Delineation Sampling Results and Initial Design for Phase 2 ISTR at OU3

Bethpage, NY

June 17, 2022

Opening Remarks Ed Hannon, Jason Pelton	11:00 – 11:05
Meeting Purpose Joel Balmat	11:05 – 11:10
TVOC Delineation Results David Stern	11:10 – 11:25
Initial Phase 2 ISTR Design Bill Lais	11:25 – 11:50
Q&A	11:50 – 12:00

Meeting Purpose

To describe the TVOC delineation sampling results and initial remedial design for the Phase 2 ISTR in the lower permeability zone (LPZ) at the recharge basin, skate park, tennis courts, and northern part of the ballfield.

TVOC Delineation

Purpose and Scope

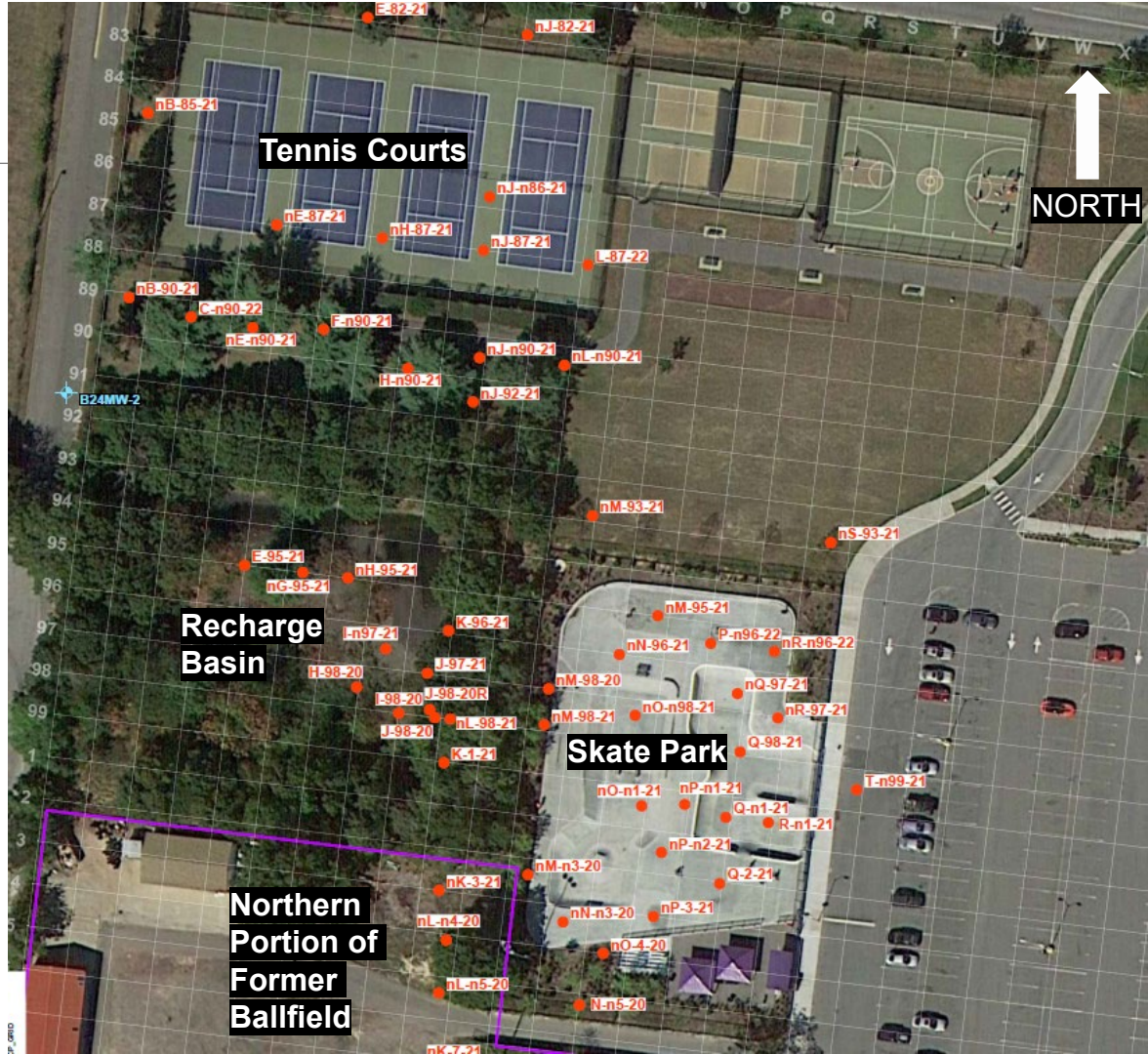
Purpose: Delineate TVOCs in soil >10 mg/kg in LPZ north of former ballfield area

Soil borings drilled March 2021 to March 2022

Adaptive approach used for boring locations and depths

56 soil borings drilled, and 577 soil samples collected

Samples collected above, within, and below the LPZ in most borings



Tennis Courts

Area delineated to <10 mg/kg to north, east and west

Further characterization to south restricted by steep slope covered in dense trees

Highest TVOC concentration was 127 mg/kg, compared to 7,735 mg/kg in ballfield

Recharge Basin

Borings drilled in accessible areas

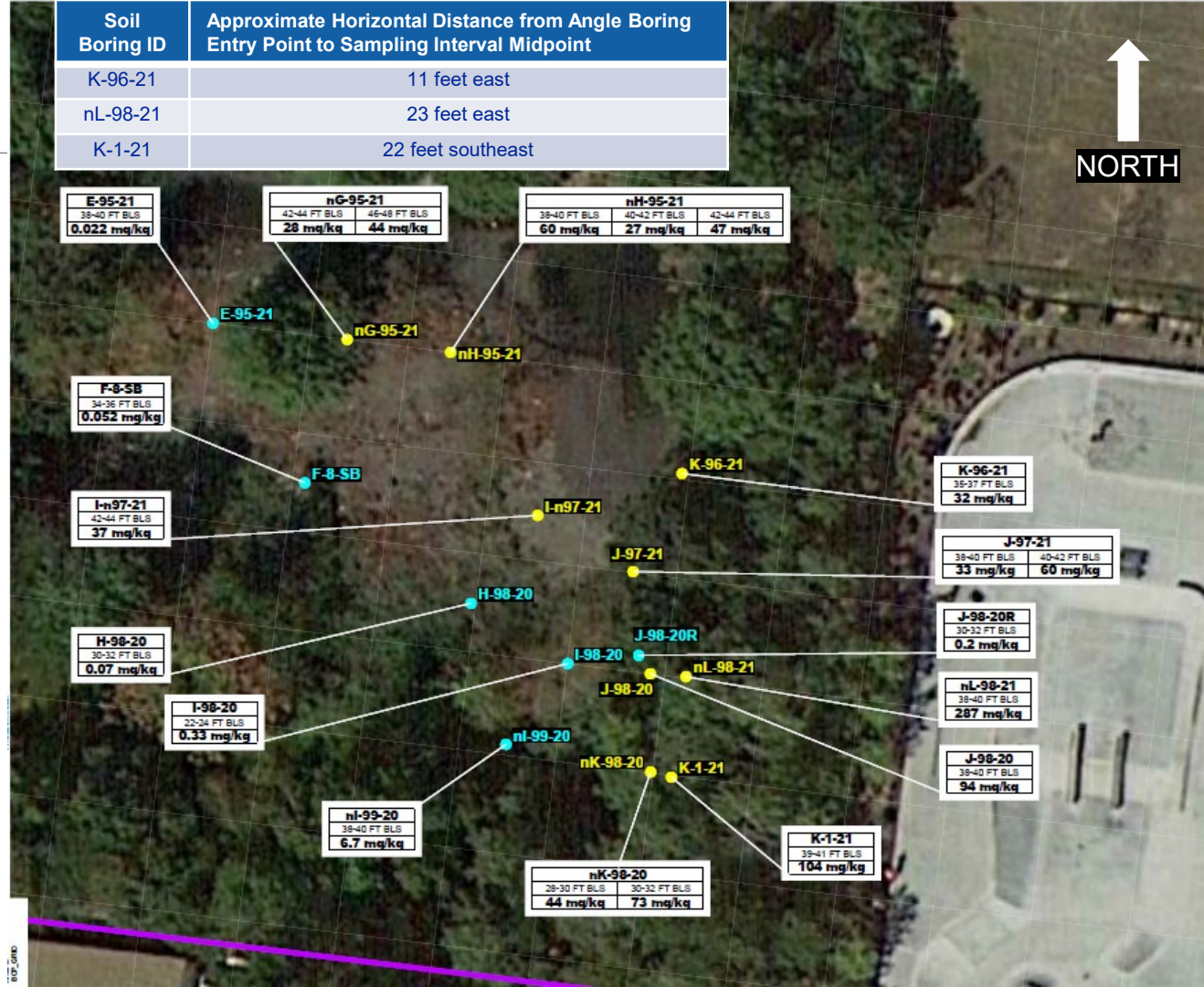
Further characterization to north, east, and south restricted by steep slopes covered in dense trees

