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488-4D Ash Landfill
Annual Groundwater Monitoring Report

2021 Data

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DISCLAIMER

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and
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Aiken, South Carolina

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LIST OF ABBREVIATIONS AND ACRONYMS

bgs	below ground surface
DAG	D-Area Groundwater
DCSA	484-17D D-Area Coal Storage Area
CPRB	489-D D-Area Coal Pile Runoff Basin
ft	foot, feet
ft msl	feet mean sea level
MCL	Maximum Contaminant Level
µg/L	microgram per Liter
NSDWS	National Secondary Drinking Water Standard
OU	Operable Unit
PCE	tetrachloroethylene
RSL	Regional Screening Level
SCDHEC	South Carolina Department of Health and Environmental Control
SRS	Savannah River Site
TCE	trichloroethylene
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds

1.0 SITE DESCRIPTION AND BACKGROUND

The 488-4D Ash Landfill is located in D Area on the Savannah River Site (SRS) and is a 15-acre landfill that received coal ash. Although the ash landfill is located within the boundary of the D-Area Groundwater (DAG) Operable Unit (OU) where multiple groundwater plumes are monitored, the 488-4D Ash Landfill is specifically monitored with five (5) groundwater wells (DCB077, DCB078, DCB079, and DCB080 and DCB 8) (**Figure 1**). The 488-4D Ash Landfill was closed in 2016 under a non-time critical removal action and was included in the DAOU 2nd Early Action Record of Decision (SRNS 2020). The groundwater associated with the landfill was previously monitored and reported to South Carolina Department of Health and Environmental Control (SCDHEC) under the Solid Waste Division (previous Solid Waste Permit #025800-1602). In 2018, groundwater monitoring and reporting for the 488-4D Ash Landfill was combined with the DAG OU. Sampling is conducted annually at the five (5) monitoring wells and previously reported in annual DAG OU monitoring reports or letter reports.

On June 16, 2022, a discussion was held among the United States Department of Energy, SCDHEC and the United States Environmental Protection Agency (USEPA) where SRS proposed an adjustment to the DAG OU Groundwater Monitoring Letter Report that was to be submitted in July 2022. It was agreed upon that the DAG OU Groundwater Monitoring Letter Report that was originally due in July 2022 will now be a full groundwater monitoring report and will be submitted in January 2023. That full report will discuss all DAG OU data from 2021 and 2022. This groundwater monitoring report is the annual data report for the 488-4D Ash Landfill for 2022 and describes sampling activities specifically conducted at the five (5) 488-4D Ash Landfill monitoring wells during calendar year 2021.

2.0 GROUNDWATER MONITORING

The 488-4D Ash Landfill groundwater monitoring is prescribed in the schedule within the DAG OU groundwater monitoring plan and the current sampling schedule that is reported in the most recent DAG OU report (SRNS 2021; **Table 2**). The following three wells are located downgradient of 488-4D Ash Landfill: DCB078, DCB079, and DCB080 (**Figure 1**). A fourth well, DCB077, is located upgradient and to the northwest of the landfill. Additionally, a fifth well,

DCB 8, located 1,640 feet upgradient of the landfill, is also upgradient of the 484-17D D-Area Coal Storage Area (DCSA) and the 489-D D-Area Coal Pile Runoff Basin (CPRB). All five (5) 488-4D Ash Landfill wells are water table wells and screened no deeper than 44 feet below ground surface (bgs).

Groundwater at the 488-4D Ash Landfill has been impacted by acidic leachate from the DCSA and the CPRB, as groundwater monitoring wells in the DAG OU monitoring program shows wells downgradient of these source units are contaminated with metals mobilized in the low-pH conditions. Additionally, many of these wells are located within areas of tritium and volatile organic compounds (VOCs) (i.e., trichloroethylene [TCE] and tetrachloroethylene [PCE]) groundwater contamination plumes. The previous sources of tritium and VOC contamination are located farther upgradient in D-Area (SRNS 2021).

2.1 Groundwater Flow

Water elevation data for the second quarter 2021 are presented in **Figure 1**. The water table near the 488-4D Ash Landfill is approximately 20 to 25 feet bgs and flows toward the southwest. Water elevations have been fairly stable over the last four years. Water elevations for May 2021 and November/December 2021 are provided in **Table 3**.

