Appendix N
Hazardous Materials Interpretive Memorandum

Stantec

Memo

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File:	195150185	Date:	April 25, 2022

Reference: WASM 3 Construction Package 2 – Hazardous Material Interpretive Memorandum

Report Summary

Stantec has prepared the hazardous material interpretive analysis for the Weston Aqueduct Supply Main 3 (WASM 3) Project, MWRA Contract No. 6539. Recommendations in this memorandum are for Construction Package 2 (CP-2) in the City of Waltham, Massachusetts.

Stantec's hazardous materials field-testing program and laboratory test results were summarized in the *DRAFT Hazardous Materials Assessment Technical Memorandum (Hazmat Tech Memo)* provided under separate cover on July 17, 2018.

The purpose of this memorandum is to provide Stantec's hazardous material recommendations for design and construction along the existing WASM 3 alignment for CP-2 based upon the findings from the subsurface field investigation summarized in the Hazmat Tech Memo.

Background

Based upon the *MWRA WASM 3, Contract 1 Rehabilitation of Water Mains - 100% Design Submission*, CP-2 extends from 250 South Street (south of Indian Community Church Boston) east to 522 Waverley Oaks Road (near Beaver Brook Reservation). As part of pre-characterization activities, environmental samples of soil and groundwater were collected along the corridor at boring locations and analyzed for a suite of potential contaminants. The exploration boring locations along CP-2 are shown on the aerial Soil Exploration Plans (Attachment A), and on the Plan and Profile sheets of the 100% Design Submission. The Soil Exploration Plans contain summary notes on the locations of the borings and results of sampling where detected concentrations exceed RCS-1 reportable concentrations. Known disposal sites along the corridor are also shown. The plans include borings CDMS-B20 at the western extent, through CDMS-B55 at the eastern extent.

Monitoring wells screened across the water table were installed to collect groundwater quality data and depth to water measurements in borings CDMS-B20, B25, and B53. Detailed analysis of the soil and groundwater results are presented in the Hazmat Tech Memo, and a summary of the soil and groundwater analytical results for CP-2 are included in Table 1 attached in Attachment B. The Hazmat Tech Memo also summarizes available information concerning the locations of disposal sites along the corridor where known releases of oil or hazardous materials (OHM) occurred. Table 2 attached indicates disposal sites along CP-2.

Based upon the environmental sampling results and the proximity of disposal sites along CP-2, Stantec has prepared this memo concerning planned access excavation activities.

Reference: **WASM 3 Construction Package 2 – Hazardous Material Interpretive Memorandum**

Summary of Preliminary Environmental Sampling Results

Soil Analytical Results Summary

Typical contaminants encountered in soils include polynuclear aromatic hydrocarbons (PAHs) and metals (see Table 3 for sample results for borings located along CP-2). Absent indications of a direct release, PAHs and metals are typically associated with urban fill. Soil samples collected from borings CDMS-B21, B32 and B38 contained elevated lead concentrations and B21 also contained elevated arsenic concentrations. When arsenic is not naturally occurring, it is typically a residual of pesticides used primarily to preserve wood from rot and decay. In the past, arsenic was also used in rat poisons, ant poisons and weed killers. The lead in these samples was tested for leachability via the Toxicity Characteristic Leaching Procedure (TCLP) method. Note arsenic levels did not trigger the need for TCLP testing. TCLP lead testing passed for the samples from CDMS-B21 and B32, but failed for sample B38 (see Table 4). Additionally, some elevated polynuclear aromatic hydrocarbons (PAHs) were detected in soil samples collected from B22 and B32. The reported concentrations for these analytes exceed the Massachusetts Department of Environmental Protection (DEP) RCS-1 reportable concentrations which are protective of direct human exposures to impacted soils.

Groundwater Analytical Results Summary

The only significant impacts to groundwater were observed in the sample collected from CDMS-B25. Tetrachloroethylene (PCE) was detected at 0.0052 milligrams per liter (mg/L). As indicated in Table 5, the concentration exceeds the Massachusetts Department of Environmental Protection's (MassDEP's) RCGW-1 reportable concentration and the Remedial General Permit Water Quality-Based Effluent Limits (RGP WQBEL).

It should be noted that not all of the borings were completed as monitoring wells. Therefore, groundwater quality has not been evaluated at every point along the corridor. For example, borings CDMS-B21, B22, B32, and B38 discussed above contained elevated lead, arsenic and/or PAHs. Since these borings were not completed as monitoring wells, the quality of the groundwater at these locations is not known. It should be anticipated that groundwater impacts may exist and dewatering in this area should be limited when possible.

Table 2 provides a summary of environmental concerns and recommended limitations to excavation or dewatering based upon the analytical data. The Contractor may find this information useful in planning locations for access pits or other soil intrusive activities. Table 6 indicates depth to groundwater in the monitoring wells when they were sampled.

Regulatory Issues

The Hazmat Memo recommends that the work for the entire corridor be conducted under as a Utility-Related Abatement Measure (URAM) which is a response action performed in accordance with 310 CMR 40.0460 (the Massachusetts Contingency Plan, MCP). This will require that the MWRA notify the MADEP in writing of:

> (a) any release or threat of release of oil and/or hazardous material at the construction site for which notification to the Department by any person is required under the provisions of 310 CMR 40.0315 (i.e., 120-day notifications);
>
> (b) their intentions to conduct a Utility-related Abatement Measure in compliance with all applicable requirements of 310 CMR 40.0460; and

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(c) the name and license number of the Licensed Site Professional who has been engaged or employed by the person conducting the Utility-related Abatement Measure.

The URAM notifies the DEP of the proposed work along a utility corridor where preliminary soil and groundwater data indicates known impacts exist. The URAM will document the results of the preliminary soil investigation, proposed soil and/or groundwater management activities during the work including potential disposal options for any surplus soil, dust suppression, health and safety concerns, and dewatering options. Once the work is completed the URAM can be closed, and no additional regulatory filings would be necessary for the MWRA.

Open Cut Replacement Areas and Rehabilitation Access Pit Locations

For portions of the alignment the selection of the locations of access pits for rehabilitation will be the responsibility of the contractor. Stantec recommends that to the extent feasible, access pits should not be located near soil borings that contain known contaminant concentrations that exceed RCS-1 reportable concentration. These include CDMS-B21, B22, B32, and B38. The proximity of access pits should be limited for these boring locations where possible (see Table 2 for recommended distances).

Multiple disposal sites were identified where known releases of oil and/or hazardous materials (OHM) have the potential to impact access pit locations. Table 2 list these sites and their locations along CP-2. Stantec recommends that the proximity of access pits should take into consideration these release sites (see Table 2).

Soil Management

In locations where the contractor is directed to excavate and access the pipe in proximity to the boring locations identified above, the contractor shall characterize the soil to determine reuse or disposal options. Soils that cannot be reused at the project site shall be disposed of at the appropriate Massachusetts lined landfill or out-of-state facility. Table 2 identifies known areas of contamination where excavation is required within the recommended boring limits described above. The table identifies the estimated disposal requirement based on preliminary sampling data.

Backfill

To the extent feasible, excavated soil should be replaced as backfill as close to its original location as possible. Transport and relocation of excavated soil to other sections of the corridor is not recommended. Surplus soils that cannot be reused as backfill in the pit where it was removed should be stockpiled and characterized to determine reuse or disposal options. The soil can be transported and stockpiled away from the corridor as long as the staging area is property owned by MWRA. Stockpiled soil should be placed on an impermeable barrier such as asphalt or poly tarp, and should be bermed to prevent runoff and dispersion of soils away from the piles. The piles should be covered with impermeable material such as poly tarp to prevent infiltration or runoff of precipitation.

Dewatering

If dewatering is to be conducted, the Contractor shall obtain all necessary data to evaluate the applicable state and federal discharge permitting (i.e., Remediation General Permit, RGP). Iron and cyanide detected in the sample collected from CDMS-B20 exceed the RGP TBEL limits. Reportable conditions in groundwater under the Massachusetts Contingency Plan (MCP) include PCE which exceeds the RCGW-1 reportable concentration at CDMS-B25 and the RGP TBEL limits at this location (see Table 5). In addition, lead TCLP

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testing in soil sample CDMS-B38 failed which indicates lead has the potential to leach from soil to groundwater. Stantec recommends that dewatering not be conducted within 500 feet from these boring locations, if possible. Where dewatering is required for excavation within 500 feet of these borings, the Contractor shall evaluate the need for a RGP if discharging to a surface water body. No significant groundwater contamination was encountered in the samples collected from the other monitoring well (CDMS-B53).

The Contractor should stop work and notify MWRA if they encounter soil that appears to be contaminated or underground structures that may contain OHM. The MWRA should contact a License Site Professional (LSP), the local Fire Department in the event of an underground storage tank or a safety concern, and / or the DEP, as necessary.

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Attachment: Attachment A - Soil Exploration Program Sheets Along CP-2
Attachment B – Data Tables