3 angled borings drilled at bottom of eastern slope

Highest TVOC concentration was 287 mg/kg, compared to 7,735 mg/kg in ballfield

TVOCs >10 mg/kg below water table in several borings

Soil Boring ID	Approximate Horizontal Distance from Angle Boring Entry Point to Sampling Interval Midpoint
K-96-21	11 feet east
nL-98-21	23 feet east
K-1-21	22 feet southeast

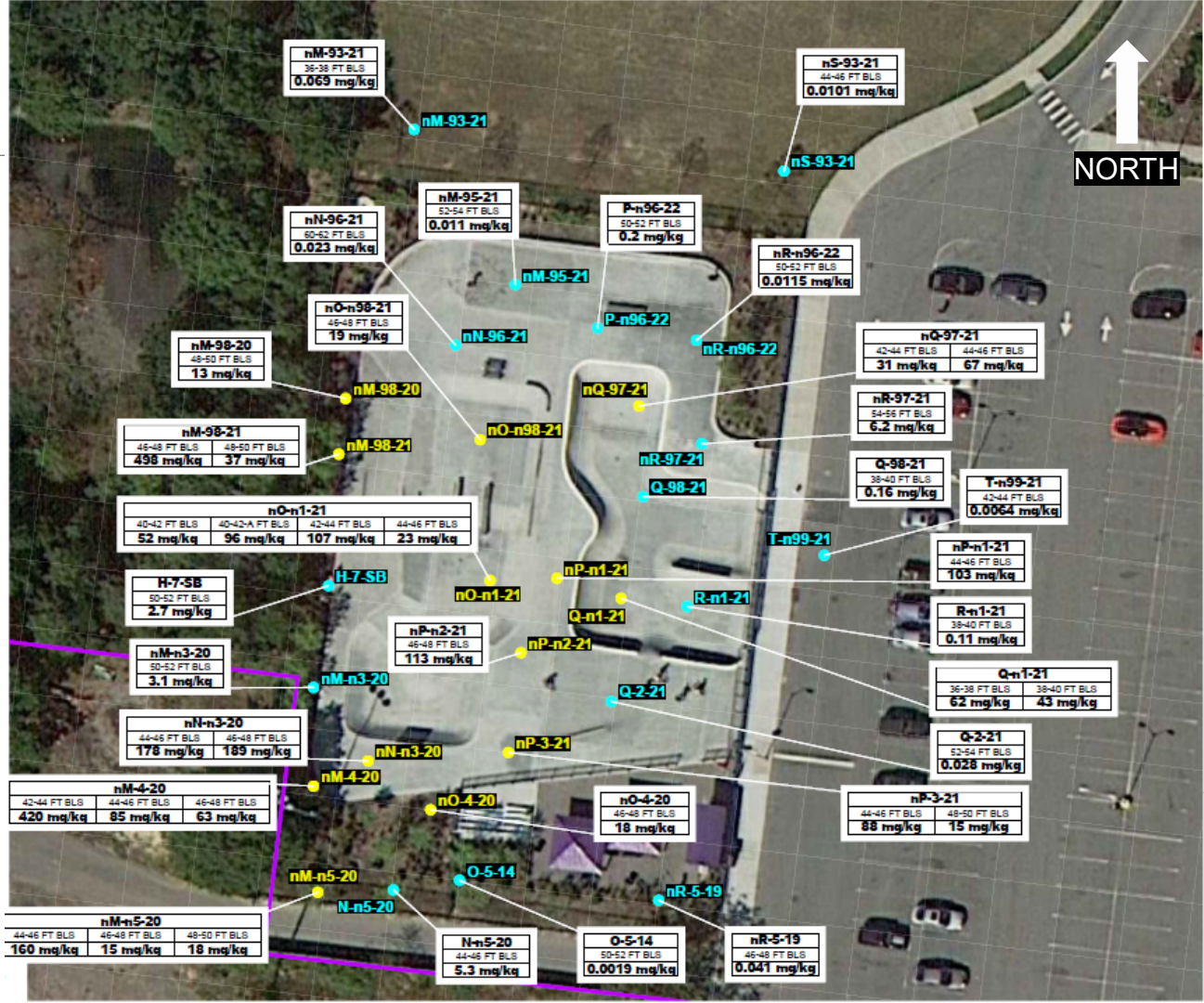


Skate Park

Area delineated to <10 mg/kg to north, east, and southeast

Highest concentration was 498 mg/kg, compared to 7,735 mg/kg in ballfield

Crane needed to lift drill rig for access to 4 borings in eastern bowl

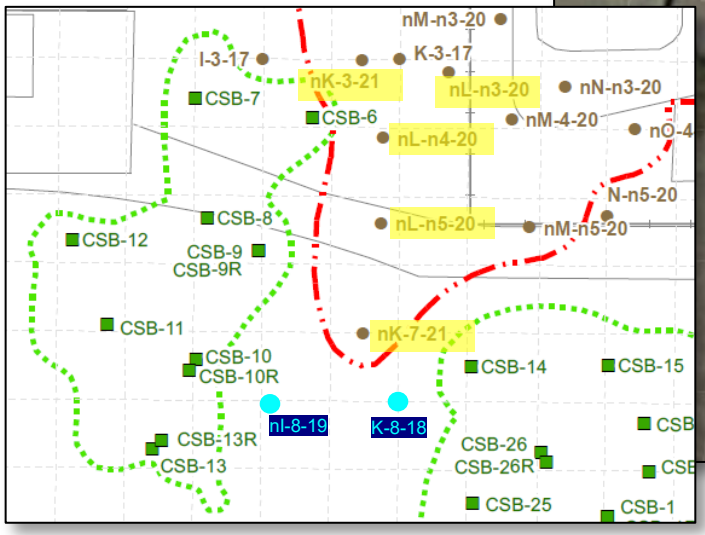


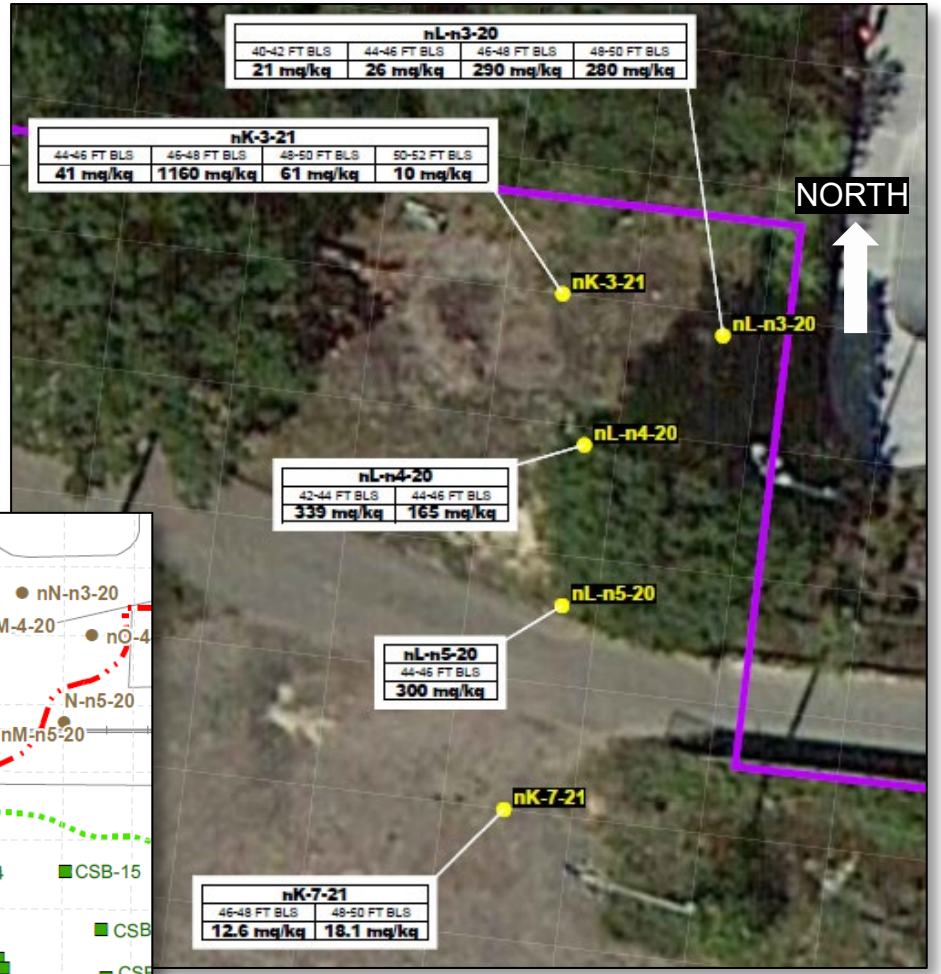
Northern Portion of Former Ballfield

