Fort Monmouth
Oceanport and Monmouth County, New Jersey
Parcel 79 Work Plan Addendum for Former Storage Tank Sites
Date: February 2016

1.0 PURPOSE

The purpose of this Parcel 79 Work Plan is to outline the site-specific Scope of Work (SOW) for the investigation of former underground storage tank (UST) and above-ground storage tanks (AST) sites within Parcel 79 at Fort Monmouth. In general, the scope consists of supplemental soil and groundwater sampling at select UST and AST sites to assess the potential for impacts to groundwater, as requested by the New Jersey Department of Environmental Protection (NJDEP) in their comment letter dated August 25, 2015. The field activities will involve:

- Advancement of approximately 10 shallow soil borings using a Geoprobe rig to depths below shallow groundwater, and collection of soil samples from select boring intervals for chemical analysis of petroleum constituents.
- Installation of temporary monitor wells within approximately 16 Geoprobe borings, and collection of "grab" groundwater samples for chemical analysis of petroleum constituents.
- Re-development and sampling of 3 existing monitor wells for chemical analysis of petroleum constituents.

Additional details on the rationale for the proposed work are provided in Parsons response to NJDEP's comment letter dated February 9, 2016.

2.0 REFERENCE DOCUMENTS

HEALTH AND SAFETY - All Site personnel are required to read, understand, and comply with the safety guidelines in the Accident Prevention Plan (APP) including the Site Health and Safety Plan (SHASP), which is included as Appendix A of the APP.

FIELD PROCEDURES – The detailed field procedures to be used for the activities described in this sampling plan are described in the March 2013 Final Sampling and Analysis Plan (SAP).

3.0 SITE BACKGROUND

Parcel 79 is located within the eastern portion of the Main Post at Fort Monmouth, just east of Oceanport Avenue (**Figure 1**). Available information for multiple USTs at Parcel 79 was previously provided to NJDEP in the Army's submittal dated April 22, 2015 and entitled *Underground Storage Tanks Within ECP Parcel 79, Fort Monmouth, New Jersey*. The NJDEP responded in their letter dated August 25, 2015 approving No Further Action (NFA) for some USTs, but requiring assessment of groundwater at other UST sites prior to determining if NFA was appropriate. NJDEP's rationale for requiring additional

groundwater assessment included the potential for soil contamination extending to within 2 ft of or into groundwater.

One round of depth-to-water measurements was previously collected from multiple existing monitor wells within Parcel 79 in October 2015 to support this supplemental field evaluation (see **Figure 2**). Groundwater flow directions are interpreted to be towards the northeast in the northern portion, towards the southeast in the southern portion, and towards the east in the central portion of Parcel 79.

4.0 SAMPLING LOCATIONS

General locations for additional sampling were identified in the Army's recent responses to NJDEP comments, and are shown on **Figure 1**. A description of the field sampling and analytical activities to be performed is presented below. A summary of the field sampling and analytical activities is presented in **Table 1**.

4.1 Area 75 Above-Ground Storage Tanks

The NJDEP (2010) guidance entitled "*Protocol For Addressing Extractable Petroleum Hydrocarbons*" specifies contingency analysis for naphthalene and 2-methylnaphthalene in the event that extractable petroleum hydrocarbon (EPH) concentrations exceed 1,000 mg/kg. In their comment letter dated August 25, 2015, NJDEP noted that contingency analysis was not previously performed for soil samples from "AST-B" that had TPH concentrations in excess of 1,000 mg/kg. Therefore, soil and groundwater from two former AST locations (AST-1 and AST-2) in Area 75 will be re-sampled to characterize the current concentrations of constituents in these areas. Additional samples are proposed at four locations (four borings and two temporary wells) as shown on **Figure 3**.

Soil samples will be collected from four Geoprobe® borings (two from the former tank centers, and two downgradient) completed to at least 4 feet below the water table to assess current concentrations and vertical extent of extractable petroleum hydrocarbons (EPH). Three soil samples will be collected from each boring. Previous surface soil samples were collected from 0 to 0.5 ft bgs, but slightly deeper near-surface soil samples will be collected to allow for the potential that some backfill was placed over the site during tank demolition. Samples will be collected from 0.5-1.0 ft bgs, from a deeper 6-inch interval that is below any field evidence of contamination to delineate vertical extent, and from the most contaminated intermediate interval encountered (between 0.5-1.0 ft bgs and the deeper vertical extent sample) based on field evidence (visual, olfactory, [photoionization detector [PID] screening). Each soil sample will be analyzed for EPH and, if necessary, for any contingency analyses (naphthalene and 2-methylnaphthalene) required by Table 2.1 of the Technical Requirements for Site Remediation.

