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PORT&TERMINAL
Technology

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Wick Drains for Soil Consolidation and Environmental Remediation

- Introduction
- Technology
- Installation
- Project Summary
- Additional Technology

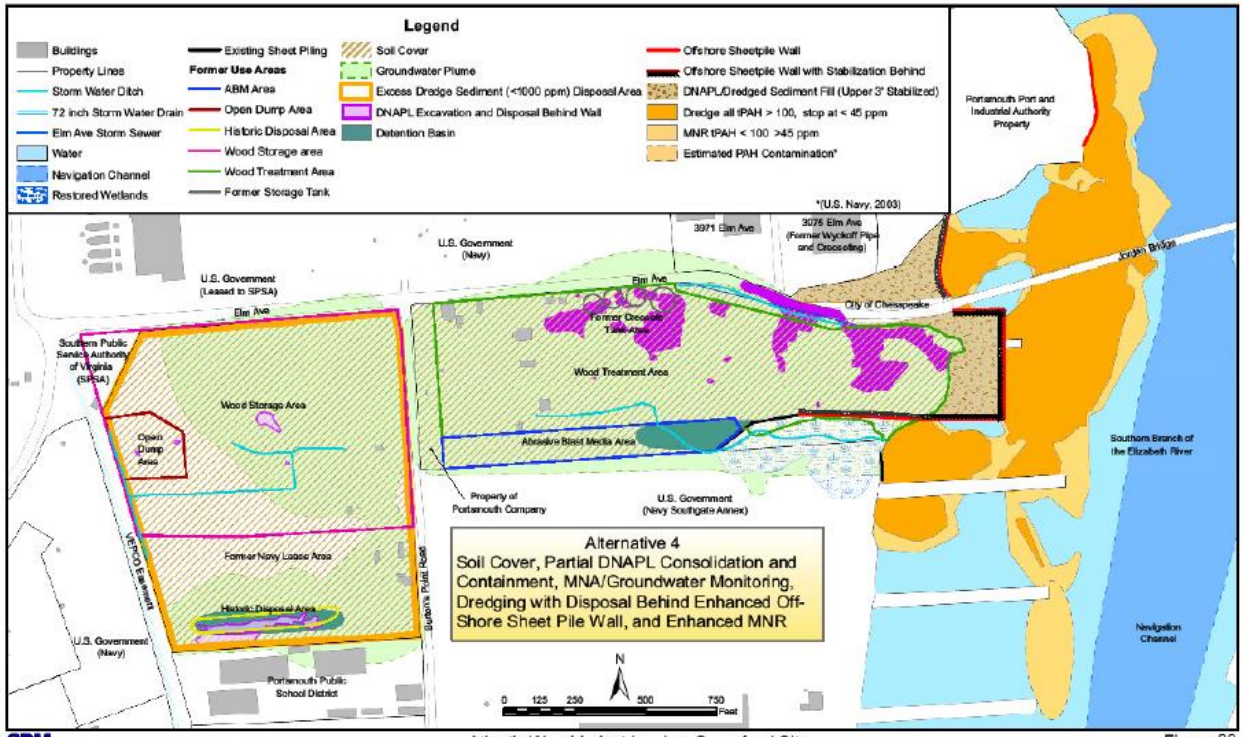
Atlantic Wood Industries Site
Portsmouth, VA

- About 50 acre Superfund site on Elizabeth River
- Approximately 30 acres contaminated sediment
- Surrounded by industrial properties
- 66 year history as wood treating facility
- Naval Shipyard also utilized site

Atlantic Wood Industries Site

- Contaminants include:
  - Creosote
  - Pentachlorophenol (PCP)
  - Abrasive Blast Media with copper, lead, zinc, arsenic
  - Acetylene sludge byproducts
- Site added to EPA National Priority List (NPL) in 1990

EPA Selected Remedy



CDM
December 2007 Record of Decision

Atlantic Wood Industries, Inc. Superfund Site
Portsmouth, Virginia

Figure 29
Alternative 4
EPA's Selected Remedy

AWI Site Remediation 2009-2017

- Step 1 – Offshore sheet pile wall – **McLean Contracting**
- Step 2 – Water treatment facility
- Step 3 – Dredge contaminated river sediments
- Step 4 – Amend/Treat contaminated DM
- Step 5 – Spread treated dredged fill
- Step 6 – Install PVD/Wick drains - **HB**
- Step 7 - Surcharge site
- Step 8 – Cap to final site grade
- Step 9 – Long term monitoring
- Step 10 – Return to commercial use
    - **Sevenson Environmental Services**