Surrounding ballfield area delineated to <10 mg/kg using ISTR confirmation samples

Highest concentration was 1,160 mg/kg, compared to 7,735 mg/kg in other areas of ballfield

Areas delineated following Phase 1 ISTR treatment (green dashed line)



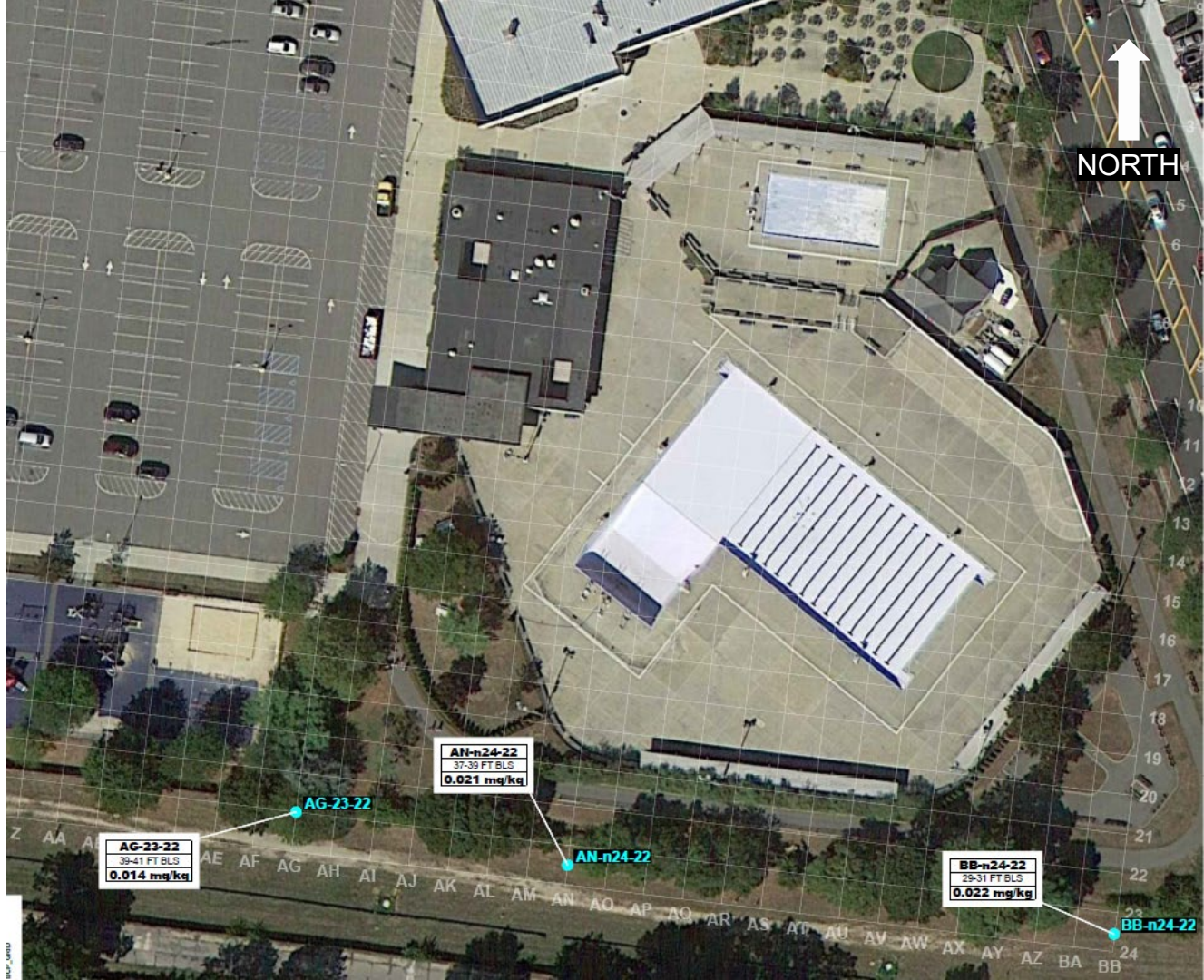


Southeast Corner of Park

Area investigated in response to 2/9/22 NYSDEC request

3 borings drilled in March 2022; samples collected from 15-45 ft

All samples contained TVOC concentrations <0.1 mg/kg



Delineation Summary

Soil borings horizontally and vertically delineated TVOC concentrations in the LPZ above 10 mg/kg in accessible areas of the Bethpage Community Park and the delineation effort has been completed.

