In-situ Thermal Treatment Overview

April 30, 2018

960606

Thermal Treatment Focus

D dense
N non
A aqueous
P phase
L liquid

What is NAPL?

SPECIFC GRAVITY

0.5

Pine (Wood) = 0.53

Gasoline = 0.72

Diesel Fuel = 0.85

Vegetable Oil = 0.89

Floats on Water

Olive Oil = 0.92

WATER = 1.0

1.0

Coal Tar (Creosote) = 1.07

Chlorobenzene = 1.11

Chloroform = 1.47

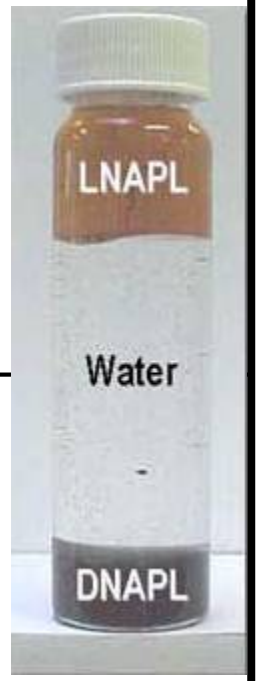
Carbon Tetrachloride = 1.58

Sinks in Water

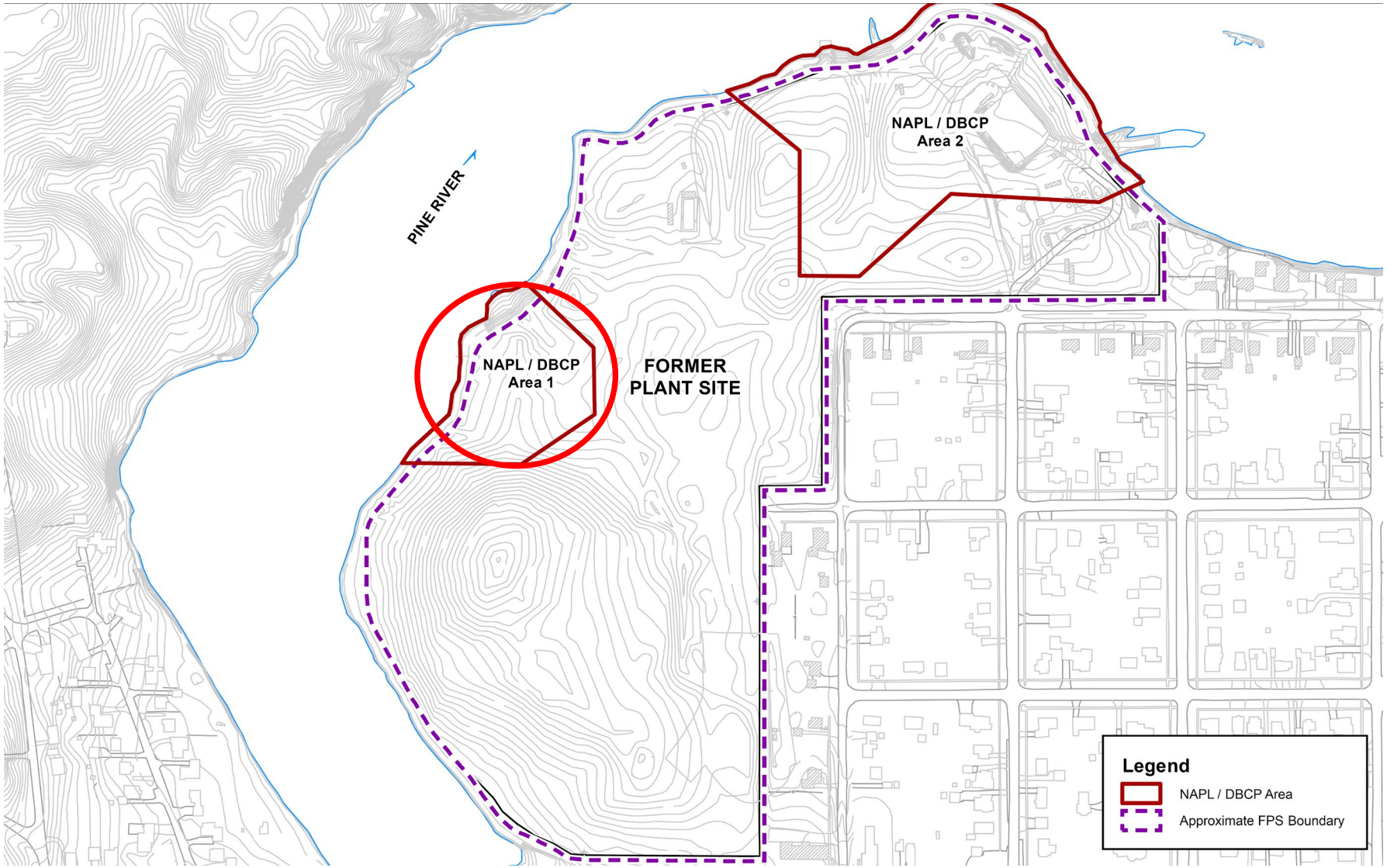
Dibromochloropropane = 2.09

Concrete = 2.40

2.5

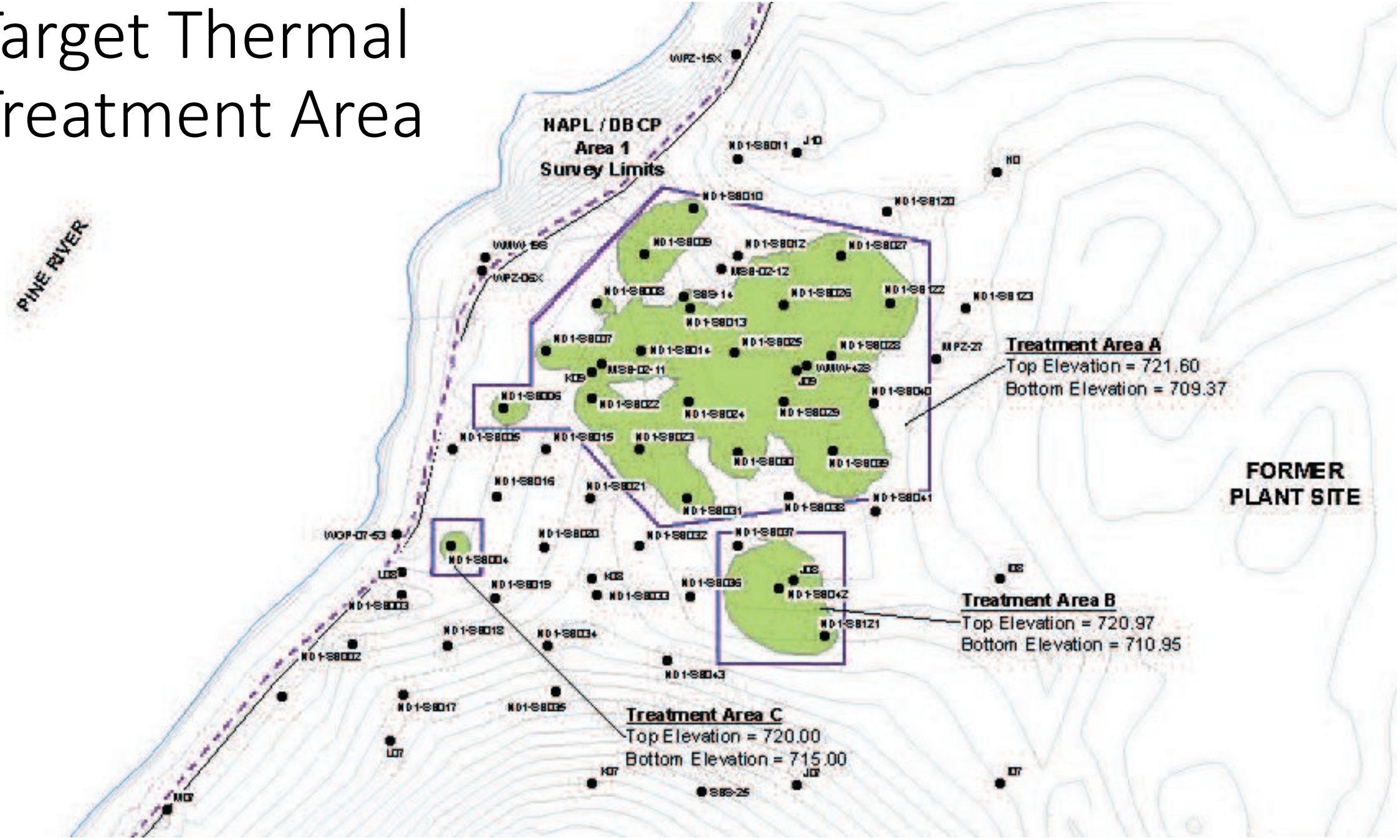


DNAPL Treatment Area 1



SB-030 11 feet below ground surface (BGS)