Vertical Prefabricated Drain Technology

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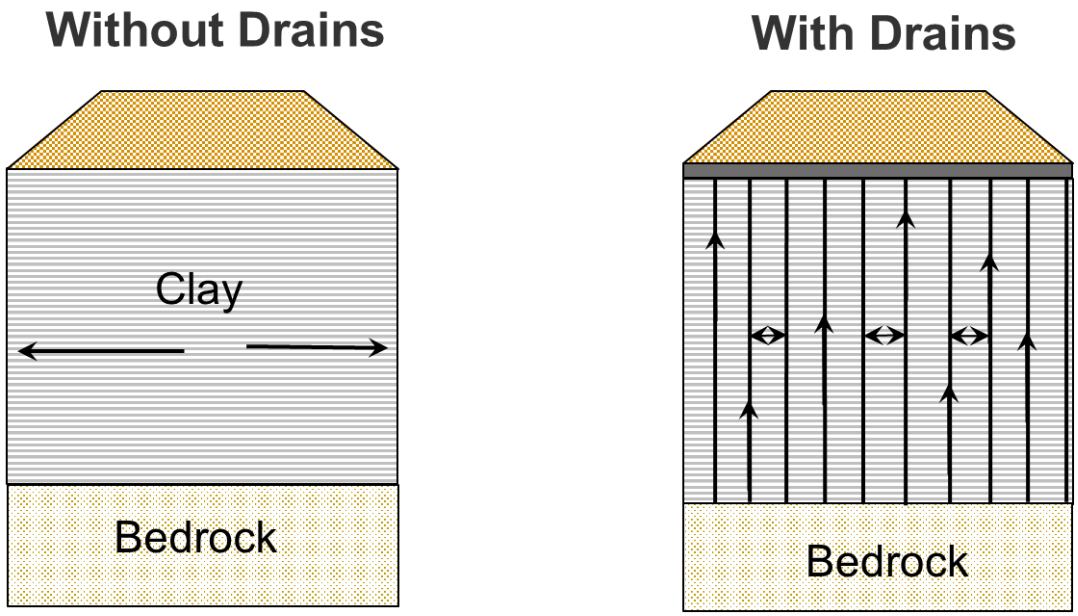
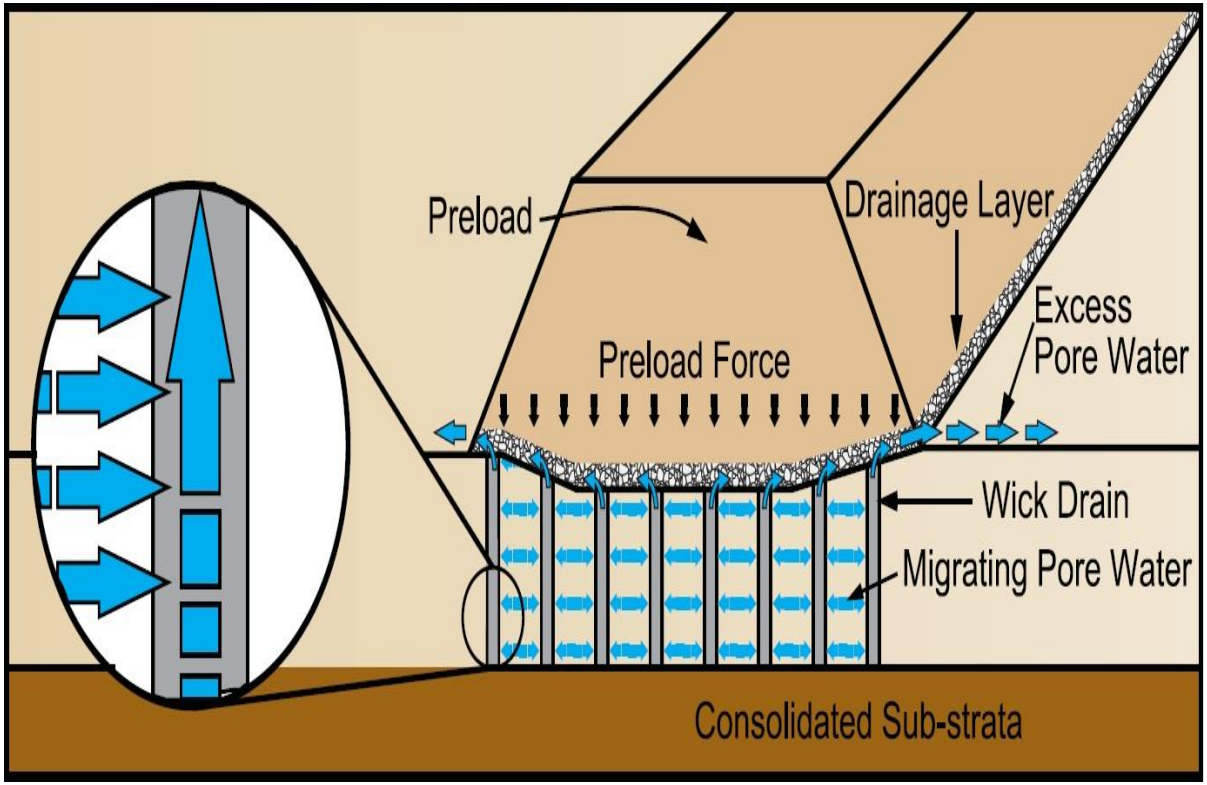
The Theory Basics