2.2 Groundwater Constituents and Parameters

The five (5) wells are monitored for constituents according to the DAG OU *Groundwater Samples Analyte List and Sample Frequency* table that is included in the DAG OU groundwater monitoring reports and letters (SRNS 2021; *Appendix B, Table B-1*). **Table 2** lists the current analytical and field parameters being monitored. As part of the DAG OU monitoring, results are compared to Maximum Contaminant Levels (MCLs), National Secondary Drinking Water Standards (NSDWS), or USEPA Regional Screening Levels (RSLs), in that order.

3.0 RESULTS

Groundwater analytical samples were collected in May 2021 for all five (5) wells associated with the 488-4D Ash Landfill. Water elevations were also collected during November/December 2021. These analytical and field results are presented in **Table 3**.

3.1 Results Above Regulatory Threshold Limits

Analytical results from the May 2021 sampling show the following nine (9) constituents were detected in the five (5) 488-4D Ash Landfill monitoring wells at concentrations above their applicable regulatory threshold level in at least one monitoring well:

- Aluminum (NSDWS)
- Beryllium (MCL)
- Cobalt (RSL)
- Iron (NSDWS)
- Manganese (NSDWS)
- Sulfate (NSDWS)
- PCE (MCL)
- TCE (MCL)
- Tritium (MCL)

These are the same constituents observed within the DAG OU (SRNS 2021). Metals contamination is sourced from the DCSA and CPRB from low-pH groundwater conditions caused by long-term coal storage and subsequent dissolution of coal and natural aquifer minerals due to acidic water leachate. Although the groundwater is elevated in metal concentrations including beryllium (**Figure 2**), the concentrations have been decreasing for the last four (4) years. **Figures 3 to 5** show the time-series plots for beryllium for the 488-4D monitoring wells. Additionally, upgradient DAG OU wells, such as DCB 23C, display higher groundwater concentrations of metals including beryllium (**Figure 2**).

Although tritium and VOC (i.e., PCE and TCE) contamination are present in the groundwater beneath the 488-4D Ash Landfill and in some of its monitoring wells, tritium and VOC contamination are not associated with the 488-4D Ash Landfill as those contaminants have not been disposed of at the landfill. The tritium and VOC groundwater contaminants are from upgradient sources within D-Area and are monitored as part of DAG OU (SRNS 2021).

Groundwater will continue to be monitored at the five (5) 488-4D Ash Landfill monitoring wells annually. The 2022 groundwater data will be supplied in the DAG OU Groundwater Monitoring Report to be submitted in January 2023. Subsequent data will be reported in July the year after the data was collected.

4.0 REFERENCES

SRNS, 2020. *Second Early Action Record of Decision Remedial Alternative Selection for the D-Area Operable Unit (U)*, July 2020, Rev 1, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

SRNS, 2021. *2020 Groundwater Monitoring Report for the D-Area Groundwater Operable Unit (U)*, July 2021, Rev. 0, Savannah River Nuclear Solutions, LLC, Savannah River Site, Aiken, SC