Table 1
Inventory of Soil Boring Laboratory Data
Weston Aqueduct Supply Main 3

Laboratory ID	Sample ID	Boring ID	Sample Interval (feet below grade)	Results	Comments
L1745745-03	B 20/S2 (2-4)	B20 / MW	S2 (2-4)	All Analytes <RCS-1	
L1745745-04	B 20/S2 (2-4) DUP	B20 / MW	S2 (2-4) DUP	All Analytes <RCS-1	
L1746434-02	B 21/S2 (2-4)	B21	S2 (2-4)	Some exceedences	Some Metals >RCS-1
L1747637-01	B 21/S2 (2-4)	B21	S2 (2-4)	TCLP analysis	Lead passed
L1746023-01	B 22/S2 (2-4)	B22	S2 (2-4)	Some exceedences	Some PAHs >RCS-1
L1736679-03	B 24/V1 (2-2.5)	B24	V1 (2-2.5)	All Analytes <RCS-1	
L1736679-04	B 24/V2 (4.5-5)	B24	V2 (4.5-5)	All Analytes <RCS-1	
L1736679-01	B 25/V1 (2-2.5)	B25 / MW	V1 (2-2.5)	All Analytes <RCS-1	Near RTN 3-10991, Industrial, Circuit Boards-cVOCs, Phase V
L1736679-02	B 25/V2 (4.5-5)	B25 / MW	V2 (4.5-5)	All Analytes <RCS-1	
L1736486-04	B 26/V1 (2-2.5)	B26	V1 (2-2.5)	All Analytes <RCS-1	
L1736486-05	B 26/V2 (5.5-6)	B26	V2 (5.5-6)	All Analytes <RCS-1	
L1737334-03	B 27/S2 (2-4)	B27	S2 (2-4)	All Analytes <RCS-1	
L1737334-01	B 28/S2 (2-4)	B28	S2 (2-4)	All Analytes <RCS-1	
L1737334-02	B 28/S3 (4-6)	B28	S3 (4-6)	All Analytes <RCS-1	
L1737144-01	B 29/S2 (2-4)	B29	S2 (2-4)	All Analytes <RCS-1	
L1737144-02	B 29/S3 (4-6)	B29	S3 (4-6)	All Analytes <RCS-1	
L1736486-02	B 30/V1 (3-3.5)	B30	V1 (3-3.5)	All Analytes <RCS-1	
L1736486-03	B 30/V2 (5-5.5)	B30	V2 (5-5.5)	All Analytes <RCS-1	
L1736486-01	B 31/V1 (2-2.5)	B31	V1 (2-2.5)	All Analytes <RCS-1	
L1743700-05	B 32/V1 (2-2.5)	B32	V1 (2-2.5)	Some exceedences	Some Metals and PAHs >RCS-1
L1744599-01	B 32/V1 (2-2.5)	B32	V1 (2-2.5)	TCLP analysis	Lead passed
L1737513-01	B 33/S2 (2-4)	B33	S2 (2-4)	All Analytes <RCS-1	
L1736152-01	B 34/V1 (2-2.5)	B34	V1 (2-2.5)	All Analytes <RCS-1	
L1737246-01	B 34/V1 (2-2.5)	B34	V1 (2-2.5)	TCLP analysis	Lead passed
L1737973-01	B 35/S2 (2-4)	B35	S2 (2-4)	All Analytes <RCS-1	
L1737973-02	B 36/S2 (2-4)	B36	S2 (2-4)	All Analytes <RCS-1	
L1736679-05	B 37/V1 (2-2.5)	B37	V1 (2-2.5)	All Analytes <RCS-1	
L1736679-06	B 37/V1 (2-2.5) DUP	B37	V1 (2-2.5) DUP	All Analytes <RCS-1	
L1736152-02	B 38/V1 (3-3.5)	B38	V1 (3-3.5)	Some exceedences	Some Metals >RCS-1
L1737246-02	B 38/V1 (3-3.5)	B38	V1 (3-3.5)	TCLP analysis	Lead failed
L1738395-01	B 39/S2 (2-4)	B39	S2 (2-4)	All Analytes <RCS-1	
L1801072-01	B 40 S-5 (8-10')	B40	S-5 (8-10')	All Analytes <RCS-1	
L1739921-03	B 41/V1 (2-2.5)	B41	V1 (2-2.5)	All Analytes <RCS-1	
L1739921-04	B 41/V2 (5.5-6)	B41	V2 (5.5-6)	All Analytes <RCS-1	
L1739921-01	B 42/V1 (3-3.5)	B42	V1 (3-3.5)	All Analytes <RCS-1	
L1739921-02	B 42/V1 (3-3.5) DUP	B42	V1 (3-3.5) DUP	All Analytes <RCS-1	
L1739003-04	B 43/S2 (2-4)	B43	S2 (2-4)	All Analytes <RCS-1	
L1739441-02	B 44/V1 (2-2.5)	B44	V1 (2-2.5)	All Analytes <RCS-1	
L1739441-01	B 45/V1 (2-2.5)	B45	V1 (2-2.5)	All Analytes <RCS-1	
L1742055-01	B 46/V1 (2.5-3)	B46	V1 (2.5-3)	All Analytes <RCS-1	
L1742055-02	B 46/V1 (2.5-3)DUP	B46	V1 (2.5-3)DUP	All Analytes <RCS-1	
L1739921-05	B 47/V1 (2-2.5)	B47	V1 (2-2.5)	All Analytes <RCS-1	
L1738607-02	B 48/S2 (2-4)	B48	S2 (2-4)	All Analytes <RCS-1	
L1738607-03	B 48/S3 (4-6)	B48	S3 (4-6)	All Analytes <RCS-1	
L1738607-04	B 48/S3 (4-6) DUP	B48	S3 (4-6) DUP	All Analytes <RCS-1	
L1802996-01	B 49/S1 (6-8)	B49	S1 (6-8)	All Analytes <RCS-1	
L1802542-01	B 49/V1 (1.5-2)	B49	V1 (1.5-2)	All Analytes <RCS-1	
L1802542-02	B 49/V1 (1.5-2) DUP	B49	V1 (1.5-2) DUP	All Analytes <RCS-1	
L1738819-01	B 50/S2 (2-4)	B50	S2 (2-4)	All Analytes <RCS-1	
L1738819-02	B 50/S3 (4-6)	B50	S3 (4-6)	All Analytes <RCS-1	
L1738819-03	B 51/S1 (1-2)	B51	S1 (1-2)	All Analytes <RCS-1	
L1738819-04	B 51/S3 (4-6)	B51	S3 (4-6)	All Analytes <RCS-1	
L1739003-02	B 52/S2 (2-4)	B52	S2 (2-4)	All Analytes <RCS-1	
L1739003-03	B 52/S3 (4-6)	B52	S3 (4-6)	All Analytes <RCS-1	
L1739003-01	B 53/S2 (2-4)	B53 / MW	S2 (2-4)	All Analytes <RCS-1	
L1738607-01	B 54/S2 (2-4)	B54	S2 (2-4)	All Analytes <RCS-1	
L1739589-01	B 54/S2 (2-4)	B54	S2 (2-4)	TCLP Analysis	Lead passed
L1739299-02	B 55/S1 (2-4)	B55	S1 (2-4)	All Analytes <RCS-1	

Table 2
Summary of Environmental Concerns Along CP-2

Boring ID	Concentrations exceeding RCS-1 in Soil	Concentrations exceeding RCGW-1 in GW	General Area Description	Oil or Hazardous Materials Reported Releases	Excavation / Dewatering Limitations	Closest Stations (between or at)	Proposed Work	Soil Management Disposal Options (for budgetting purposes)	Group
CDMS-B 20MW		None	Commercial/Wooded		Do not dewater within 500' either side, if possible	96 and 97		Unlined or lined landfill	IA, IB
CDMS-B 21	Arsenic and lead (passed TCLP)		Commercial/Wooded		Do not excavate within 100' either side, if possible	100 and 101		Unlined or lined landfill	IA, IB
CDMS-B 22	Benzo(a)pyrene		Commercial		None	103 and 104		Unlined or lined landfill	IA, IB
CDMS-B 23			Residential-Multi-Unit		None			Unlined or lined landfill	IA, IB
CDMS-B 24			Commercial/Residential	Abutting gas station-A2 RAO 2003 (petroleum) Multiple release sites adjacent north (petroleum, waste oil, cVOCs, historic fill, SVOCs)	Do not excavated 100' west of B-24 to B-26, if possible Do not dewater within 500' either side of B25MW, if possible	114 and 115		Out-of-State facility or Haz Waste facility	II, III
CDMS-B 25MW		PCE	Commercial	Multiple surrounding release sites (petroleum, waste oil, cVOCs, historic fill, SVOCs)		120 and 121			
CDMS-B 26			Commercial/Residential	Multiple release sites adjacent south (petroleum, waste oil, cVOCs, historic fill, SVOCs)		124 and 125			
CDMS-B 27			Commercial/Residential		None	130 and 131		Unlined or lined landfill	IA, IB
CDMS-B 28			Commercial	Multiple surrounding release sites (petroleum, waste oil, metals, cVOCs, historic fill, SVOCs)	Do not excavate between 200' east and 300' west, if possible	at 135		Out-of-State facility or Haz Waste facility	II, III
CDMS-B 29			Commercial	Multiple release sites adjacent north (petroleum)	Do not excavate between B-29 and B-31, if possible	139 and 140		Unlined or lined landfill	IA, IB
CDMS-B 30			Commercial	Multiple release sites adjacent and to the south (petroleum)		143 and 144			
CDMS-B 31			Commercial	Multiple release sites adjacent south (petroleum)		147 and 148			
CDMS-B 32	Lead (passed TCLP) and benzo(a)pyrene		Commercial		Do not excavate within 100' either side, if possible	158 and 159		Unlined or lined landfill	IA, IB
CDMS-B 33			Commercial/Residential		None	at 162+50		Unlined or lined landfill	IA, IB
CDMS-B 34	None		Commercial/Residential		None	165 and 166		Unlined or lined landfill	IA, IB
CDMS-B 35MW			Commercial/Residential		None	169 and 170		Unlined or lined landfill	IA, IB
CDMS-B 36			Commercial/Residential		None	175 and 176		Unlined or lined landfill	IA, IB
CDMS-B 37			Commercial/Residential			179 and 180		Unlined or lined landfill	IA, IB
CDMS-B 38	Lead (failed TCLP)		Commercial/Residential		Do not excavate within 100' either side, if possible	at 185		Out-of-State facility or Haz Waste facility	II, III
CDMS-B 39			Commercial/Residential		None	191 and 192		Unlined or lined landfill	IA, IB
CDMS-B 40			Commercial	Multiple release sites adjacent east (petroleum)	Do not excavate from 100' west of B-40 through 100' east of B-41, if possible	194 and 195		Unlined or lined landfill	IA, IB
CDMS-B 41			Commercial			200 and 201			
CDMS-B 42			Commercial/Residential		None	204 and 205		Unlined or lined landfill	IA, IB
CDMS-B 43			Commercial/Residential		None	211 and 212		Unlined or lined landfill	IA, IB
CDMS-B 44			Commercial/Residential		None	215 and 216		Unlined or lined landfill	IA, IB
CDMS-B 45			Wooded		None	at 222		Unlined or lined landfill	IA, IB
CDMS-B 46	None		Wooded		None	225 and 226		Unlined or lined landfill	IA, IB
CDMS-B 47			Commercial		None	231 and 232		Unlined or lined landfill	IA, IB
CDMS-B 48			Commercial	Release sites adjacent east (petroleum, metals)	Do not excavate within 100' west of B-48 throuh 200 feet east of B-49, if possible	235 and 236		Unlined or lined landfill	IA, IB
CDMS-B 49			Commercial			239 and 240			
CDMS-B 50			Commercial		None	248 and 249		Unlined or lined landfill	IA, IB
CDMS-B 51			Commercial		None	249 and 250		Unlined or lined landfill	IA, IB
CDMS-B 52			Commercial/Residential	Release sites adjacent (petroleum, waste oil, cVOCs)	Do not excavate from 100' west of B-52 through 100' east of B-53, if possible	255 and 256		Out-of-State facility or Haz Waste facility	II, III
CDMS-B 53		None	Commercial/Residential			263 and 264			
CDMS-B 54			Residential		None	268 and 269		Unlined or lined landfill	IA, IB
CDMS-B 55			Commercial/Wooded		None	272 and 273		Unlined or lined landfill	IA, IB

Notes
RCS-1 - reportable concentrations
MW indicates boring completed with a monitoring well
TPH - total petroleum hydrocarbons
PAHs - polynuclear aromatic hydrocarbons
Blank cells indicate no reportable soil impacts or release sites near boring
Group IA - Soils acceptable at a Massachusetts unlined (or lined) landfill as cover material and meet Massachusetts unlined landfill reuse criteria as outlined in the COMM-97-01 policy.
Group IB - Soils acceptable at a Massachusetts lined landfill as cover material and meet Massachusetts lined landfill reuse criteria as specified in COMM-97-01.
Group II - Soils required to be disposed of at an out of state disposal facility, which cannot be disposed of as Group IA or IB, and meet out of state facility requirements.
Group III – Hazardous Waste. Soil determined to contain "listed" hazardous waste constituents: soil, through VOC analysis, that indicates the presence of any of F-code wastes set forth in 40 CFR 261.31 or U-code wastes set forth in 40 CFR 261.33;
or soil determined to exhibit a "characteristic" of hazardous waste such as ignitability, corrosivity, reactivity or toxicity (soil, through TCLP analysis, that exceeds the regulatory limit established for any one or more RCRA metals set forth in Table 1 of 40 CFR 261.24).

