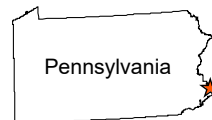


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**Sources:**

Aerial Imagery: Pennsylvania Spatial Data Access Web Service dated 2018.

Topographic Map: USGS The National Map Web Service.

Quadrangle: Lambertville, NJ

**verdantas**

Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Release Location Map**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number  
006.0000034328

Date  
08/2025

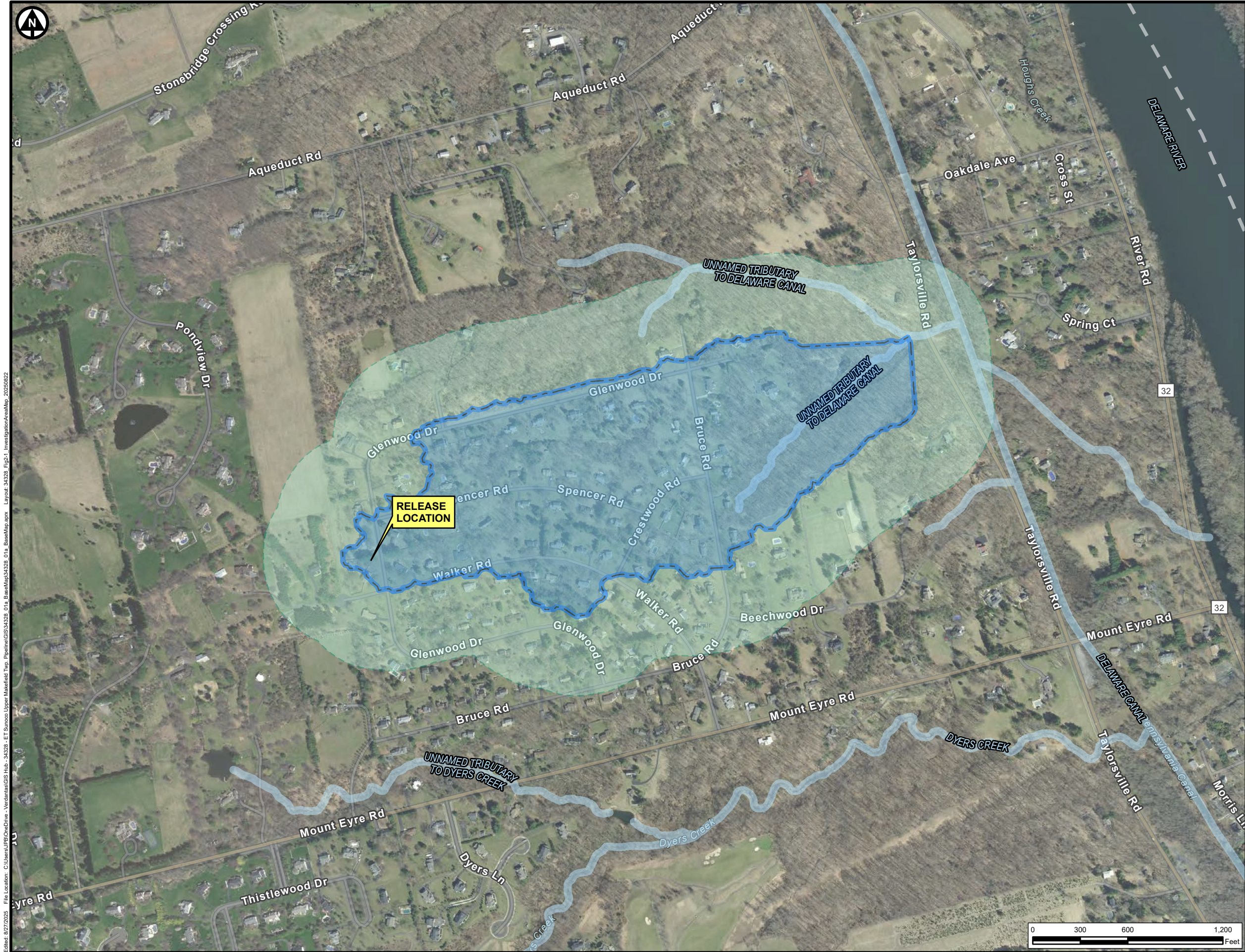
Author  
JPB

Scale  
1 in = 2,000 ft

Figure

**1-1**





Edited: 8/27/2025 File Location: C:\Users\JPB\OneDrive - Verdantas\GIS Hub - 34228 - ET Sumcoo Upper Makefield Twp. Pipeline\GIS\34228 01a BaseMap.aprx Layout: 34228 Fig2-1 Investigation Area Map 20250822

Produced Using Esri's ArcGIS Software

LEGEND

- Catchment/Drainage Area
- Catchment/Drainage 500' Buffer

**Note:**  
The aerial photo was acquired from the Pennsylvania Spatial Data Access (PASDA) web service. Aerial photography dated 2018.

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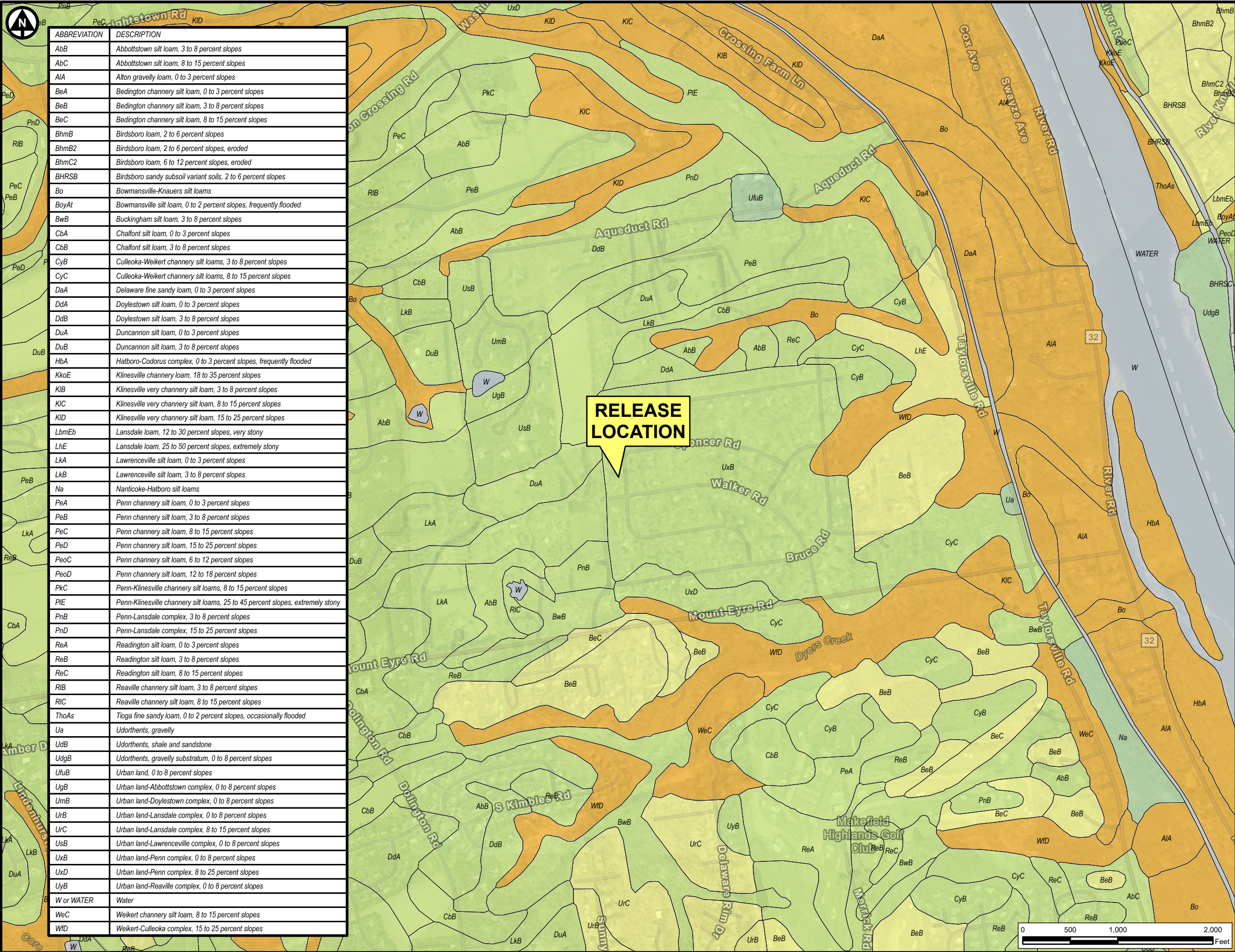
Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

Investigation Area Map

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 600 ft
Figure	2-1





SOIL CLASSIFICATION

- Alfisols
- Entisols
- Inceptisols
- Ultisols
- Bodies of Water
- No Soil
- Data Not Available

NOTE: Soils data provided by the US Department of Agriculture (USDA) web service, last accessed August 2025.