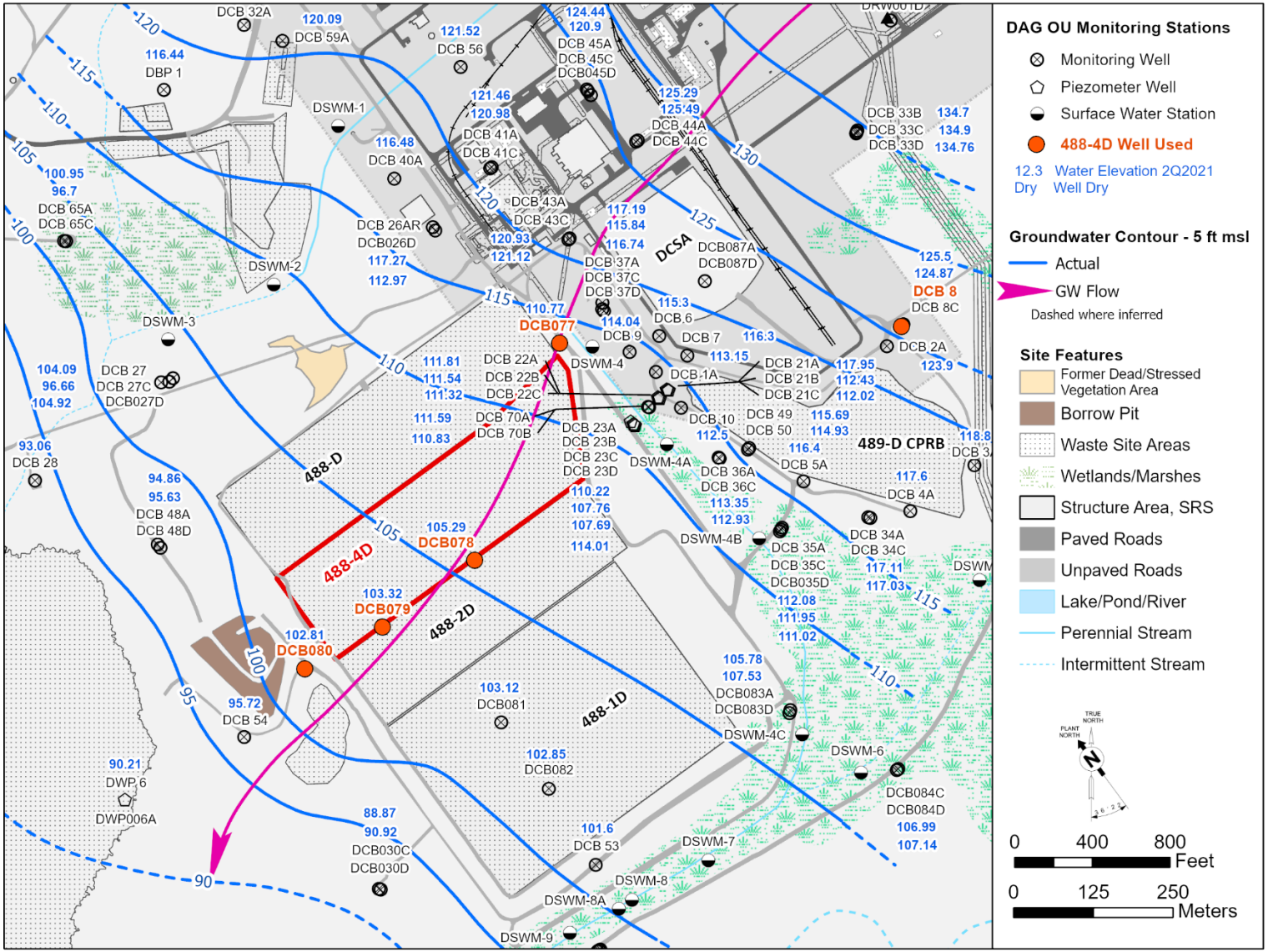

Figure 1. Monitoring Well Locations at the 488-4D Ash Landfill and 2Q2021 Water Level Elevations