TVOC concentrations in soil exceeding 10 mg/kg were detected within the LPZ except for 3 samples collected slightly above or below the LPZ.

Initial Design of Phase 2 ISTR

Phase 2 Scope & Objective

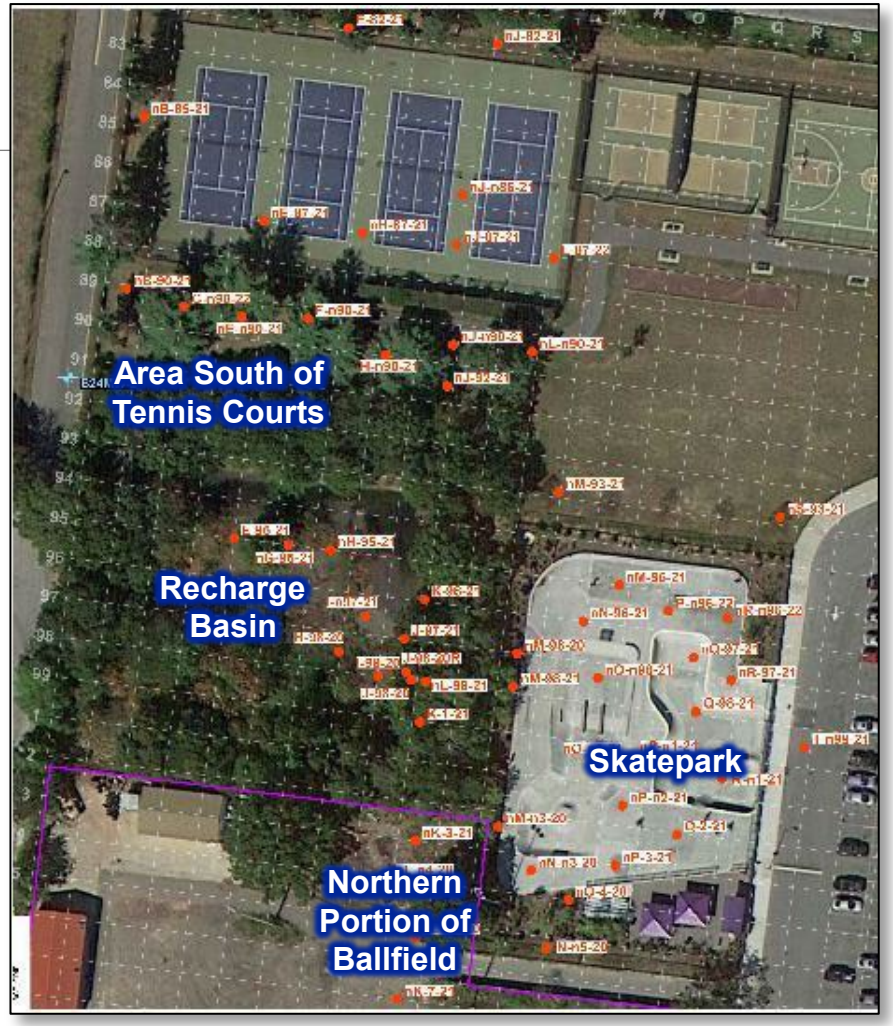
Scope:

Treat VOCs in the following areas:

- Skatepark;
- Recharge basin;
- Area south of tennis courts; and
- Northern portion of the former ballfield.

Remedial Action Objective:

Treat TVOCs in the LPZ to an average concentration of less than 10 mg/kg.



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Treatment Approach/Methodology

Soil Treatment:

- Vertical and angled heater wells to heat soil to 100°C
- Vapor extraction wells (VEWs) and multi-phase extraction (MPE) wells to extract vaporized VOCs and steam and to maintain pneumatic and hydraulic control

Vapor and Liquid Treatment:

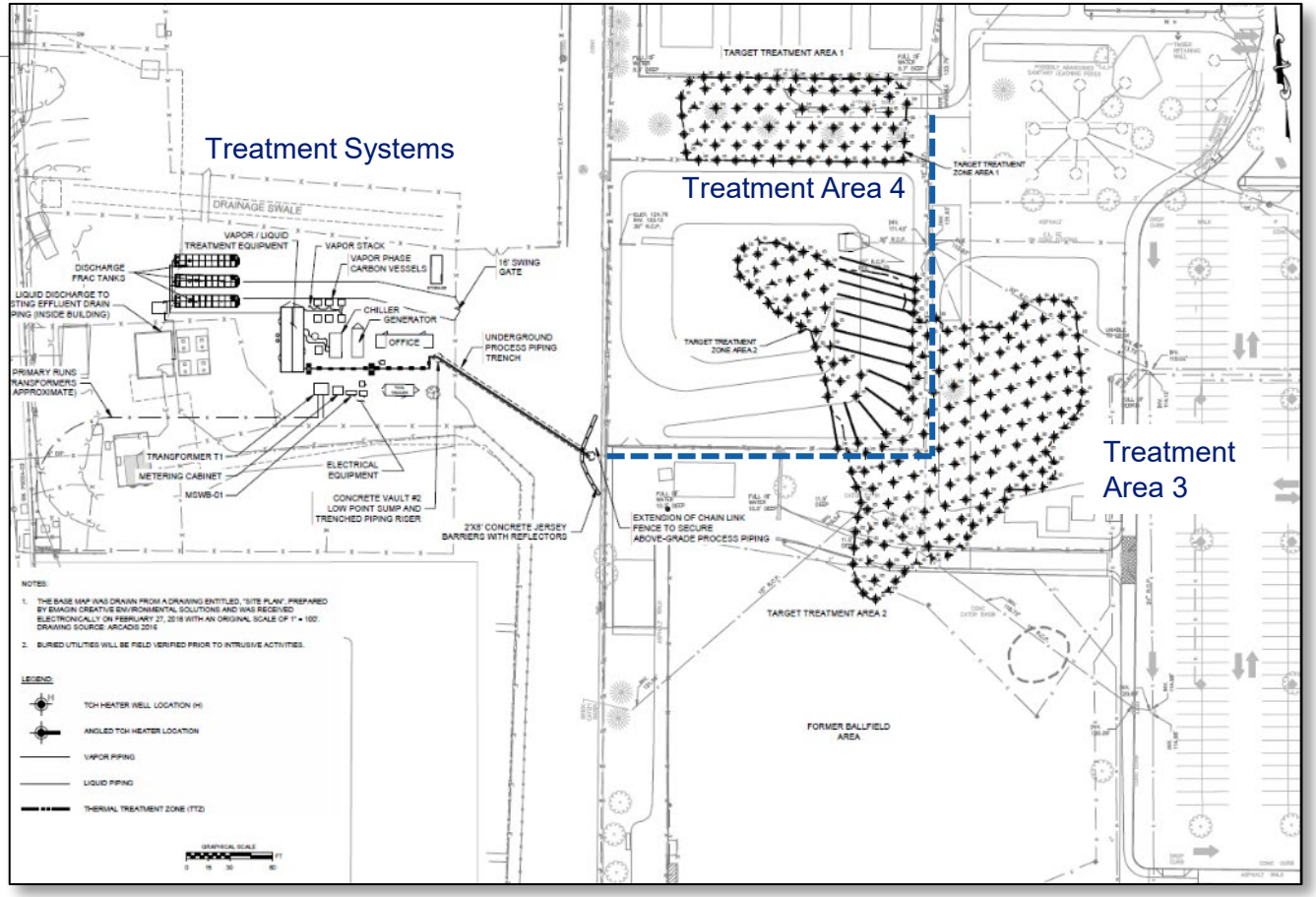
- Granular activated carbon (GAC) to treat extracted vapor
- GAC to treat extracted liquids - condensate and groundwater

