

# **Appendix D**

## **Plume Analytics Technical Memo**



AECOM  
7595 Technology Way  
Denver, CO 80237  
aecom.com

**Project name: CFFF Annual  
Groundwater Monitoring Report**

**Project ref: 60641050**

**From: Randy Sillan**

**Date:  
September 27, 2021**

**To: Jeremy Grant**

**CC: Robin Mikeal**

# Memo

## 1. Introduction

AECOM evaluated the behavior of multiple dissolved phase plumes in groundwater at the Westinghouse Columbia Fuel Fabrication Facility in Hopkins, South Carolina (the "Site"). The objective of the plume analytics program is to evaluate the behavior over time of constituents of potential concern (COPCs) in groundwater that supports evaluation of plume stability and migration and groundwater monitoring and management strategies. The methods and results of the plume analytics evaluation are presented in this technical memorandum along with the slide presentation that summarizes the results.

## 2. Methods

### 2.1 Plume Analysis

Since concentration trends of COPCs at individual wells are not typically representative of overall behavior of COPCs plumes, a whole plume analysis method is used to assess plume-wide behavior and stability. The GroundWater Spatio-Temporal Data Analysis Tool (GWSDAT) is used to evaluate plume behavior by calculating the following plume metrics over time:

- The average concentration of a COPC within the dissolved phase plume,
- The dissolved mass of a COPC in the plume,
- The area of the dissolved phase plume, and
- The center of mass of the dissolved phase plume.

For this analysis, a dissolved phase plume contains concentrations of a COPC that exceed a concentration threshold that is typically defined as the cleanup standard or criteria for the COPC in groundwater, which may be site-specific. In general, the maximum contaminant level (MCL) was used as the threshold to define a plume and its extent and calculate its metrics (average concentration, mass, area, and center). For some plume snapshots, the MCL contour is not contained within the monitoring well network, which defines the extent of the spatial domain in which the plume metrics are calculated.

In other words, the MCL contour extends beyond the domain established by the well network and the plume metrics for a plume defined by the MCL cannot be calculated. In this situation, the threshold value that defines the plume extent is increased until the plume is contained within the spatial domain of the monitoring well network and plume metrics can be calculated.

When evaluating temporal trends in plume metrics as performed in this evaluation, the threshold value was increased until plume metrics could be calculated for each snapshot and provide adequate plume metrics for trend analysis using a consistent threshold value to define the plume. For future iterations of plume analytics, minimum threshold boundaries shall be used until the minimum bounding threshold is equal to the MCL and adequate plume snapshots are available for trend analysis.

The primary tool in GWSDAT for spatial analysis of a plume is a concentration smoother that generates concentration contours of the plume using a nonparametric regression technique known as Penalised Splines (P-Splines). This method evaluates the spatial distribution of monitoring wells and associated concentration data to generate concentration contours that delineate the solute plume for a plume snapshot or sampling event. The concentration contours generated by GWSDAT that define the plume at each time step (snapshot) are used by GWSDAT to calculate the plume metrics (average concentration, dissolved mass, plume area, and plume center of mass).

The plume metrics calculated by GWSDAT are numerical approximations of complex calculations to estimate changes in plume average concentration, dissolved mass, area, and center of mass within the monitoring network over time using multiple sampling events that provide plume snapshots over time. Trends in plume metrics over time approximated by GWSDAT are evaluated using the Mann-Kendall trend test to estimate the statistical significance of trends in the plume metrics over time that can be used to assess plume stability (USEPA, 2009).

Temporal changes in plume average concentration and dissolved mass per foot of aquifer thickness provides an assessment of processes (e.g. source strength, remedial actions, and natural attenuation) that control plume behavior. Temporal changes in the plume center of mass can indicate plume migration or the spatial variability within the plume of processes that change COPC concentrations over time. Likewise, temporal changes in plume area provides an assessment of plume stability and the processes that control distribution of mass within a plume.

Since the objective of performing the spatiotemporal plume analysis is to evaluate the change in plume behavior over time, a consistent monitoring well network that defines the dissolved plume is used during an evaluation time period. In addition, monitoring wells should be included in the analysis that bound and define the extents of the dissolved plume during each monitoring event. The evaluation time period has to include at least four plume snapshots and estimates of plume metrics to evaluate a trend using the Mann-Kendall test. Typically, the confidence in the estimated Mann-Kendall statistic increases as the number of monitoring events increases. However, the number of monitoring events to include in the plume analytics evaluation should include the most recent events, which provide the best representation of recent and potential future plume behavior.

## 2.2 Mann-Kendall Trend Test

The Mann-Kendall test evaluates whether values tend to increase or decrease over time by analyzing the sign of the difference between later values and all earlier values. The Mann-Kendall test does not assess the magnitude of change. The Mann-Kendall test assumes that a value can always be declared less than, greater than, or equal to another value and that data are independent. The Mann-Kendall test statistic,  $S$ , is calculated from the differences in values over time and is a large positive number when later values tend to be larger than earlier values indicating an increasing trend. When  $S$  is a large negative number, later values tend to be smaller than earlier values indicating a decreasing trend. When the absolute value of  $S$  is small, no trend is indicated.

In addition to the Mann-Kendall statistic, the method calculates the statistical confidence in the Mann-Kendall statistic,  $S$ , and the coefficient of variation, COV, for the set of values. Per the methodology presented in Aziz et al. (2003), the following descriptions for trends in values are applied using the specified criteria:

- “No Trend” is applied when the confidence is less than 90% and  $S$  is greater than zero ( $S > 0$ ) or the confidence is less than 90%,  $S$  is less than or equal to zero ( $S \leq 0$ ), and the coefficient of variation is greater than or equal to one ( $COV \geq 1$ ).
- A “Stable” trend is applied when the confidence is less than 90% and the  $COV < 1$ .
- A “Decreasing” trend or “Probably Decreasing” trend is applied when  $S < 0$  and the confidence is greater than 95% or 90%, respectively.
- An “Increasing” trend or “Probably Increasing” trend is applied when  $S > 0$  and the confidence is greater than 95% or 90%, respectively.

This methodology for assigning trends in values assumes the statistical significance level, also denoted as alpha, is 0.05 and is the probability of rejecting the null hypothesis when there is no trend. As discussed in Section 2.1, the confidence in an observed trend typically increases with an increase in the number of values being evaluated. To assess stability of dissolved plumes at the Site, trends in the plume metrics (average concentration, mass, and area) over time were evaluated using the Mann-Kendal test and trend descriptions were applied per the methodology in Aziz et al. (2003). For the plume center of mass metric, the distance between the plume center of mass and a specified monitoring well located within the plume was calculated for each plume snapshot and COPC. The trend in this distance was evaluated using the Mann-Kendall test. In most cases the specified monitoring well was the location where the COPC concentration was greatest within the plume during the evaluation period.

## 2.3 COPCs and Plumes

Plume analytics was performed for six COPCs and their associated groundwater plumes:

- Tetrachloroethylene (PCE)
- Trichloroethylene (TCE)
- Fluoride
- Nitrate
- Total Uranium
- Technetium-99 (Tc-99)

The spatiotemporal behavior of the PCE and TCE plumes were evaluated for two separate groundwater zones of the surficial (water table) aquifer: Lower and Upper. Plume metrics and behavior in the Lower and Upper zones were estimated from the concentrations of chlorinated ethenes from four groundwater sampling events between October 2019 and April 2021. Prior to October 2019, the extent of the groundwater sampling network was less and did not delineate the PCE and TCE plumes. The initial threshold concentration for defining the PCE and TCE plumes was 5 micrograms per liter (ug/L). To calculate plume metrics for trend analysis over the four sampling events, threshold concentrations that defined the plume extent for calculation of plume metrics were mostly greater than the MCL and varied based on the COPC and the plume location (Table 1). Based on the distribution of PCE and TCE concentrations greater than 5 ug/L (or a plume-specific threshold concentration) in the Lower and Upper zones and the presence of separate plumes within a groundwater zone, plume metrics were calculated for six plumes as listed in Table 1.

