

Use of Phytoremediation To Augment Standard Pump and Treat Technologies at Superfund Sites



WSP

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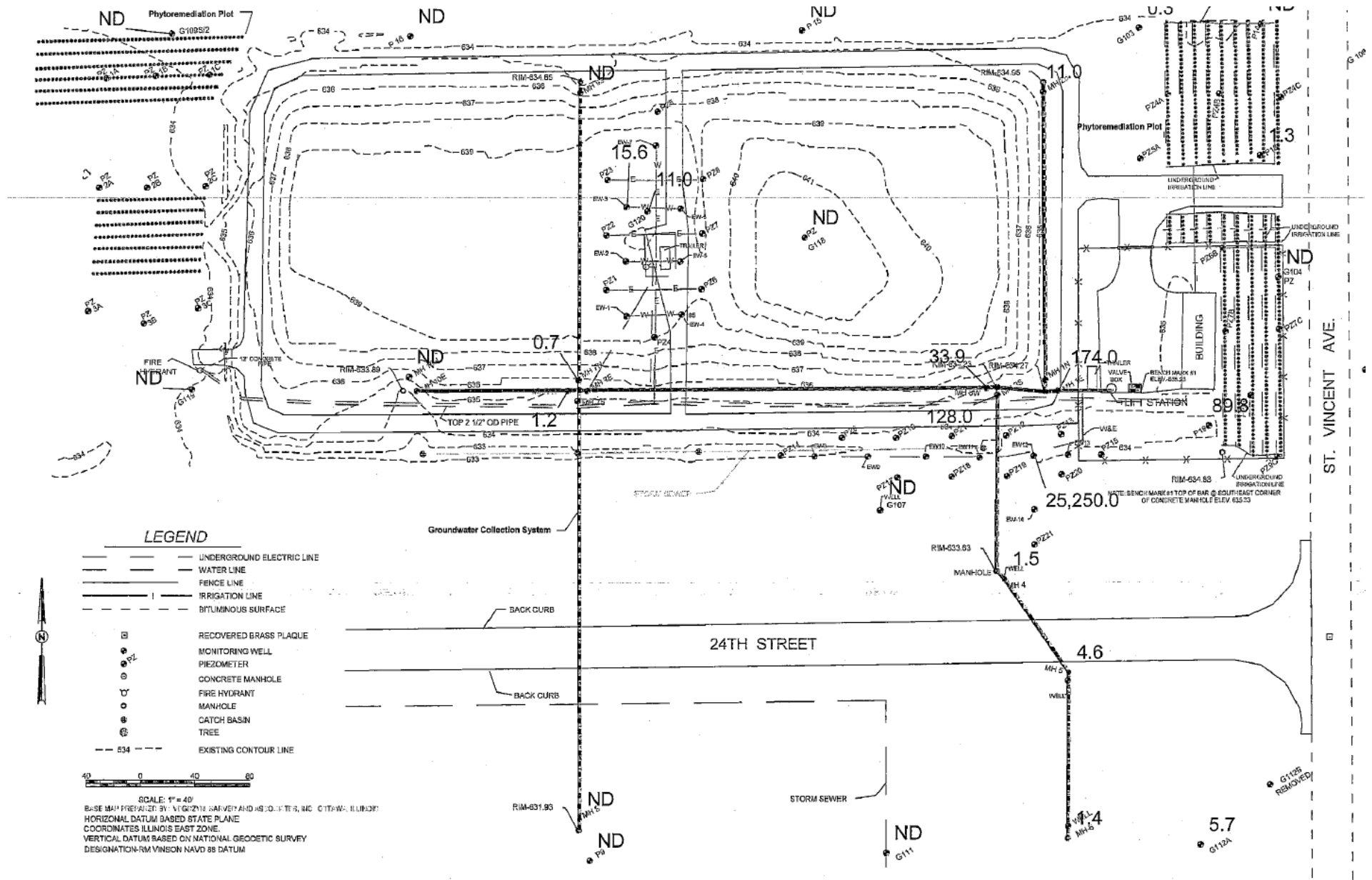
The Site