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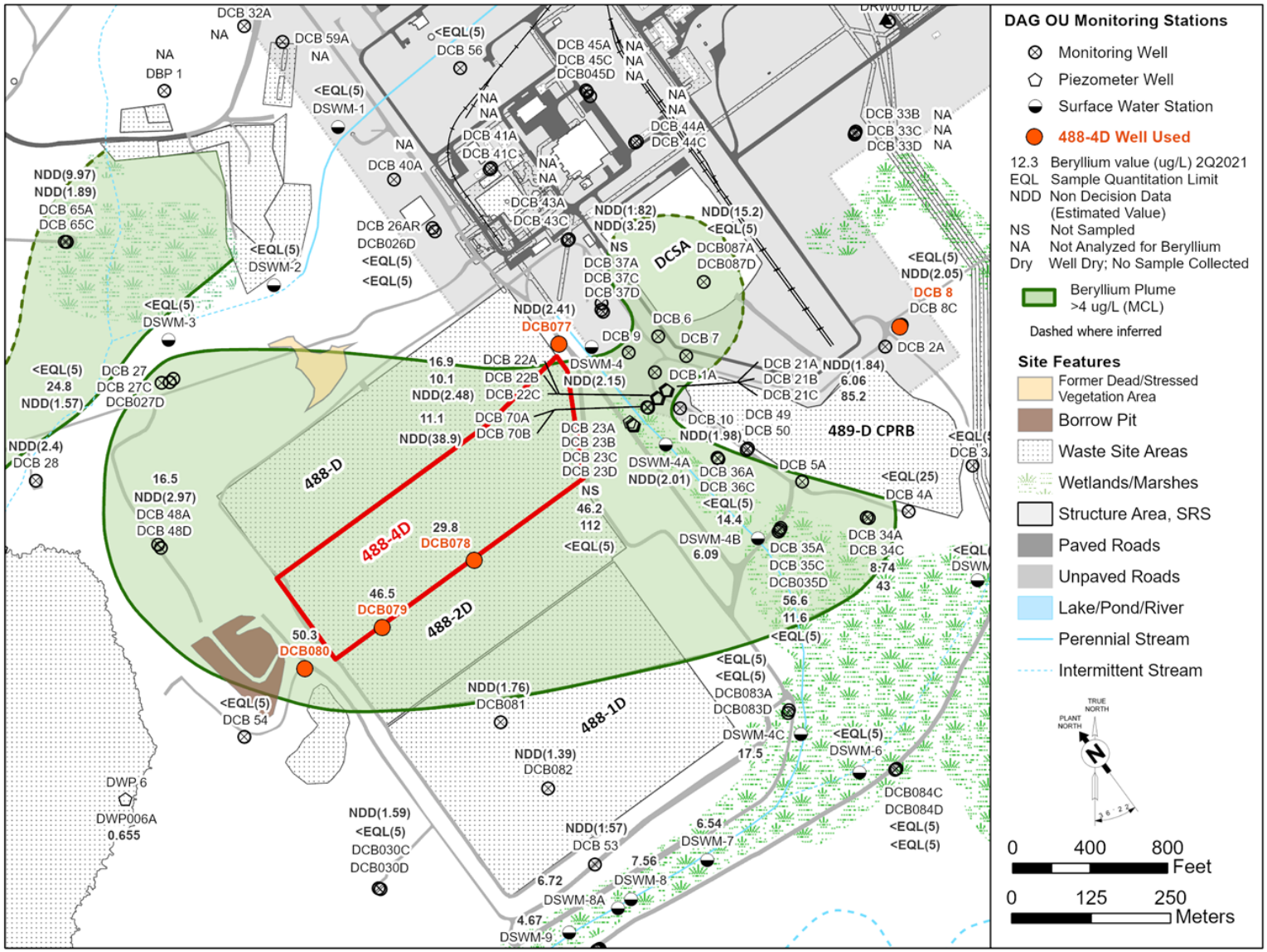

Figure 2. Beryllium Concentrations at the 