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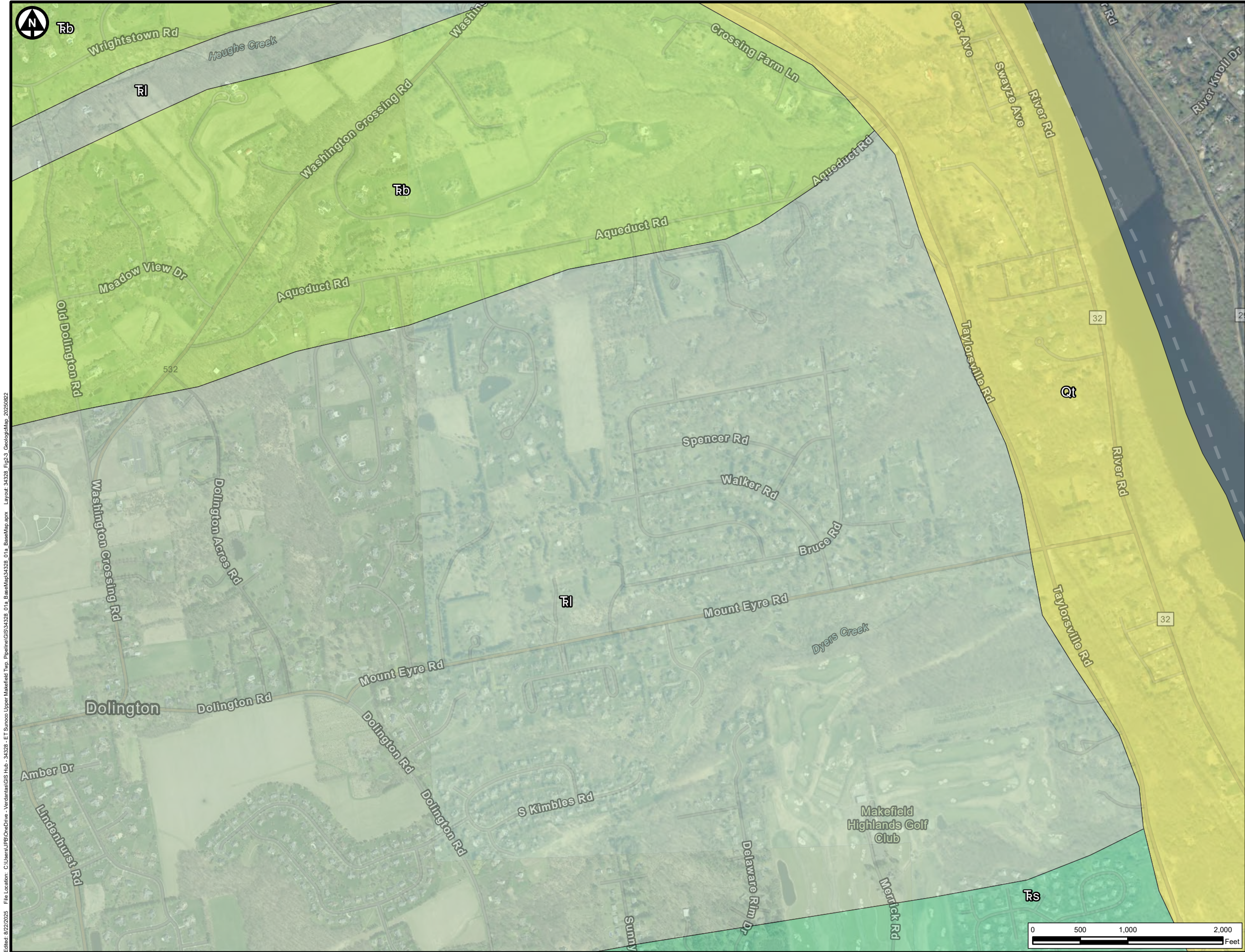
Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

USDA Soil Map





Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 1,000 ft
Figure	2-2





GEOLOGIC FORMATION

-  Trenton Gravel
-  Brunswick Formation
-  Lockatong Formation
-  Stockton Formation

NOTE: Bedrock geology provided by the Pennsylvania Department of Conservation and Natural Resources (PA DCNR) web service, last accessed August 2025.

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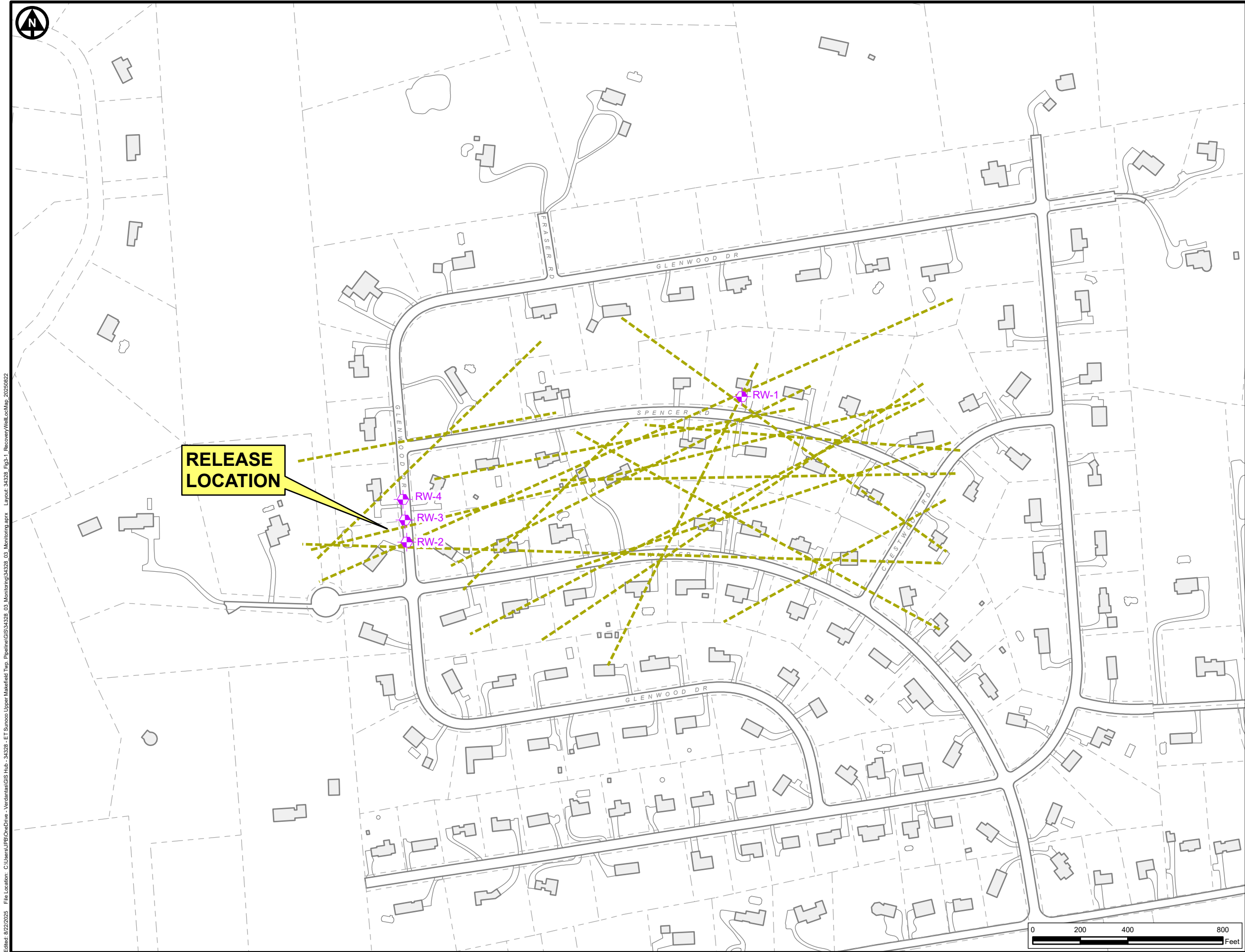
Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Regional Geologic Map**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 1,000 ft
Figure	<b>2-3</b>





LEGEND

- Recovery Well
- ERI Anomaly Location and Inferred Alignment
- Parcel Boundary (approx.)
- Existing Building
- Edge of Roadway (approx.)