- **16-Acre Abandoned Electrical Equipment Manufacturing Plant located in a residential community**
- **PCB soil contamination**
- **PCB and VOC groundwater contamination**
- **One of the largest incineration projects in the country.**



“Pump” and Treat System

- **Groundwater collection: interconnected trenches that gravity drained into a single collection manhole**
- **Treatment:**
 - pH adjustment
 - Air stripping (VOC removal)
 - GAC (PCB removal/VOC polishing)
 - POTW discharge



- LEGEND**
- UNDERGROUND ELECTRIC LINE
 - WATER LINE
 - FENCE LINE
 - IRRIGATION LINE
 - BITUMINOUS SURFACE
 - RECOVERED BRASS PLAQUE
 - MONITORING WELL
 - PZ PIEZOMETER
 - CONCRETE MANHOLE
 - FIRE HYDRANT
 - MANHOLE
 - CATCH BASIN
 - TREE
 - 534 EXISTING CONTOUR LINE

SCALE: 1" = 40'
 BASE MAP PREPARED BY: NUGENT'S SERVICES AND ASSOCIATES, INC. CITY OF ILLINOIS
 HORIZONTAL DATUM BASED STATE PLANE
 COORDINATES ILLINOIS EAST ZONE
 VERTICAL DATUM BASED ON NATIONAL GEODETTIC SURVEY
 DESIGNATION: RM VINSON NAVD 88 DATUM



OCTOBER 26 -28, 2020

Couple of Kickers

- The incinerator was permitted under TSCA.
- New VOC source areas were identified.
- Additional excavation would not be “publicly” acceptable.
- Funding/Time running out.

REMEDY

- Identified 4 hot spot areas
- Develop and implement series of Remedy Enhancements:
 - Two Dual Phase Extraction systems (Topic for another presentation); and
 - Two Phyto remediation plots (Topic for today)

WHY PHYTOREMEDIATION?

- Shallow groundwater table, at least at one location
- Relatively low operation and maintenance cost
- Green technology
- Would still be “working” after groundwater treatment system is shut down
- Remember, site located in a residential community

The Design Team

- Illinois EPA
- University of Florida
- Iowa State University
- WSP, Formerly: Ecology and Environment, Inc.