488-4D Ash Landfill, Second Quarter 2021

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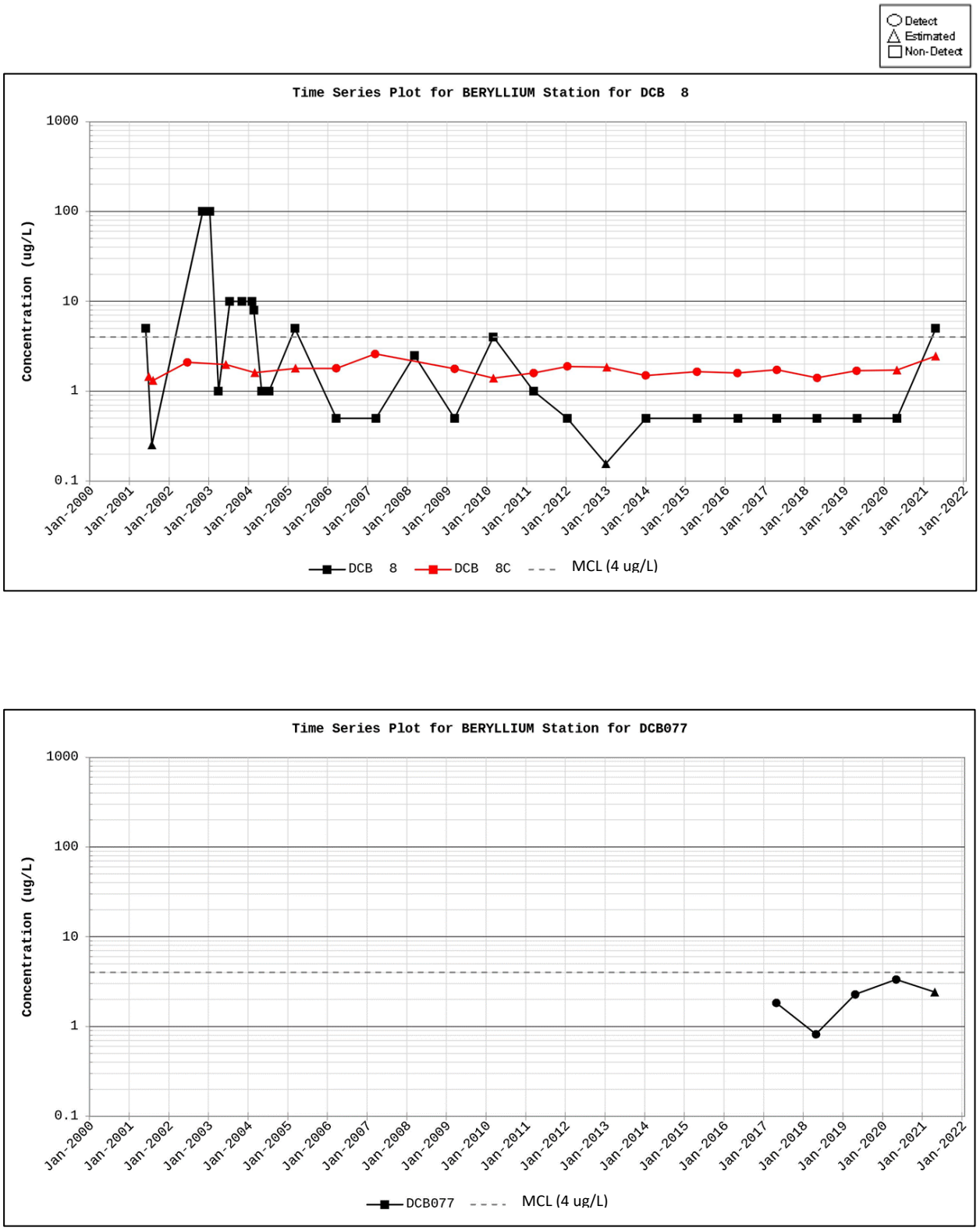