Table 3
Soil Analytical Results
Weston Aqueduct Supply Main 3

Green = Group 1A (Unlined or Lined LF) Blue = Group IB (Lined LF) Purple = Group II (Out-of-State) Red = Group III (Haz Waste)	CAS Number	MADEP RCS-1 2014	MADEP RCS-2 2014	Similar Soils Limiting Soil Concentration RCS-1 2014	Similar Soils Limiting Soil Concentration RCS-2 2014	MADEP Table 1 Unlined LF Comm97	MADEP Table 1 Lined LF Comm97	Units	Boring / Sample ID (depth interval in parentheses, feet below grade) Sample Date and Laboratory Sample ID															
									B21/S2		B22/S2		B32/V1		B34/V1		B38/V1		B46/V1		B46/V1			
									(2-4)		(2-4)		(2-2.5)		(2-2.5)		(3-3.5)		(2.5-3)		(2.5-3)			
									15-DEC-17		13-DEC-17		29-NOV-17		06-OCT-17		06-OCT-17		15-NOV-17		15-NOV-17			
									L1746434-02		L1746023-01		L1743700-05		L1736152-01		L1736152-02		L1742055-01		L1742055-02			
										Qual		Qual		Qual		Qual		Qual		Qual		Qual		Qual
General Chemistry																								
Solids, Total	---							%	81.4		92		81.8		88.9		92.5		92.7		93.3			
pH (H)	12408-02-5							SU	7		7.8		5.8		6.7		8.6		7.3		7.3			
MCP General Chemistry																								
Chromium, Hexavalent	18540-29-9	100	200	100	200			mg/kg	0.98	U	0.87	U	0.98	U	0.9	U	0.86	U	0.86	U	0.86	U		
General Chemistry																								
Oxidation/Reduction Potential	---							mv	240		200		280		200		180		230		230			
MCP Total Metals																								
Antimony, Total	7440-36-0	20	30	10	10			mg/kg	2.44	U		U		U		U		U		U		U		U
Arsenic, Total	7440-38-2	20	20	20	20	40	40	mg/kg	21.3		4.06		13.1		6.01		2.81		4.34		5.5			
Barium, Total	7440-39-3	1000	3000	375	375			mg/kg	55.5		29.4		120		20.9		36.2		22.6		26.3			
Beryllium, Total	7440-41-7	90	200	4	4			mg/kg	0.307		0.298		0.426		0.303			U		U				U
Cadmium, Total	7440-43-9	70	100	20	20	30	80	mg/kg	0.765			U		U	0.531			U	0.45		0.505			
Chromium, Total	7440-47-3	100	200	100	200	1000	1000	mg/kg	10.9		13		14		14.3		6.54		8.32		10.2			
Copper, Total	7440-50-8	1000	10000	300	300			mg/kg	24.5		18.6		45.2		17		8.94		22.7		24.8			
Lead, Total	7439-92-1	200	600	200	500	1000	2000	mg/kg	281		18.3		837		118		891		20		18.8			
Mercury, Total	7439-97-6	20	30	3	3	10	10	mg/kg	0.191			U	0.774		0.084			U		U				U
Nickel, Total	7440-02-0	600	1000	150	150			mg/kg	7.28		8.22		7.87		10.4		5.03		7.52		8.65			
Selenium, Total	7782-49-2	400	700	5	5			mg/kg	2.44	U		U		U		U		U		U		U		U
Silver, Total	7440-22-4	100	200	6	6			mg/kg	0.487	U		U		U		U		U		U		U		U
Thallium, Total	7440-28-0	8	60	6	6			mg/kg	2.44	U		U		U		U		U		U		U		U
Vanadium, Total	7440-62-2	400	700	225	225			mg/kg	24.8		20.1		22.8		22.2		9.69		24.9		27.4			
Zinc, Total	7440-66-6	1000	3000	500	500			mg/kg	112		28.4		92.6		47.8		120		36.2		37			
MCP Volatile Organics by 8260/5035																								
1,1,2,2-Tetrachloroethane	79-34-5	0.005	0.02					mg/kg	0.0026	U		U		U		U		U		U		U		U
1,1,2-Trichloroethane	79-00-5	0.1	2					mg/kg	0.0038	U		U		U		U		U		U		U		U
1,2,4-Trimethylbenzene	95-63-6	1000	10000					mg/kg	0.01	U		U		U		U		U		U		U		U
1,2-Dibromoethane	106-93-4	0.1	0.1					mg/kg	0.01	U		U		U		U		U		U		U		U
1,2-Dichloropropane	78-87-5	0.1	0.1					mg/kg	0.009	U		U		U		U		U		U		U		U
1,3,5-Trimethylbenzene	108-67-8	10	100					mg/kg	0.01	U		U		U		U		U		U		U		U
1,3-Dichloropropene, Total	542-75-6	0.01	0.4					mg/kg	0.0026	U		U		U		U		U		U		U		U
1,4-Dioxane	123-91-1	0.2	6					mg/kg	0.1	U		U		U		U		U		U		U		U
Acetone	67-64-1	6	50					mg/kg	0.092	U		U		U		U		U		U		U		U
Bromoform	75-25-2	0.1	1					mg/kg	0.01	U		U		U		U		U		U		U		U
cis-1,3-Dichloropropene	10061-01-5	0.01	0.1					mg/kg	0.0026	U		U		U		U		U		U		U		U
Dibromochloromethane	124-48-1	0.005	0.03					mg/kg	0.0026	U		U		U		U		U		U		U		U
Methyl ethyl ketone	78-93-3	4	50					mg/kg	0.026	U		U		U		U		U		U		U		U
Methyl isobutyl ketone	108-10-1	0.4	50					mg/kg	0.026	U		U		U		U		U		U		U		U
Methyl tert butyl ether	1634-04-4	0.1	100					mg/kg	0.0051	U		U		U		U		U		U		U		U
Methylene chloride	75-09-2	0.1	4					mg/kg	0.026	U		U		U		U		U		U		U		U
Naphthalene	91-20-3	4	20					mg/kg	0.01	U		U		U		U		U		U		U		U
o-Xylene	95-47-6							mg/kg	0.0051	U		U		U		U		U		U		U		U
p/m-Xylene	179601-23-1							mg/kg	0.0051	U		U		U		U		U		U		U		U
Toluene	108-88-3	30	1000					mg/kg	0.0038	U		U		U		U		U		U		U		U
trans-1,3-Dichloropropene	10061-02-6	0.01	0.1					mg/kg	0.0026	U		U		U		U		U		U		U		U
Trichloroethene	79-01-6	0.3	0.3					mg/kg	0.0026	U		U		U		U		U		U		U		U
Xylenes, Total	1330-20-7	100	100					mg/kg	0.0051	U		U		U		U		U		U		U		U
Total VOCs						4	10		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3
Soil Analytical Results
Weston Aqueduct Supply Main 3

Green = Group 1A (Unlined or Lined LF) Blue = Group IB (Lined LF) Purple = Group II (Out-of-State) Red = Group III (Haz Waste)	CAS Number	MADEP RCS-1 2014	MADEP RCS-2 2014	Similar Soils Limiting Soil Concentration RCS-1 2014	Similar Soils Limiting Soil Concentration RCS-2 2014	MADEP Table 1 Unlined LF Comm97	MADEP Table 1 Lined LF Comm97	Units	Boring / Sample ID (depth interval in parentheses, feet below grade) Sample Date and Laboratory Sample ID													
									B21/S2		B22/S2		B32/V1		B34/V1		B38/V1		B46/V1		B46/V1	
									(2-4)		(2-4)		(2-2.5)		(2-2.5)		(3-3.5)		(2.5-3)		(2.5-3)	
									15-DEC-17		13-DEC-17		29-NOV-17		06-OCT-17		06-OCT-17		15-NOV-17		15-NOV-17	
									L1746434-02		L1746023-01		L1743700-05		L1736152-01		L1736152-02		L1742055-01		L1742055-02	
										Qual		Qual		Qual		Qual		Qual		Qual		Qual
MCP Semivolatile Organics																						
1,4-Dichlorobenzene	106-46-7	0.7	1					mg/kg	0.2	U		U		U		U		U		U		U
2,4-Dichlorophenol	120-83-2	0.7	40					mg/kg	0.18	U		U		U		U		U		U		U
2,4-Dimethylphenol	105-67-9	0.7	100					mg/kg	0.2	U		U		U		U		U		U		U
2,4-Dinitrophenol	51-28-5	3	50					mg/kg	0.98	U		U		U		U		U		U		U
2,4-Dinitrotoluene	121-14-2	0.7	10					mg/kg	0.2	U		U		U		U		U		U		U
2-Chlorophenol	95-57-8	0.7	100					mg/kg	0.2	U		U		U		U		U		U		U
2-Methylnaphthalene	91-57-6	0.7	80	0.7	5			mg/kg	0.24	U		U		U		U		U		U		U
3-Methylphenol/4-Methylphenol	108-39-4	500	5000					mg/kg	0.29	U		U		U		U		U		U		U
Acenaphthene	83-32-9	4	3000	4	5			mg/kg	0.16	U	0.15			U		U		U		U		U
Acenaphthylene	208-96-8	1	10	1	5			mg/kg	0.16	U	0.28		0.4			U		U		U		U
Anthracene	120-12-7	1000	3000	10	10			mg/kg	0.12	U	0.73		0.44			U		U		U		U
Benzo(a)anthracene	56-55-3	7	40	7	20			mg/kg	0.13		2.4		2.2			U		U	0.19			U
Benzo(a)pyrene	50-32-8	2	7	2	7			mg/kg	0.16	U	2.5		2.1			U		U	0.23			U
Benzo(b)fluoranthene	205-99-2	7	40	7	20			mg/kg	0.22		3.2		2.9		0.14			U	0.29		0.16	
Benzo(ghi)perylene	191-24-2	1000	3000	10	10			mg/kg	0.16	U	1.6		1.4			U		U	0.15			U
Benzo(k)fluoranthene	207-08-9	70	400	10	10			mg/kg	0.12	U	1		0.92			U		U		U		U
Bis(2-chloroethoxy)methane	111-91-1	500	5000					mg/kg	0.22	U		U		U		U		U		U		U
Bis(2-chloroethyl)ether	111-44-4	0.7	0.7					mg/kg	0.18	U		U		U		U		U		U		U
Bis(2-chloroisopropyl)ether	108-60-1	0.7	0.7					mg/kg	0.24	U		U		U		U		U		U		U
Bis(2-ethylhexyl)phthalate	117-81-7	90	600					mg/kg	0.2	U		U		U		U		U		U		U
Butyl benzyl phthalate	85-68-7	100	1000					mg/kg	0.2	U		U		U		U		U		U		U
Chrysene	218-01-9	70	400	20	20			mg/kg	0.16		2.2		2.3			U		U	0.17			U
Di-n-octylphthalate	117-84-0	1000	10000					mg/kg	0.2	U		U		U		U		U		U		U
Dibenzo(a,h)anthracene	53-70-3	0.7	4	0.7	4			mg/kg	0.12	U	0.4		0.33			U		U		U		U
Dibenzofuran	132-64-9	100	1000					mg/kg	0.2	U	0.18			U		U		U		U		U
Diethyl phthalate	84-66-2	10	200					mg/kg	0.2	U		U		U		U		U		U		U
Dimethyl phthalate	131-11-3	0.7	50					mg/kg	0.2	U		U		U		U		U		U		U
Fluoranthene	206-44-0	1000	3000	40	40			mg/kg	0.26		4.4		4.5		0.12			U				
Fluoranthene	206-44-0	1000	3000	40	40			mg/kg	0.2	U	0.23			U		U		U	0.29		0.14	
Fluorene	86-73-7	1000	3000	10	10			mg/kg	0.12	U		U		U		U		U		U		U
Hexachlorobenzene	118-74-1	0.7	0.8					mg/kg	0.2	U		U		U		U		U		U		U
Hexachlorobutadiene	87-68-3	30	100					mg/kg	0.16	U		U		U		U		U		U		U
Hexachloroethane	67-72-1	0.7	3					mg/kg	0.16	U			1.5			U		U		U		U
Indeno(1,2,3-cd)pyrene	193-39-5	7	40	7	10			mg/kg	0.18	U	1.8			U		U		U	0.16			U
Isophorone	78-59-1	100	1000					mg/kg	0.2	U		U		U		U		U		U		U
Naphthalene	91-20-3	4	20	44	5			mg/kg	0.18	U		U		U		U		U		U		U
Nitrobenzene	98-95-3	500	5000					mg/kg	0.41	U		U		U		U		U		U		U
Pentachlorophenol	87-86-5	3	10					mg/kg	0.14			U	2.2			U		U		U		U
Phenanthrene	85-01-8	10	1000	10	30			mg/kg	0.2	U	2			U		U		U				
Phenanthrene	85-01-8	10	1000	10	30			mg/kg	0.24				3.7		0.11			U		U		U
Phenol	108-95-2	1	20					mg/kg				U								U		U
Pyrene	129-00-0	1000	3000	40	40			mg/kg			3.8											
Pyrene	129-00-0	1000	3000	40	40			mg/kg											0.28		0.14	
Total Semi-VOCs						100	100		**1.15**		**27.45**		**25.53**		**0.37**		**0**		**1.76**	**0**	**0.44**	**0**
MCP Polychlorinated Biphenyls																						
Aroclor 1260	11096-82-5	1	4					mg/kg	0.26			U		U		U		U		U		U
Aroclor 1268	11100-14-4	1	4					mg/kg	0.0399	U		U		U		U		U		U		U
Totak PCBs	1336-36-3	1	4			<2	<2	mg/kg	0.26			U		U		U		U		U		U
Petroleum Hydrocarbon Quantitation																						
TPH	---	1000	3000			2500	5000	mg/kg	63.2		177		136		40.5			U		U		U
Volatile Petroleum Hydrocarbons																						
C5-C8 Aliphatics	C5-C8-ALPHA-UJ							mg/kg	8.5	U		U		U		U		U		U		U
C5-C8 Aliphatics, Adjusted	C5-C8-ALPHA-J	100	500					mg/kg	8.5	U		U		U		U		U		U		U
C9-C10 Aromatics	C9-C10-ALPHA-UJ	100	500					mg/kg	8.5	U		U		U		U		U		U		U
C9-C12 Aliphatics	C9-C12-ALPHA-UJ							mg/kg	8.5	U		U		U		U		U		U		U
C9-C12 Aliphatics, Adjusted	C9-C12-ALPHA-J	1000	3000					mg/kg	8.5	U		U		U		U		U		U		U
Extractable Petroleum Hydrocarbons																						
C11-C22 Aromatics	C11-C22-ALPHA-UJ							mg/kg	18.9			U	67.5		17.6			U		U		U
C11-C22 Aromatics, Adjusted	C11-C22-ALPHA-J	1000	3000					mg/kg	18.9		91.1		47.2		17.6			U		U		U
C19-C36 Aliphatics	C19-C36-ALPHA-UJ	3000	5000					mg/kg	9.49		47.9		12.4			U		U		U		U
C9-C18 Aliphatics	C9-C18-ALPHA-UJ	1000	3000					mg/kg	8.05	U	6.95			U		U		U		U		U