**Table 1. Designated PCE and TCE Plumes for Plume Metrics**

COPC	Threshold Concentration	Sampling Events	Groundwater Zone	Plume Location
PCE	60 ug/L	4 (Oct 2019 – Apr 2021)	Upper	Main Plume
	6 ug/L	4 (Oct 2019 – Apr 2021)		Southern Plume
	9 ug/L	4 (Oct 2019 – Apr 2021)	Lower	Main plume
TCE	6 ug/L	4 (Oct 2019 – Apr 2021)	Upper	Northern
	5 ug/L	4 (Oct 2019 – Apr 2021)		Southern
	39 ug/L	4 (Oct 2019 – Apr 2021)	Lower	Main plume

Although the distribution of TCE in the Upper groundwater zone indicates the presence of an Upper Main plume in the vicinity of the Upper Main PCE plume, trend analysis was not conducted because plume metrics could only be calculated for one (April 2020) of the four sampling events and TCE concentrations within this area were less than 5 ug/L in April 2021.

Concentration data from wells designated as Lower and Upper were combined to evaluate the spatiotemporal behavior of the Fluoride, Nitrate, Uranium, and Tc-99 plumes. The number of groundwater sampling events, threshold concentrations, and separate plumes are summarized in Table 2.

**Table 2. List of Designated Plumes for Fluoride, Nitrate, Uranium, and Tc-99.**

COPC	Threshold Concentration	Sampling Events	Plume Location
Fluoride	4 mg/L	4 (Oct 2019 – Apr 2021)	Single plume
Nitrate	15 mg/L	4 (Oct 2019 – Apr 2021)	Single plume
Uranium	30 ug/L	4 (Oct 2019 – Apr 2021)	Northern Plume
			Southern Plume
Tc-99	900 pCi/L	5 (Apr 2019 – Apr 2021)	Single plume

### 3. Results

The plume metrics calculated by GWSDAT are provided in Table 3. In most cases, concentration data (and activity data for Tc-99) used to estimate the plume metrics by GWSDAT were limited to data from monitoring wells that delineated the extent of the plume using the threshold concentration (Tables 1 and 2) and included concentration data from within the plume and immediately surrounding the boundaries of the plume. For the fluoride, nitrate, uranium, and Tc-99 plumes; plumes were delineated and plume metrics calculated using data from both the Upper and Lower zones. At locations where there are paired monitoring wells that are screened in either the Upper or Lower zone, the monitoring well with the greater COPC concentration was used to delineate the plume and calculate the plume metrics.

The Mann-Kendall statistic, confidence, COV, and implied trend for the plume metrics are summarized in Table 4. Charts of the plume metrics versus time are provided in the presentation attachment. In summary, most of the delineated plumes are stable or decreasing based on their plume metrics having Mann-Kendall trends that are no trend, stable, or decreasing. For the Main PCE plume in the Lower zone, the dissolved mass and plume area are increasing even though trends in the average concentration in the plume and its center of mass are not statistically significant. For the Southern uranium plume, the Mann-Kendall trends for the plume metrics are

increasing indicating that the plume is not stable and increasing. However, the Southern uranium plume and its plume metrics are defined by one monitoring well where concentrations exceed the threshold criteria.

Going forward, the plume analytics evaluation using the methods in this technical memorandum should be performed annually to incorporate new concentrations data that may:

- Improve the certainty in the Mann-Kendall statistic and trend,
- Refine delineation of dissolved phase plumes, and
- Be used to modify and optimize the long-term groundwater monitoring program.

**Table 3. Summary of Plume Metrics for COPC Plumes.**

COPC	Plume Designation	Date*	Plume Metric					Assumed Source <sup>2</sup>	Plume Center Distance from Source (ft)
			Average Concentration <sup>1</sup>	Dissolved Mass (kg/ft)**	Area (ft <sup>2</sup> )	Center X-direction (ft)	Center Y-direction (ft)		
PCE	Upper Zone Main Plume	10/15/19	70	6.24E-03	10,496	2,023,646.4	745,554.7	W-39	34.3
		04/15/20	88	3.63E-02	48,526	2,023,690.2	745,579.2		34.5
		10/15/20	85	4.79E-02	66,155	2,023,699.2	745,585.9		42.5
		04/15/21	77	1.71E-02	26,130	2,023,653.4	745,560.6		27.0
	Upper Zone Southern Plume	10/15/19	23	4.93E-02	255,447	2,024,325.5	744,459.2	W-67	160
		04/15/20	19	4.34E-02	267,379	2,024,384.4	744,434.9		104
		10/15/20	16	3.87E-02	277,807	2,024,354.2	744,473.4		132
		04/15/21	17	4.55E-02	314,776	2,024,371.3	744,427.0		119
	Lower Zone Main Plume	10/15/19	13	1.74E-01	1,550,173	2,023,499.0	745,522.2	W-33	129
		04/15/20	14	1.83E-01	1,550,758	2,023,637.5	745,528.4		154
		10/15/20	14	1.89E-01	1,597,425	2,023,707.7	745,530.5		204
		04/15/21	14	1.96E-01	1,693,727	2,023,629.1	745,527.7		148
TCE	Upper Zone Northern Plume	10/15/19	18	1.41E-03	9,360	2,024,223.7	745,196.0	W-76	14.8
		04/15/20	15	1.12E-03	8,817	2,024,226.7	745,191.5		10.8
		10/15/20	14	1.25E-03	10,506	2,024,221.7	745,204.3		23.2
		04/15/21	13	1.11E-03	10,199	2,024,221.8	745,206.9		25.8
	Upper Zone Southern Plume	10/15/19	6	1.58E-03	28,843	2,024,476.0	744,443.6	W-67	18.8
		04/15/20	6	1.74E-03	31,957	2,024,477.8	744,445.8		16.0
		10/15/20	6	1.49E-03	28,917	2,024,480.9	744,444.7		15.7
		04/15/21	6	1.90E-03	35,785	2,024,486.0	744,429.1		30.5
	Lower Zone Main Plume	10/15/19	75	8.83E-02	138,766	2,023,862.5	745,655.7	W-65	169
		04/15/20	76	7.64E-02	118,270	2,023,879.0	745,675.8		150
		10/15/20	65	7.37E-02	132,680	2,023,835.1	745,640.8		199
		04/15/21	68	4.57E-02	79,331	2,023,915.6	745,714.7		114
Fluoride	Single Plume	10/15/19	7	1.42E+01	237,158	2,024,091.4	744,860.9	W-30	242
		04/15/20	7	1.12E+01	181,519	2,024,067.3	744,833.6		275
		10/15/20	7	1.15E+01	193,860	2,024,091.2	744,867.6		235
		04/15/21	7	1.16E+01	205,799	2,024,080.8	744,858.8		247
Nitrate	Single Plume	10/15/19	82	4.36E+02	622,743	2,023,896.0	744,984.4	W-7A	80.6
		04/15/20	77	3.74E+02	573,885	2,023,914.7	744,984.8		88.3
		10/15/20	73	3.77E+02	605,597	2,023,891.1	744,989.7		84.4
		04/15/21	72	3.48E+02	569,699	2,023,921.7	744,968.3		78.4
Uranium	Northern Plume	10/15/19	267	1.07E-02	4,704	2,024,219.9	745,370.2	W-55	28.1
		04/15/20	115	3.02E-03	3,103	2,024,218.4	745,376.0		22.1
		10/15/20	213	7.37E-03	4,083	2,024,217.5	745,372.2		25.7
		04/15/21	120	3.32E-03	3,244	2,024,218.1	745,374.4		23.6
	Southern Plume	10/15/19	101	2.00E-03	2,342	2,024,340.9	745,165.0	W-77	7.97
		04/15/20	102	2.13E-03	2,447	2,024,340.7	745,164.0		7.44
Tc-99	Single Plume	04/15/19	3,106	2.09E+09	79,111	2,024,052.1	744,850.9	W-6	126
		10/15/19	2,647	1.86E+09	82,526	2,024,034.8	744,842.5		142
		04/15/20	2,589	1.66E+09	75,548	2,024,027.8	744,848.0		141
		10/15/20	2,876	1.83E+09	75,007	2,024,042.5	744,854.1		128
		04/15/21	2,671	1.36E+09	60,073	2,024,066.6	744,875.7		97.6

Notes:

\* Dates are aggregate dates that represent a semiannual sampling event and not the actual date of sample collection.

<sup>1</sup> Average concentration units vary by COPC and are mg/L for fluoride and nitrate and ug/L for uranium, PCE, and TCE.