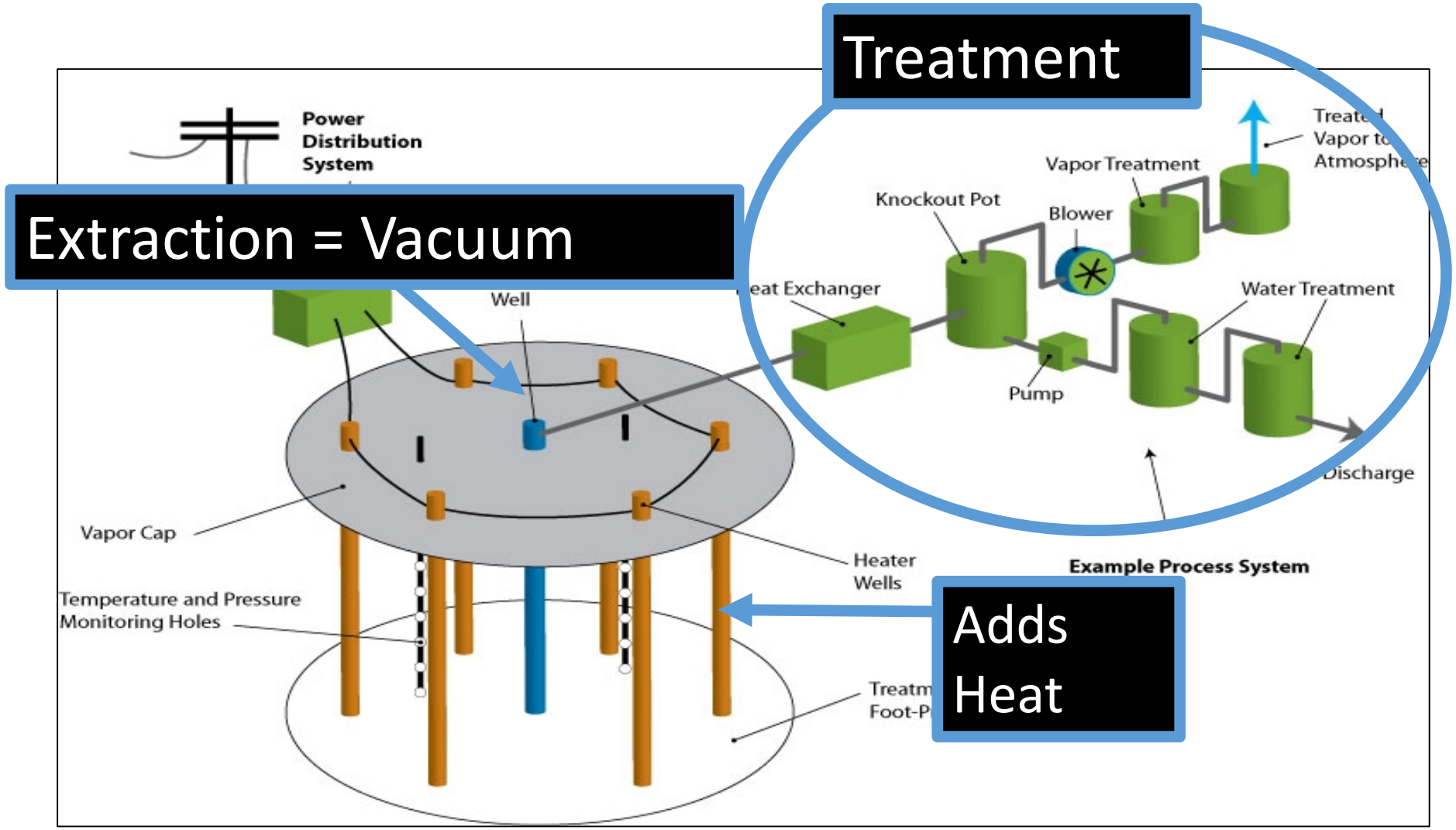
Target Thermal Treatment Area

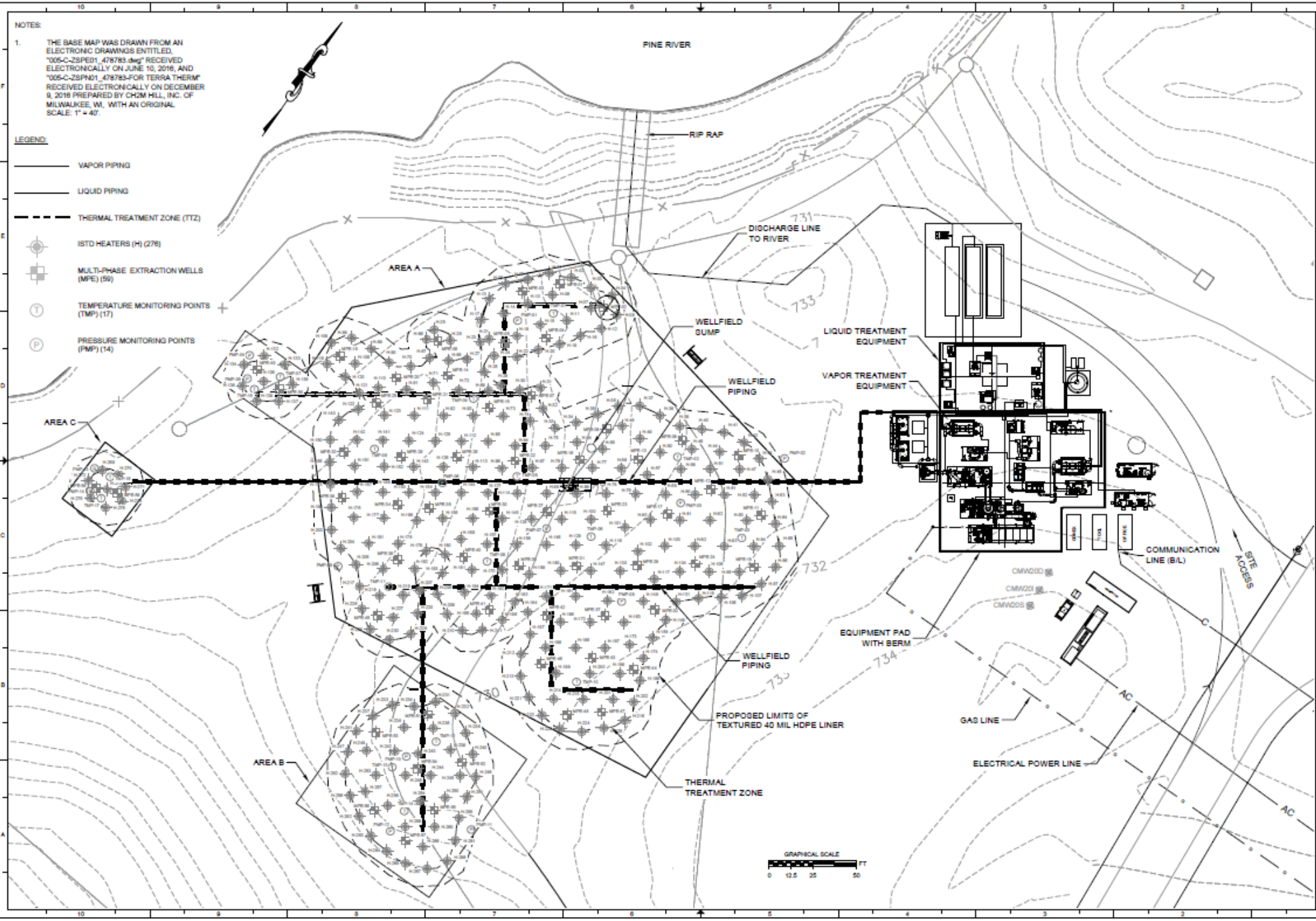


Primary Objectives of In-situ Thermal Cleanup

- Reduce the ability of DNAPL to impact groundwater beneath the site
- Eliminate DNAPL from moving offsite
- Prevent recontamination of Pine River surface water/sediments