Table 4
TCLP Results
Weston Aqueduct Supply Main 3
(mg/L)

Boring	Sample ID	Sample Depth (ft)	Lead	Chromium	Mercury
B-7	S1	(0-2)	<0.5		
B-7	S1	(0-2)	1.15		
B-21	S2	(2-4)	<0.5		
B-32	V1	(2-2.5)	2.05		
B-34	V1	(2-2.5)	<0.5		
B-38	V1	(3-3.5)	7.02		
B-54	S2	(2-4)	<0.5		
B-63	S2	(2-4)	0.511		
B-64	V1	(2-2.5)	<0.5		
B-102	S3	(4-6)	<0.5		
B-109	S5	(8-10)	2.45	<0.2	<0.001
B-115	VE-2	(2-5)	<0.5		
B-114	VE-1	(2-4)	<0.05		
EPA Limit			**5**	**5**	**0.2**
Notes:					
Red indicates concentration exceeds RCS-1 reportable concentration					
Blank cell indicates analyte not tested for TCLP					

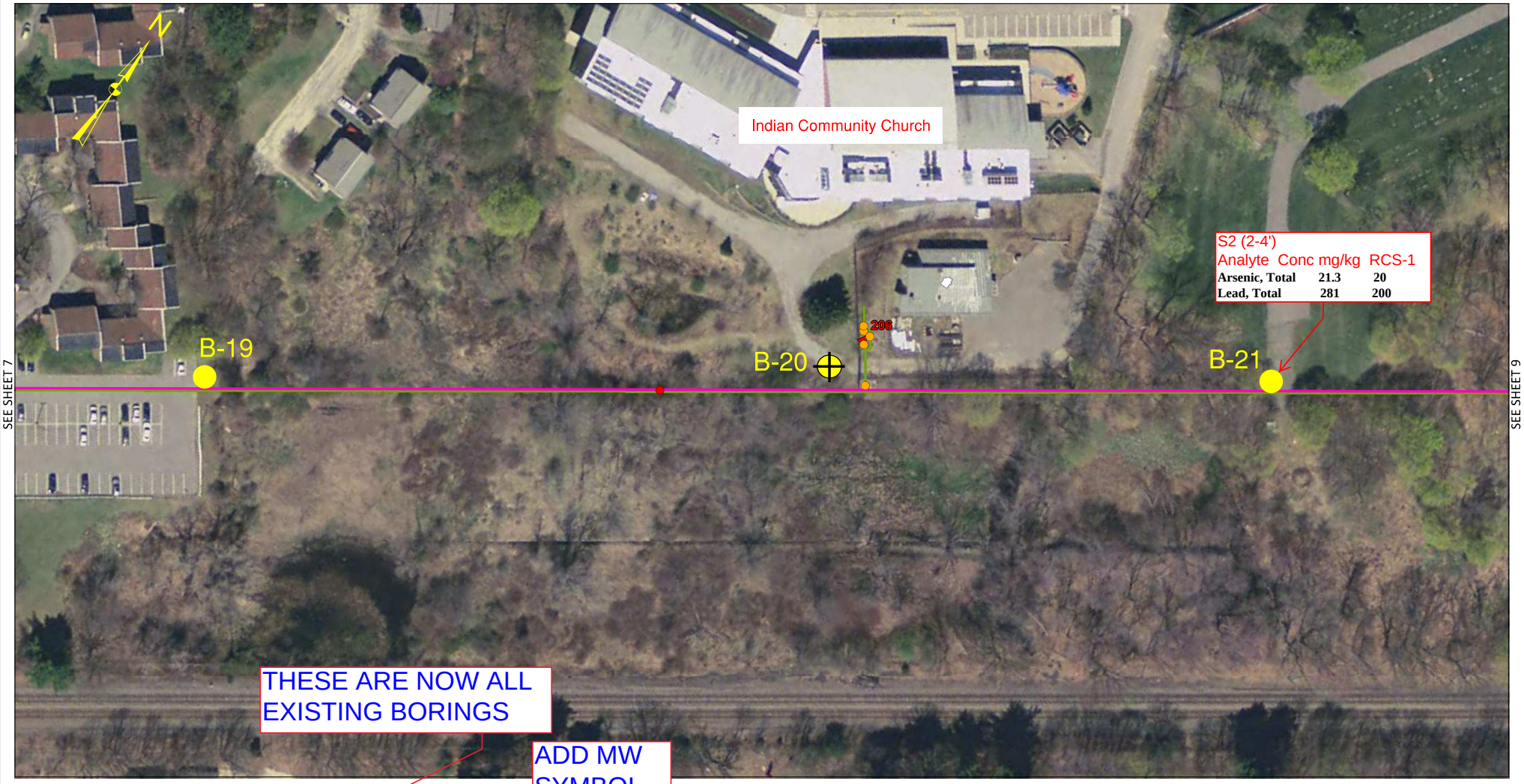
Table 5
Analytes Detected in Groundwater
Weston Aqueduct Supply Main 3
Sampled on April 8, 2018

	MADEP RCGW-1 2014	MADEP RCGW-2 2014	RGP WQBEL	Units	Monitoring Well Locations		
					B-20	B-25	B-53
Metals							
Antimony	**0.006**	**8**	**0.64**	**mg/L**			
Arsenic	**0.01**	**0.9**	**0.104**	**mg/L**			
Cadmium	**0.004**	**0.004**	**0.0102**	**mg/L**			
Chromium	**0.1**	**0.3**	**0.074**	**mg/L**			
Copper	**10**	**100**	**0.009**	**mg/L**		0.0027	0.0085
Iron	**NS**	**NS**	**1**	**mg/L**	1.81		
Lead	**0.01**	**0.01**	**0.0025**	**mg/L**			
Nickel	**0.1**	**0.2**	**0.052**	**mg/L**	0.0048		
Zinc	**0.9**	**0.9**	**0.12**	**mg/L**			
Selenium	**0.05**	**0.1**	**0.005**	**mg/L**			
Silver	**0.007**	**0.007**	**0.0032**	**mg/L**			
Mercury	**0.002**	**0.02**	**0.00077**	**mg/L**			
Volatile Organic Compounds							
	Varies	**Varies**		**mg/L**	All ND		All ND
Tetrachloroethene	**0.005**	**0.05**	**0.0033**	**mg/L**		**0.0052**	
Trichloroethene	**0.005**	**0.005**	**0.005**	**mg/L**		0.0024	
cis-1,2-Dichloroethene	**0.02**	**0.1**	**0.07**	**mg/L**		0.0031	
Semi-Volatile Organic Compounds							
	Varies	**Varies**		**mg/L**	All ND	All ND	All ND
Polychlorinated Biphenyls							
	0.0005	**0.005**		**mg/L**	All ND	All ND	All ND
Total Petroleum Hydrocarbons							
	0.2	**5**		**mg/L**	All ND	All ND	All ND
Other							
Total Suspended Solids	**NS**	**NS**	**30**	**mg/L**			
Cyanide	**0.03**	**0.03**	**0.0052**	**mg/L**	0.007		
Chlorine	**NS**	**NS**	**0.0011**	**mg/L**			
Nitrogen, Ammonia	**NS**	**NS**	**Report only**	**mg/L**			
Phenolics	**NS**	**NS**	**0.3**	**mg/L**			
Chloride	**NS**	**NS**	**Report only**	**mg/L**	96.7	901	171

Notes
Red indicates concentration exceeds RCGW-1 reportable concentration
Blank cells indicates analyte not detected based upon laboratory method detection limits
ND: Not detected
RGP WQBEL: Remedial General Permit Water Quality-Based Effluent Limits