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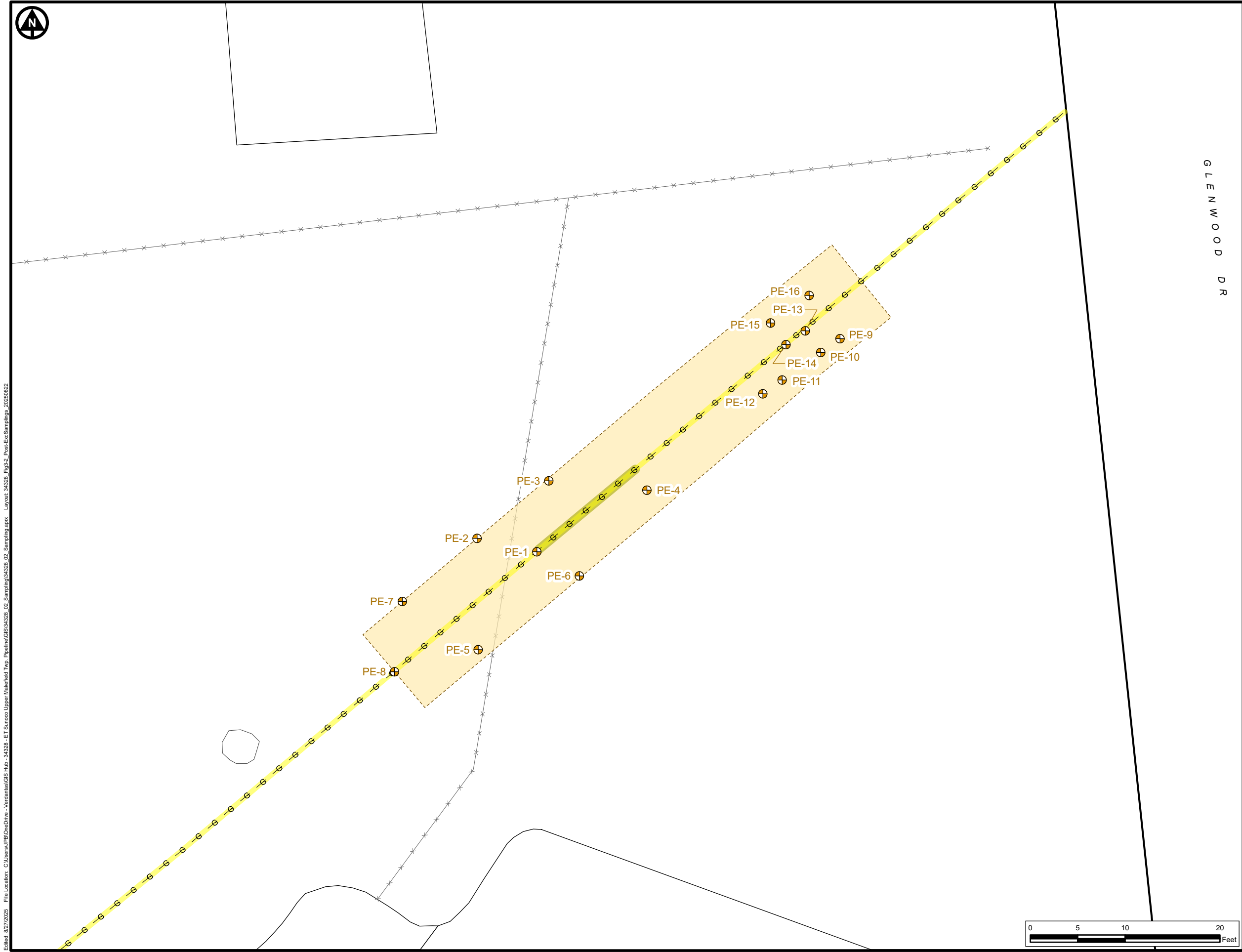


Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

Recovery Well  
Location Map

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 400 ft
Figure	3-1

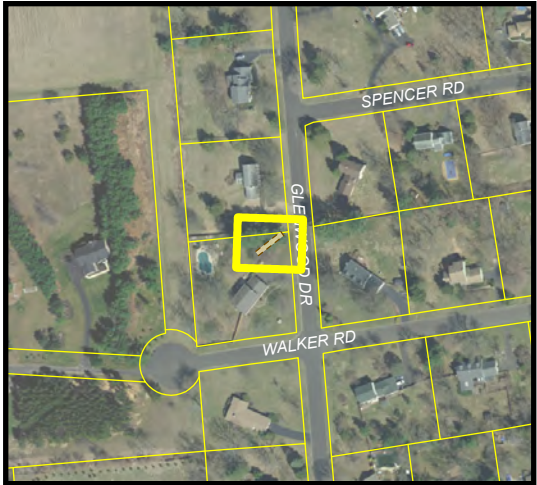


LEGEND

- Post-Excavation Soil Sample (February 2025)
- Gas Line
- Gas Line Replacement Segment
- Excavation Area
- Existing Building
- Edge of Roadway (approx.)
- Fence (approx.)

**Note:**  
The aerial photo below was acquired from the Pennsylvania Spatial Data Access (PASDA) web service. Aerial photography dated 2018.

EXCAVATION LOCATION MAP (1"=500')



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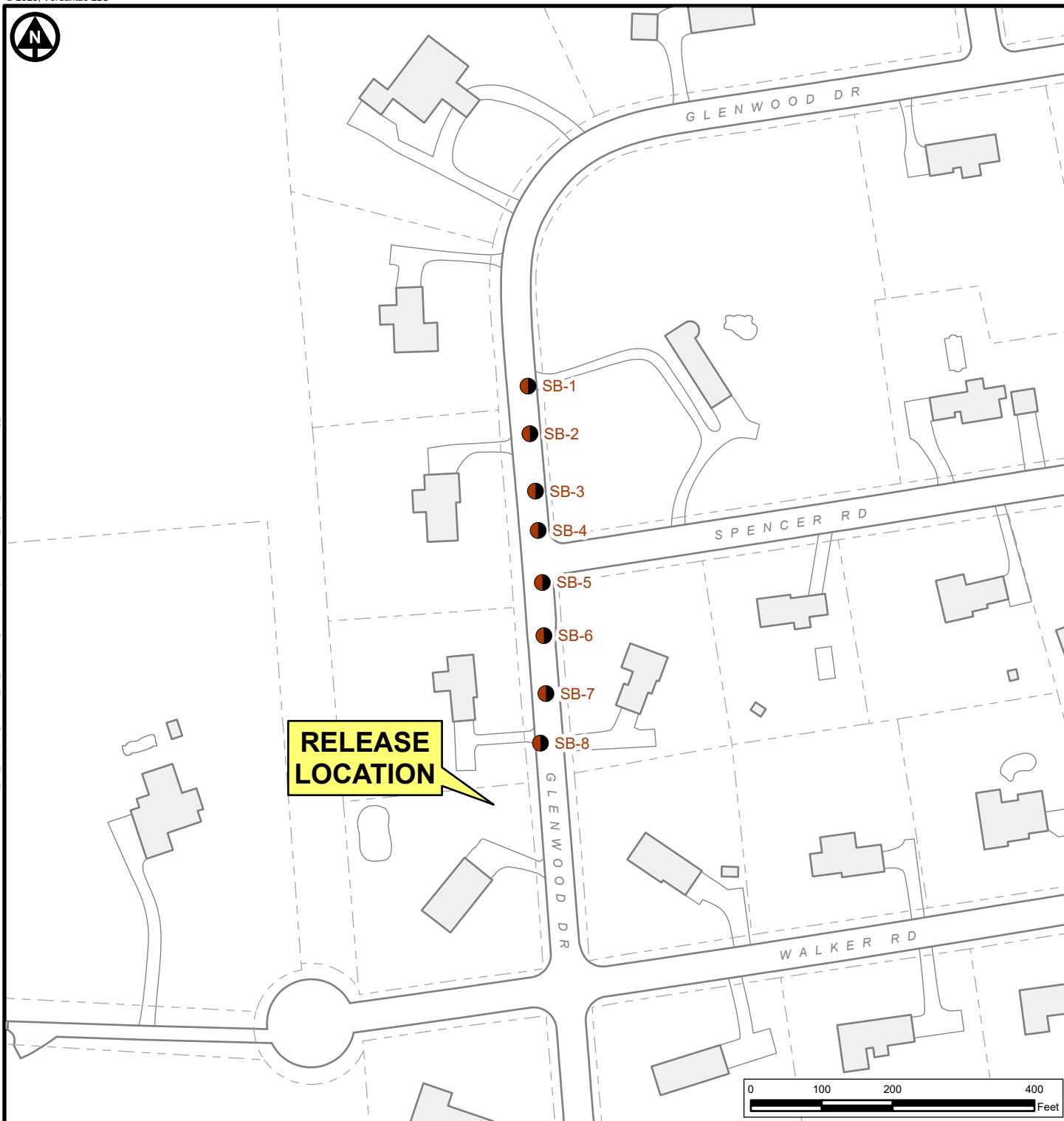


Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

Soil Excavation Map with  
Post-Excavation Samples

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 10 ft
Figure	3-2



**LEGEND**

- Soil Boring (February 2025)
- Parcel Boundary (approx.)
- Existing Building
- Edge of Roadway (approx.)

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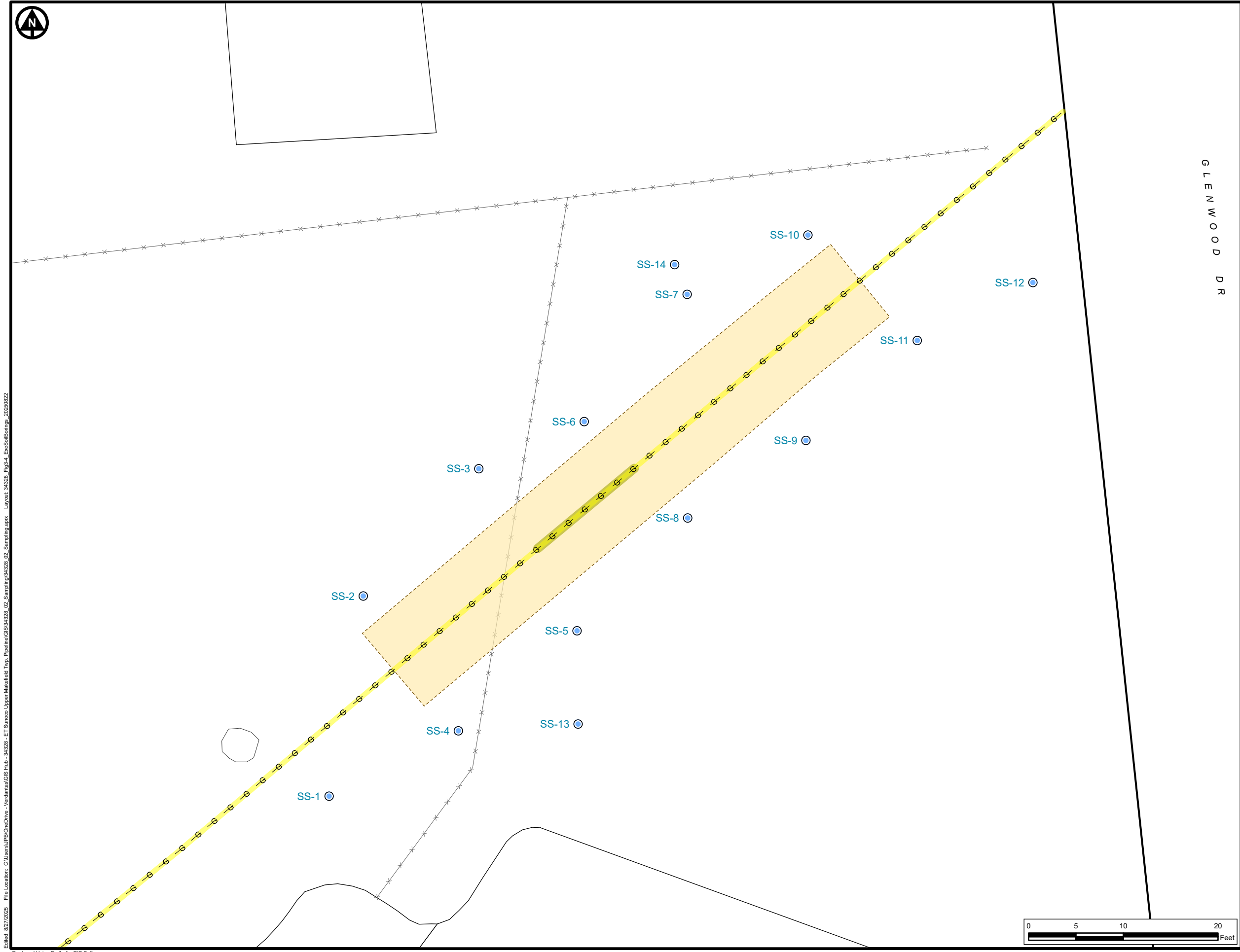
**verdantas**

Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Reconnaissance Soil Boring  
Location Map**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 200 ft
Figure	<b>3-3</b>



LEGEND

- Soil Sample Location (June 2025)
- Gas Line
- Gas Line Replacement Segment
- Excavation Area
- Existing Building
- Edge of Roadway (approx.)
- Fence (approx.)

**Note:**  
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EXCAVATION LOCATION MAP (1"=500')



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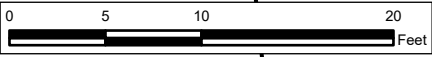


Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

Excavation Area Soil Boring  
Location Map


Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 10 ft
Figure	3-4





REDACTED



Twin Oaks - Newark 14" Diameter Pipeline LNAPL Incident: Site Characterization Work Plan	Project Number	006.0000034328
	Date	08/2025
	Author	JPB
	Scale	1 in = 1,000 ft
	Figure	3-5
Potable Well Locations with POET Systems Installed		
Upper Makefield Township Bucks County, Pennsylvania		



REDACTED

REDACTED



Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Locations of  
Monitored and Sampled  
Potable Supply Wells**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number  
006.0000034328

Date  
08/2025

Author  
JPB

Scale  
1 in = 1,000 ft

Figure

**3-6**





#### LEGEND

- Shallow Monitoring Well
- Shallow Monitoring Well Installed (Survey Data Not Yet Received)
- Deep Monitoring Well
- Deep Monitoring Well Installed (Survey Data Not Yet Received)
- Parcel Boundary (approx.)
- Existing Building
- Edge of Roadway (approx.)