Thermal Treatment Overview

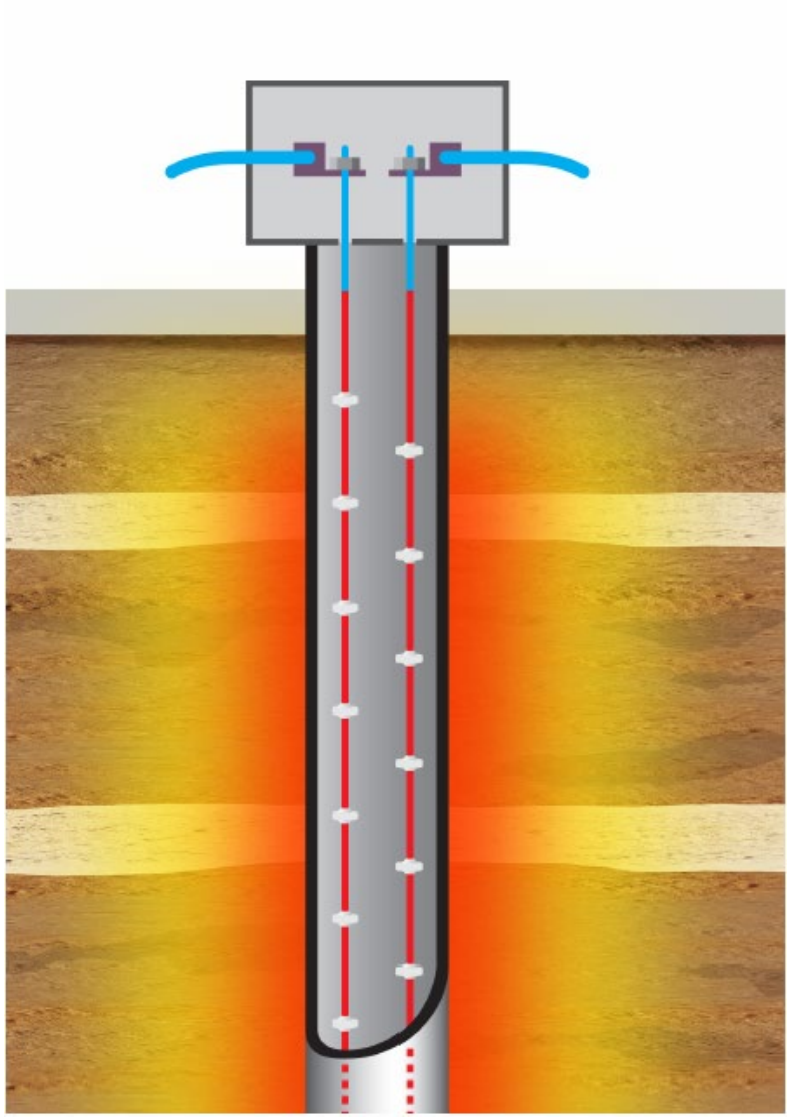


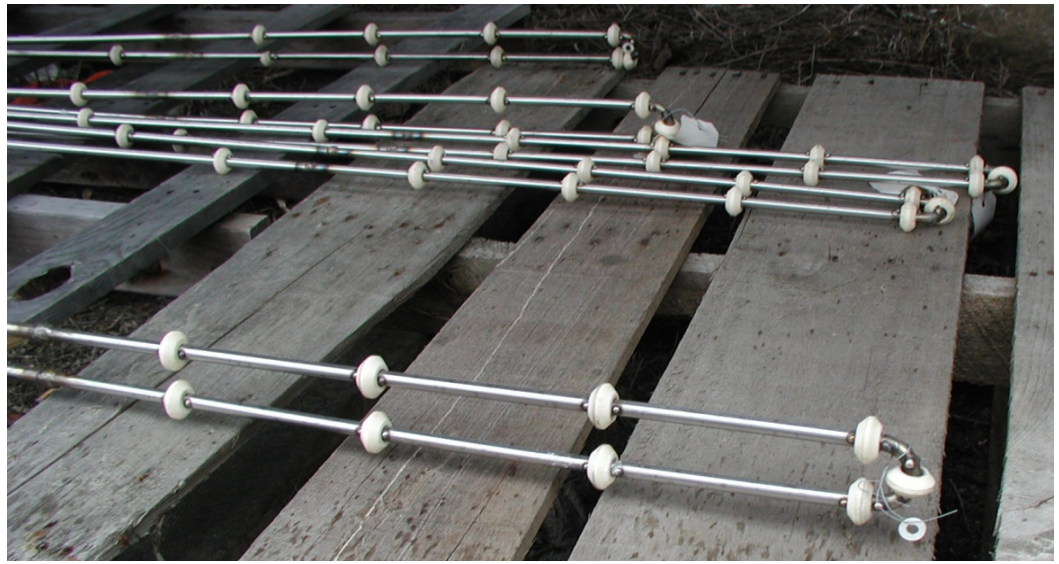

NOTES:
1. THE BASE MAP WAS DRAWN FROM AN ELECTRONIC DRAWINGS ENTITLED, "005-C-ZSPE01_478783.dwg" RECEIVED ELECTRONICALLY ON JUNE 10, 2016, AND "005-C-ZSPN01_478783-FOR TERRA THERM" RECEIVED ELECTRONICALLY ON DECEMBER 9, 2016 PREPARED BY CH2M HILL, INC. OF MILWAUKEE, WI, WITH AN ORIGINAL SCALE: 1" = 40'.
LEGEND:
VAPOR PIPING
LIQUID PIPING
THERMAL TREATMENT ZONE (TTZ)
ISTD HEATERS (H) (276)
MULTI-PHASE EXTRACTION WELLS (MPE) (59)
TEMPERATURE MONITORING POINTS (TMP) (17)
PRESSURE MONITORING POINTS (PMP) (14)
PINE RIVER
RIP RAP
DISCHARGE LINE TO RIVER
AREA A
AREA B
AREA C
WELLFIELD SUMP
WELLFIELD PIPING
LIQUID TREATMENT EQUIPMENT
VAPOR TREATMENT EQUIPMENT
COMMUNICATION LINE (B/L)
SITE ACCESS
EQUIPMENT PAD WITH BERM
GAS LINE
ELECTRICAL POWER LINE
PROPOSED LIMITS OF TEXTURED 40 MIL HDPE LINER
THERMAL TREATMENT ZONE
CMW20D
CMW20I
CMW20S
GRAPHICAL SCALE
0 12.5 25 50 FT
TERRATHERM
a Cascade Company
IN SITU THERMAL TREATMENT DESIGN
ST.LOUIS, MICHIGAN
MECHANICAL SITE LAYOUT
AS SHOWN
D
A
1 OF 1
M101