Monitoring:

- Temperature and pressure monitoring to track subsurface heating, pneumatic and hydraulic control
- Vapor and liquid treatment system monitoring for mass removal and discharge compliance

System Layout

Heater wellfields in 2 treatment areas connected by pipelines to vapor and liquid treatment systems in McKay field



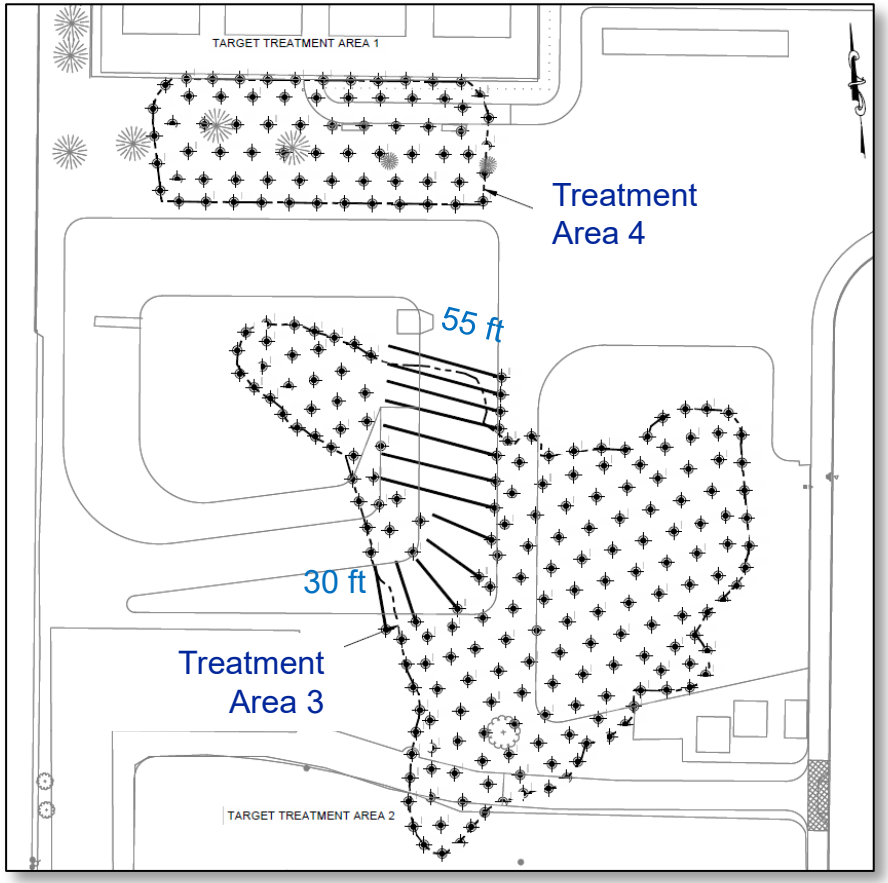
Heater Wellfield Initial Design

Two treatment areas:

- 37,900 sq ft total surface area (78% larger than Phase 1)
- 29,400 cu yd heated volume (96% larger than Phase 1)
- 1,300 lbs estimated TVOC mass (43% less than Phase 1)

306 heater wells on 15 ft centers:

- 256 vertical wells
- 50 angled wells in 12 clusters
- Heated zone extends minimum 5 ft above and 5 ft below target treatment zone (TTZ)



Example Angled Well "Fan" in Recharge Basin

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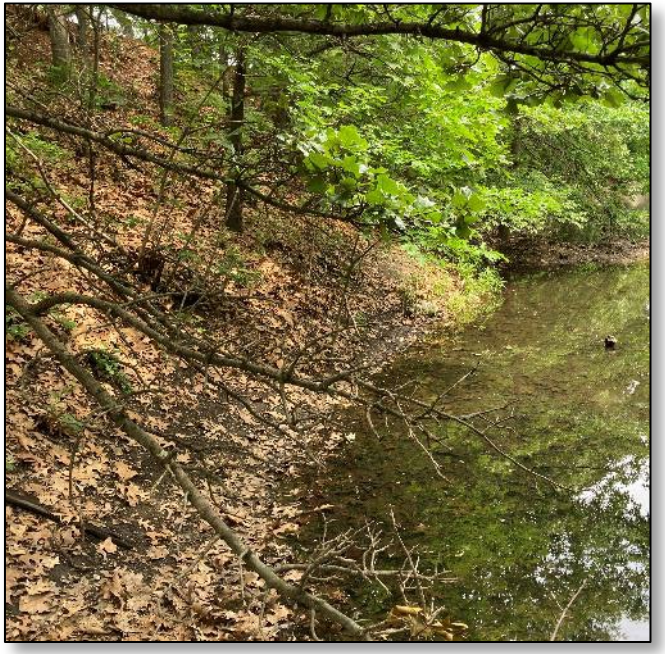
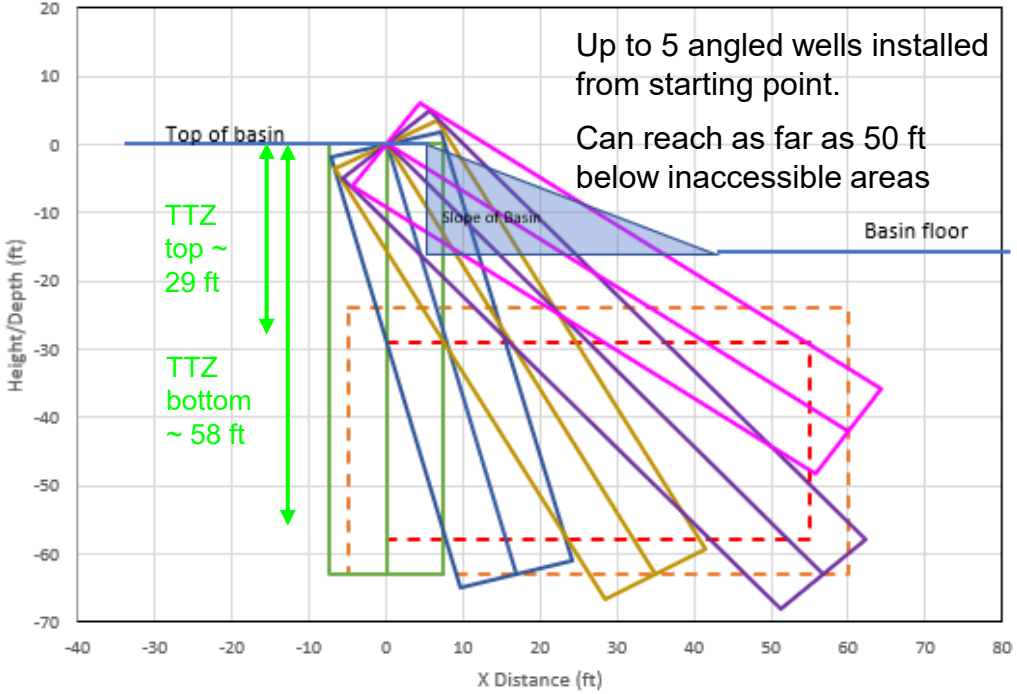
Heater "fans" utilized to treat soil in areas not accessible for vertical drilling

