Case Study – Pinehurst Hotel Cleaners

• Laundry & dry-cleaning facility for former Pinehurst Hotel

• Operated 1930’s through 1970’s

• Contamination identified during due diligence assessment on adjacent property in 1990

• Property owner entered site into DSCA Program in 2001
Site

Pinehurst Water Supply Reservoir

Class WS-III Stream

Site
PCE Plume in Soil

- Maximum PCE concentration: 180 ppm
- Impacted soil exposed at ground surface
Groundwater Flow Direction
• Maximum PCE concentration in groundwater: 340 ug/L
• Maximum PCE concentration in surface water: 14 ug/L
Based on risk assessment, remediation needed to address:

- Surficial soil exposure
- Source soil and groundwater impacting surface water
Soil Remediation

- Excavated 750 tons
Soil Remediation

- Treated on-site using mobile steam distillation unit
Soil Remediation

• Compliance with Village of Pinehurst requests
Groundwater Remediation

- Injection in source area
- Phytoremediation downgradient
• Injection of ZVI, HRC, EHC, nutrients, and oxygen scavengers in source area
• Mulched surface to promote anaerobic activity
Chemical Injection
Groundwater Remediation

- Injection in source area
- Phytoremediation downgradient
Phytoremediation Area

199 mixed hybrid poplars and hybrid willows planted in Area B

394 hybrid poplars planted in Area A

Area B (0.14 acres)

Area A (0.60 acres)

**LEGEND**
- Monitoring Well
- Storm Sewer Line
- Water Line
- Stream
- Hybrid Poplar
- Hybrid Willow
- 100' Buffer Zone

**Area A**
- Clear and grub, removing several trees.
- Plant hybrid poplar in trenches or borings on a 6′ x 6′ spacing.
- Pine straw in rows and turf grass between rows for weed control.

**Area B**
- Clear and grub, removing 30 Sycamore & Yellow Poplar that are 2 1/2″ dbh. LEAVE ALL EXISTING MAGNOLIA TREES.
- Plant hybrid willow and hybrid poplar using dibble bar or shallow trench or borings.
- Pine straw placed over rows for weed control.
Phytoremediation Area B After
Phytoremediation Area B 2.5 Years Later
Phytoremediation Area A After
Phytoremediation Area A 2.5 Years Later
Phytoremediation Area A 2.5 Years Later
Excellent Public Perception
PCE Concentration Vs Time in Surface Water

- **Phytoremediation System Install**
  - SW-1 sampling location dry

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**Concentration (ug/L)**

- SW-1
- SW-2
Concentration Vs Time in Phytoremediation Area

Phytoremediation System Installation

No sampling data available

Concentration (ug/L)

cis-1,2-DCE
PCE
trans-1,2-DCE
VC

Date markers:
- 9/25/07
- 4/12/08
- 10/29/08
- 5/17/09
- 12/3/09
- 6/21/10
- 1/7/11
- 7/26/11
- 2/11/12
- 8/29/12
Additional Phytoremediation Details

Costs for this site:

- Design and planting: $65K
- Annual O&M costs ~$10K/year initially, ultimately <$5K/year

Technology Pros/Cons:

- Need a large area to plant trees (typically at least 2-3 years travel time)
- Need time to establish trees (typically 2-4 years in south)
- Best for lower level impacts
PROJECT ACCOMPLISHMENTS

- Contaminant plume extent adequately delineated
- Risks posed by contamination successfully addressed
- Public perception challenges successfully addressed
- Only remaining cost is minimal phyto-remediation system O&M