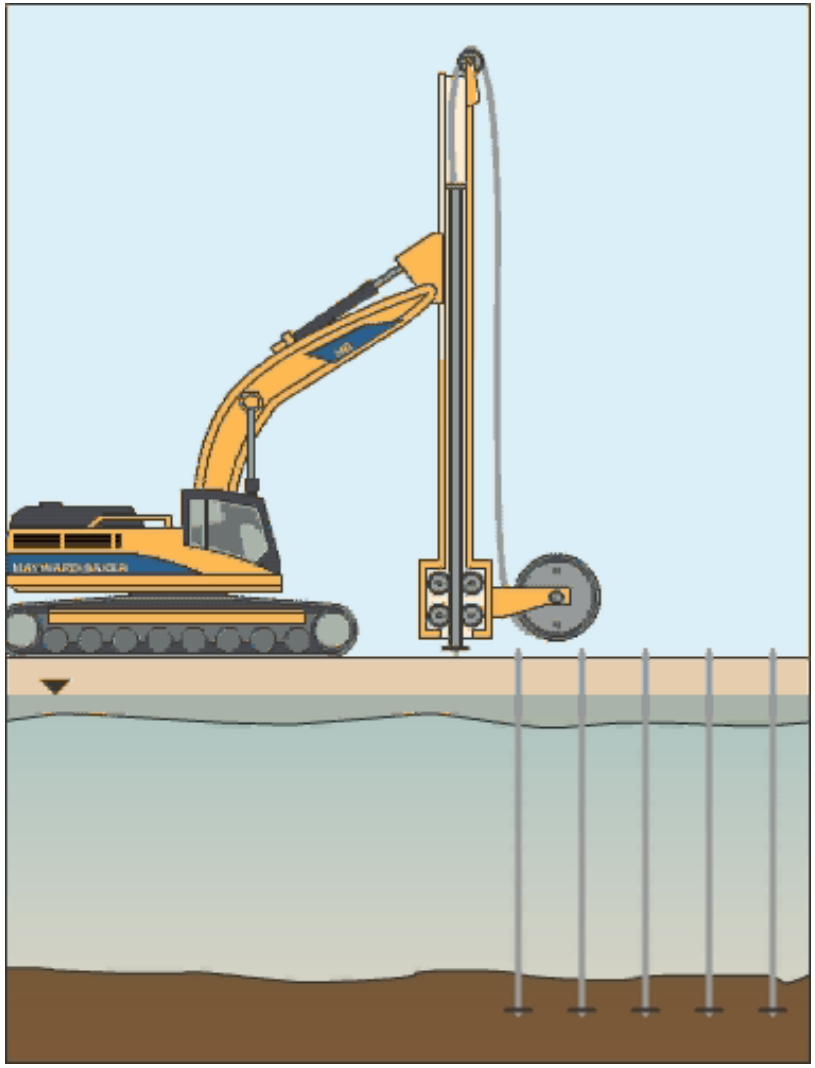
- A structure constructed on a site that is underlain by soft, saturated soils
- Load on the soil is partially supported by incompressible water within the soil matrix
- As time passes, the excess pore water pressure dissipates as the contaminated water slowly drains
- Then, the load share is increased in the soil and consolidation and settlement occurs
- Process can take a very long time

The General Idea



PREFABRICATED VERTICAL DRAINS (PVD or Wick Drains)





Surcharging

- Surcharge prior to construction is placing a temporary fill upon the area
- Wick drains are used to greatly accelerate the drainage of pore water –with contaminants
- Allows the consolidation to occur much quicker
- Pore water is collected and treated

The Product

- Wick Drains are a plastic band shaped conduit
- Approximately 4 inches wide by ¼ inch thick
- Composed of a poly strip with drainage channels wrapped in a filter fabric
- Relatively inert to chemical reaction

Vertical Wick Drain Installation Process

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Installation Methods

- Static Push
- Vibratory Energy
- Preparatory drilling
  - Data Acquisition

Project Summary: Consolidation of DNAPL

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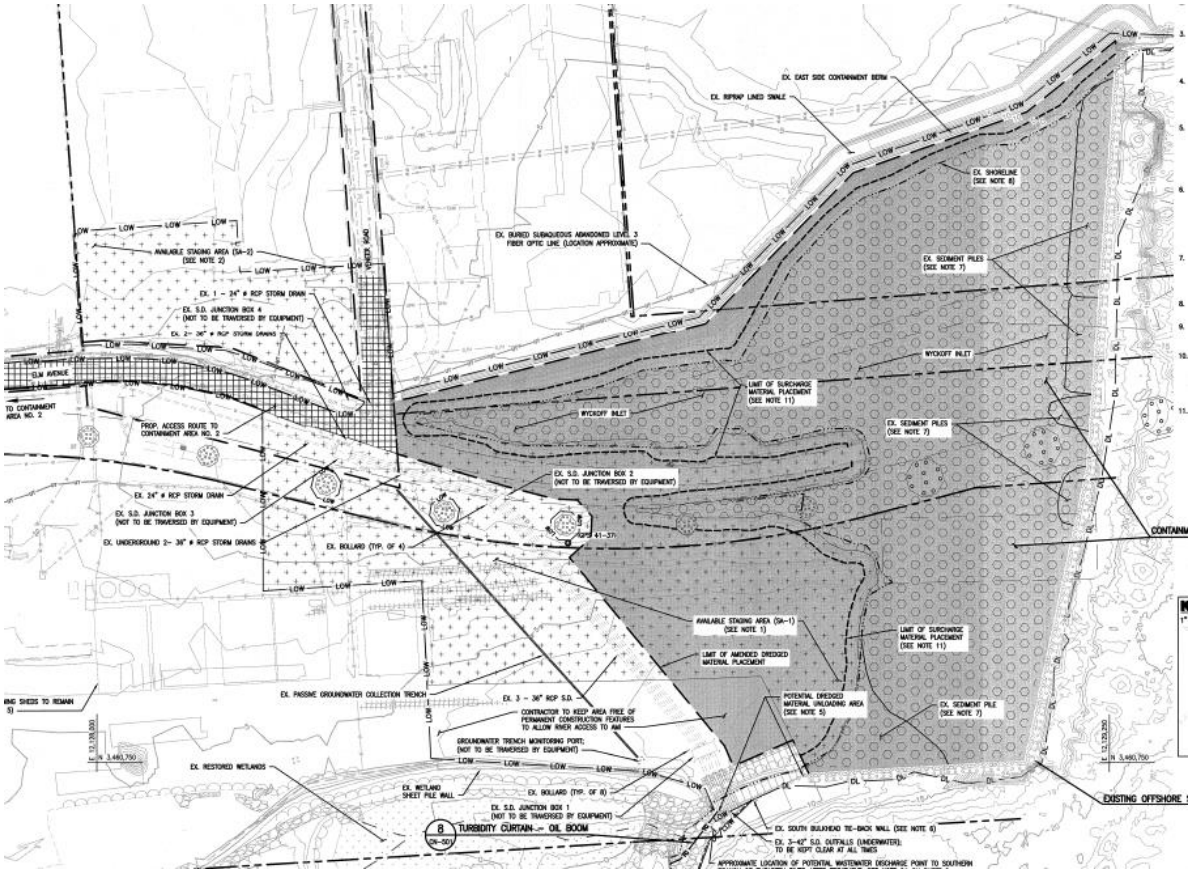
Environmental Remediation with Wick Drains