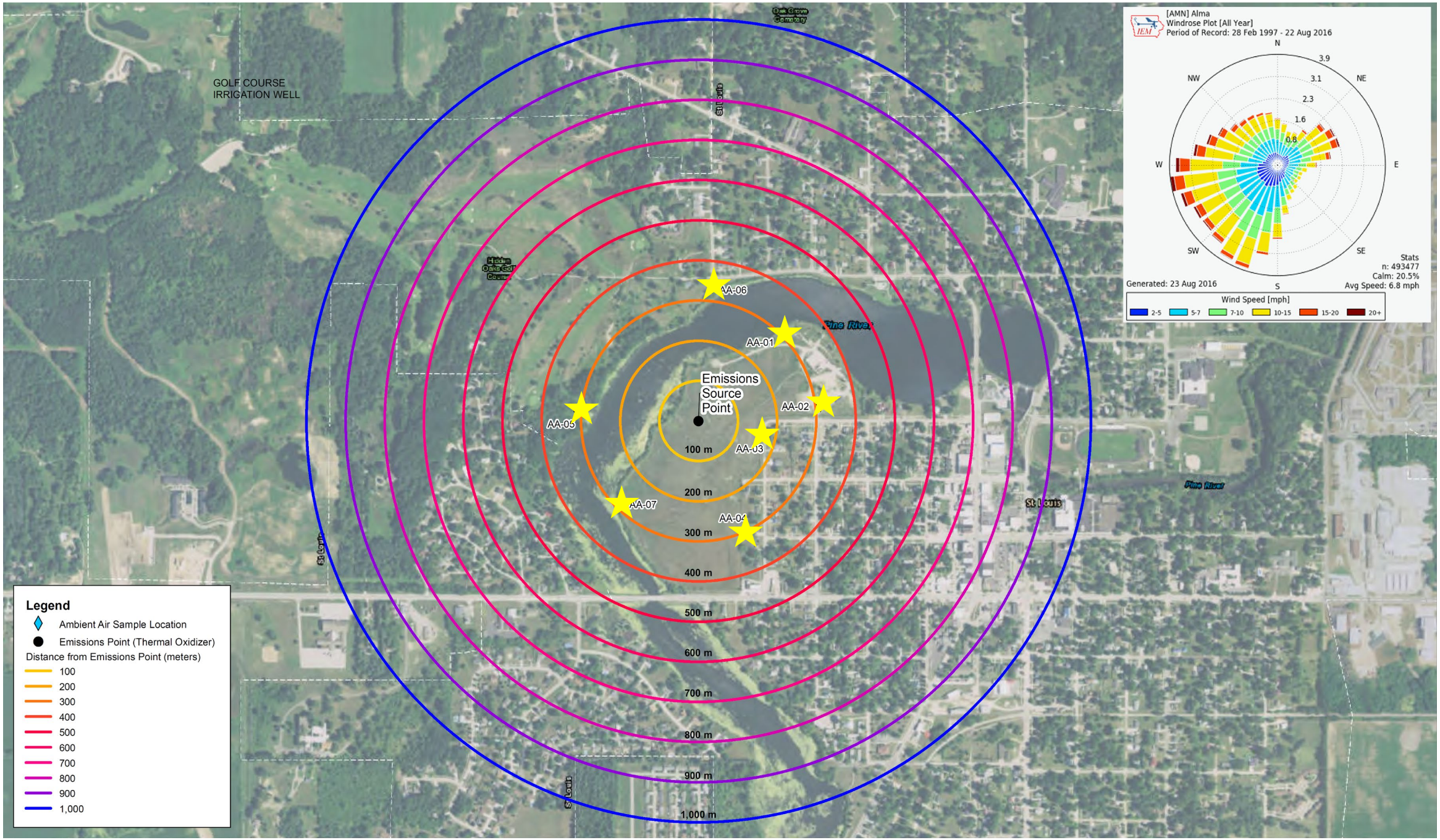
In-situ Thermal Treatment – Key Components

- Thermal conduction heating system
- Vapor extraction for contaminant recovery
  - Thermal oxidation, acid gas scrubbing, granular activated carbon treatment
- Liquid extraction
    - Groundwater treatment with permitted river discharge (MDEQ Permit)
- In-situ temperature monitoring systems
- Backup systems – Standby power generator
  - Redundant process equipment

Heating Equipment

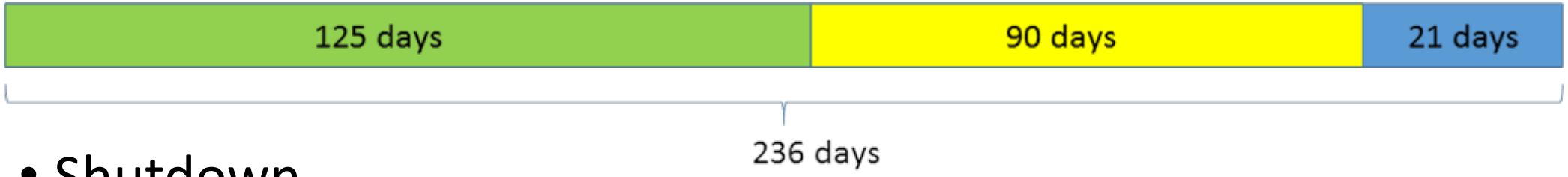





GOLF COURSE
IRRIGATION WELL
Emissions
Source
Point
AA-01
AA-02
AA-03
AA-04
AA-05
AA-06
AA-07
100 m
200 m
300 m
400 m
500 m
600 m
700 m
800 m
900 m
1,000 m
Legend
Ambient Air Sample Location
Emissions Point (Thermal Oxidizer)
Distance from Emissions Point (meters)
100
200
300
400
500
600
700
800
900
1,000
[AMN] Alma
Windrose Plot [All Year]
Period of Record: 28 Feb 1997 - 22 Aug 2016
N
NE
E
SE
S
SW
W
NW
3.9
3.1
2.3
1.6
0.8
Stats
n: 493477
Calm: 20.5%
Avg Speed: 6.8 mph
Generated: 23 Aug 2016
Wind Speed [mph]
2-5
5-7
7-10
10-15
15-20
20+