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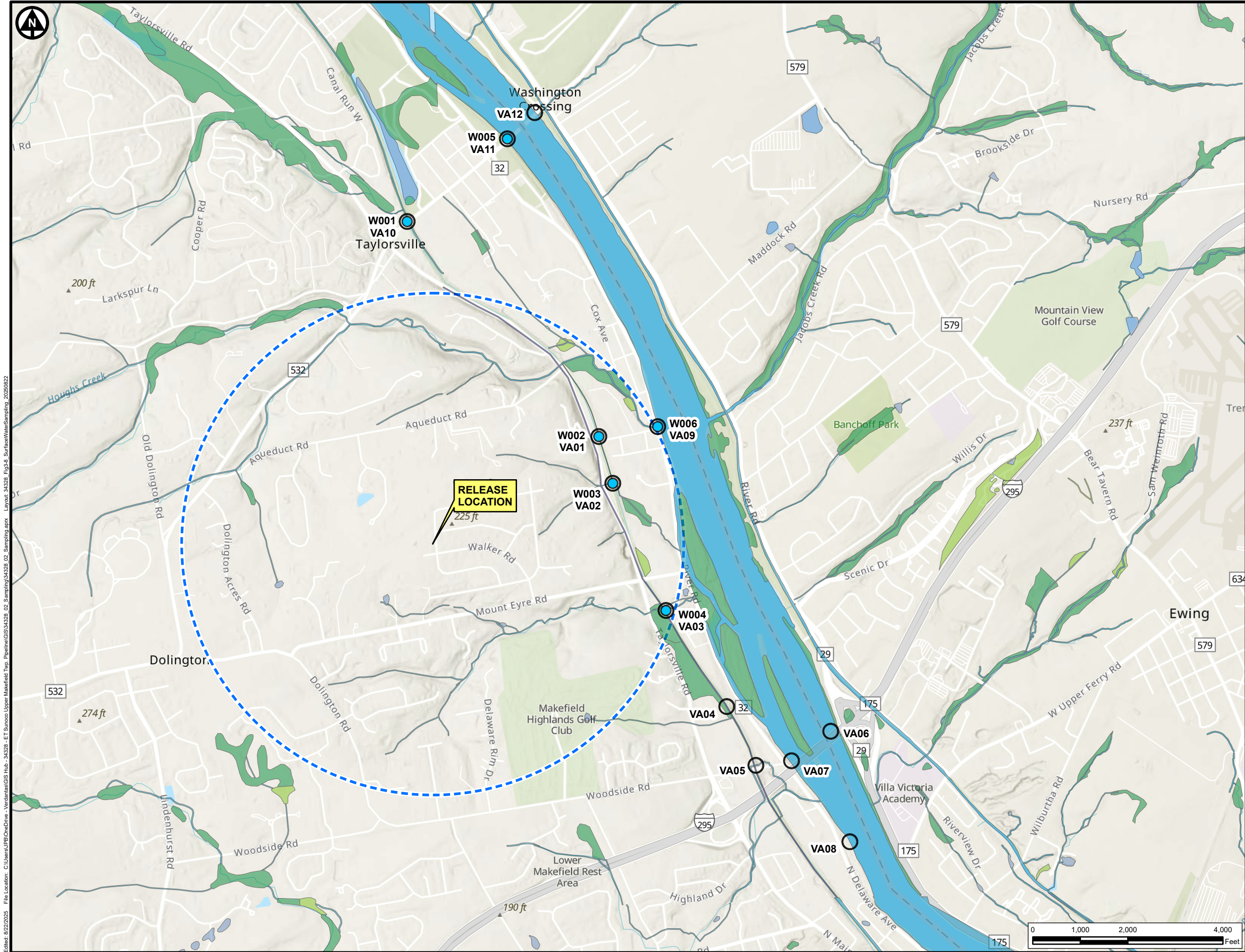
Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

### Locations of Monitoring Wells

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	09/2025
Author	JPB
Scale	1 in = 400 ft
Figure	3-7





LEGEND

- Surface Water Sample
- Visual Assessment Location
- One Mile Radius

WETLANDS

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

Topographic Base Map from Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

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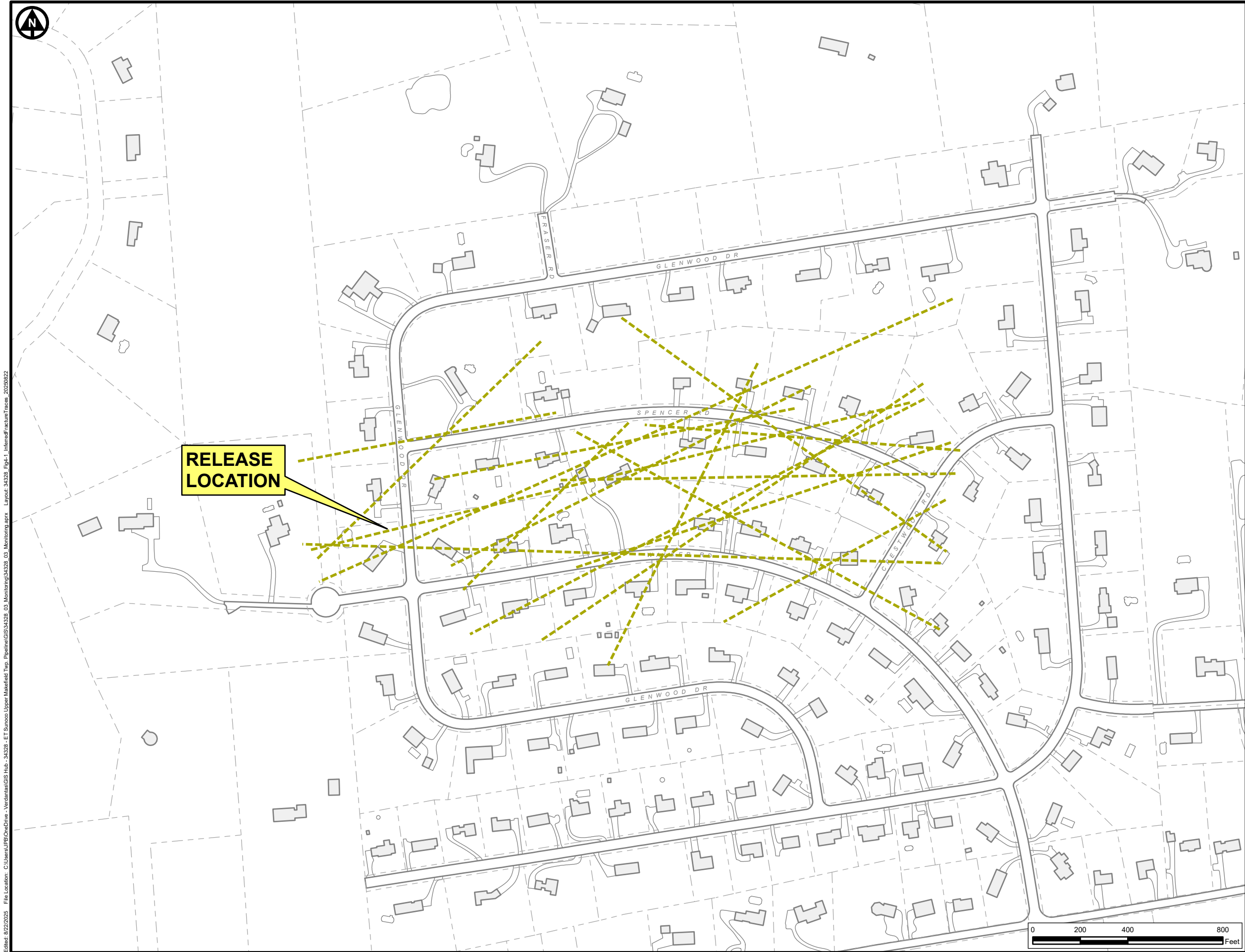
Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

Surface Water  
Visual Assessment and  
Sampling Location Map

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 2,000 ft
Figure	3-8





**LEGEND**

- ERI Anomaly Location and Inferred Alignment
- - - Parcel Boundary (approx.)
- Existing Building
- Edge of Roadway (approx.)