Groundwater samples will be collected from the two Geoprobe® borings located north (downgradient) of the former AST locations, as shown on **Figure 3**. Groundwater from these locations will be sampled using temporary wells within the Geoprobe borings, and then the borings will be abandoned. Each groundwater sample will be analyzed for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) plus tentatively identified compounds (TICs), as specified in Table 2-1 of the NJAC 7:26E Technical Requirements for Site Remediation.

4.2 Multiple Parcel 79 Underground Storage Tanks

NJDEP noted that groundwater assessment was not performed for USTs 437, 440, 441, 444, 445, 448, 449 (where no tank was found), 450, and 451 (**Figure 4**), and for UST 142B (**Figure 5**). Therefore, additional sampling of groundwater is proposed from immediately downgradient of each of these former tank locations. A Geoprobe® boring will be completed to approximately 4 feet below the water table. Groundwater from these locations will be sampled using temporary wells within the Geoprobe borings, and then the borings will be abandoned. Each groundwater sample will be analyzed for VOCs and SVOCs plus TICs.

4.3 USTs 202A and 202D

NJDEP noted that groundwater assessment was not performed for USTs 202A and 202D. Therefore, additional sampling of groundwater is proposed from the vicinity of each former tank location. Soil sampling will also be performed because NJDEP commented that soil contamination encountered at UST 202A could have contributed to impacts to groundwater.

Additional Geoprobe soil sampling is proposed for three locations as shown on **Figure 6**. Each Geoprobe boring will be completed to at least 4 feet below the water table to assess current concentrations and vertical extent of EPH. Three soil samples will be collected from each boring. Samples will be collected from approximately 3.0-3.5 ft bgs (or another interval representative of clean overburden), from a deeper 6-inch interval that is below any field evidence of contamination to delineate vertical extent, and from the most contaminated intermediate interval encountered (between 3.0-3.5 ft bgs and the deeper vertical extent sample) based on field evidence (visual, olfactory, PID screening). Each soil sample will be analyzed for EPH, with additional contingency SVOC analysis for naphthalene and 2-methylnaphthalene in the event that EPH concentrations exceed 1,000 mg/kg.

Groundwater from one downgradient boring location will be sampled using a temporary well within the Geoprobe boring, and then the boring will be abandoned. This groundwater sample will be analyzed for VOCs and SVOCs plus TICs.

Existing monitor well 202MW01 was constructed by the Army at this site in 2011 to monitor groundwater contamination from the UST 202D site, but was never sampled. Well 202MW01 and downgradient well M16MW02 will be re-developed and sampled using the NJDEP low-flow purge and sample method, and analyzed for VOCs and SVOCs plus TICs.

4.4 UST 490

NJDEP noted that groundwater assessment was not performed for UST 490, and that TPH in soil exceeded the residential standard. Therefore, additional sampling of soil and groundwater is proposed at this former tank location.

Additional Geoprobe soil and groundwater sampling is proposed for three locations as shown on **Figure 7**. The purpose of the two Geoprobe locations north of Building 490 is to supplement the existing soil and groundwater analyses for delineation of TPH contamination in excess of soil and groundwater comparison criteria towards the east and north. The purpose of the third Geoprobe location south of Building 490 is for delineation of petroleum contamination in the downgradient direction (south). Each Geoprobe boring will be completed to at least 4 feet below the water table to assess current concentrations

and vertical extent of EPH. Three soil samples will be collected from each boring. Samples will be collected from approximately 2.0-2.5 ft bgs (or another interval representative of clean overburden), from a deeper 6-inch interval that is below any field evidence of contamination to delineate vertical extent, and from the most contaminated intermediate interval encountered (between 2.0-2.5 ft bgs and the deeper vertical extent sample) based on field evidence (visual, olfactory, PID screening). Each soil sample will be analyzed for EPH, with additional contingency SVOC analysis for naphthalene and 2-methylnaphthalene in the event that EPH concentrations exceed 1,000 mg/kg.

Groundwater samples from these three boring locations will be sampled using temporary wells within the Geoprobe borings, and then the borings will be abandoned. Each groundwater sample will be analyzed for VOCs and SVOCs plus TICs.

Existing monitor well 490MW01 was constructed by the Army at this site in 2011 to monitor groundwater contamination from the UST 490 site, but was never sampled. Well 490MW01 will be re-developed and sampled using the NJDEP low-flow purge and sample method, and analyzed for VOCs and SVOCs plus TICs.

5.0 OTHER ITEMS

Additional sampling of soil or groundwater may be performed to further delineate the extent of contamination in excess of applicable regulatory levels, based on the results of the sampling proposed in Section 4.0.