Figure 3. Beryllium Time Series Plots at DCB 8 and DCB077

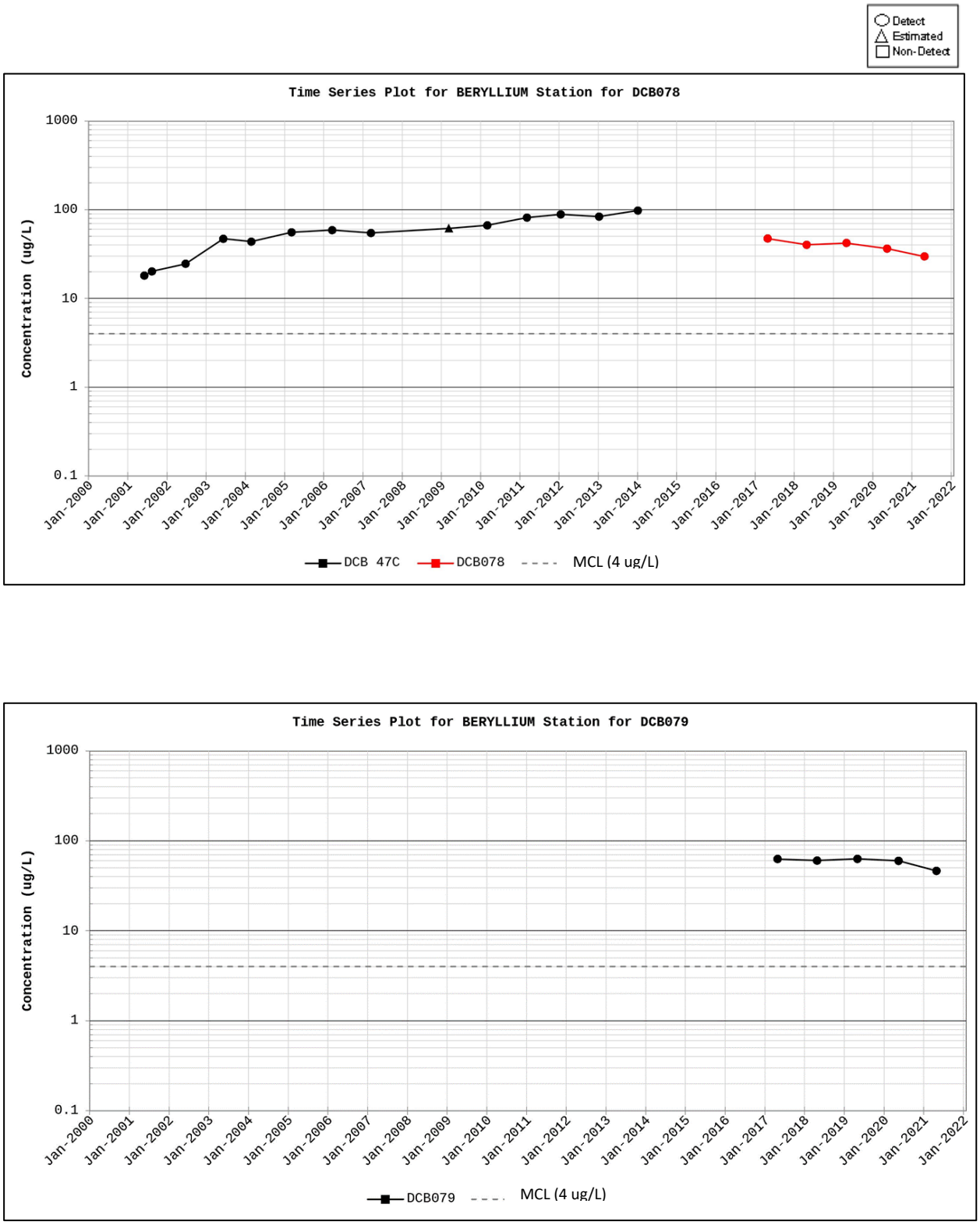

Figure 4. Beryllium Time Series Plots at DCB078 and DCB079

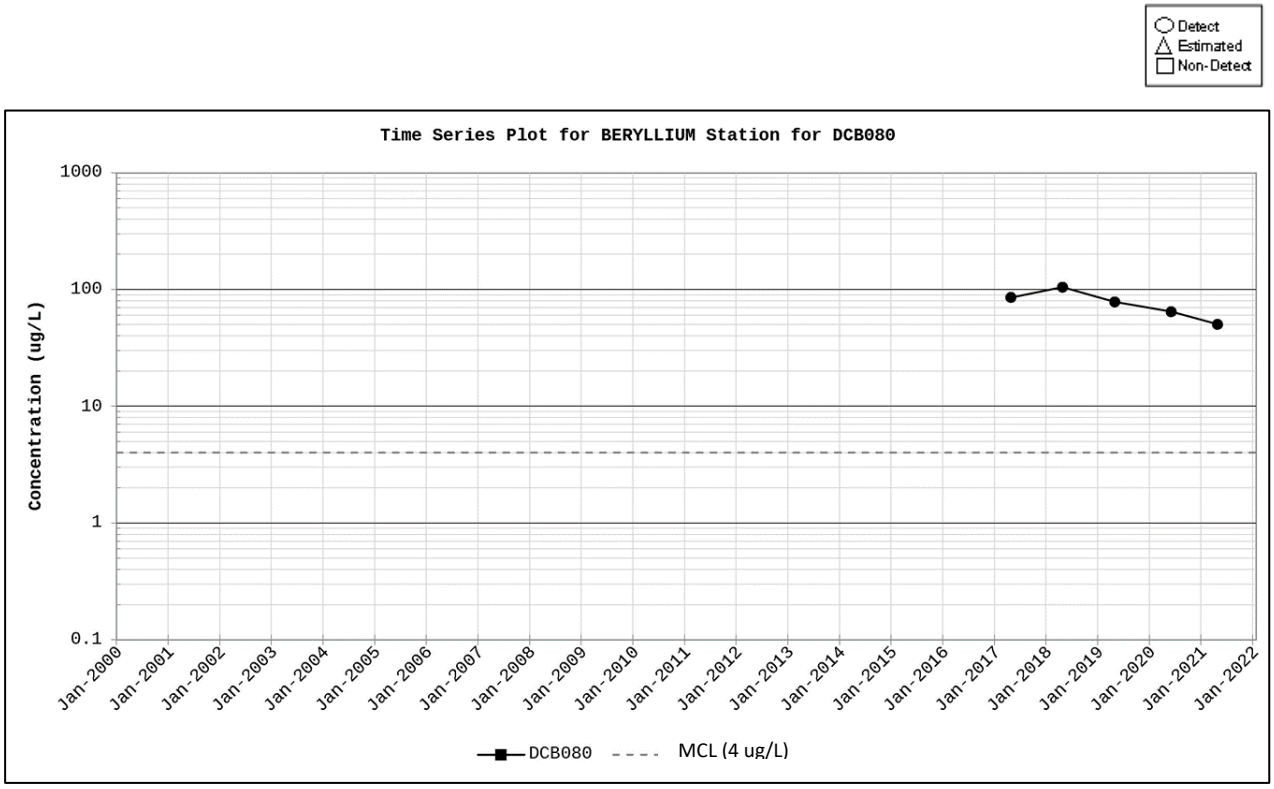

Figure 5. Beryllium Time Series Plot at DCB080

Table 1. Groundwater Monitoring Network at the 488-4D Ash Landfill

Station	Well Use	Aquifer	UTM East	UTM North	Reference Elevation *(ft msl)*	Ground Elevation *(ft msl)*	Depth to Top of Screen Zone *(ft bgs)*	Depth to Bottom of Screen Zone *(ft bgs)*
DCB 8	upgradient	UTRA	431521.3	3673555.1	137.20	134.80	4.5	24.5
DCB077	upgradient	UTRA	430985.68	3673528.71	130.64	127.7	9.7	29.7
DCB078	downgradient	UTRA	430852.27	3673189.19	126.56	126.7	19.7	39.7
DCB079	downgradient	UTRA	430707.50	3673083.91	127.65	127.8	23.7	43.7
DCB080	downgradient	UTRA	430585.51	3673019.20	119.03	116.1	13.1	33.1

UTM – Universal Transverse Mercator; UTRA – Upper Three Runs Aquifer (water table)