<sup>1</sup> Average concentrations unit for Tc-99 is an activity at picocuries per liter, pCi/L.

\*\* Dissolved mass units are kilograms of COPC per foot of aquifer thickness (kg/ft) except for Tc-99, which is total activity of pCi/ft.

The plume center of mass is shown as state plane coordinates in feet.

<sup>2</sup> The assumed source location is the location within the plume where the COPC concentration is greatest and is a reference for estimating changes to the distance between the assumed source and the plume center.

**Table 4. Summary of Mann-Kendall Trends for Plume Metrics through April 2021.**

COPC	Plume Designation	Mann-Kendall Trends of Plume Metrics			
		Average Concentration <sup>1</sup>	Dissolved Mass <sup>2</sup>	Area	Plume Center Distance from Source
PCE	Upper Zone Main Plume	<b>Stable</b> (S=0, Conf=37.5%, COV=0.10)	<b>No Trend</b> (S=2, Conf=62.5%, COV=0.70)	<b>No Trend</b> (S=2, Conf=62.5%, COV=0.65)	<b>Stable</b> (S=0, Conf=37.5%, COV=0.18)
	Upper Zone Southern Plume	<b>Stable</b> (S=-4, Conf=83.3%, COV=0.15)	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.10)	<b>Increasing</b> (S=6, Conf=95.8%, COV=0.10)	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.18)
	Lower Zone Main Plume	<b>No Trend</b> (S=2, Conf=62.5%, COV=0.02)	<b>Increasing</b> (S=6, Conf=95.8%, COV=0.05)	<b>Increasing</b> (S=6, Conf=95.8%, COV=0.04)	<b>No Trend</b> (S=2, Conf=62.5%, COV=0.20)
TCE	Upper Zone Northern Plume	<b>Decreasing</b> (S=-6, Conf=95.8%, COV=0.14)	<b>Stable</b> (S=-4, Conf=83.3%, COV=0.11)	<b>No Trend</b> (S=2, Conf=62.5%, COV=0.08)	<b>No Trend</b> (S=4, Conf=83.3%, COV=0.38)
	Upper Zone Southern Plume	<b>Stable</b> (S=-4, Conf=83.3%, COV=0.03)	<b>No Trend</b> (S=2, Conf=62.5%, COV=0.11)	<b>No Trend</b> (S=4, Conf=83.3%, COV=0.10)	<b>Stable</b> (S=0, Conf=37.5%, COV=0.34)
	Lower Zone Main Plume	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.07)	<b>Decreasing</b> (S=-6, Conf=95.8%, COV=0.25)	<b>Stable</b> (S=-4, Conf=83.3%, COV=0.23)	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.23)
Fluoride	Single Plume	<b>Stable</b> (S=-4, Conf=83.3%, COV=0.04)	<b>Stable</b> (S=0, Conf=37.5%, COV=0.12)	<b>Stable</b> (S=0, Conf=37.5%, COV=0.12)	<b>Stable</b> (S=0, Conf=37.5%, COV=0.07)
Nitrate	Single Plume	<b>Decreasing</b> (S=-6, Conf=95.8%, COV=0.06)	<b>Stable</b> (S=-4, Conf=83.3%, COV=0.10)	<b>Stable</b> (S=-4, Conf=83.3%, COV=0.04)	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.05)
Uranium	Northern Plume	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.41)	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.60)	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.20)	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.10)
	Southern Plume	<b>Increasing</b> (S=6, Conf=95.8%, COV=0.08)	<b>Increasing</b> (S=6, Conf=95.8%, COV=0.18)	<b>Increasing</b> (S=6, Conf=95.8%, COV=0.10)	<b>Stable</b> (S=-2, Conf=62.5%, COV=0.04)
Tc-99	Single Plume	<b>Stable</b> (S=-2, Conf=59.2%, COV=0.08)	<b>Decreasing</b> (S=-8, Conf=95.8%, COV=0.15)	<b>Decreasing</b> (S=-8, Conf=95.8%, COV=0.12)	<b>Stable</b> (S=-4, Conf=75.8%, COV=0.14)

Notes:

<sup>1</sup> Average concentrations unit for Tc-99 is an activity at picocuries per liter, pCi/L.

<sup>2</sup> For Tc-99, total dissolved mass is total activity of pCi/ft.



## 4. References

Aziz, J.J, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales. 2003. MAROS: A Decision Support System for Optimizing Monitoring Plans, *Groundwater*, vol. 41, no. 3, pp. 355-367.

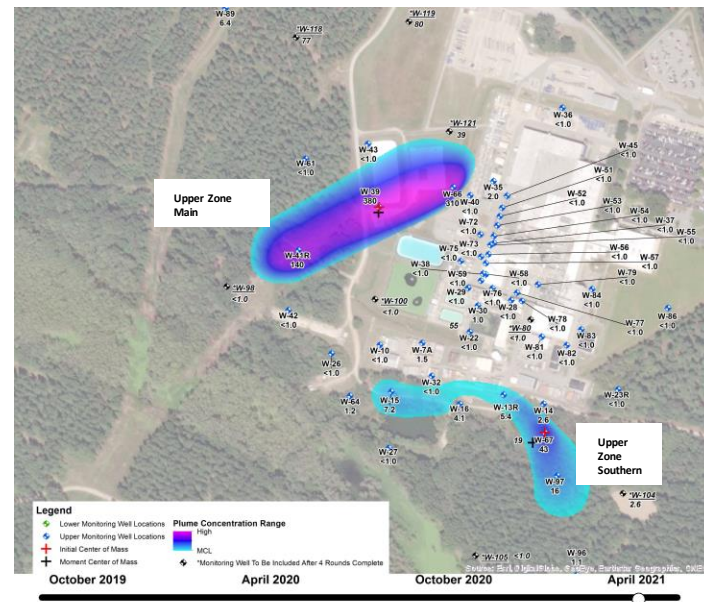
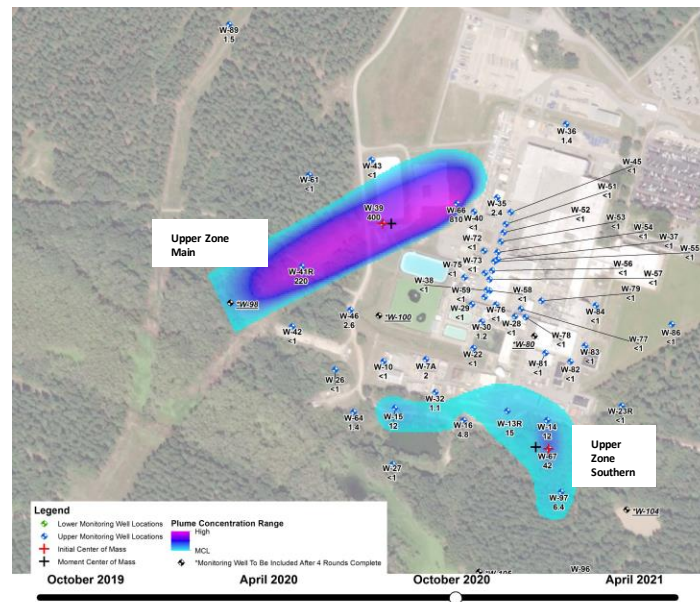
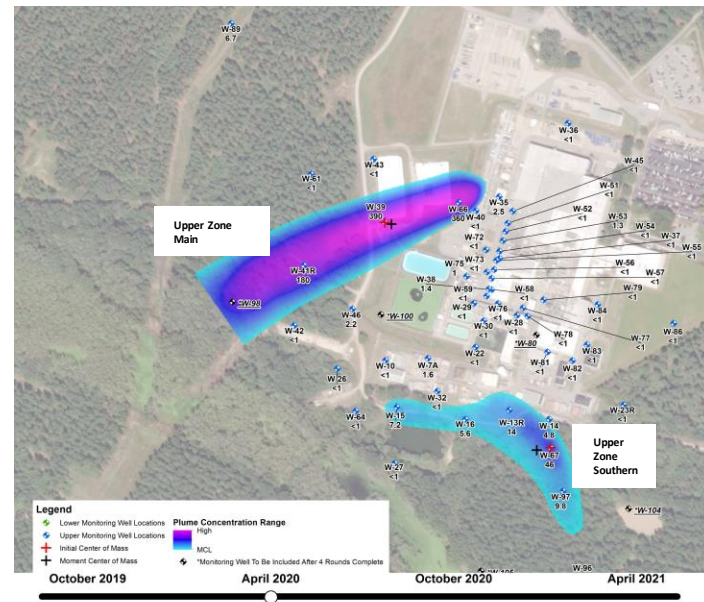
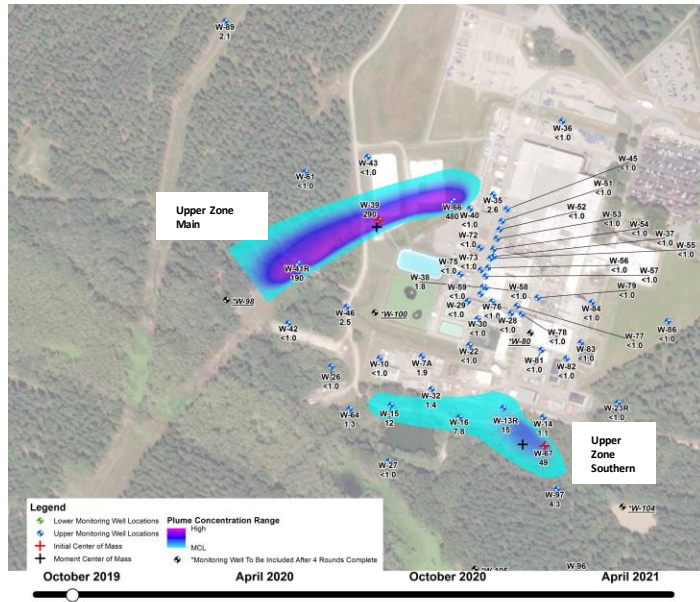
US Environmental Protection Agency. 2009. *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities: Unified Guidance*. Washington D.C.: OSWER, EPA 530-R-09-007.