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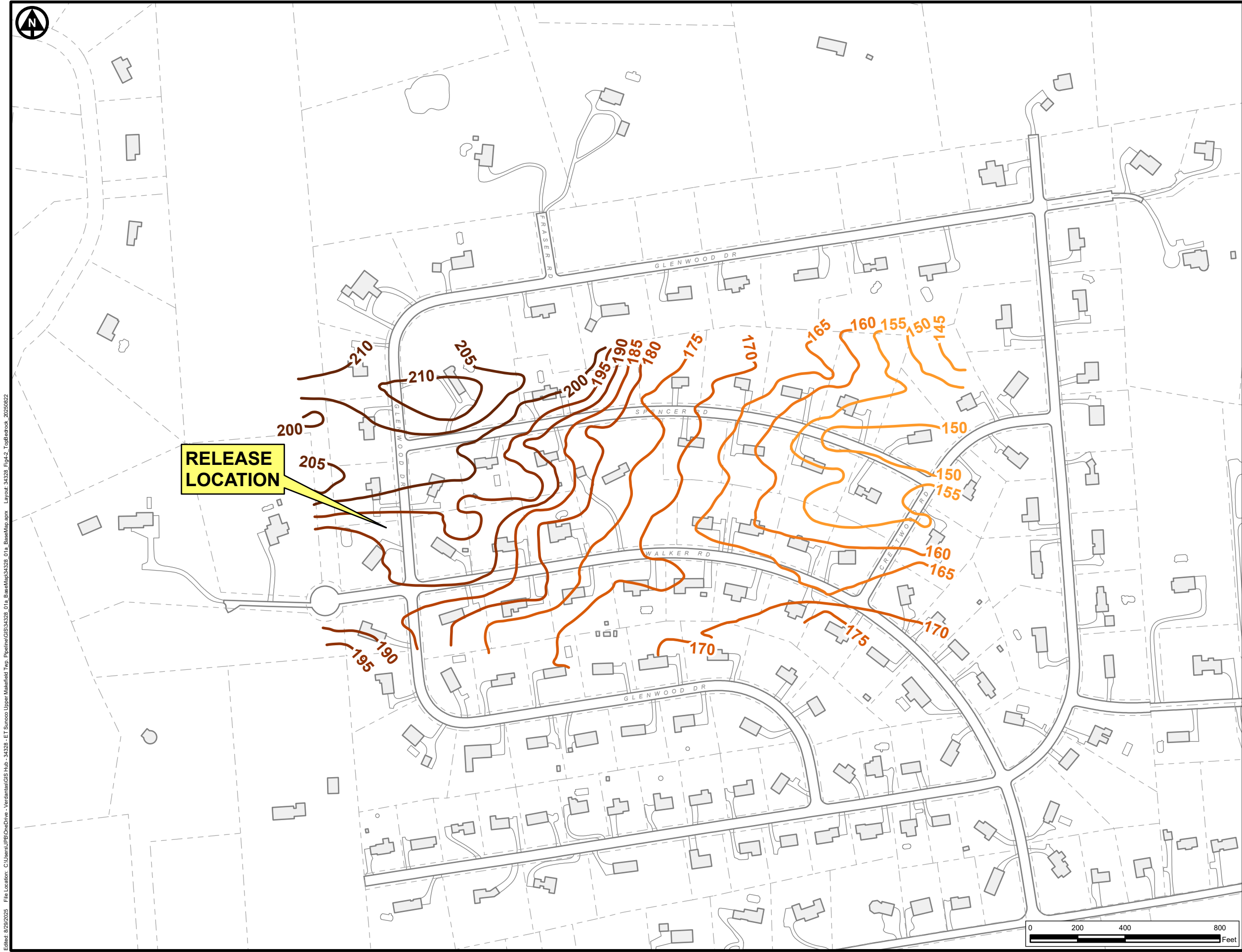
Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Inferred Fracture Traces  
from ERI**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 400 ft
Figure	4-1





**LEGEND**

- Parcel Boundary (approx.)
- Existing Building
- Edge of Roadway (approx.)

**TOP OF BEDROCK ELEVATION**

- Less Than 155'
- 155' to 165'
- 165' to 175'
- 175' to 185'
- 185' to 195'
- Greater Than 195'

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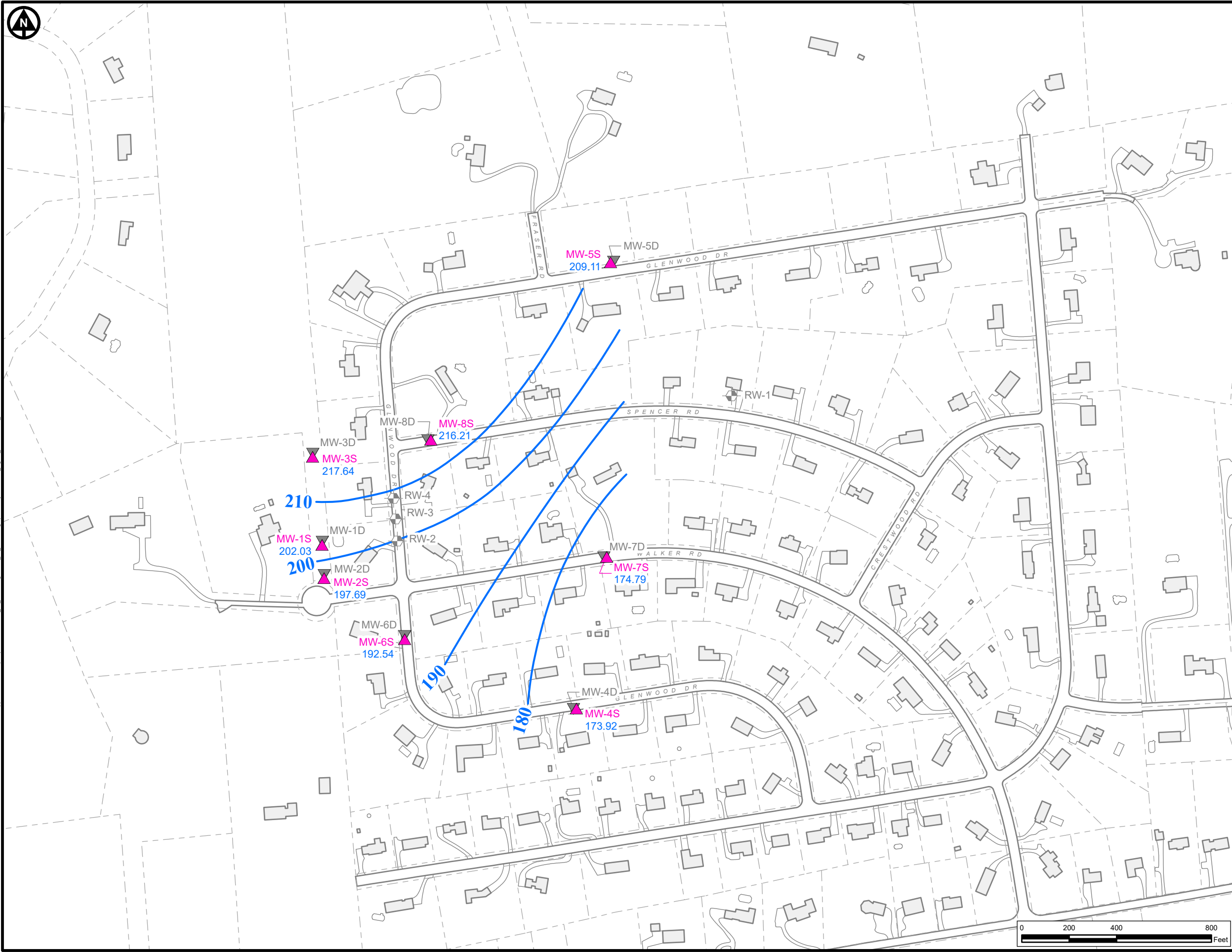
Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Top of Bedrock  
Elevation Map  
from Seismic Refraction**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 400 ft
Figure	<b>4-2</b>





- LEGEND**
- Shallow Monitoring Well
  - Deep Monitoring Well
  - Recovery Well
  - Groundwater Elevation Contour (feet amsl)
  - 209.11 Groundwater Elevation (feet amsl)
  - Parcel Boundary (approx.)
  - Existing Building
  - Edge of Roadway (approx.)

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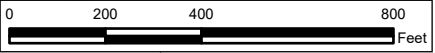


Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Groundwater Elevation Contour Map  
Shallow Monitoring Wells  
August 13, 2025**

Upper Makefield Township  
Bucks County, Pennsylvania


Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 400 ft
Figure	4-3





REDACTED

REDACTED



Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**LNAPL Sampling Results  
(Historical vs. August 2025)**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.000034328
Date	08/2025
Author	JPB
Scale	1 in = 300 ft
Figure	<b>4-4</b>



REDACTED

REDACTED



Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Historical Aggregate VOC Detections  
in Potable Wells**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number  
006.0000034328

Date  
08/2025

Author  
JPB

Scale  
1 in = 1,000 ft

Figure  
**4-5**



REDACTED

REDACTED



Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Recent VOC Detections  
in Potable Wells**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 1,000 ft
Figure	<b>4-6</b>



REDACTED

REDACTED



Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Historical Aggregate  
Lead Detections  
in Potable Wells**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number  
006.0000034328