TABLE 1
SAMPLING SUMMARY FOR PARCEL 79 WORK PLAN ADDENDUM
FORT MONMOUTH, NEW JERSEY

Parcel	Location	Field Meter Readings [a/]	VOCs + TICs by Method 8260C [b/]	SVOCs + TICs by Method 8270D [c/]	Non-Fractionated EPH [d/]
Soil					
79	Area 75 ASTs (Figure 3) - 4 soil borings, 3 samples each (assume 1 sample in each boring requires contingency SVOC analysis) [e/]	4	0	4	12
79	USTs 202A and 202D (Figure 6) - 3 soil borings, 3 samples each (assume 1 sample in each boring requires contingency SVOC analysis) [e/]	4	0	3	9
79	UST 490 - 3 soil borings, 3 samples each (assume 1 sample in each boring requires contingency SVOC analysis) [e/]	3	0	3	9
Groundwater					
79	Area 75 ASTs - 2 groundwater samples (Figure 3)	2	2	2	0
79	USTs 437, 440, 441, 444, 445, 448, 449, 450, and 451 (Figure 4) - 1 groundwater sample each	9	9	9	0
79	UST 142B (Figure 5) - 1 groundwater sample	1	1	1	0
79	USTs 202A and 202D (Figure 6) - 3 groundwater samples	3	3	3	0
79	UST 490 - 4 groundwater samples	4	4	4	0
QA/QC samples (see SAP for additional details) [f/]					
Field Duplicates (5% Sampling Frequency per media)		NA [g/]	1	2	2
Matrix Spike (5% Sampling Frequency per media)		NA	1	2	2
Matrix Spike Duplicate (5% Sampling Frequency per media)		NA	1	2	2
Trip Blank (1 per cooler of VOCs per media)		NA	1	0	0
QA Split (5% per media)		NA	1	2	2
Equipment Blank (5% Sampling Frequency per media)		NA	1	2	2
	TOTAL	**NA**	**25**	**39**	**40**

Notes:

NA = not applicable.

TBD = to be determined.

[a/] Field meter readings include, in soil samples: photoionization detector (PID) readings along entire soil column; and in groundwater: PID h pH, temperature, electrical conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), and turbidity.

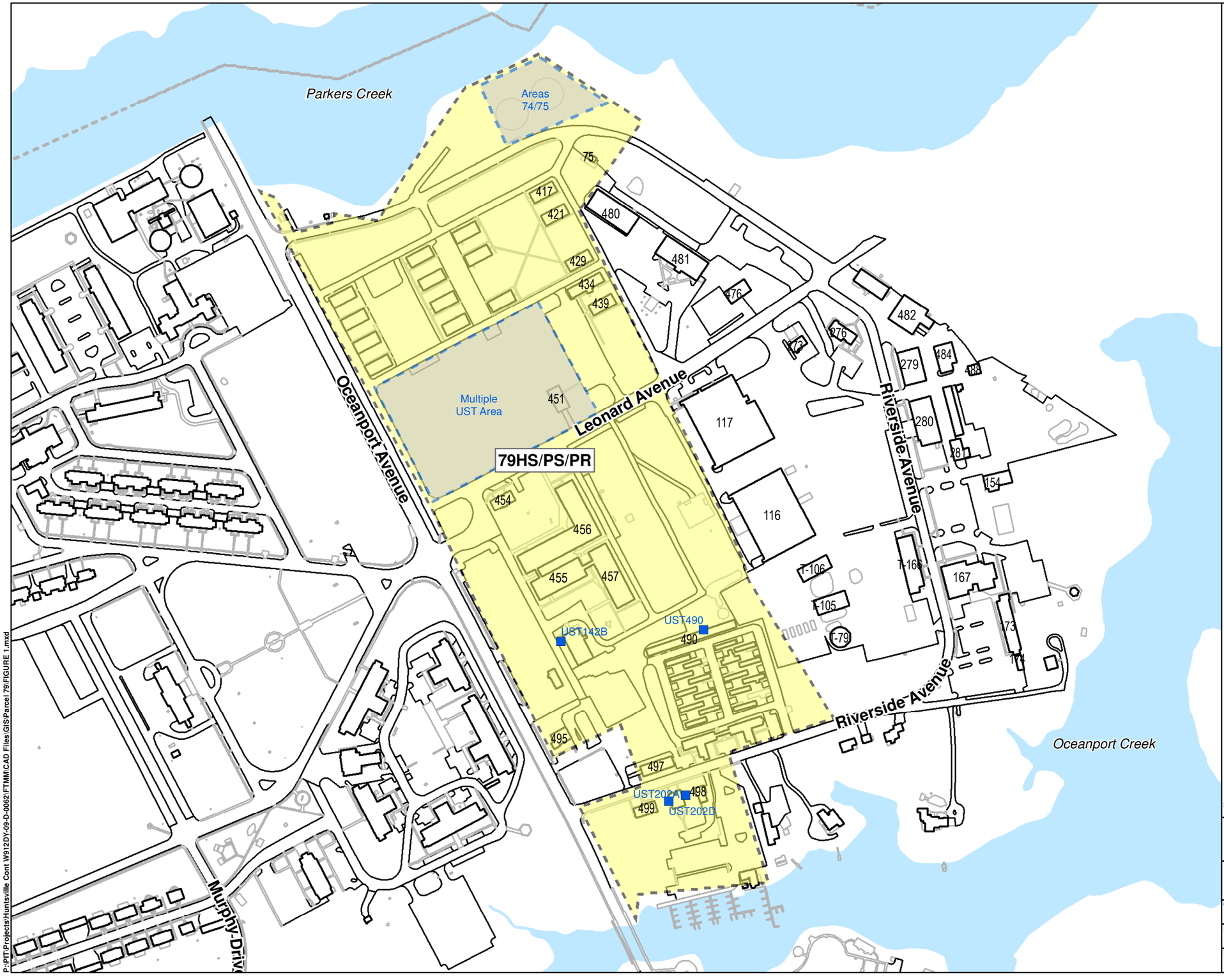
[b/] VOCs = volatile organic compounds; TICs = tentatively identified compounds.