# Plume Analytics Summary

Westinghouse Columbia Fuel Fabrication Facility

October 2019 – April 2021

# Plume Analytics – PCE Upper (2019-2021)



# PCE Upper Main: Oct 2019

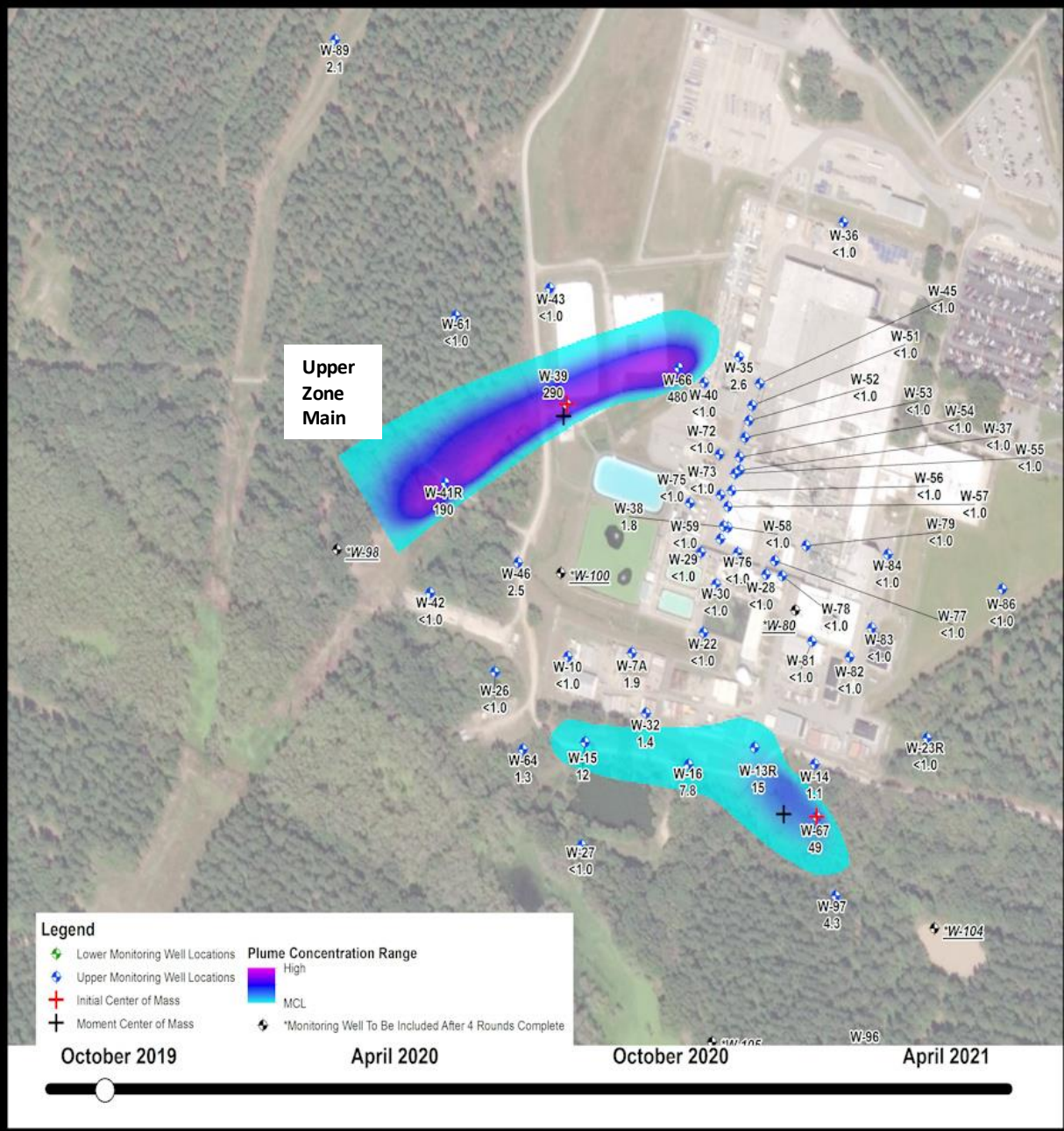
Plume Area: 10,496 ft<sup>2</sup>  
 Average Concentration: 70 ug/L  
 Threshold: 60 ug/L (MCL: 5)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.65