The SYSTEMS

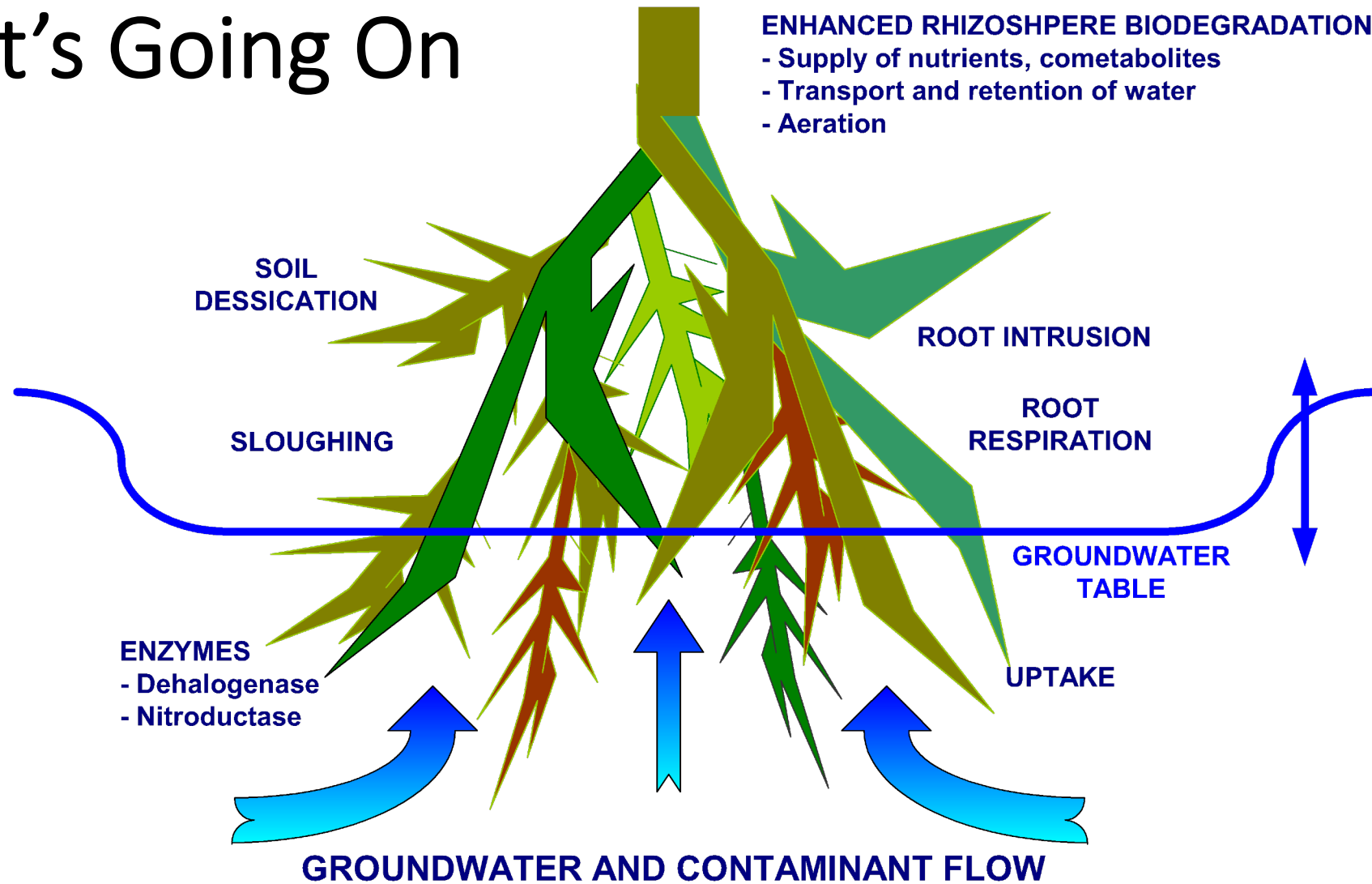
- **North West Corner**

- PCE Contaminated Soil and Groundwater
- Plot Size: 95' x 235'
- Poplar, willow, and limited bald cypress
- 643 trees planted
- No Specialize planting required.

- **East Side of GTU**

- TCE Groundwater contamination
- Plot Size: 90' x 300'
- Poplar and willows
- 418 trees planted
- Not the case here