Table 6
Monitoring Well Gauging Data
Weston Aqueduct Supply Main 3

Boring ID	Well Depth (ft)	Depth to Water (ft)
B-9	19	7.88
B-17	19	Dry
B-20	13.4	3.3
B-25	15	7.88
B-53	9.4	6.4
B-75A	12	5.5
B-93		Dry
B-100	14.5	12.72
B-104	13.3	8.37
B-107	12.8	6.96
B-110	16	5.68
B-113	16	3.68



Note: Analytical samples collected from every proposed boring

Legend

- Manhole (No Chamber)
- Existing Borings
- Existing Borings
- Proposed Borings
- Air Valves
- Mainline Valves
- Blowoff Valves
- Meter Facility
- WASM 3 Route

Stantec

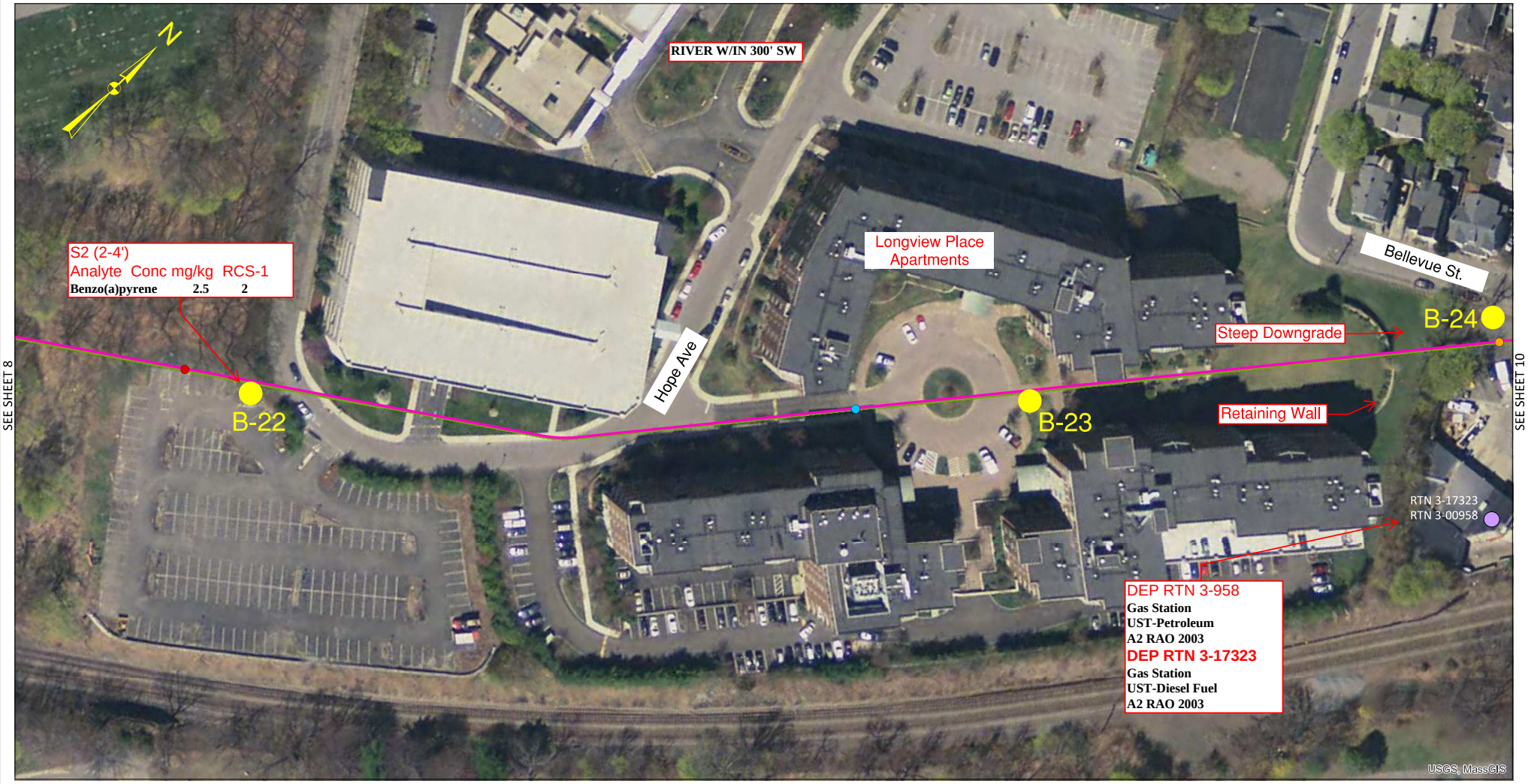
DATE: APRIL 2017

0 40 80 160

SCALE: 1 inch = 80 feet

MASSACHUSETTS WATER RESOURCES AUTHORITY

WASM 3 SOIL EXPLORATION PROGRAM



Note: Analytical samples collected from every proposed boring

Legend

- Manhole (No Chamber)
- Existing Borings
- Site with RTN
- Existing Borings
- Proposed Borings
- Air Valves
- Mainline Valves
- Blowoff Valves
- Meter Facility
- WASM 3 Route

Stantec

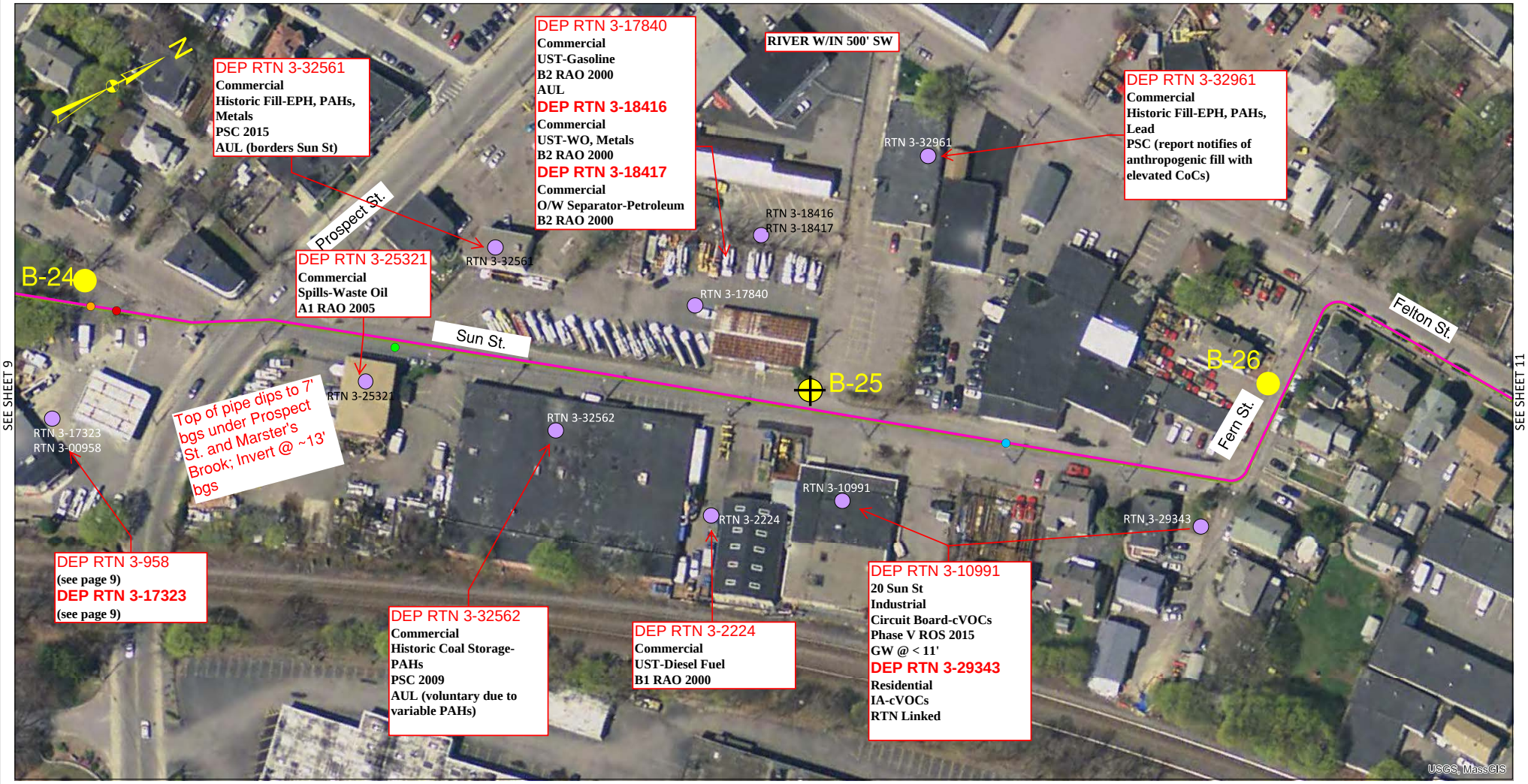
DATE: APRIL 2017

0 40 80 160

SCALE: 1 inch = 80 feet

MASSACHUSETTS WATER RESOURCES AUTHORITY

WASM 3 SOIL EXPLORATION PROGRAM



Note: Analytical samples collected from every proposed boring

Legend

- Manhole (No Chamber)
- Existing Borings
- Existing Borings
- Proposed Borings
- Proposed Monitoring Well
- Site with RTN
- Air Valves
- Mainline Valves
- Blowoff Valves
- Meter Facility
- WASM 3 Route