Total Plume Mass:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.70

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.10

Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.18



# PCE Upper Main: Apr 2020

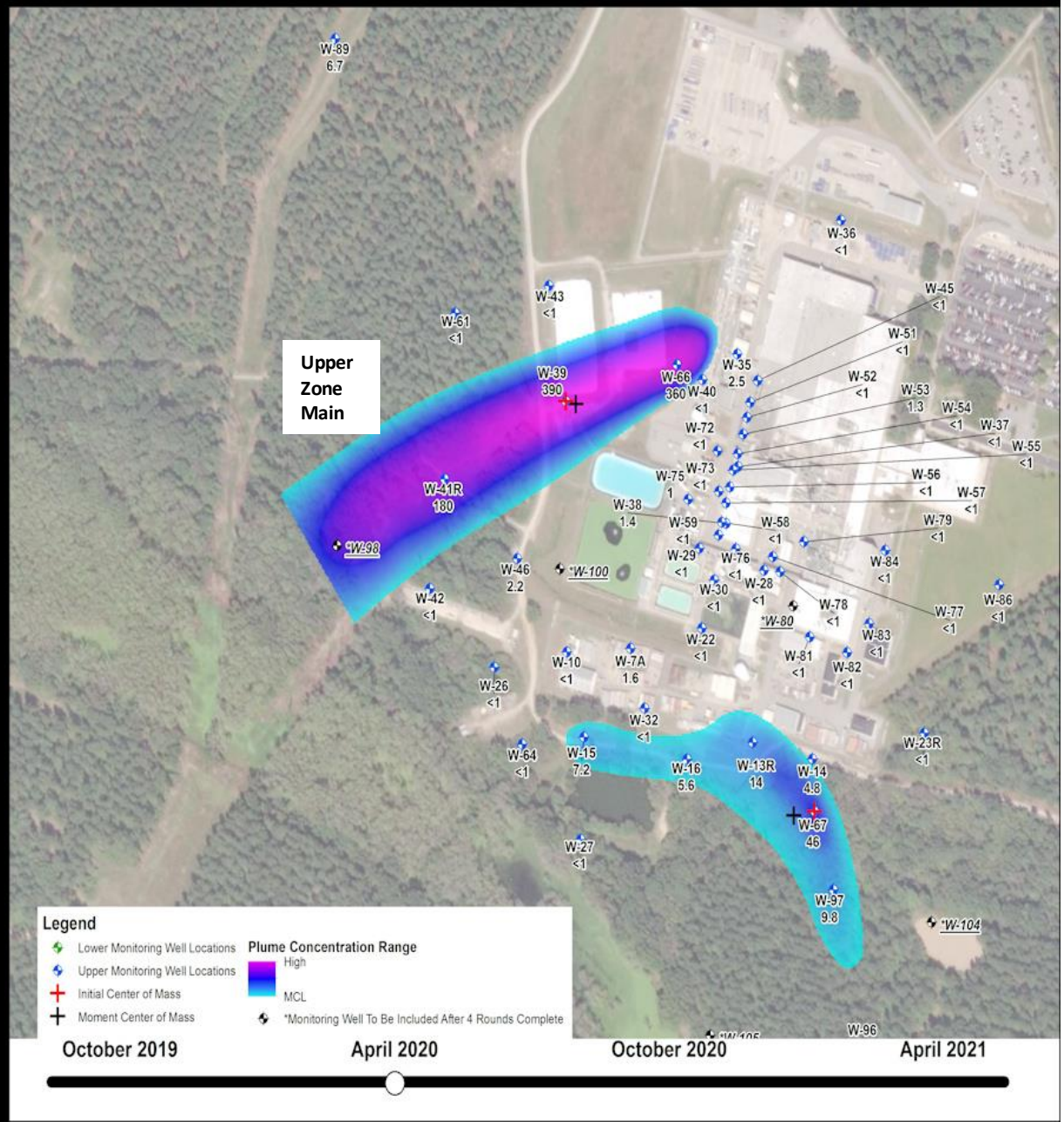
Plume Area: 48,526 ft<sup>2</sup>  
 Average Concentration: 88 ug/L  
 Threshold: 60 ug/L (MCL: 5)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.65

Total Plume Mass:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.70

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.10

Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.18



# PCE Upper Main: Oct 2020

Plume Area: 66,155 ft<sup>2</sup>  
 Average Concentration: 85 ug/L  
 Threshold: 60 ug/L (MCL: 5)

## Plume Area:

MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.65

## Total Plume Mass:

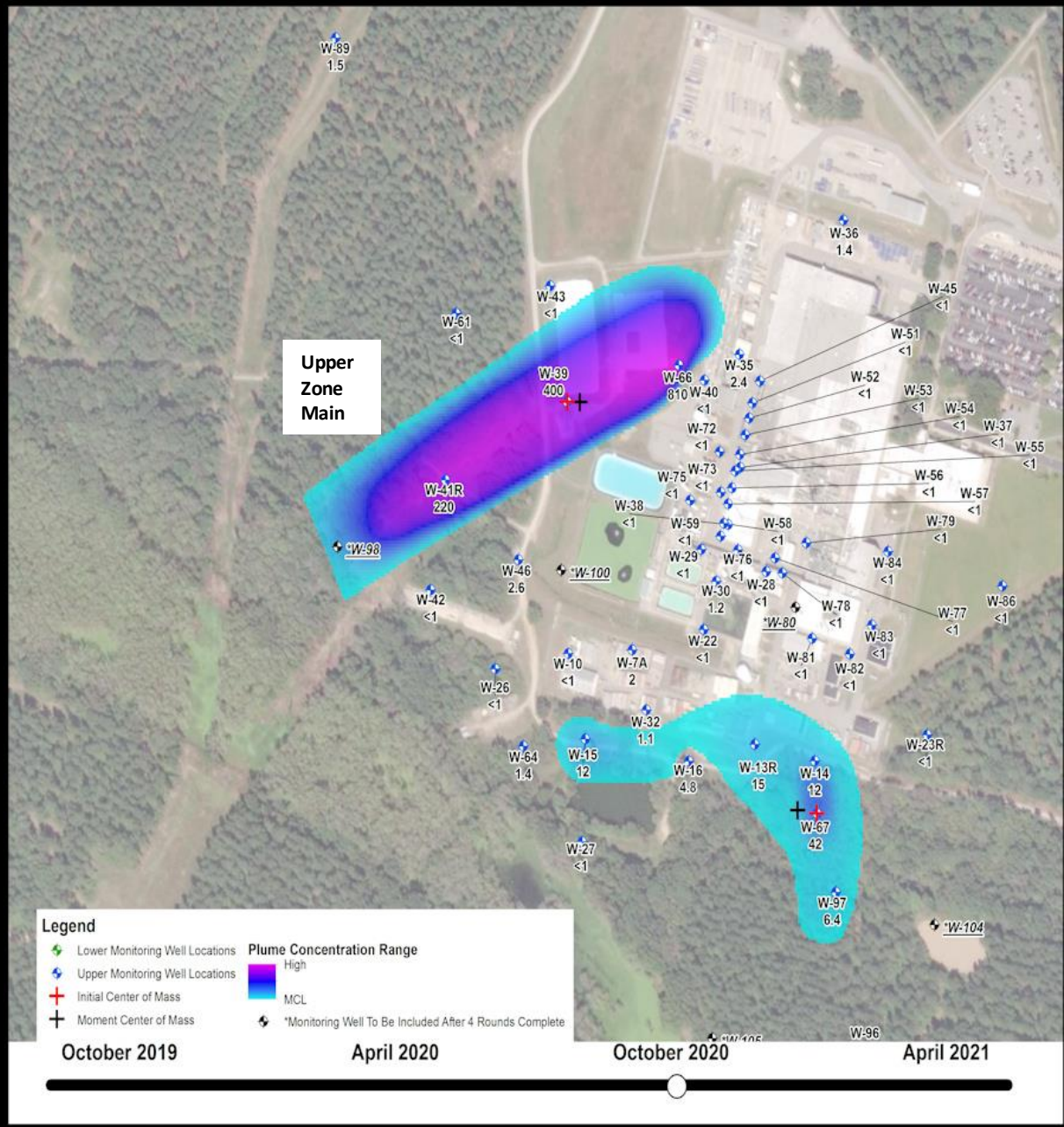
MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.70