Date  
08/2025

Author  
JPB

Scale  
1 in = 1,000 ft

Figure  
**4-7**



REDACTED

REDACTED



Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

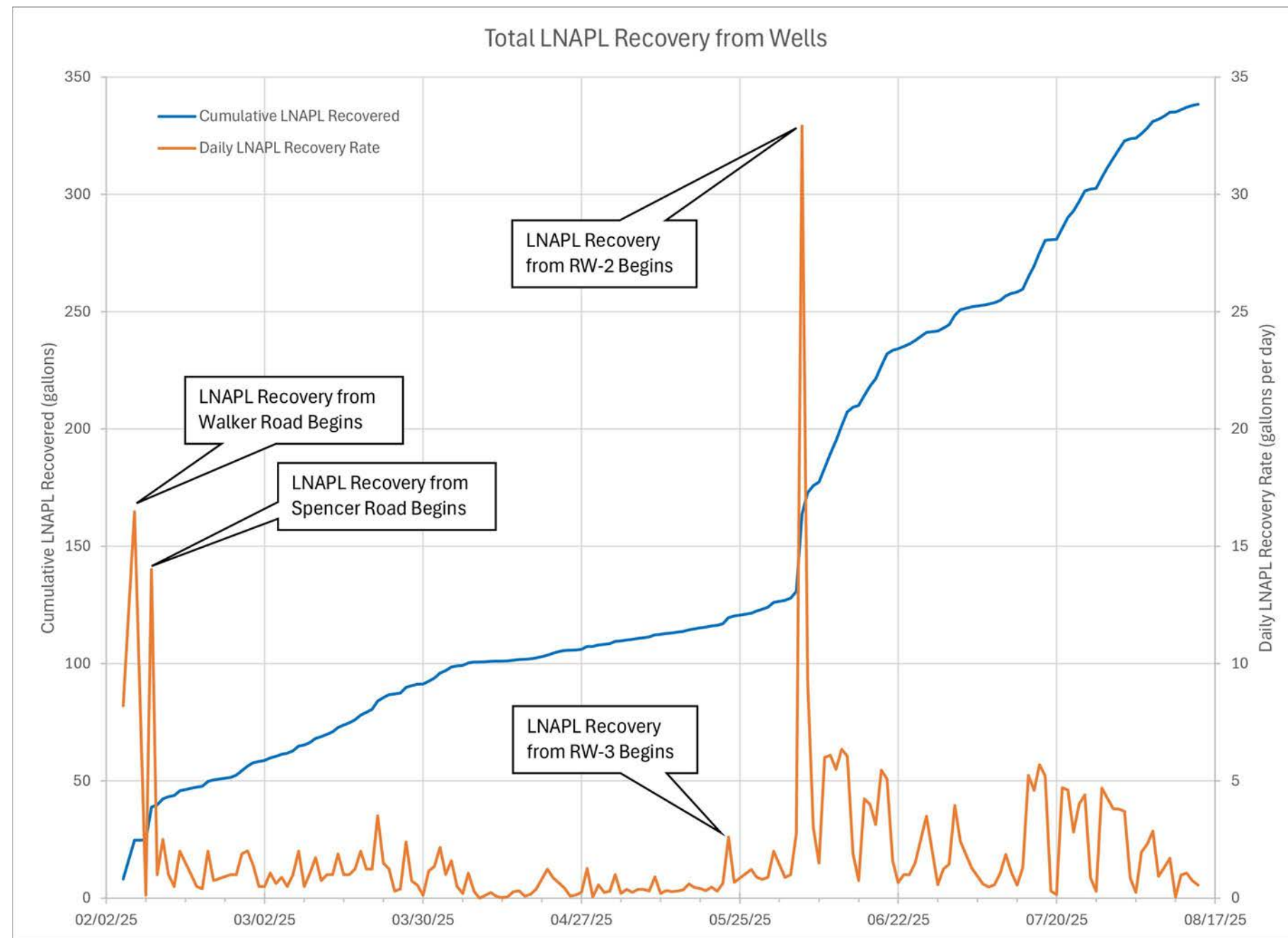
**Recent Lead Detections  
in Potable Wells**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	08/2025
Author	JPB
Scale	1 in = 1,000 ft
Figure	4-8



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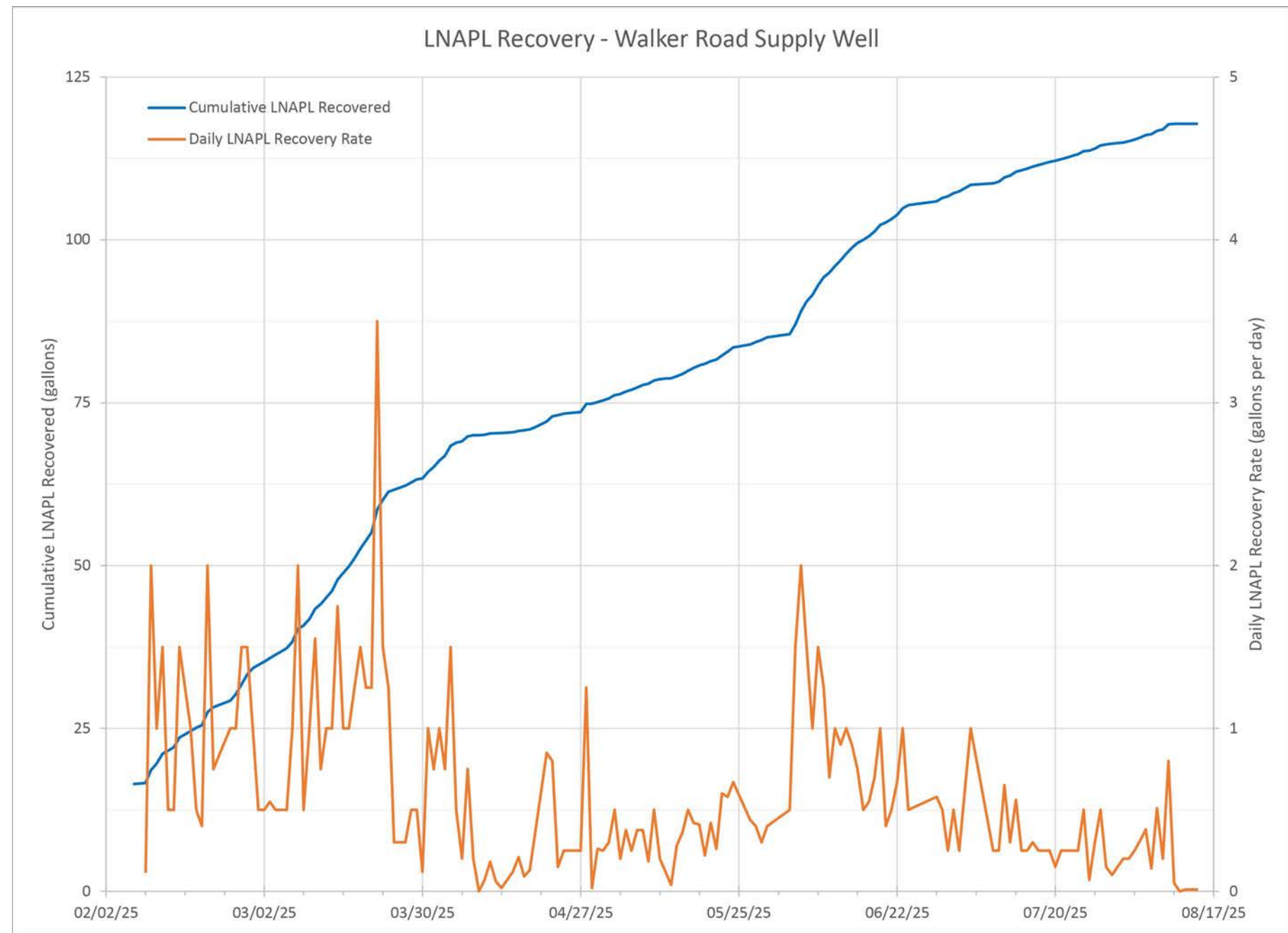
Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**Total LNAPL Recovery  
From Wells**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	09/02/2025
Author	JPB
Scale	NTS
Figure	5-1

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Note: LNAPL Removal Rate does not depict 16.48 gallons of LNAPL removed on February 7, 2025

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Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**LNAPL Recovery  
Walker Road Supply Well**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number  
006.0000034328