Stantec

remove

TB39

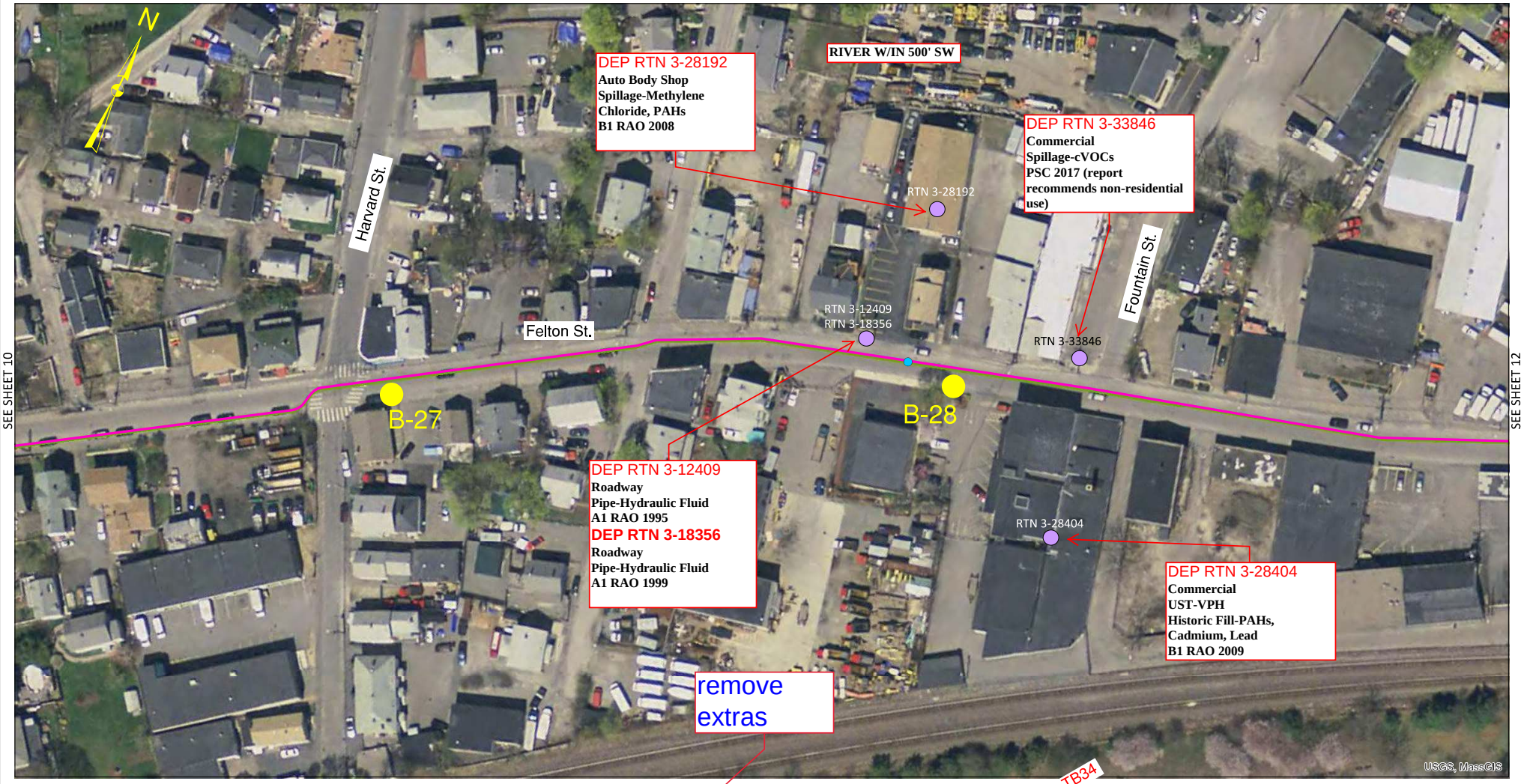
DATE: APRIL 2017

0 40 80 160

SCALE: 1 inch = 80 feet

MASSACHUSETTS WATER RESOURCES AUTHORITY

WASM 3 SOIL EXPLORATION PROGRAM



Note: Analytical samples collected from every proposed boring

Legend

- Manhole (No Chamber)
- Existing Borings
- Existing Borings
- Proposed Borings
- Site with RTN
- Air Valves
- Mainline Valves
- Blowoff Valves
- Meter Facility
- WASM 3 Route

Stantec

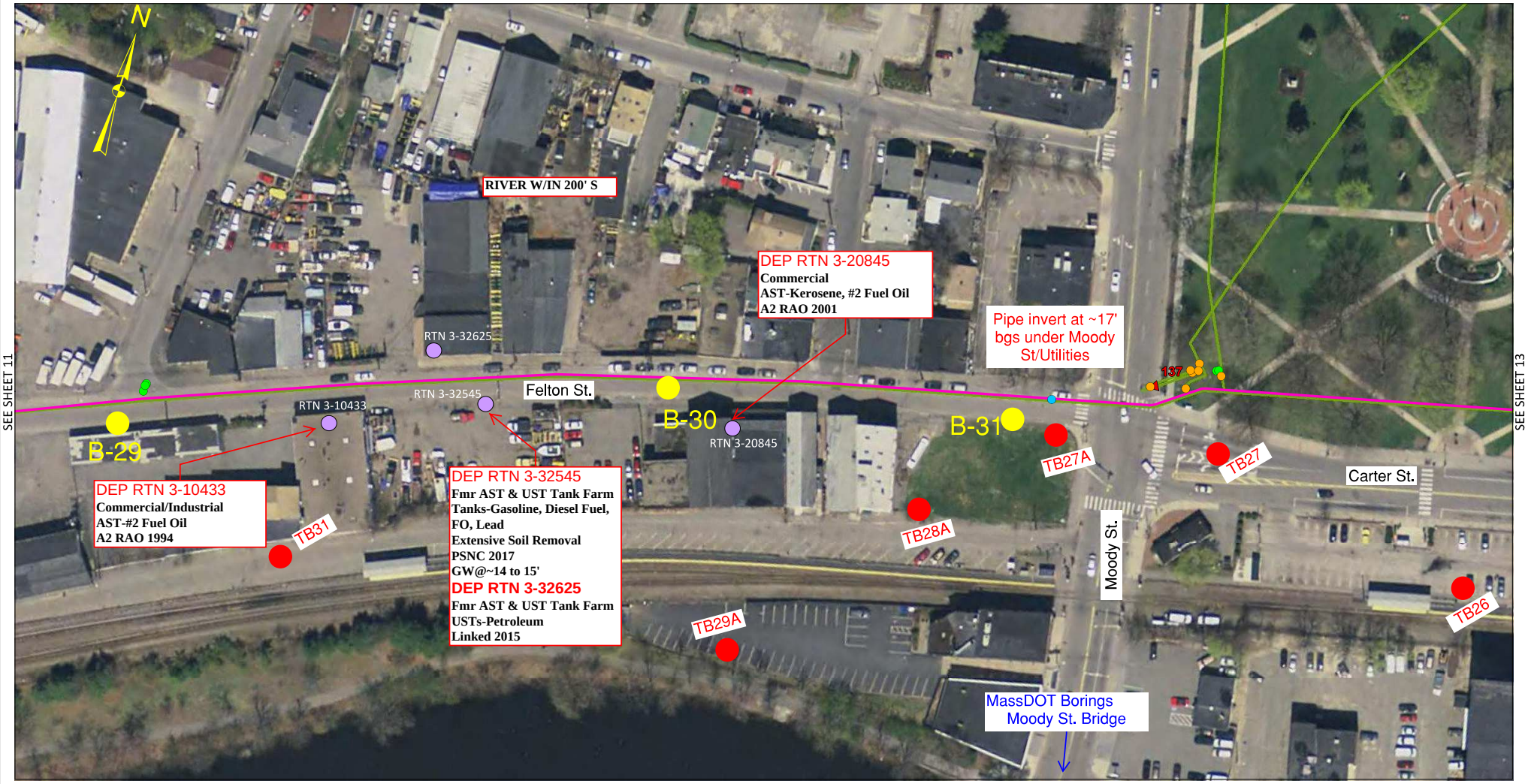
DATE: APRIL 2017

0 40 80 160

SCALE: 1 inch = 80 feet

MASSACHUSETTS WATER RESOURCES AUTHORITY

WASM 3 SOIL EXPLORATION PROGRAM



Note: Analytical samples collected from every proposed boring

Legend

- Manhole (No Chamber)
- Existing Borings
- Existing Borings
- Site with RTN
- Proposed Borings
- Air Valves
- Mainline Valves
- Blowoff Valves
- Meter Facility
- WASM 3 Route

Stantec

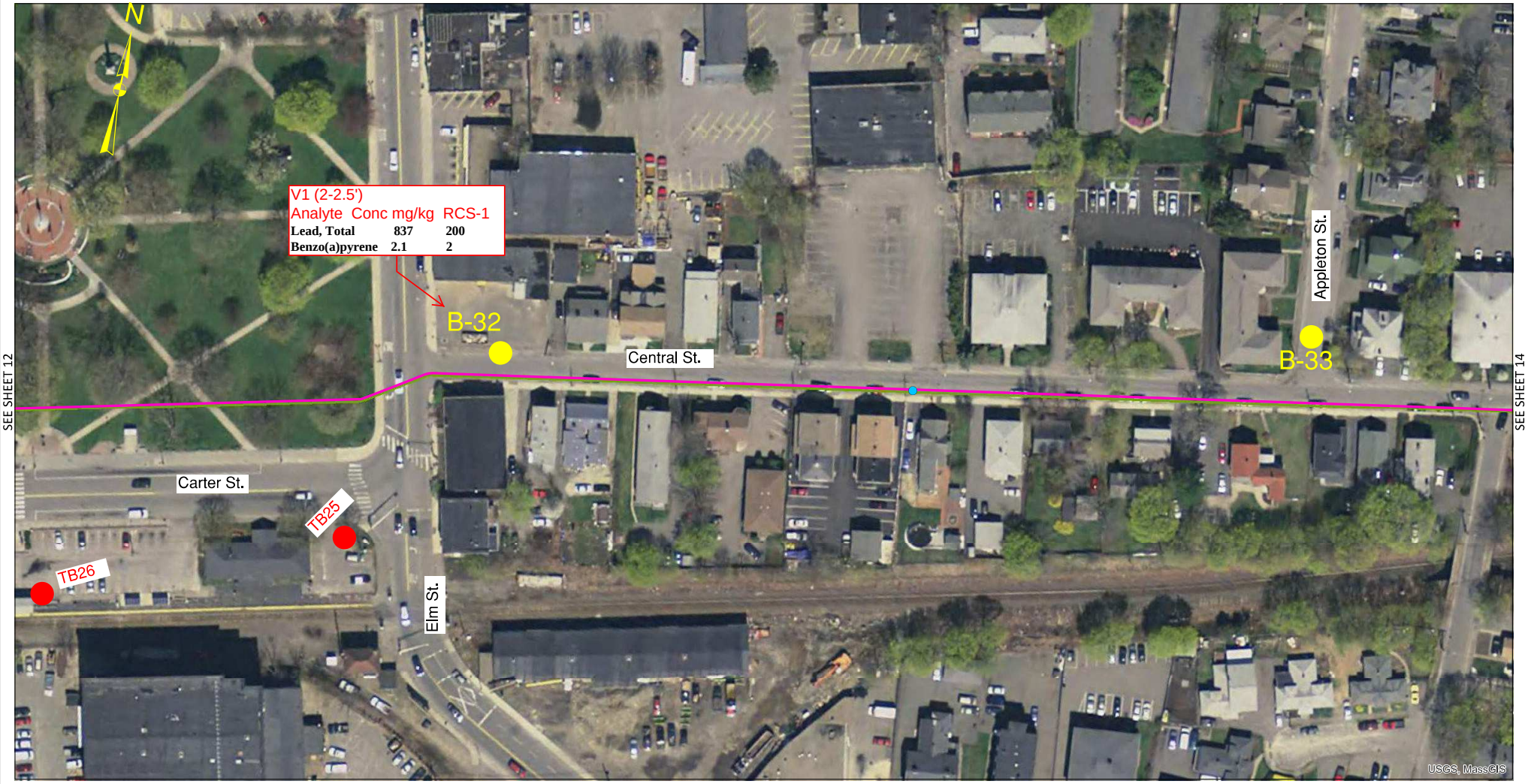
DATE: APRIL 2017

0 40 80 160

SCALE: 1 inch = 80 feet

MASSACHUSETTS WATER RESOURCES AUTHORITY

WASM 3 SOIL EXPLORATION PROGRAM



Note: Analytical samples collected from every proposed boring

Legend

- Manhole (No Chamber)
- Existing Borings
- Existing Borings
- Proposed Borings
- Air Valves
- Mainline Valves
- Blowoff Valves
- Meter Facility
- WASM 3 Route