Table 2. Monitored Constituents for the 488-4D Ash Landfill

Monitoring Well	Second Quarter	Fourth Quarter
DCB 8	Fp, M, S, T, U	W
DCB077	Fp, M, S, T, V	W
DCB078	Fp, M, S, T, V	W
DCB079	Fp, M, S, T, V	W
DCB080	Fp, M, S, T, V	W

Fp-Field Parameters; M-Metals; S-Sulfate; T-Tritium; U-Uranium; V-VOCs; W-Water Elevation Only

Metals	
Aluminum	Magnesium
Antimony	Manganese
Arsenic	Mercury
Barium	Nickel
Beryllium	Potassium
Cadmium	Selenium
Calcium	Silver
Chromium	Sodium
Cobalt	Thallium
Copper	Vanadium
Iron	Zinc
Lead	

VOC
Vinyl Chloride
Cis-1,2-Dichloroethylene
Tetrachloroethylene (PCE)
Trans-1,2-Dichloroethylene
Trichloroethylene (TCE)

Field Parameters
Depth to Water
Purge Volume
Turbidity
Water Temperature
pH
Specific Conductance
Alkalinity

Table 3. 2021 Sampling Results for the 488-4D Ash Landfill

See insert on next page

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Table 3. 488-4D Ash Landfill Groundwater Monitoring Data