Operation Timeframe & Shutdown of System

- Operation
  - Expected to take 125 days to heat to boiling point
  - Minimum of 90 days of operation at boiling point
  - Post treatment of 21 days



- Shutdown
  - System data used to demonstrate contaminant mass reduction
  - Document no additional contaminants can be removed
  - Confirmation performance through soil sampling

Additional Information

- Velsicol EPA Web Site
  - www.epa.gov/superfund/velsicol-chemical-michigan
- Velsicol In-situ Thermal Treatment Web Site
- Contact Number 989-681-8187 (on new front gate sign)
- USEPA List Server
- T. A Cutler Memorial Library

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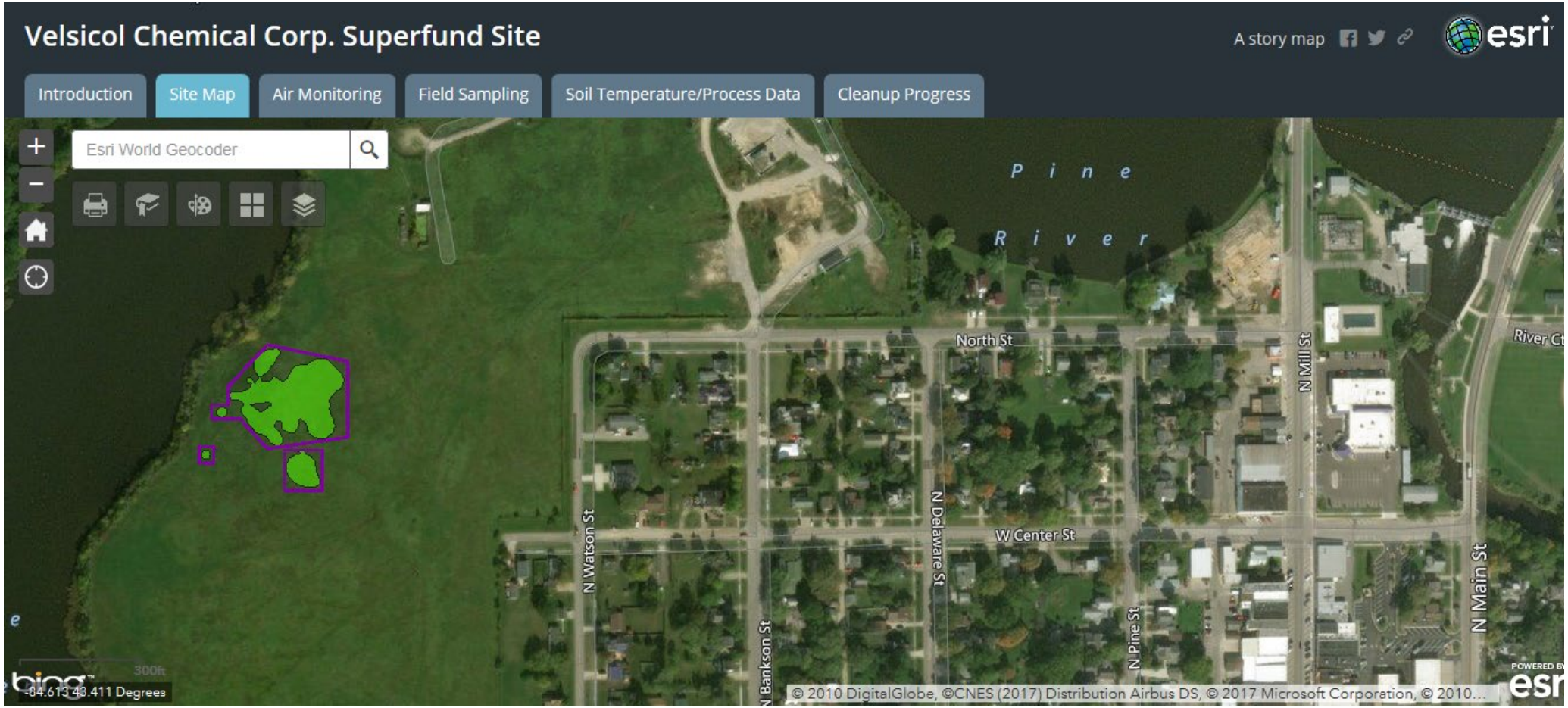
Velsicol In-situ Thermal Web Page