Stantec

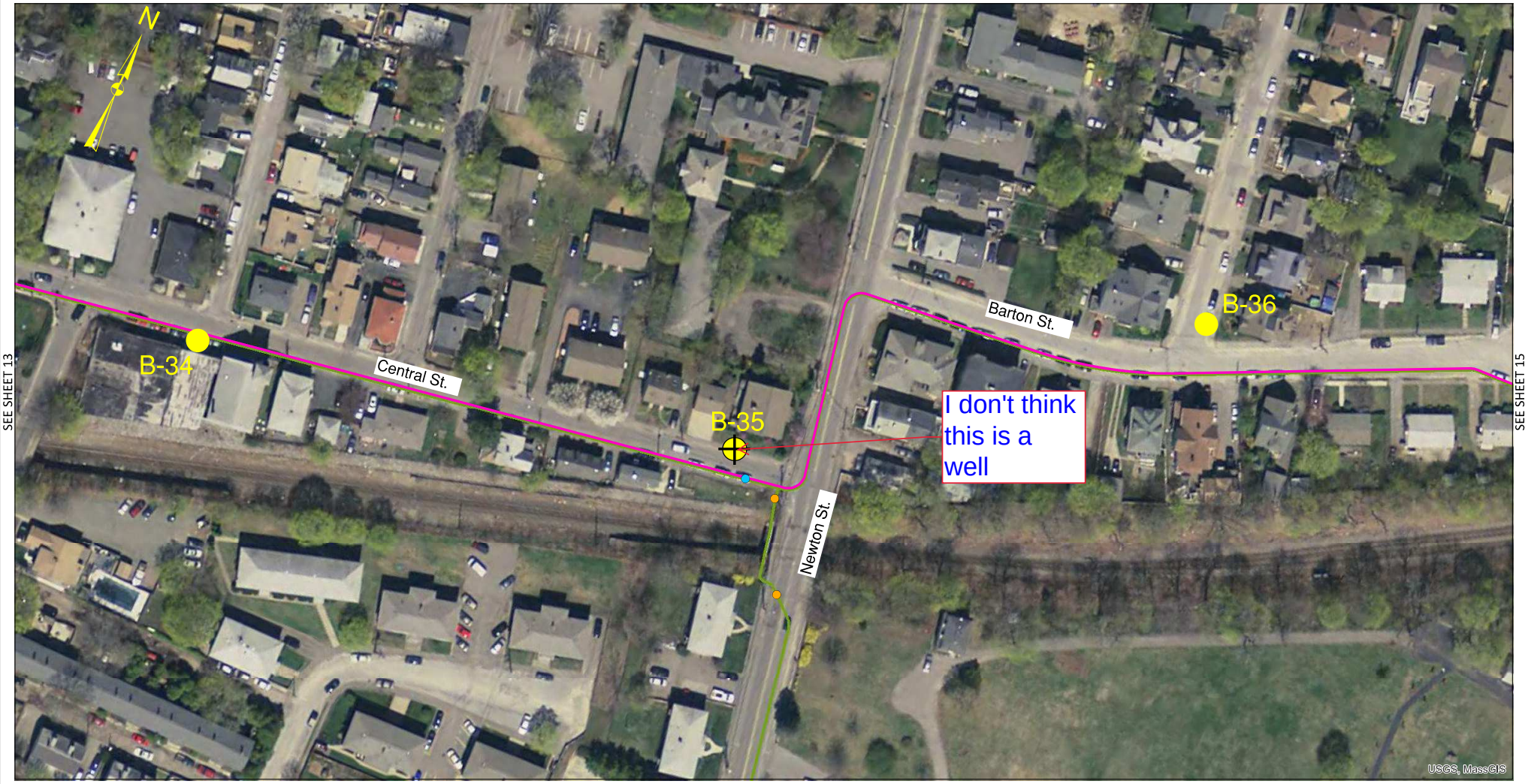
DATE: APRIL 2017

0 40 80 160

SCALE: 1 inch = 80 feet

MASSACHUSETTS WATER RESOURCES AUTHORITY

WASM 3 SOIL EXPLORATION PROGRAM



Note: Analytical samples collected from every proposed boring

Legend

- Manhole (No Chamber)
- Existing Borings
- Existing Borings
- Proposed Borings
- Proposed Monitoring Well
- Air Valves
- Mainline Valves
- Blowoff Valves
- Meter Facility
- WASM 3 Route

Stantec

DATE: APRIL 2017

0 40 80 160

SCALE: 1 inch = 80 feet

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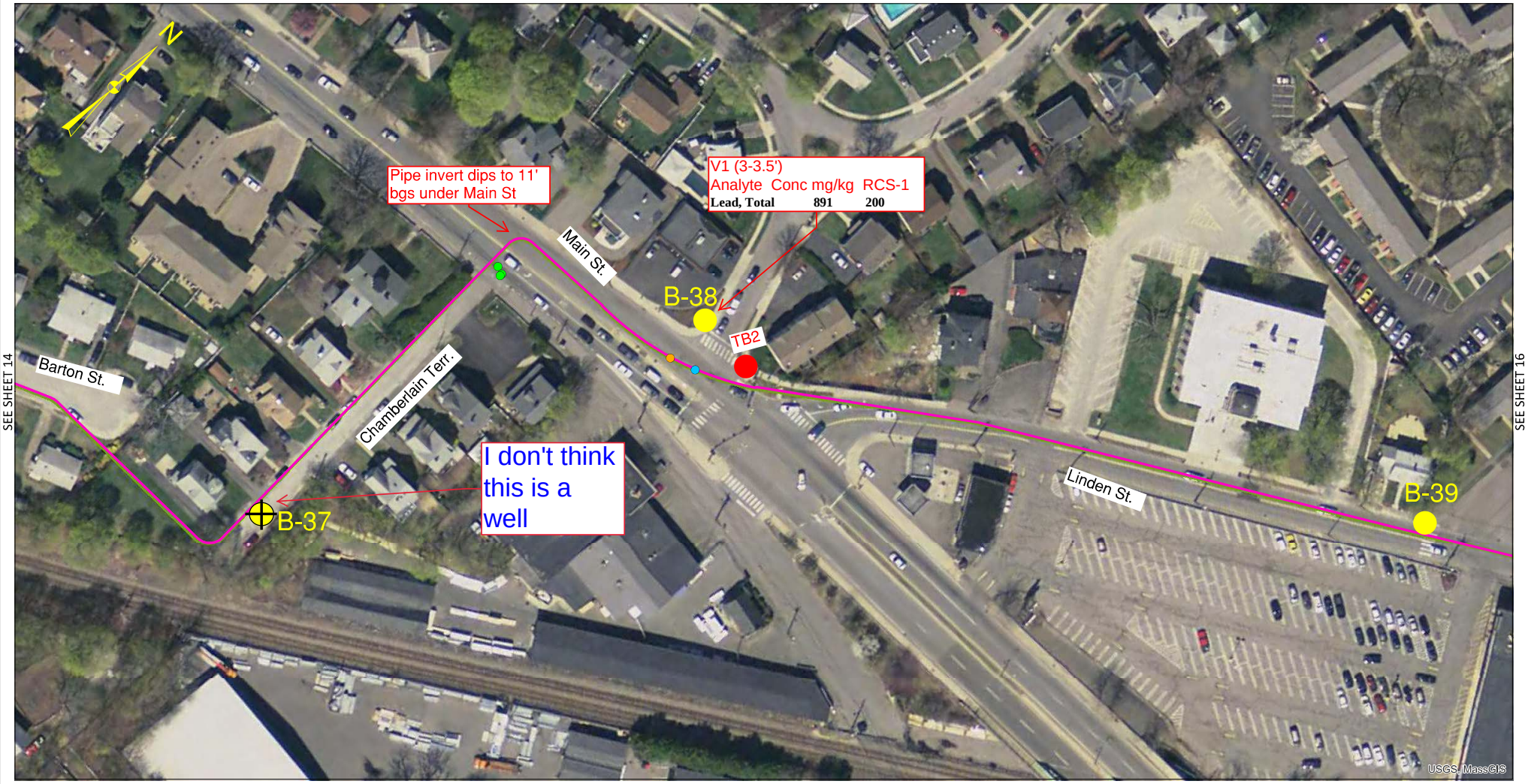

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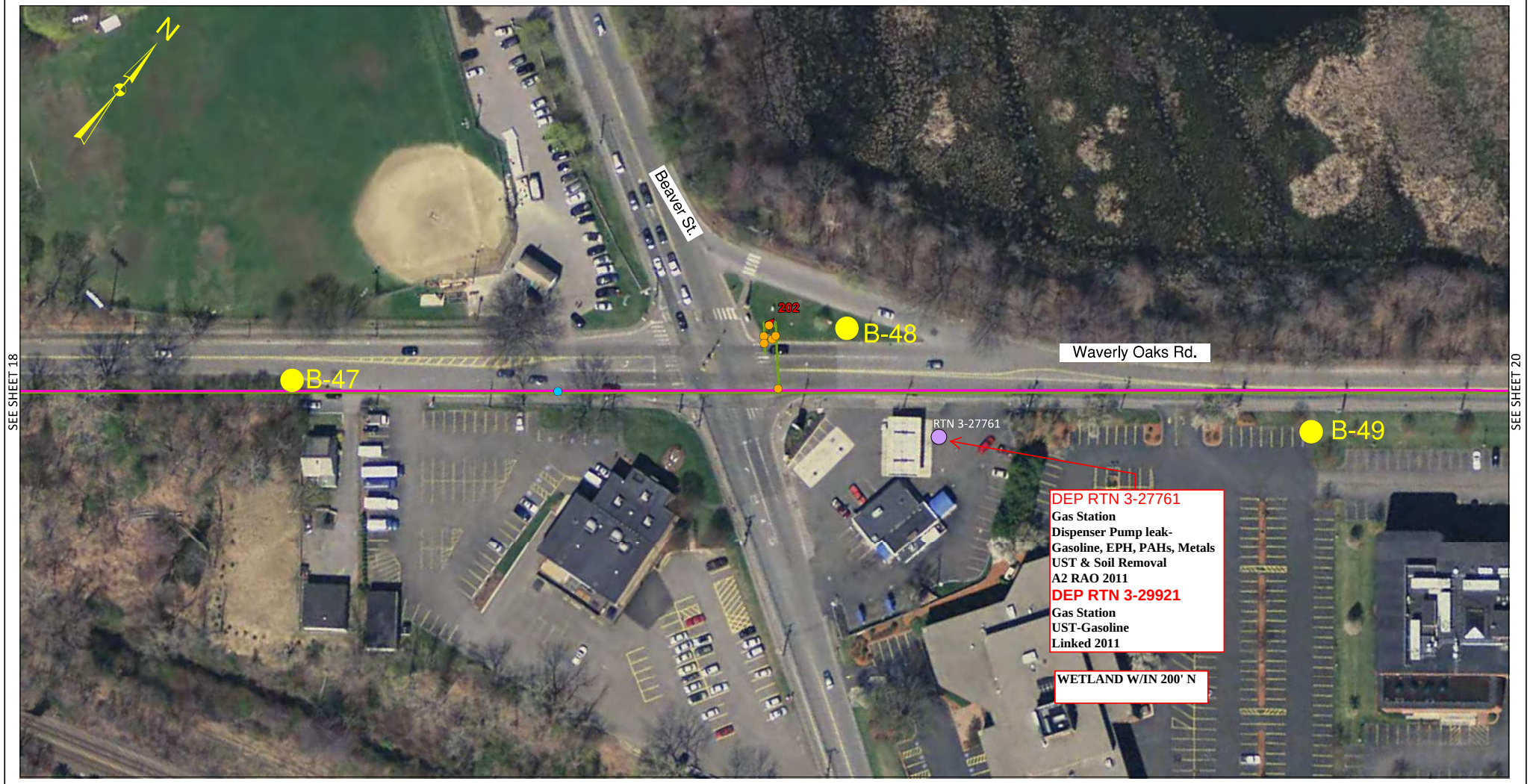