			Field Data															D Area Analyte Suite																														
																		Inorganics																									Organics					Radionuclides
			SAMPLE COLLECTION DATE	WATER LEVEL MEASUREMENT DATE	SYNCHRONOUS WATER ELEVATION	DEPTH TO WATER	VOLUME PURGED	TURBIDITY	PH	WATER TEMPERATURE	SPECIFIC CONDUCTANCE	TOTAL ALKALINITY (AS CACO3)	SAMPLING EVENT WATER ELEVATION	OXIDATION/REDUCTION POTENTIAL	OXYGEN	**Constituent**	FIELD CONDITIONS	ALUMINUM	ANTIMONY	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD	MAGNESIUM	MANGANESE	MERCURY	NICKEL	POTASSIUM	SELENIUM	SILVER	SODIUM	SULFATE	THALLIUM	URANIUM	VANADIUM	ZINC	CHLOROETHENE (VINYL CHLORIDE)	CIS-1,2-DICHLOROETHYLENE	TETRACHLOROETHYLENE (PCE)	TRANS-1,2-DICHLOROETHYLENE	TRICHLOROETHYLENE (TCE)	TRITIUM
			day-month-year	day-month-year	ft	ft	gal	NTU	pH	degC	uS/cm	mg/L	ft	mV	mg/L	**Unit**		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	mg/L	ug/L	ug/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	pCi/mL
																MCL			6	10	2000	4	5		100		1300		15			2			50				2	30			2	70	5	100	5	20
																NSDWS		200										300			50					100		250				5000						
Station	**Well Use**	**Aquifer Zone**														**RSL**										6							390															
DCB 8	Monitoring Well	UTRA	05-May-2021	03-May-2021	125.5	11.7	20	8.3	5	18.9	48	0	125.5	187	2.33			416	<EQL (20)	<EQL (30)	19.6	<EQL (5)	<EQL (5)	1770	[1.63]	<EQL (5)	99.9	1430	<EQL (20)	777	[4.48]	<EQL (0.2)	<EQL (5)	229	<EQL (30)	<EQL (5)	3.72	4.94	<EQL (20)	[0.111]	[1.41]	[5.77]	NS	NS	NS	NS	NS	<EQL (1.45)
DCB 8	Monitoring Well	UTRA	13-Dec-2021	13-Dec-2021	122.76	14.44	18	14.1	5.2	20	28	5	122.76	191	4.18			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DCB077	Monitoring Well	UTRA	11-May-2021	03-May-2021	110.77	19.97	6	67.6	4.4	23	1010	0	110.67	317	2.14			2840	<EQL (20)	<EQL (30)	27.3	[2.41]	<EQL (5)	74900	[1.46]	[2.99]	[5.88]	55900	[11]	10900	2820	<EQL (0.2)	6.21	8300	<EQL (30)	<EQL (5)	7.18	627	<EQL (20)	NS	<EQL (5)	30.2	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1)	<EQL (1.11)
DCB077	Monitoring Well	UTRA		11-Nov-2021	110.14													NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DCB078	Monitoring Well	UTRA	12-May-2021	03-May-2021	105.29	21.54	24	14.3	4.2	20.2	868	0	105.02	240	1.94			15300	<EQL (20)	<EQL (30)	20.8	29.8	<EQL (5)	66300	[3.33]	249	[10.1]	37200	<EQL (20)	[28400]	4340	<EQL (0.2)	199	3160	<EQL (30)	<EQL (5)	17.7	521	<EQL (20)	NS	<EQL (5)	567	<EQL (1)	[0.8]	[0.53]	<EQL (1)	12.6	<EQL (1.44)
DCB078	Monitoring Well	UTRA	17-Dec-2021	17-Dec-2021	104.33	22.23	2	12.9	4.2	20.2	903	0	104.33	226	0.83			NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
DCB079	Monitoring Well	UTRA	12-May-2021	03-May-2021	103.32	24.56	20	1.7	4.2	20.7	401	0	103.09	251	2.14			2390	<EQL (20)	<EQL (30)	25.2	46.5	<EQL (5)	29900	[1.74]	199	<EQL (20)	8480	<EQL (20)	[6170]	3350	<EQL (0.2)	44.2	3310	<EQL (30)	<EQL (5)	17.6	177	<EQL (20)	NS	<EQL (5)	233	<EQL (1)	2.2	2.58	<EQL (1)	32.8	[63.2]
DCB079	Monitoring Well	UTRA		11-Nov-2021	101.76																																											
DCB080	Monitoring Well	UTRA	12-May-2021	03-May-2021	102.81	16.44	26	2.4	4	19.6	684	0	102.59	266	1.51			8090	<EQL (100)	<EQL (150)	[18.4]	50.3	<EQL (25)	42800	<EQL (50)	186	[20.4]	45300	[29.6]	[17300]	2370	<EQL (0.2)	59	7370	<EQL (150)	<EQL (25)	14.2	388	<EQL (100)	NS	<EQL (25)	242	<EQL (1)	2.71	5.71	<EQL (1)	21.9	[31.2]
DCB080	Monitoring Well	UTRA		03-May-2021	102.81	16.44							102.59				Lab Duplicate																					393										[33]
DCB080	Monitoring Well	UTRA		11-Nov-2021	101.24																																											

Explanation

[##]	EPA Functional Guideline Code of 'J' was applied to the result, indicating an estimated quanity.
<EQL(##)	Constituent was below detection. The sample-specific Estimated Quantitation Limit is in parentheses.
🟥	Result exceeds applicable limit.
REJ	Result Rejected.
	Result is less than the applicable limit and without EPA Functional Guidline qualifiers.
NS	Requested to be sampled but was not. See comments as to why not.
Blue Text	Not a required sample analysis.