- Similar to standard port berth creation
- Required wick drains to accelerate consolidation
- Allows the pore water to be collected
- And, treated at on site facility

AWI - Site Plan



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AWI North – Prior to Construction

AWI South – Prior to Construction

Spreading Sand Drainage Blanket

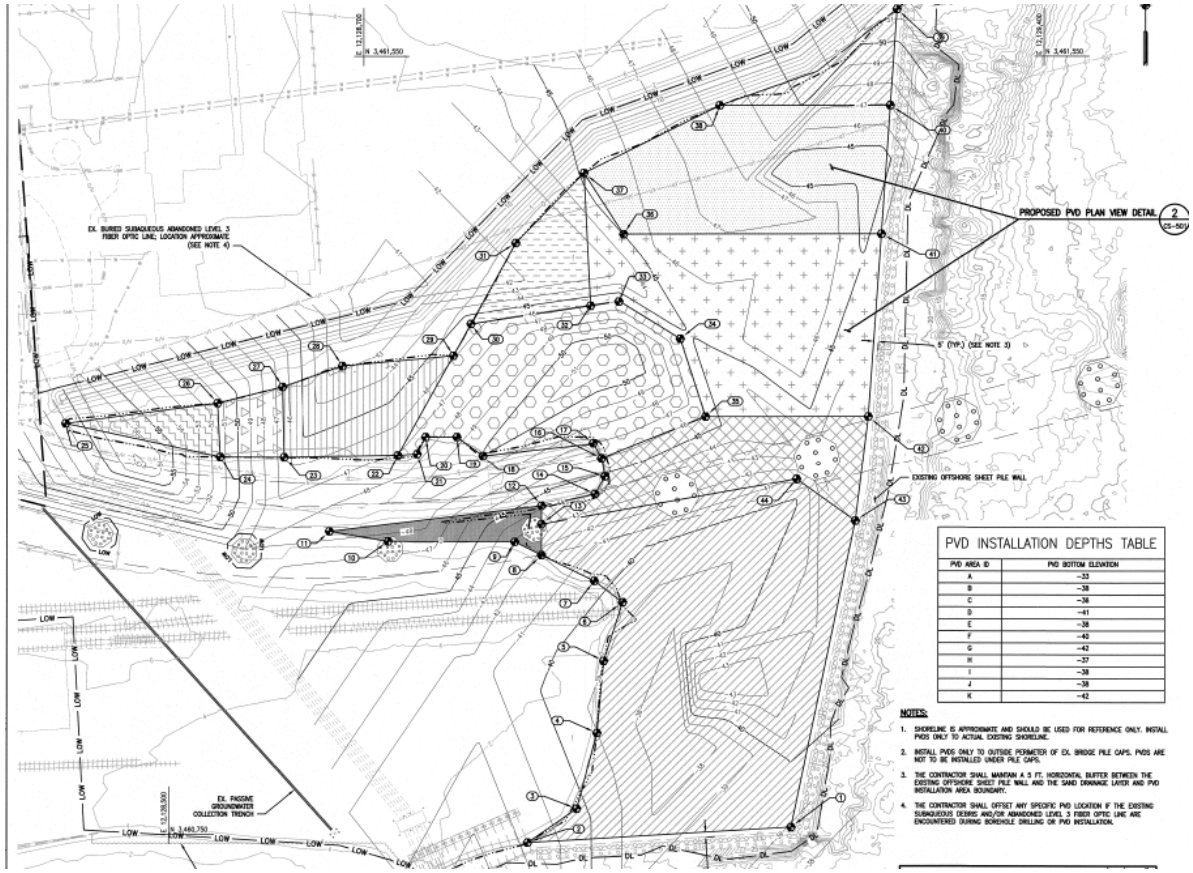

Sevenson
PC 400 LC

Finished Sand Blanket

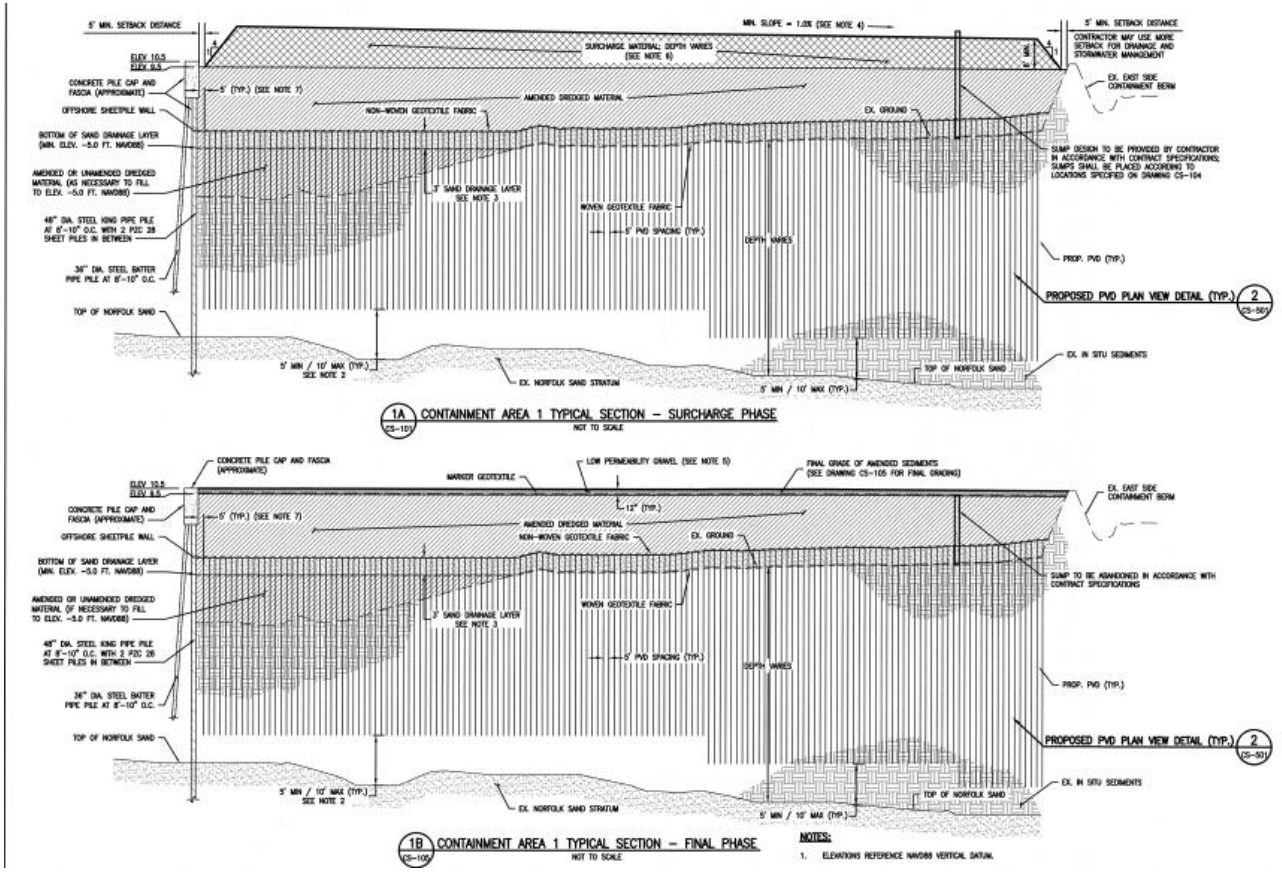
- Shows leaching contaminants to surface