Angles generally between 35 and 75 degrees from horizontal.



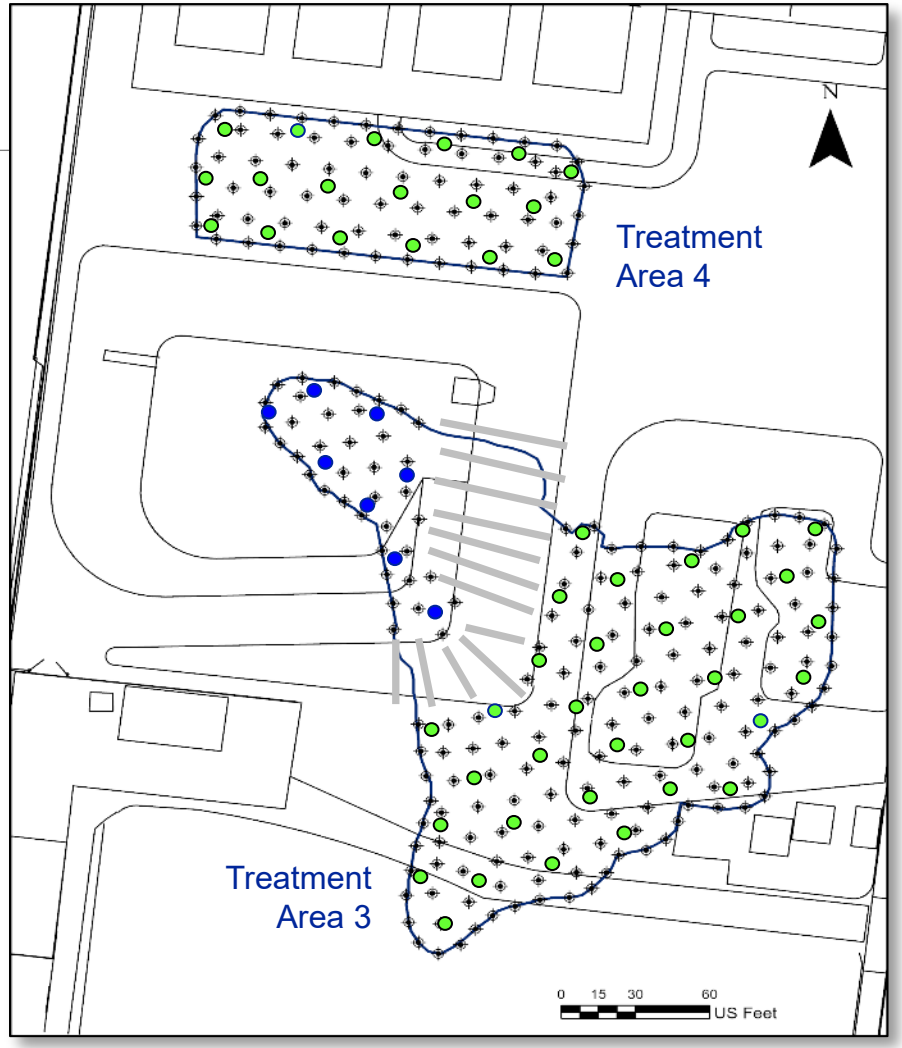


Extraction System

51 vertical extraction wells

7 multi-phase extraction wells

Selected VEWs equipped with pumps to remove perched water as needed

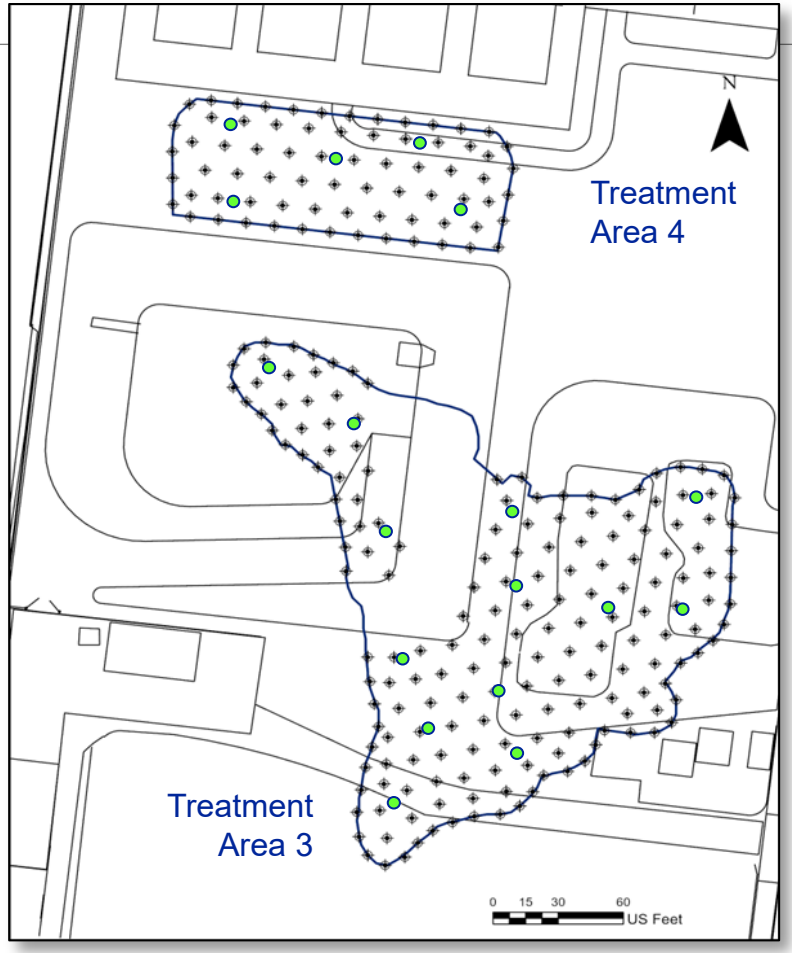


Monitoring System

18 temperature monitoring points in TTZ

5-10 monitoring location clusters (locations TBD) to measure:

- Shallow vapor concentration and pressures
- Soil temperature
- Perched water elevations
- Groundwater elevations and water quality