## Plume Average Concentration:

MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.10

## Plume Center:

MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.18



# PCE Upper Main: Apr 2021

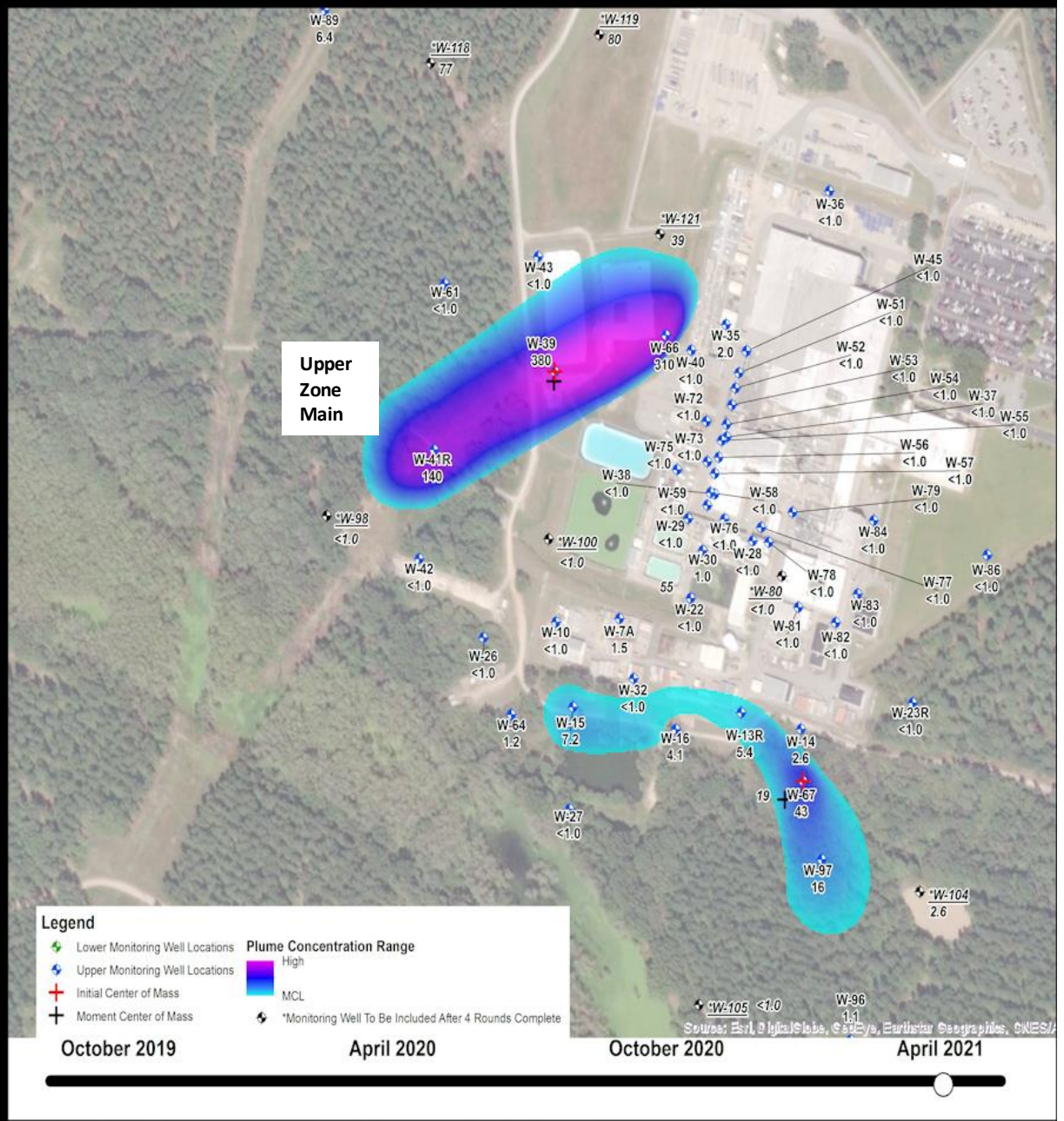
Plume Area: 26,130 ft<sup>2</sup>  
 Average Concentration: 77 ug/L  
 Threshold: 60 ug/L (MCL: 5)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.65

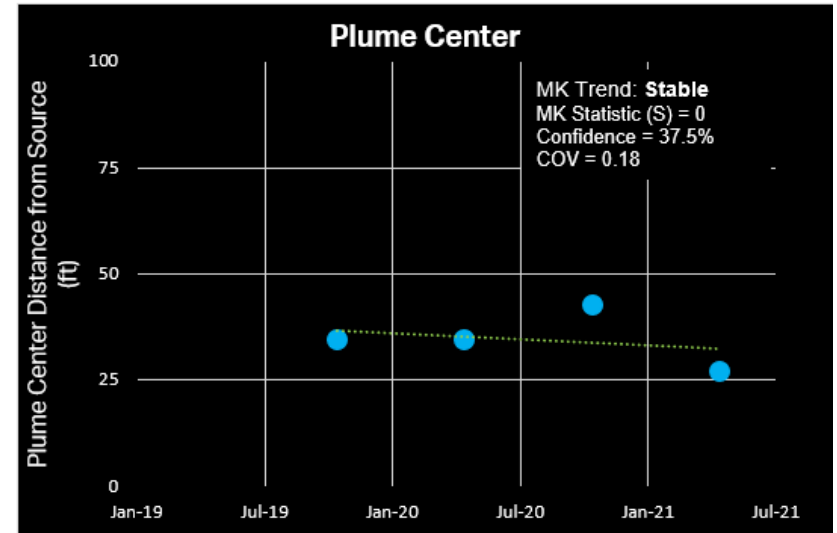
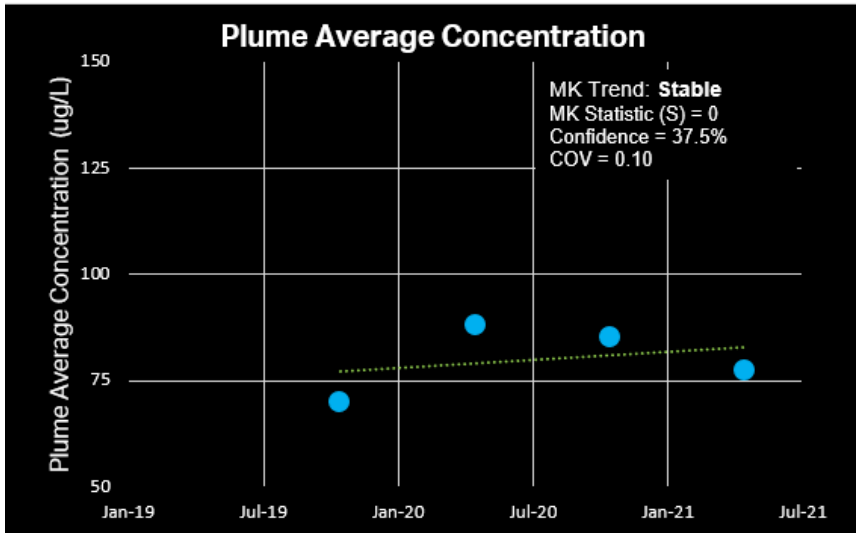
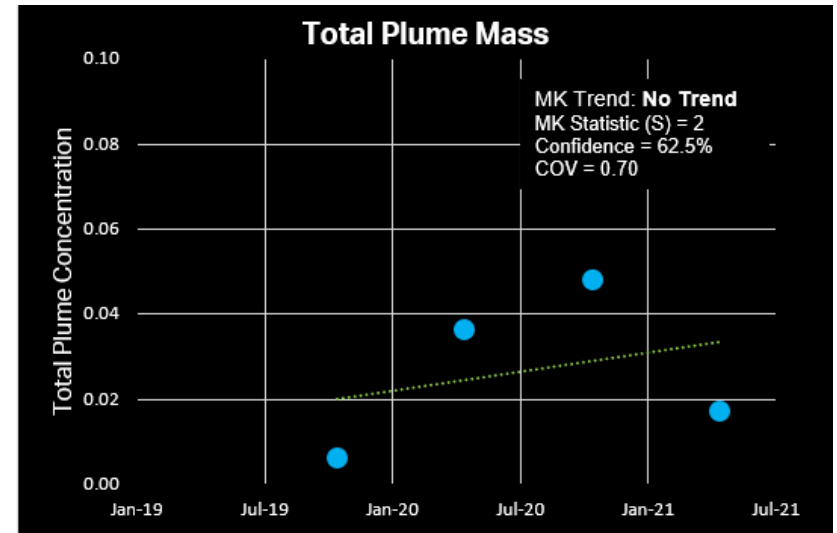
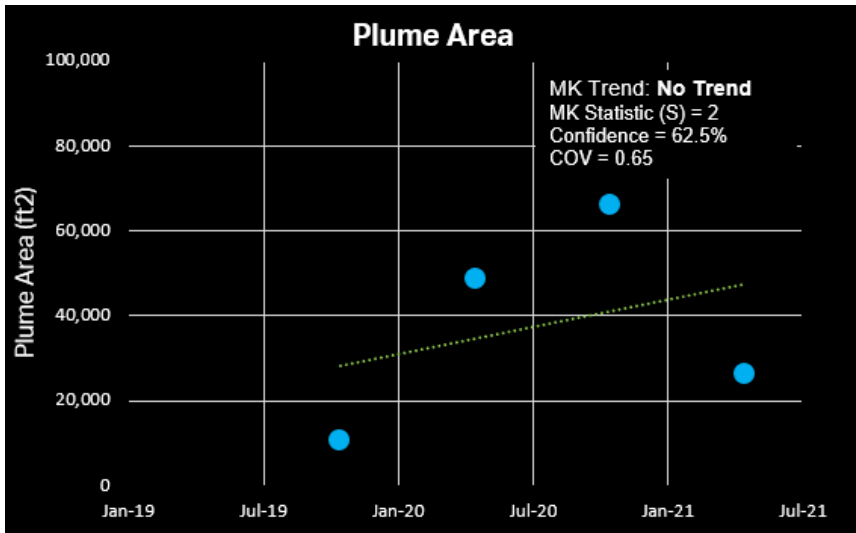
Total Plume Mass:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.70