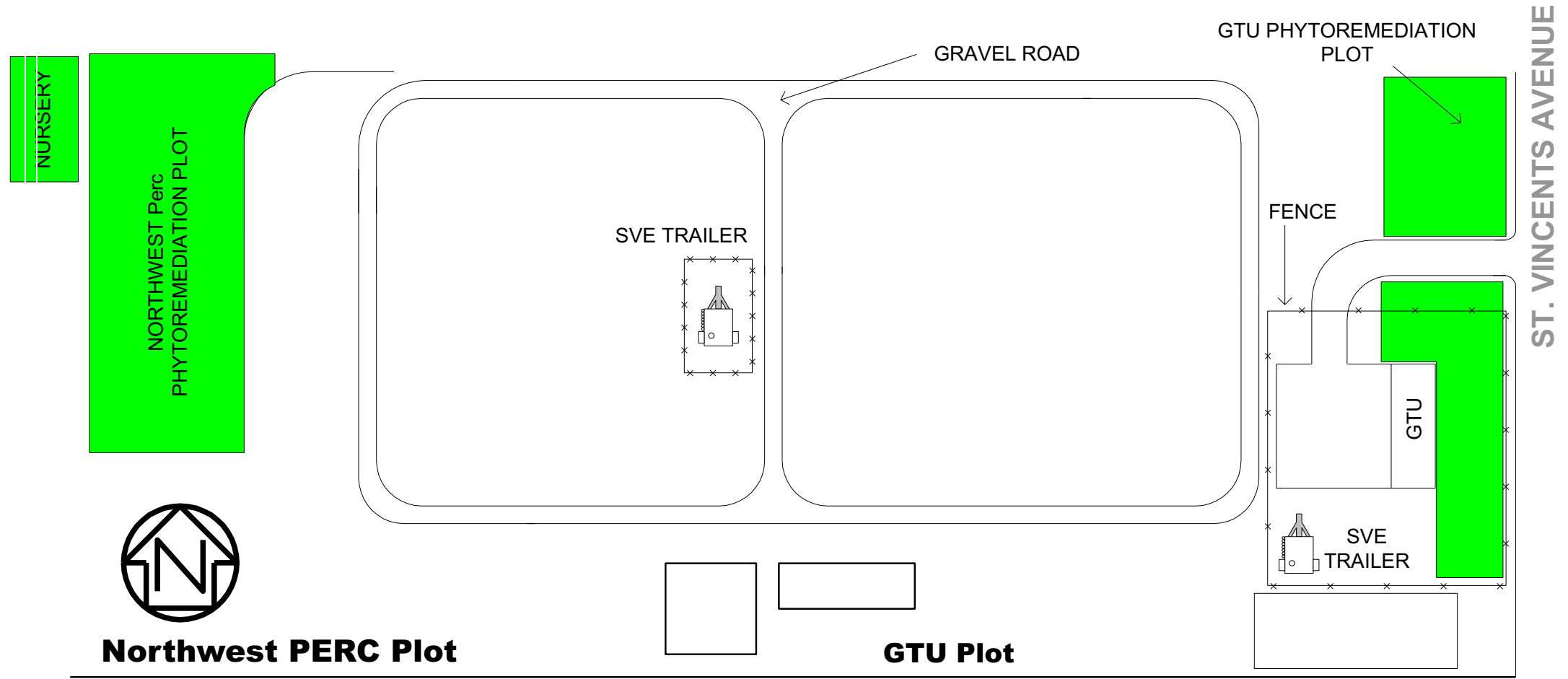
What's Going On



The Systems cont.

- **Randomized complete block split-plot design**
- **For Northwest Corner: 18 different poplar clones, 24 willow distinct clones and 1 type of bare root planted.**
- **For GTU: 1 type of poplar and 21 different willow clones planted.**
- **Pine bark added in 4-foot wide strips for weed prevention**