Dredging of Contaminated Sediments

PVD Installation Layout Plan



Wick Drain Section



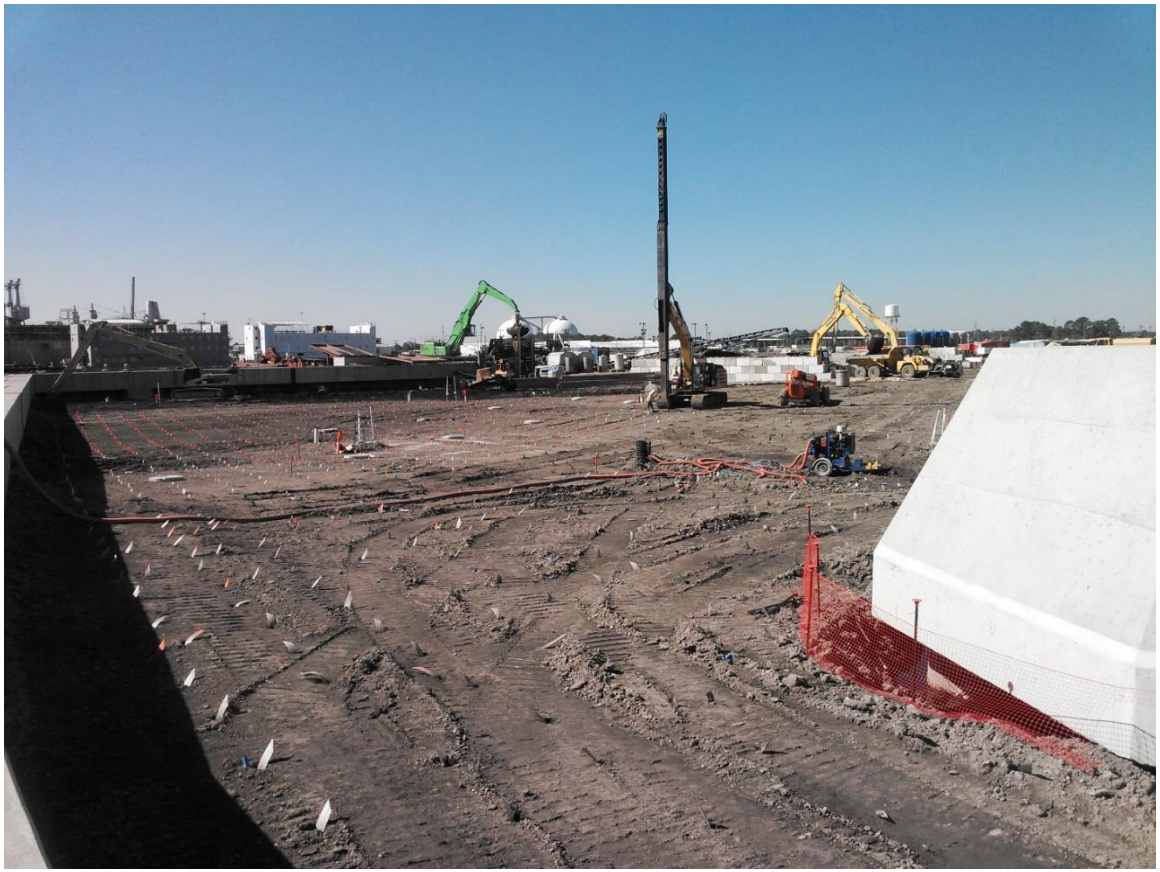
AWI- Wick Drain Layout in North Cell

PVD Layout With Monitoring Wells & Sumps

Spreading Treated DM

New Jordan Bridge Foundations Bisect Site

AWI – South Cell



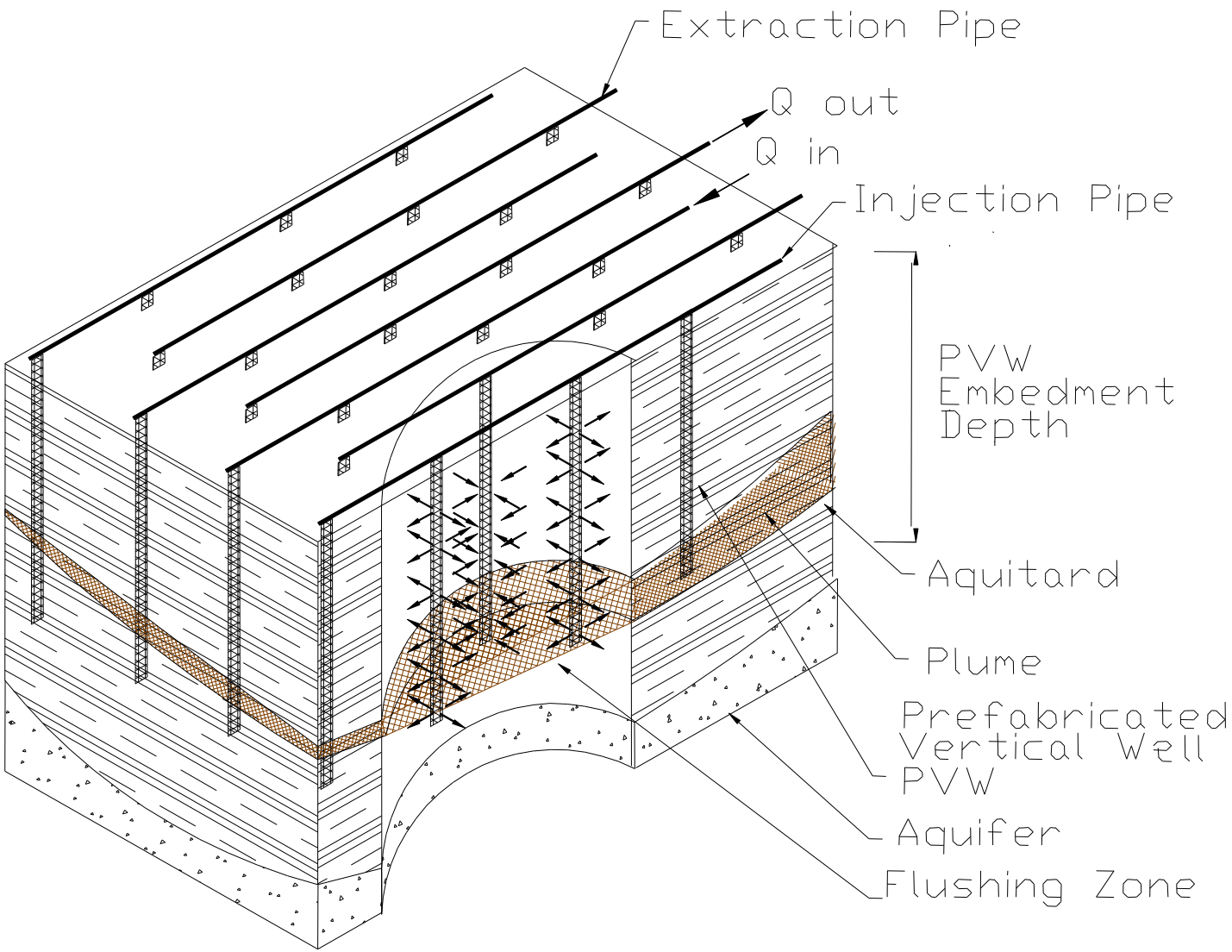
DM mixing and wick installation

