 717-6542
- **NASA Related Areas:** Paul Carpenter, Senior Engineering Geologist / Project Manager, Paul.Carpenter@dtsc.ca.gov, (916) 255-3691
- **DOE Related Areas:** Tanya Brosnan, Senior Engineering Geologist / Project Manager, Tanya.Brosnan@dtsc.ca.gov, (818) 717-6619

For non-technical, Public Participation inquiries, please contact:

- **Public Participation Inquiries:** Jamie Slaughter, Public Participation & Community Outreach Manager, Jamie.Slaughter@dtsc.ca.gov, (818) 938-8353

For Media related inquiries, please contact:

- **Media Inquiries:** Elizabeth Leslie-Gassaway, Information Officer Specialist, Elizabeth.Leslie-Gassaway@dtsc.ca.gov, (916) 282-8941

Thank You