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.10

Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.18



# PCE Upper Main Plume Graphs (60 ug/L Threshold)





# PCE Upper South: Oct 2019

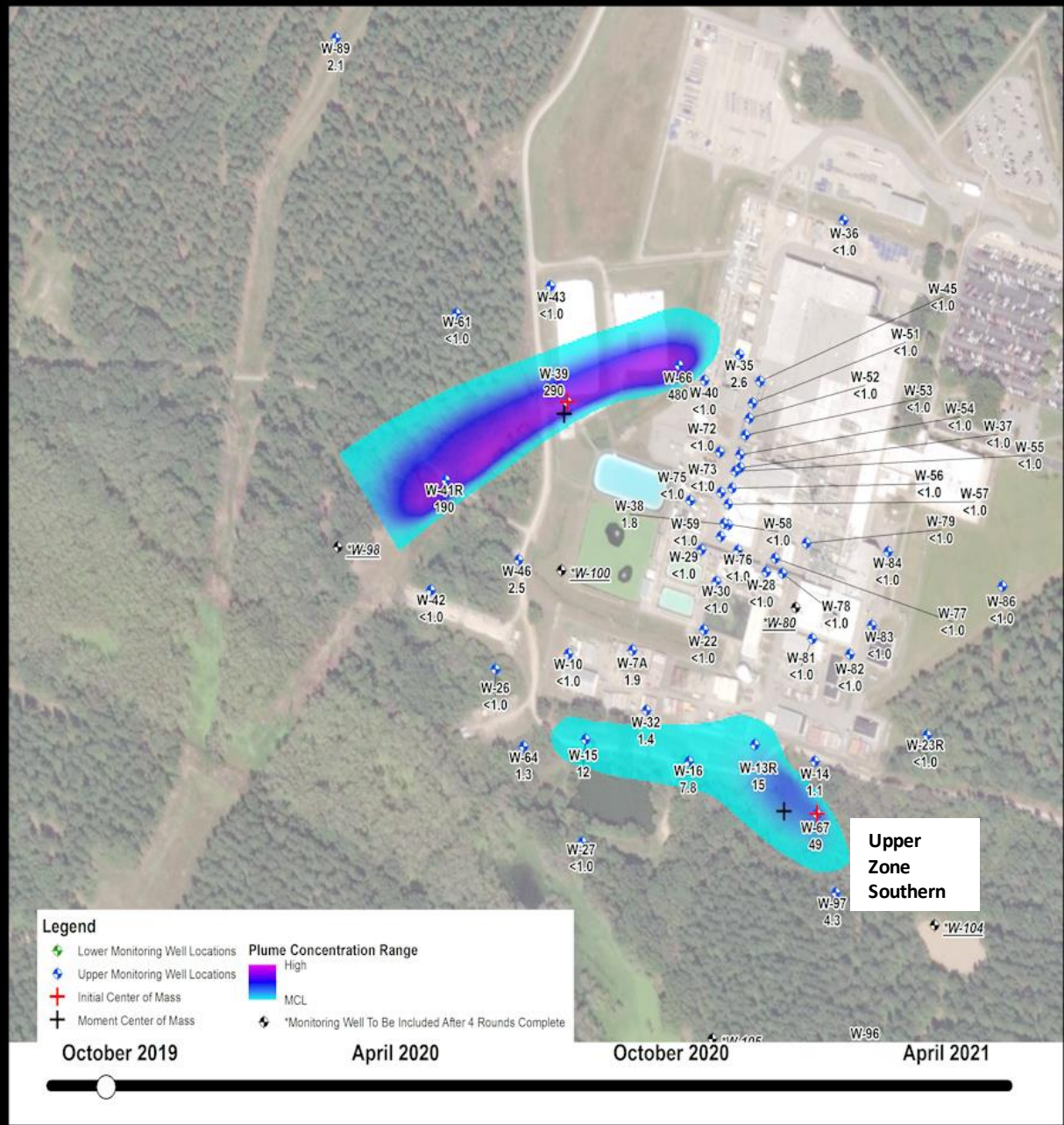
Plume Area: 255,447 ft<sup>2</sup>  
 Average Concentration: 23 ug/L  
 Threshold: 6 ug/L (MCL: 5)

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.09

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.10

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.15

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.18



# PCE Upper South: April 2020

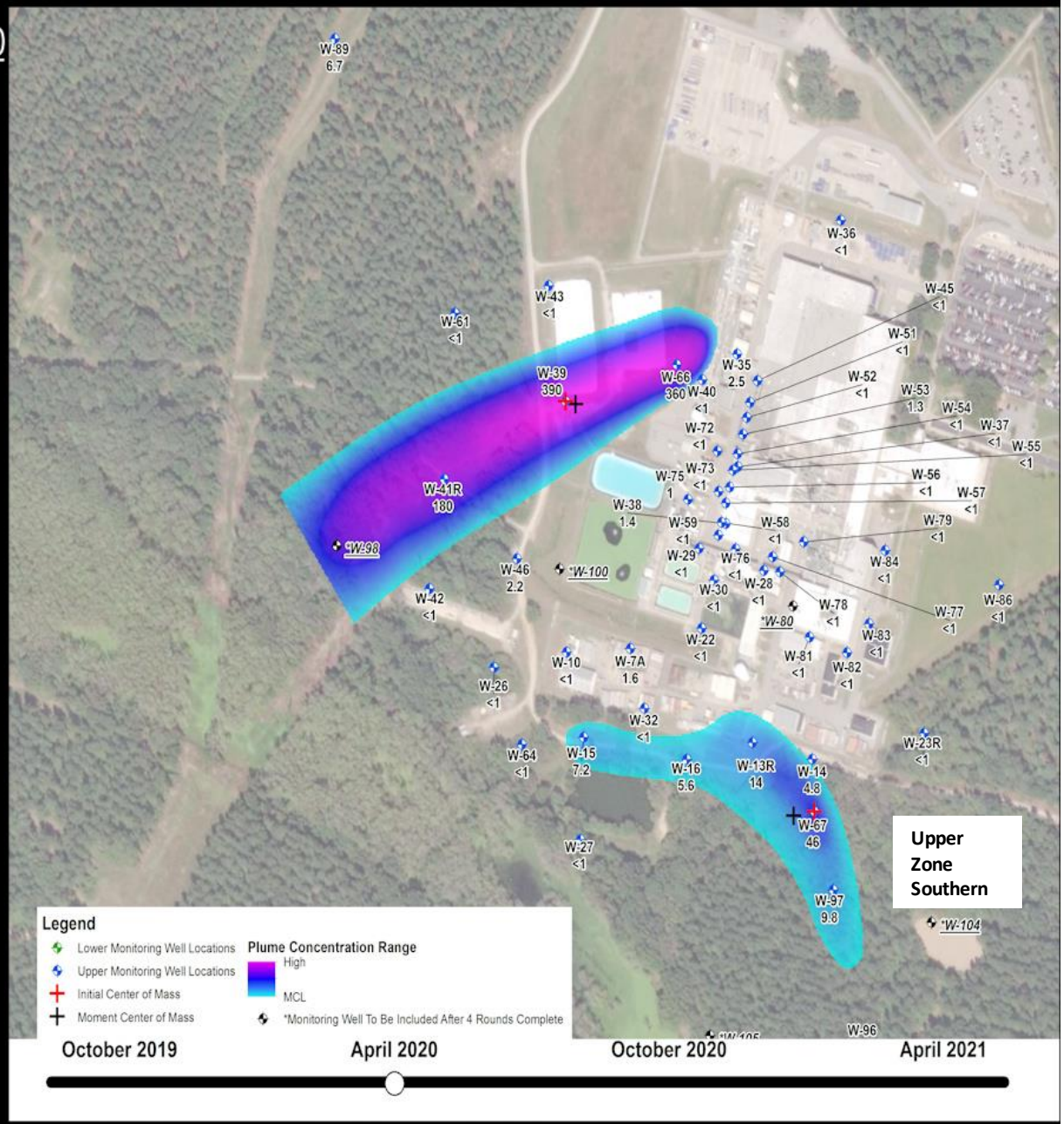
Plume Area: 267,379 ft<sup>2</sup>  
 Average Concentration: 19 ug/L  
 Threshold: 6 ug/L (MCL: 5)