AWI- Surcharge on North cell

AWI- Surcharge on South cell

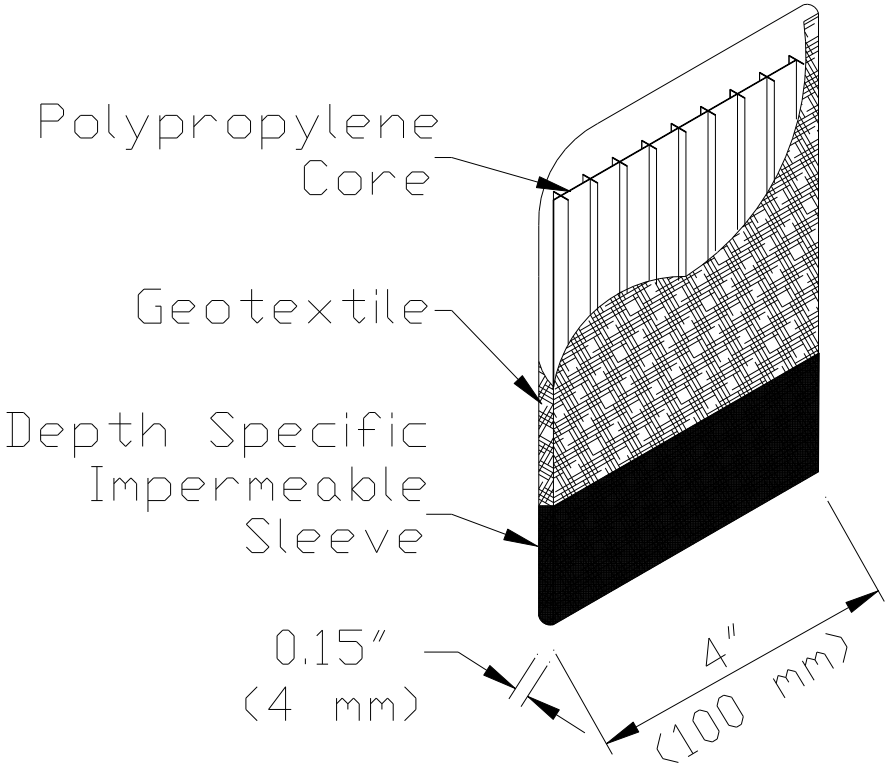
An Additional Wick Drain Environmental Technology: WIDE

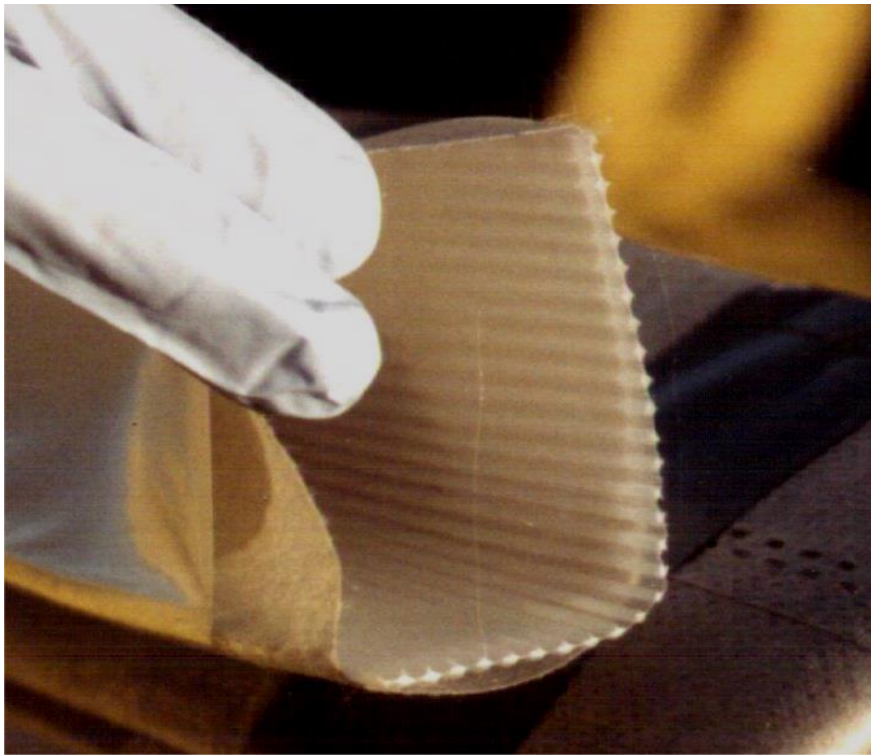
- Well Injection Depth Extraction
- Used on ACOE, DOE, USAF test projects
- Developed with WVU, Water Institute
- An efficient means of plume capture and treatment