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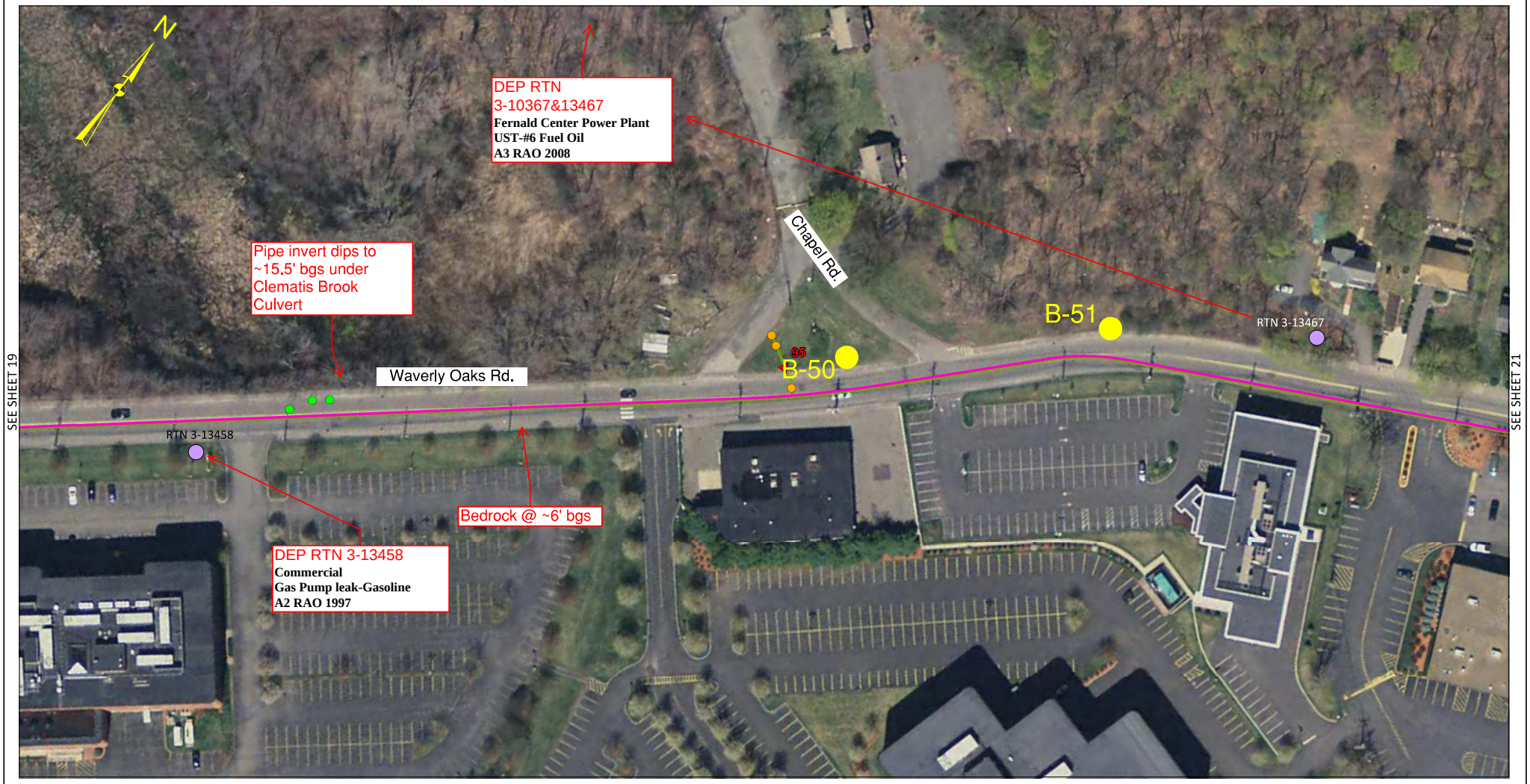

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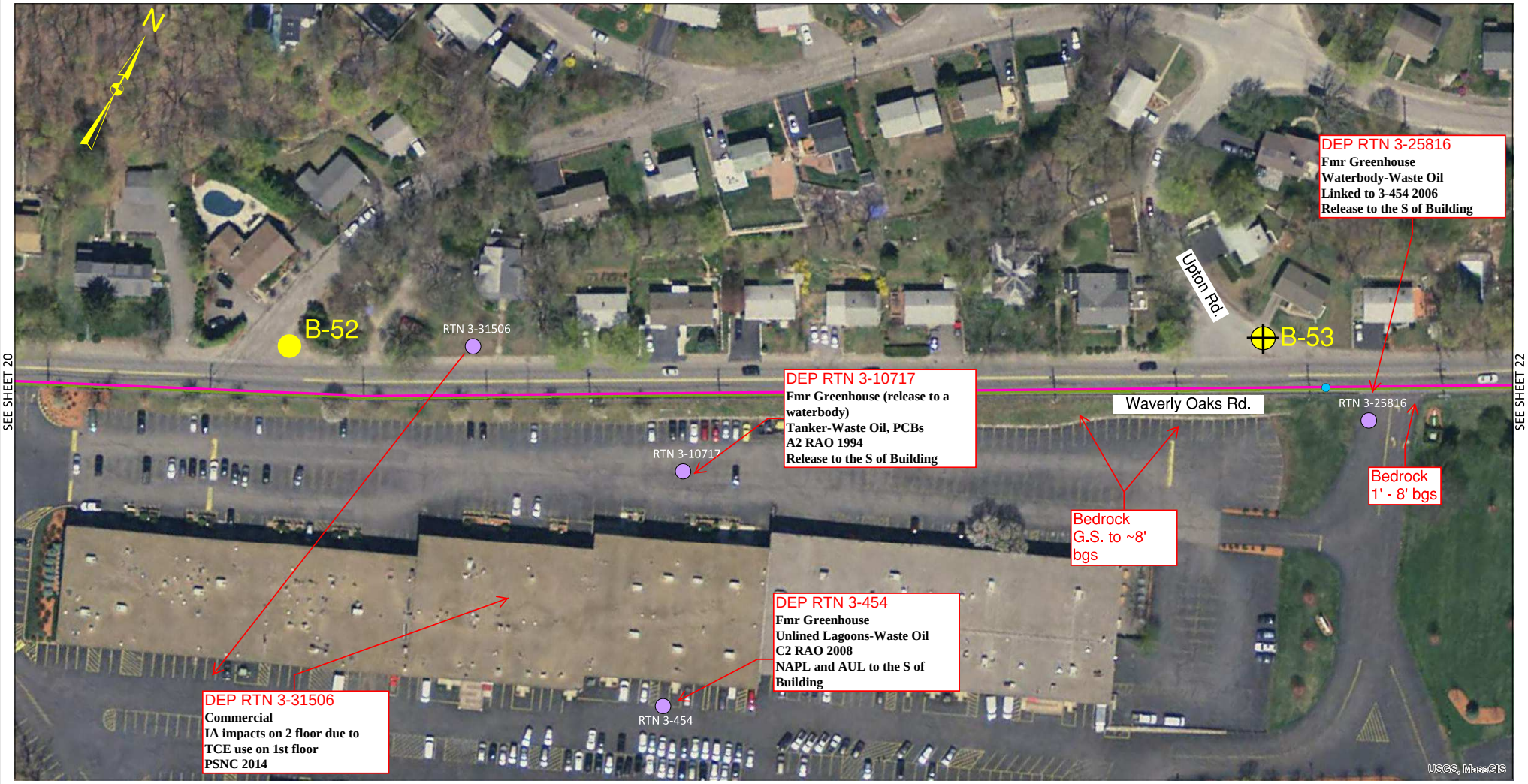

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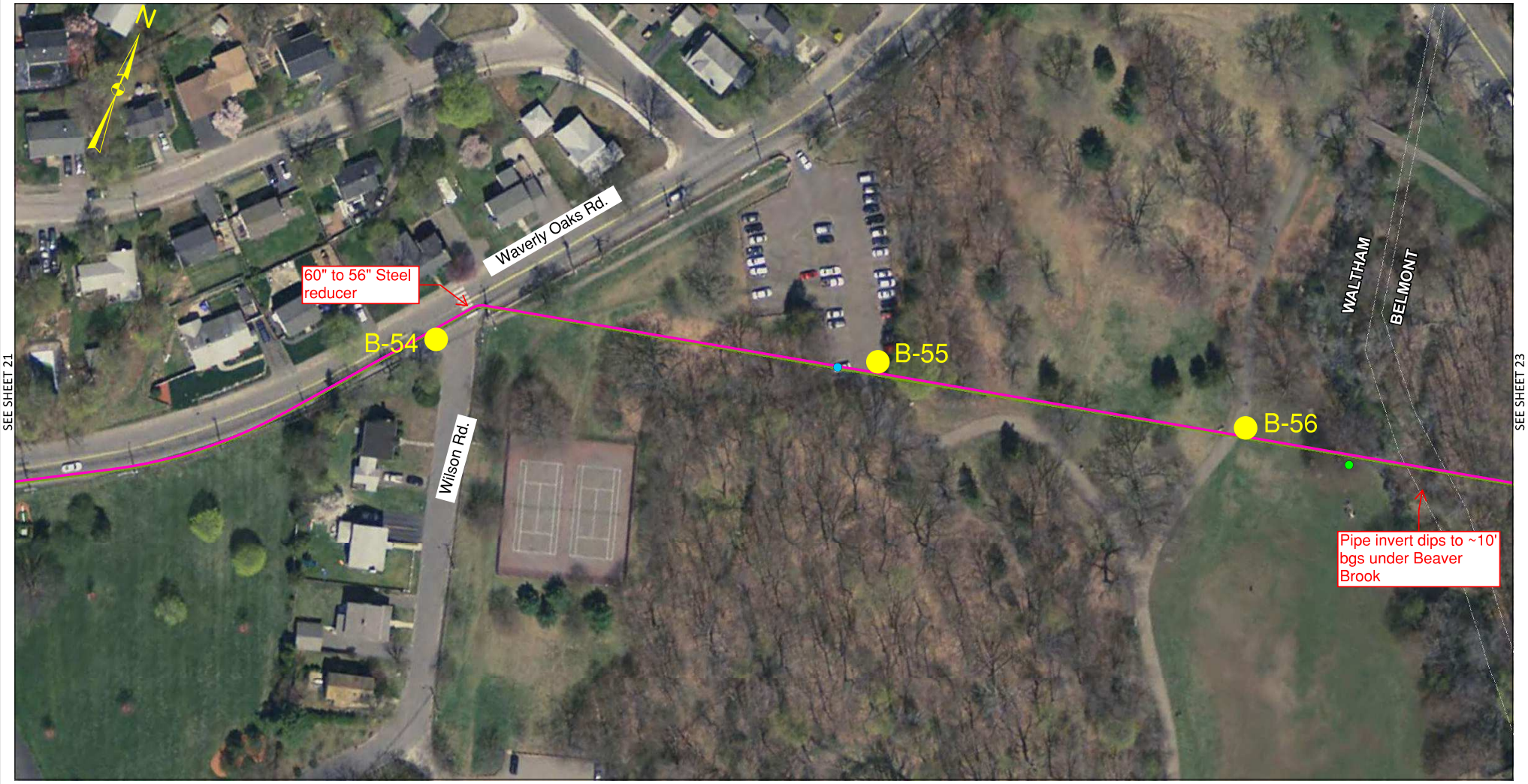

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