[c/] SVOCs = semivolatile organic compounds; TICs = tentatively identified compounds.

[d/] EPH = extractable petroleum hydrocarbons.

[e/] If any EPH concentrations in soil exceed 1000 mg/kg in any of the site samples, then minimum 25% of the samples where EPH exceeds 1

[f/] QA/QC = quality assurance/quality control; SAP = Sampling and Analysis Plan.



LEGEND:

- Parcel 79 Boundary
- Municipal Boundary
- Multiple UST
- Surface Water Feature
- UST Location

N

1 inch = 300 feet

0 150 300 600 Feet

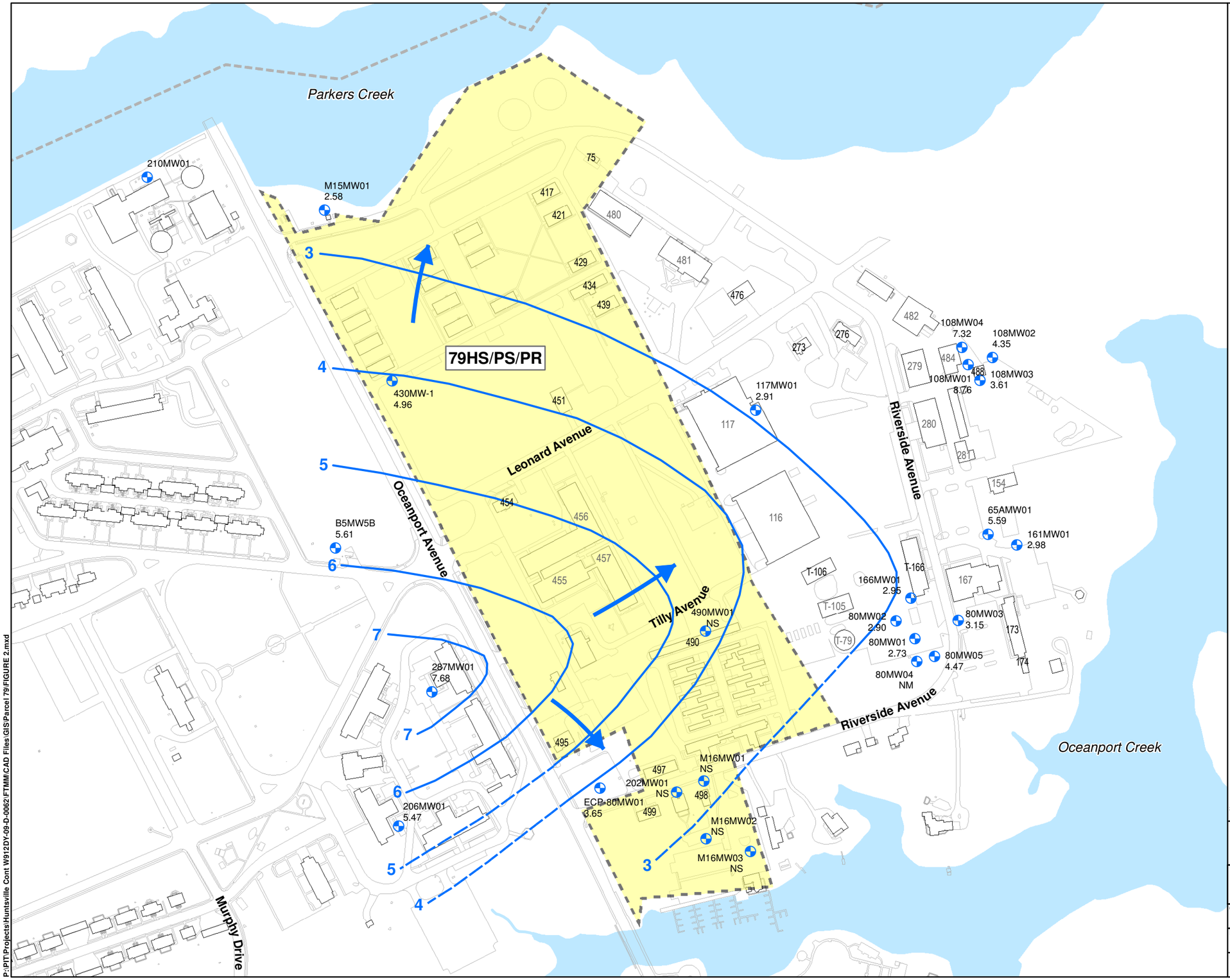
Source: FTMM Supplied CAD, 2013; U.S. Army BRAC, 2008; 2008 SI Report; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey

LAYOUT OF PARCEL 79

CREATED BY: RR	REVIEWED BY: KF
DATE: FEB. 2016	FIGURE NUMBER: FIGURE 1
PROJECT NUMBER: 748810-06010	FILE: FIGURE 1.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\Parcel 79\FIGURE 1.mxd



LEGEND:

- Shallow Monitoring Well
- Parcel 79 Boundary
- Municipal Boundary
- Surface Water Feature
- Grounwater Elevation Contour
- Inferred Groundwater Elevation Contour
- Estimated Groundwater Flow Direction

NOTES:

Groundwater elevations in monitoring wells 482MW01, 482MW02, 108MW01, 108MW02, 108MW03, 108MW04, 65AM01, 161MW01, 80MW03 and 80MW05 were considered anomalous compared to the fluid levels at neighboring wells and were not used to create groundwater contours.

NS = Not Surveyed

NM = Not Measured

N

1 inch = 300 feet

0 150 300 600 Feet

Source: FTMM Supplied CAD, 2013; U.S. Army BRAC, 2008; 2008 SI Report; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey

PARCEL 79 SHALLOW GROUNDWATER CONTOURS - OCTOBER 7, 2015

CREATED BY: RR	REVIEWED BY: KF
DATE: FEB. 2016	FIGURE NUMBER: FIGURE 2
PROJECT NUMBER: 748810-06010	FILE: FIGURE 2.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\Parcel 79\FIGURE 2.mxd

LEGEND:

- Geoprobe Soil Boring
- Temporary Well
- Parcel 79 Boundary
- Municipal Boundary
- Former Above Ground Storage
- Estimated Groundwater Flow Direction

N

1 inch = 50 feet

0 25 50 100 Feet

Source: FTMM Supplied CAD, 2013; U.S. Army BRAC, 2008; 2008 SI Report; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	**Fort Monmouth** **New Jersey**

PROPOSED AREA 75
SAMPLE LOCATIONS

CREATED BY: RR	REVIEWED BY: ME
DATE: FEB. 2016	FIGURE NUMBER: FIGURE 3
PROJECT NUMBER: 748810-06010	FILE: FIGURE 3.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\Parcel 79\FIGURE 3.mxd

LEGEND:

- Parcel 79 Boundary
- Municipal Boundary
- Multiple UST
- Former UST Location
- Proposed Groundwater Sample
- Estimated Groundwater Flow Direction