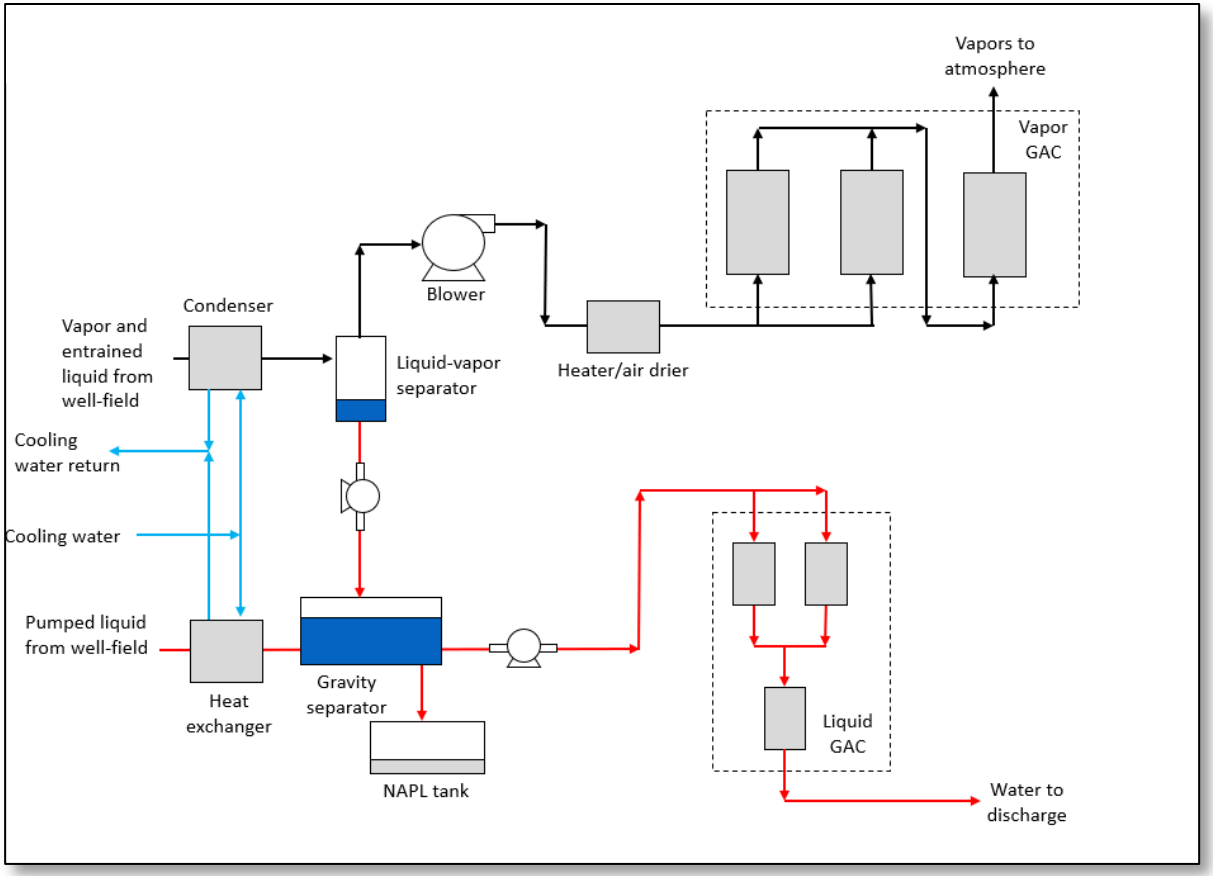


- TTZ temperature monitoring (18)
- Monitoring clusters (5-10) – locations TBD

Treatment System Process Flow Diagram

Treatment system components:

- Condensate Knockout Tank
- Caustic Supply System Vapor Heat Exchanger
- Chiller System
- Moisture Separator
- Process Blowers
- Vapor Phase Carbon Vessels
- Permanganate Polishing Vessel
- Iron removal equipment



Phase I Infrastructure to be Reused for Phase 2

Subsurface road crossing infrastructure (vapor, liquid and compressed air)

Above grade vapor piping, stands, valves and appurtenances will be relocated as necessary

Select vapor extraction and heater wells along the Phase 1 / Phase 2 border

Multi-phase extraction pumps and skid mounted transfer pumps

Process area electrical transformer (500 KVA) and distribution panel

Temperature monitoring system

Tier One vapor & liquid treatment systems

Phase I Infrastructure to be Removed

All down-hole and wellhead components of the Phase 1 heater wells, vapor extraction wells, temperature monitoring wells and multi phase extraction wells not targeted for reuse in Phase 2

All wellfield cables

All above grade piping and stands in Phase 1 wellfield

Phase 1 wellfield surface liner

Comparison of Phase 1 & Phase 2 ISTR

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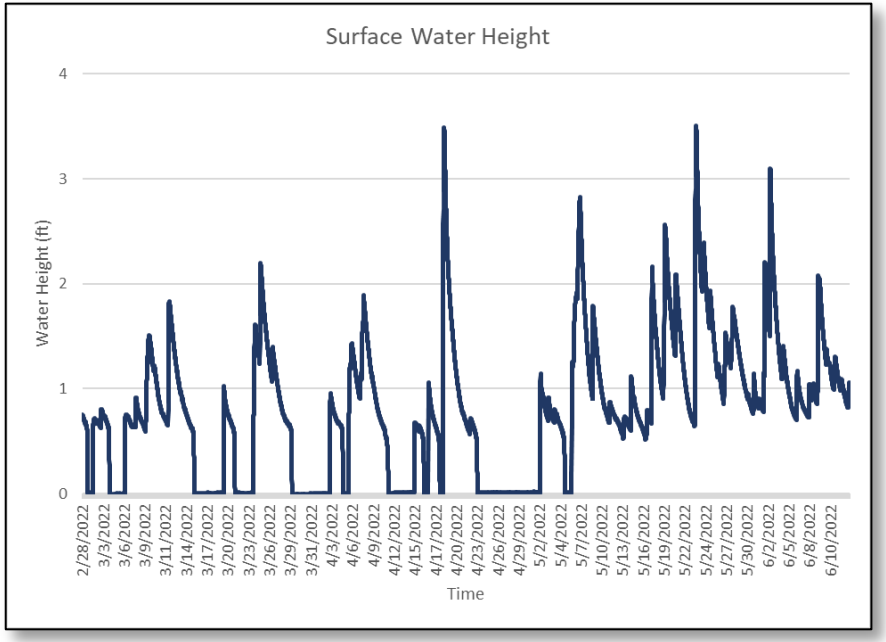
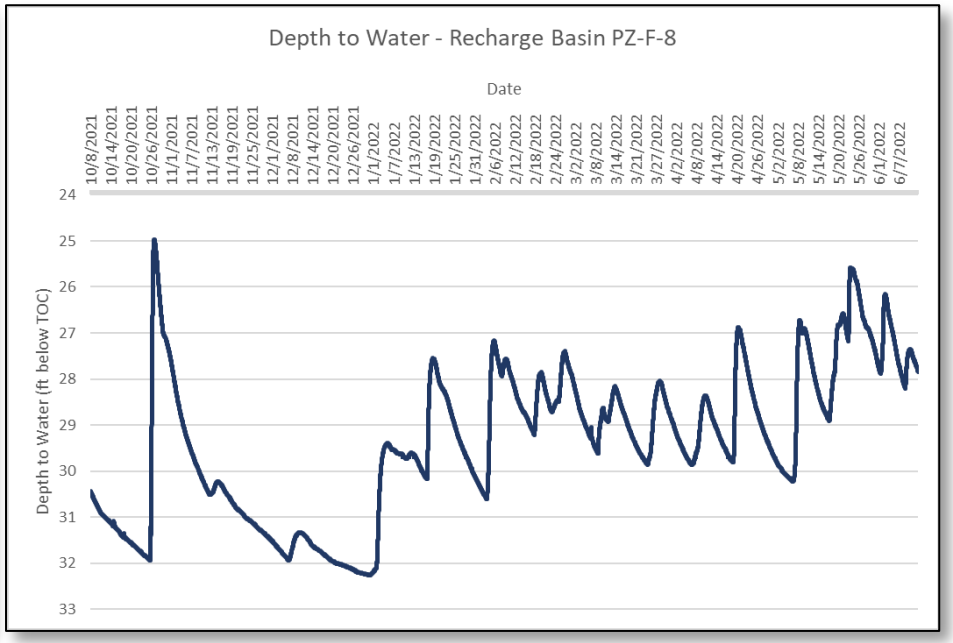
Characteristics	Phase 1: Ballfield	Phase 2: Tennis Courts, Recharge Basin, Skatepark, Northern Ballfield
Lateral extent / volume of treatment area(s)	21,333 sq ft / 7,111 cu yds	37,900 sq ft / 29,400 cu yds
Highest pre-treatment TVOC concentration	7,735 mg/kg	1,157 mg/kg
Treatment of saturated soil	Minimal	Yes, in the recharge basin
Number and type of heater wells	178 vertical wells	256 vertical wells plus 50 angled wells
Power requirements	4,087,000 kWh	11,800,000 kWh
Surface features of treatment area	Relatively flat, contiguous surface with no impediments to access No utilities to redirect/protect	Recharge basin and skatepark difficult to access for drilling due to elevation changes and sloped areas
Hydrogeology and water management	Limited surface water management required	Recharge basin receives large quantities of stormwater that will affect remedy effectiveness
Security	Treatment area within locked ballfield fence. Not in public areas.	Multiple treatment areas will require new security measures. Near public areas (tennis courts and skatepark).