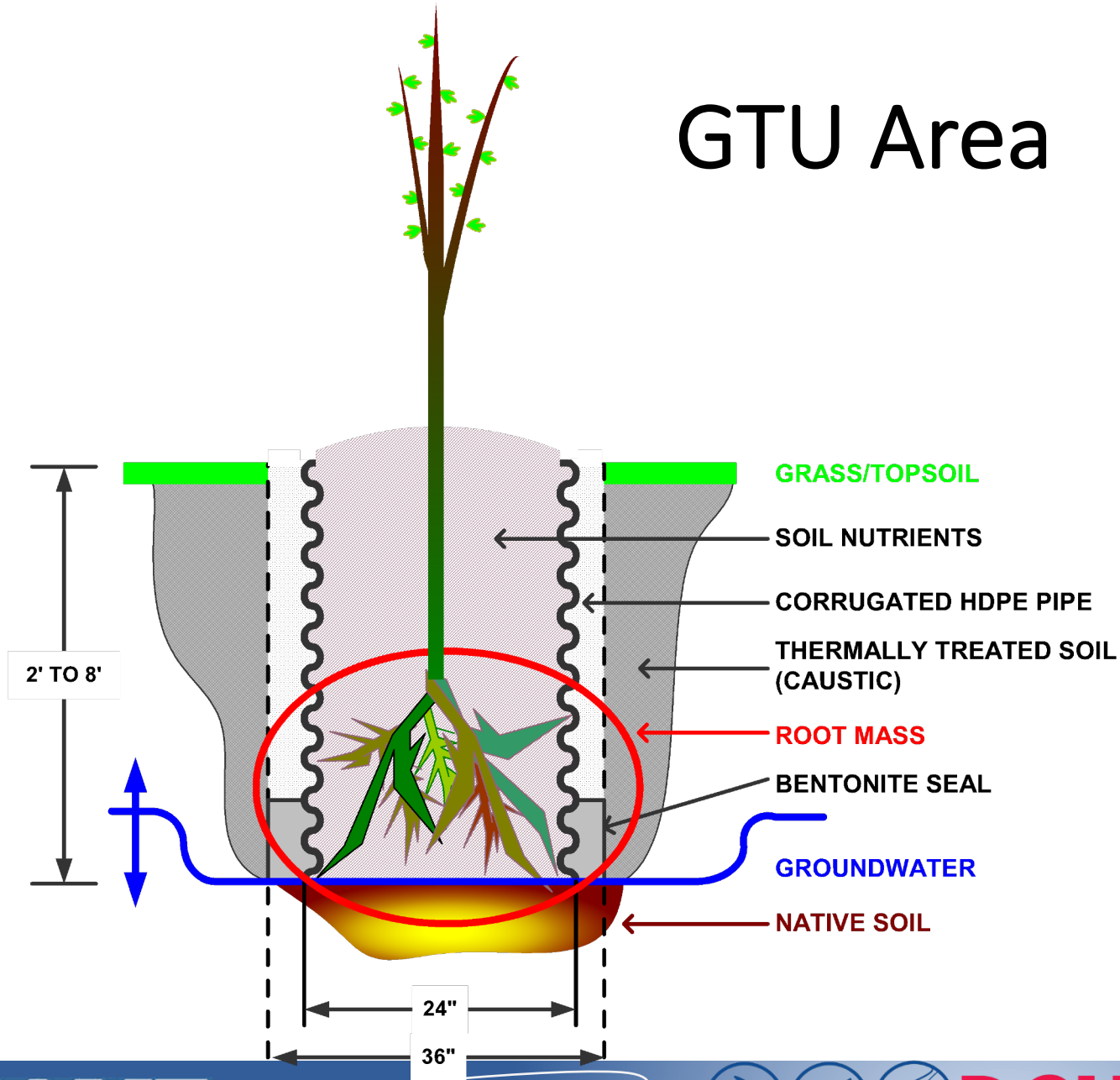
Site Schematic



NW Corner Plantings



GTU Area



OPERATIONS AND MONITORING

- **Weed Control**
- **Fertilization**
- **Irrigation**
- **Pest/Disease Control**
- **Growth Monitoring**
- **Groundwater Monitoring (standard stuff)**
- **Biomass sampling.**

BIOMASS SAMPLING



BIG DON'T!!! (i.e., Over Water)



END RESULTS

- Trees height ranged from 4 to 5 meters in height after 2 years.
- Annual groundwater uptake was estimated to be 209,000 gallons.
- 3 Years after the initial plantings: GTU and Dual Phase systems were shutdown
- No significant increase in contaminant concentrations or areal extent of contaminant plumes after 5-years of planting.
- **PHYTOREMEDIATION SYSTEMS CONTINUE TO OPERATE, AND ANALYTICAL RESULTS SHOW THAT VOC CONTAMINANT EXTRACTION AND DEGRADATION IS STILL OCCURRING.**

THANK YOU

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