N

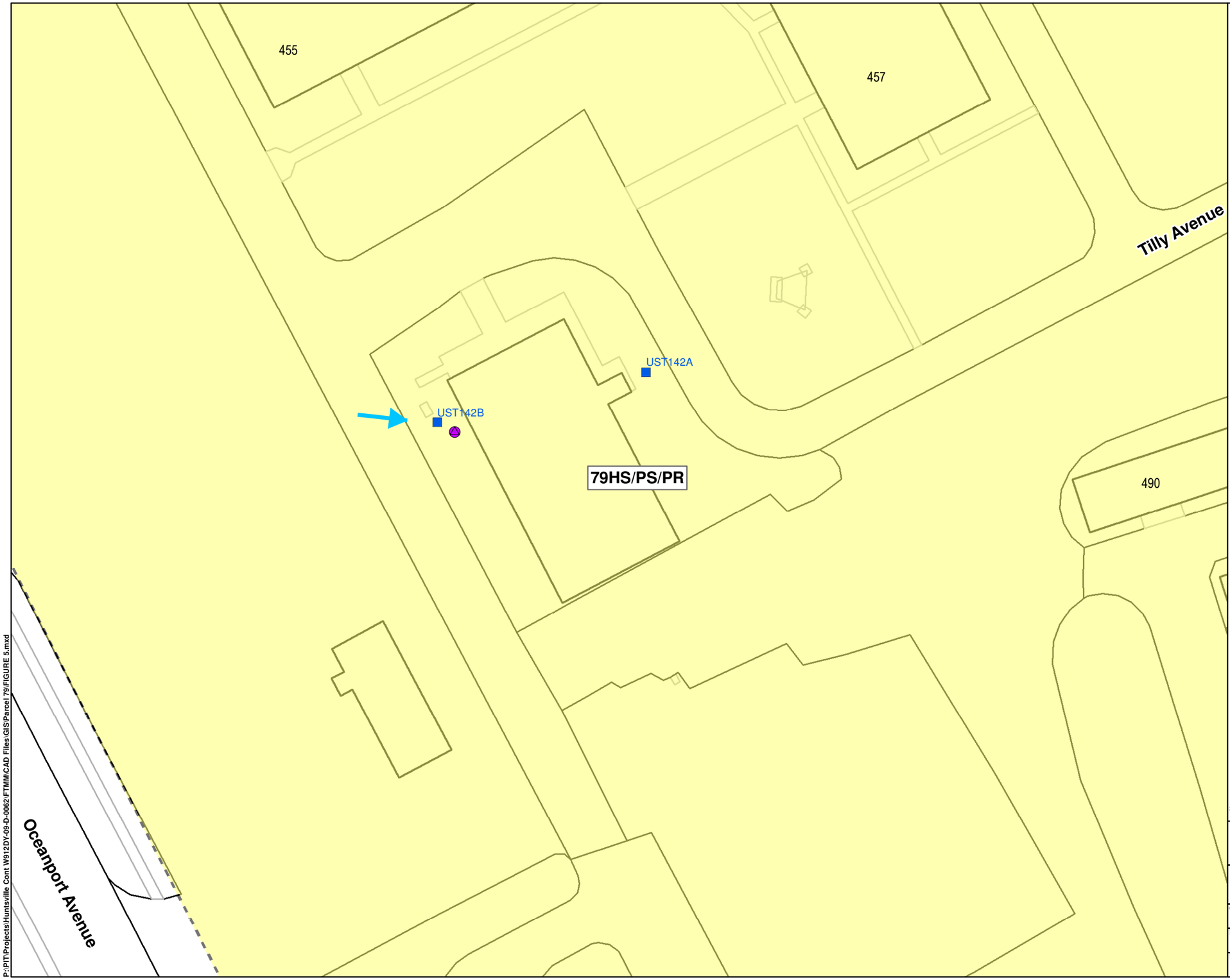
1 inch = 100 feet

0 50 100 200 Feet

Source: FTMM Supplied CAD, 2013; U.S. Army BRAC, 2008; 2008 SI Report; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey
PROPOSED GROUNDWATER SAMPLE LOCATIONS FOR MULTIPLE USTS AT PARCEL 79	
CREATED BY: RR	REVIEWED BY: KF
DATE: FEB. 2016	FIGURE NUMBER: FIGURE 4
PROJECT NUMBER: 748810-06010	FILE: FIGURE 4.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\Parcel 79\FIGURE 4.mxd



LEGEND:

- Parcel 79 Boundary
- Municipal Boundary
- Former UST Location
- Proposed Groundwater Sample
- Estimated Groundwater Flow Direction