Design Challenges / Potential Solutions

Stormwater Flow into Recharge Basin:



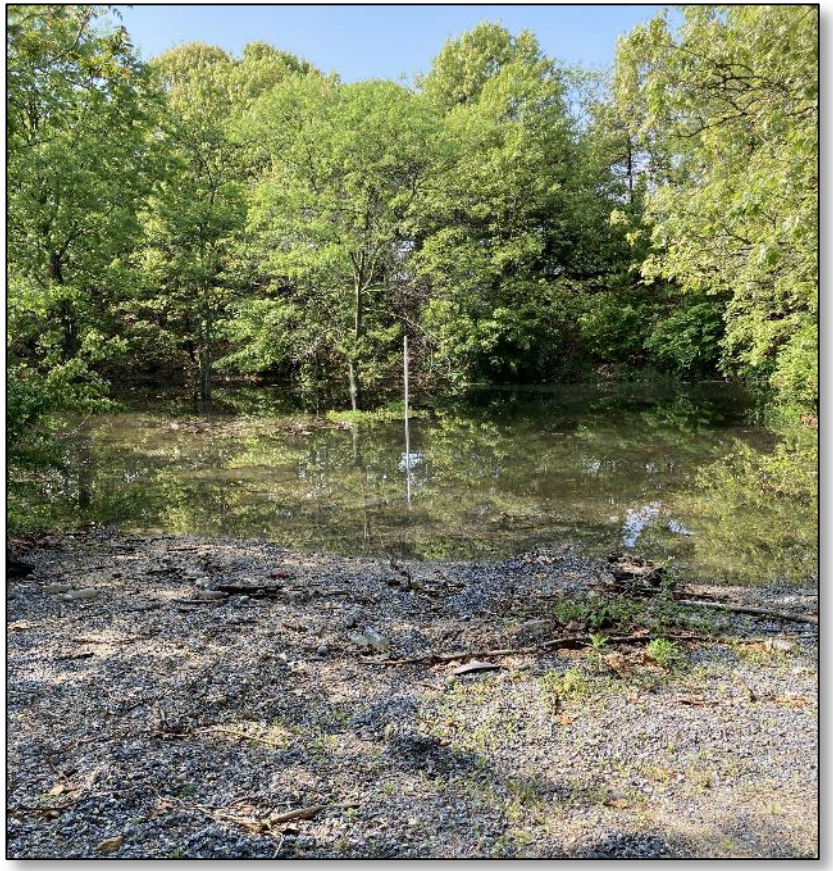


Design Challenges / Potential Solutions

Stormwater Flow into Recharge Basin

Challenge: Up to 400,000 gallons of water may be discharged into the TTZ during rain events, if water is not controlled. Influx of stormwater into recharge basin will percolate through the heated zone and affect the remedy as follows:

- Cool the heated zone, and reduce effectiveness of heating
- Flood VEWs, and reduce capture of VOC vapors and steam
- Pick up contaminants mobilized by heating and impact or recontaminate the perched water and possibly the underlying groundwater.



Design Challenges / Potential Solutions

Stormwater Flow into Recharge Basin

Solution(s): Divert stormwater to another location, equip VEWs with pumps to minimize flooding

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Design Challenges / Potential Solutions

Power Requirements:

Challenge: Larger heated volume requires power beyond what is currently available (11M kWh vs 4M kWh)

Solution: Coordinate an additional metered service with PSE&G

Equipment Capacity:

Challenge: Larger heated volume requires larger extraction equipment (1,800 scfm vs 1,100 scfm)

Solution: Design and implement Tier 1 system modifications to increase extraction and treatment capacity

Phase 2 ISTR Conceptual Schedule

Phase of Work	Activity	Schedule[1/]
Initial Construction Activities	Work plan for site prep and ISTR well installation	Q3/22
	Site prep / drill treatment points	Q3/22-Q1/23
	Work plan for subsurface piping and electrical service installation	Q3/22
	Install buried process piping & electrical service	Q4/22
Remedy Design	Resolve design challenges	Q3/22-Q4/22
	Submit Draft Remedial Action Work Plan Addendum (RAWPA)	Q4/22
	Incorporate DEC/TOB comments & submit revised RAWPA	Q1/23
Remedy Construction & Operations	Complete ISTR construction	Q2/23
	Remedial system operation	Q2/23-Q4/23
	Post-treatment confirmation sampling	Q4/23
	Equipment removal & site restoration	Q1/24

[1/] The schedule assumes no delays in task implementation caused by:

- Local, State, or Federal Directives and Orders restricting travel or business operations related to COVID-19
- Obtaining site access agreements and required permits
- DEC/DOH/TOB work plan reviews and possible approvals
- Actions or involvements of other regulatory/government agencies
- Availability of subcontractors
- Weather and other force majeure events
- Additional characterization required beyond locations and depths identified in applicable work plans
- Other project-related conditions or events beyond the control of Northrop Grumman

Q&A