Date  
09/02/2025

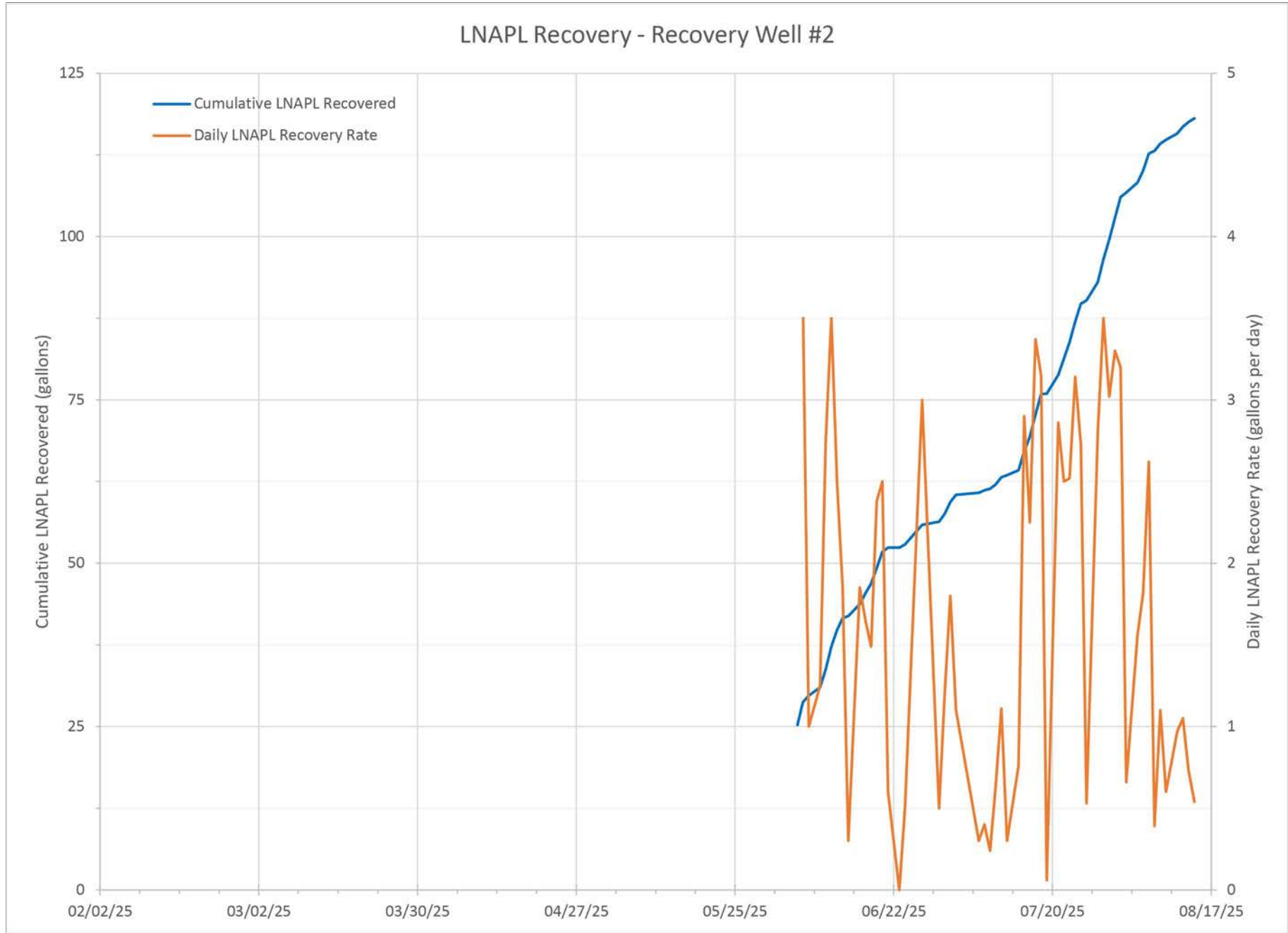
Author  
JPB

Scale  
NTS

Figure  
**5-2**



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Note: LNAPL Removal Rate does not depict 25.25 gallons of LNAPL removed on June 5, 2025

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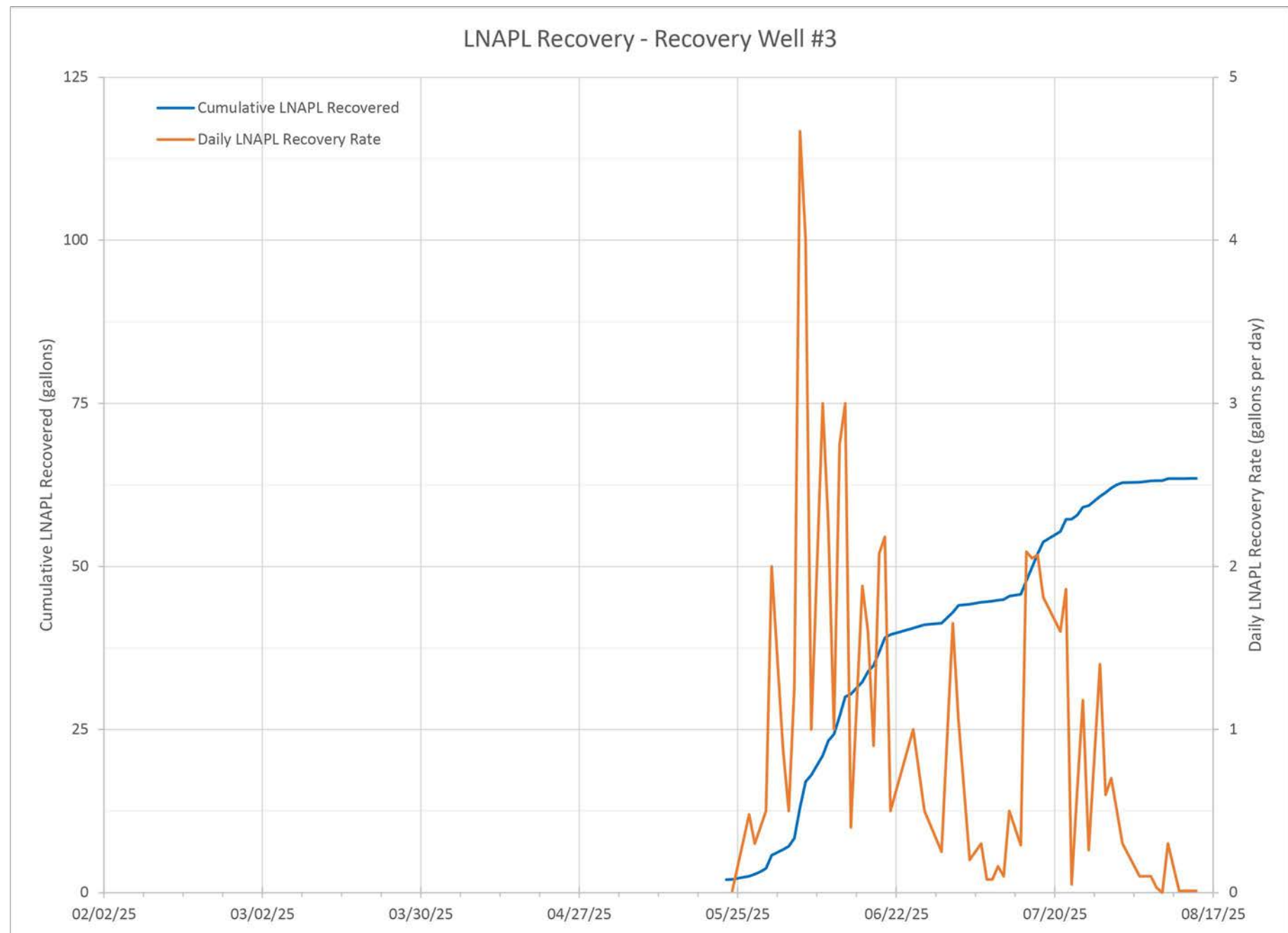
Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**LNAPL Recovery  
Recovery Well #2**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number	006.0000034328
Date	09/02/2025
Author	JPB
Scale	NTS
Figure	5-3

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Note: LNAPL Removal Rate does not depict 2.0 gallons of LNAPL removed on May 23, 2025

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Twin Oaks - Newark 14" Diameter Pipeline  
LNAPL Incident: Site Characterization Work Plan

**LNAPL Recovery  
Recovery Well #3**

Upper Makefield Township  
Bucks County, Pennsylvania

Project Number  
006.0000034328

Date  
09/02/2025

Author  
JPB

Scale  
NTS

Figure  
**5-4**