N

1 inch = 40 feet

0 20 40 80 Feet

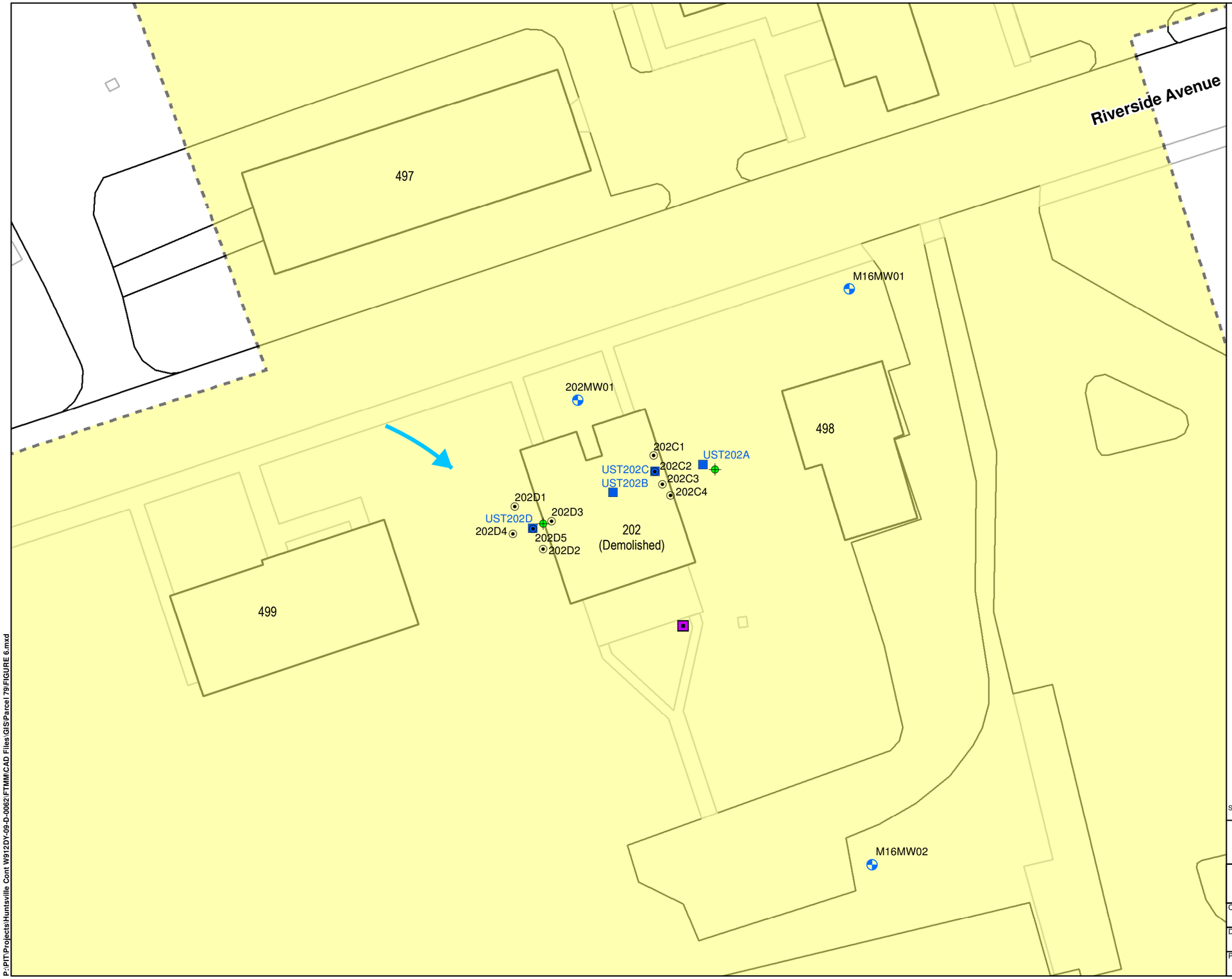
Source: FTMM Supplied CAD, 2013; U.S. Army BRAC, 2008; 2008 SI Report; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	**Fort Monmouth** **New Jersey**

PROPOSED UST142B SAMPLE LOCATION

CREATED BY: RR	REVIEWED BY: KF
DATE: FEB. 2016	FIGURE NUMBER: FIGURE 5
PROJECT NUMBER: 748810-06010	FILE: FIGURE 5.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\Parcel 79\FIGURE 5.mxd



LEGEND:

- Parcel 79 Boundary
- Municipal Boundary
- Shallow Monitoring Well
- Former UST Location
- Proposed Soil Sample
- Proposed Soil and Groundwater Sample
- Estimated Groundwater Flow Direction