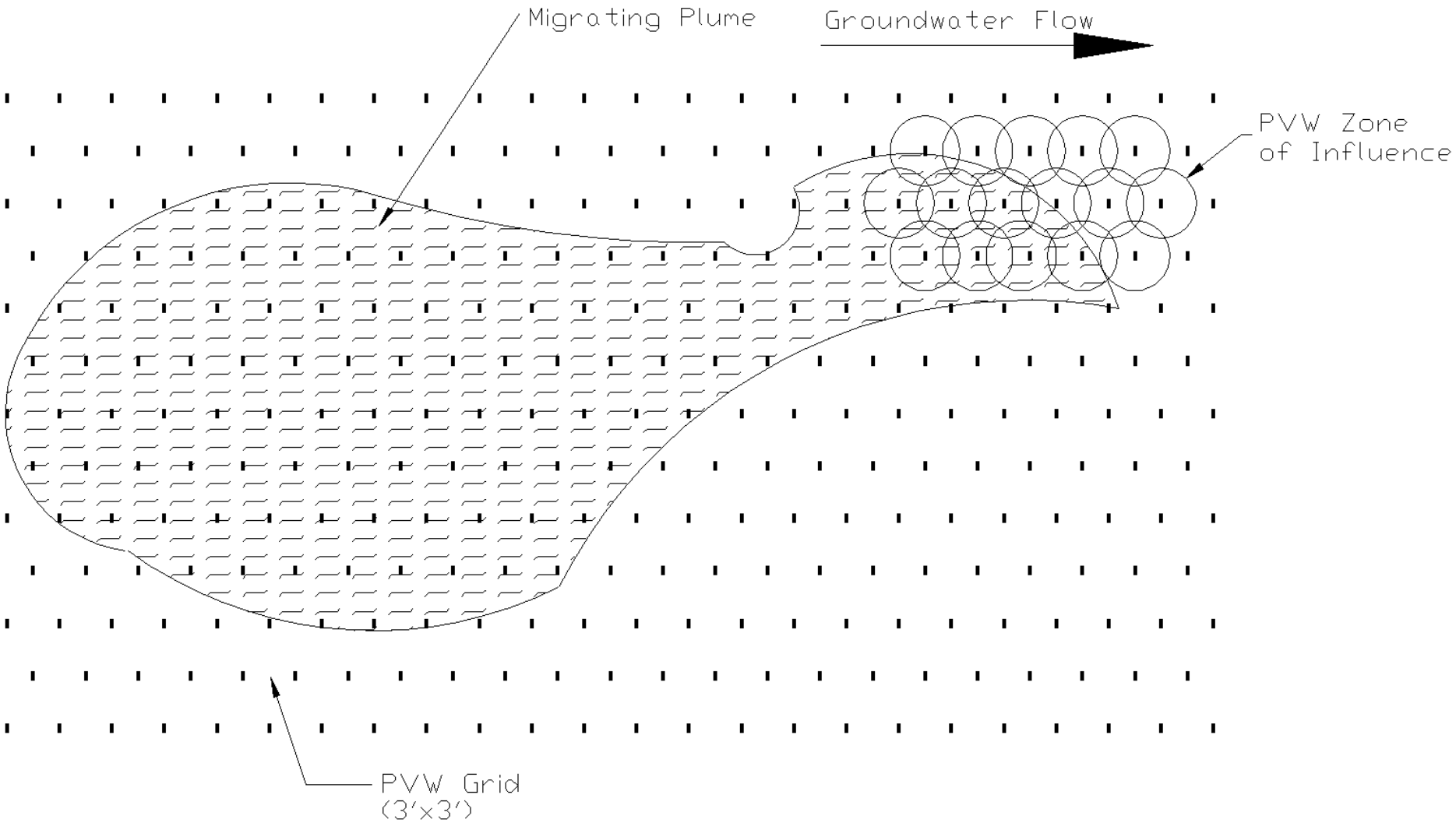
Well Injection Depth Extraction (WIDE) Soil Flushing

Prefabricated Vertical Well (PVW)





WIDE System - Conceptual Plan View



WIDE System Advantages

- **Reduced Drainage Path (2 - 5 ft) for Accelerated Flushing**
- **Redundancy for Efficient Collection**
- **Applicability to Diverse Soil Types and Conditions (Low *k* 10^{-3} *to* 10^{-8} *cm/s*, High Clay %)**
- **Target Flushing Area for Source Plume Control**
- **Cost-Effective, Rapid Installation, Off-the-shelf Components**
- **Separation of VOC and Metal Waste Streams**
- **Workers Isolated from Extracted Waste**


MAT'SU

WIDE - System Performance

Objective

- Groundwater Profile Determination
- Contaminant Transport Path Prediction

Forecast to Optimize

- Well Spacing
- Pumping Duration
- Pumping Rate

WIDE System


bobcat

Current vacuum extraction option

New modular system

Very efficient

Quick installation

Summary

- Contaminated dredged materials and soil can be treated on site.
- Wick drains can be utilized to consolidate and stabilize the fine grained dredged material
- Discharged pore water can be collected and treated
- A rehabilitated port facility is created

- Injection/Extraction Option available
- Targeted plume remediation

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