N

1 inch = 30 feet

0 15 30 60 Feet

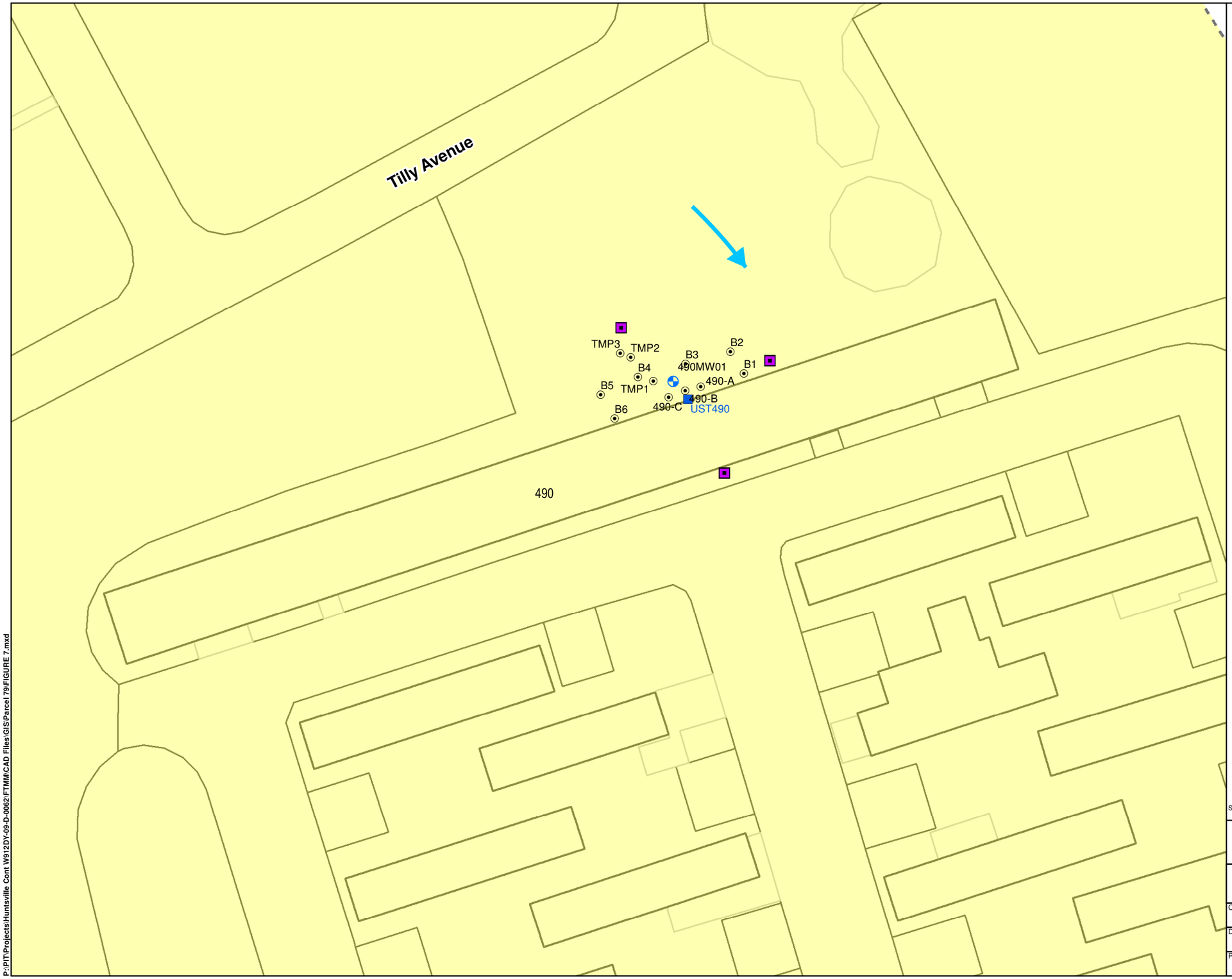
Source: FTMM Supplied CAD, 2013; U.S. Army BRAC, 2008; 2008 SI Report; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	**Fort Monmouth** **New Jersey**

PROPOSED UST202A AND UST202D SAMPLE LOCATIONS

CREATED BY: RR	REVIEWED BY: KF
DATE: FEB. 2016	FIGURE NUMBER: FIGURE 6
PROJECT NUMBER: 748810-06010	FILE: FIGURE 6.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\Parcel 79\FIGURE 6.mxd



LEGEND:

- Parcel 79 Boundary
- Shallow Monitoring Well
- Former UST Location
- Proposed Soil and Groundwater Sample
- Historic Soil/Groundwater Sample
- Estimated Groundwater Flow Direction

N

1 inch = 30 feet

0 15 30 60 Feet

Source: FTMM Supplied CAD, 2013; U.S. Army BRAC, 2008; 2008 SI Report; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey

PROPOSED UST490 TSAMPLE LOCATIONS

CREATED BY: RR	REVIEWED BY: KF
DATE: FEB. 2016	FIGURE NUMBER: FIGURE 7
PROJECT NUMBER: 748810-06010	FILE: FIGURE 7.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\Parcel 79\FIGURE 7.mxd