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.09

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.10

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.15

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.18



# PCE Upper South: Oct 2020

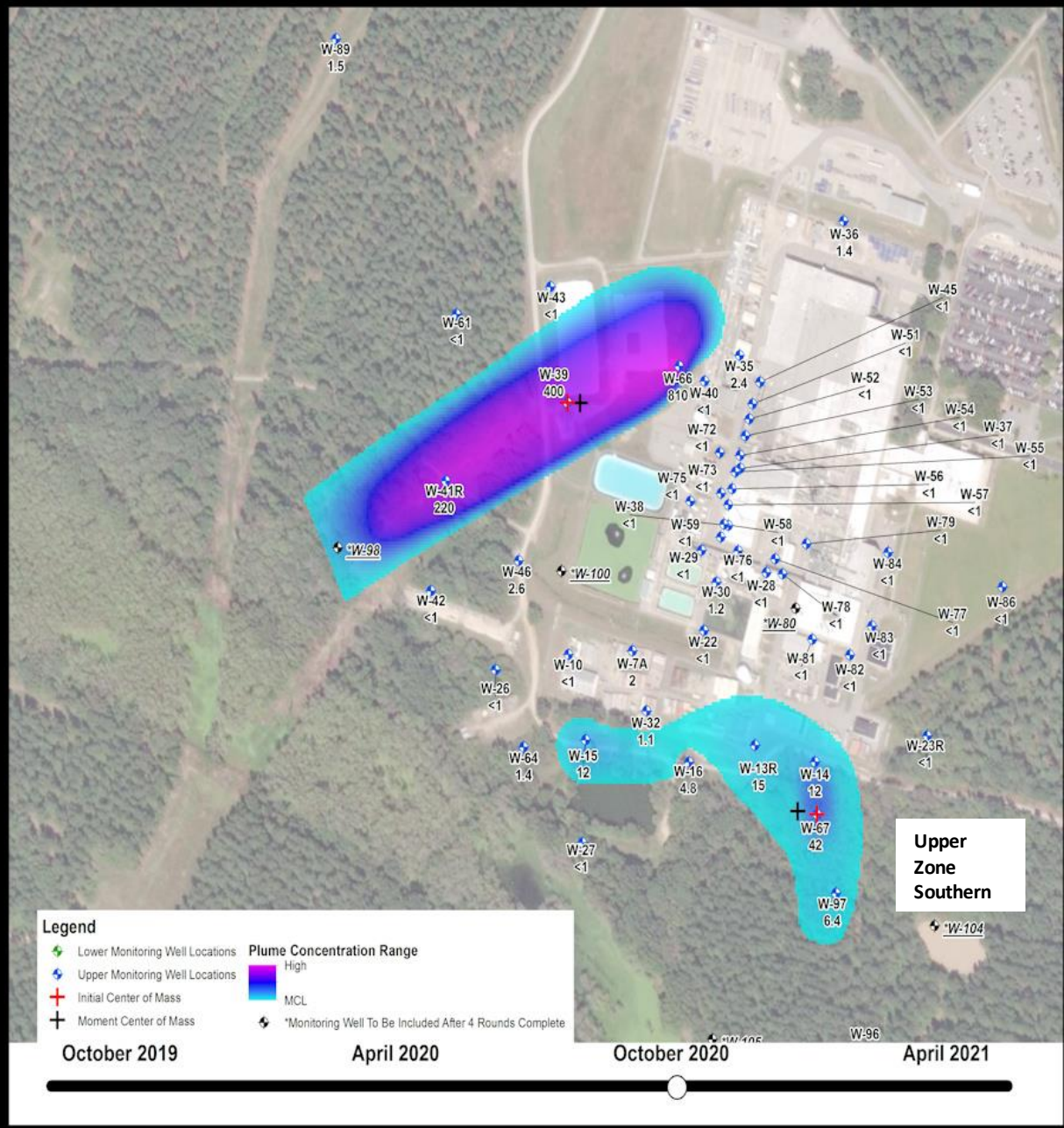
Plume Area: 277,807 ft<sup>2</sup>  
 Average Concentration: 16 ug/L  
 Threshold: 6 ug/L (MCL: 5)

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.09

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.10

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.15

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.18



# PCE Upper South: April 2021

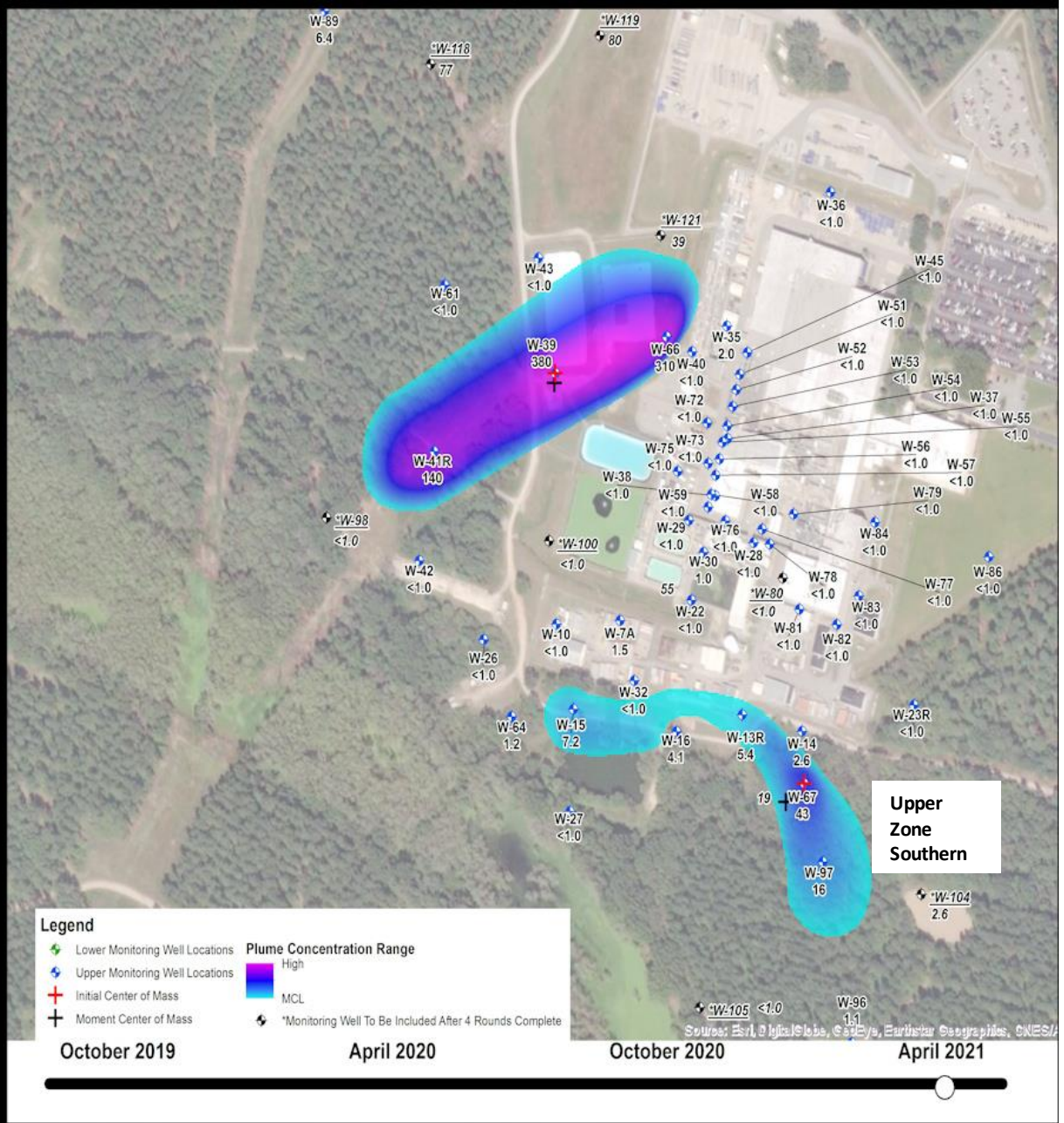
Plume Area: 314,776 ft<sup>2</sup>  
 Average Concentration: 17 ug/L  
 Threshold: 6 ug/L (MCL: 5)

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.09

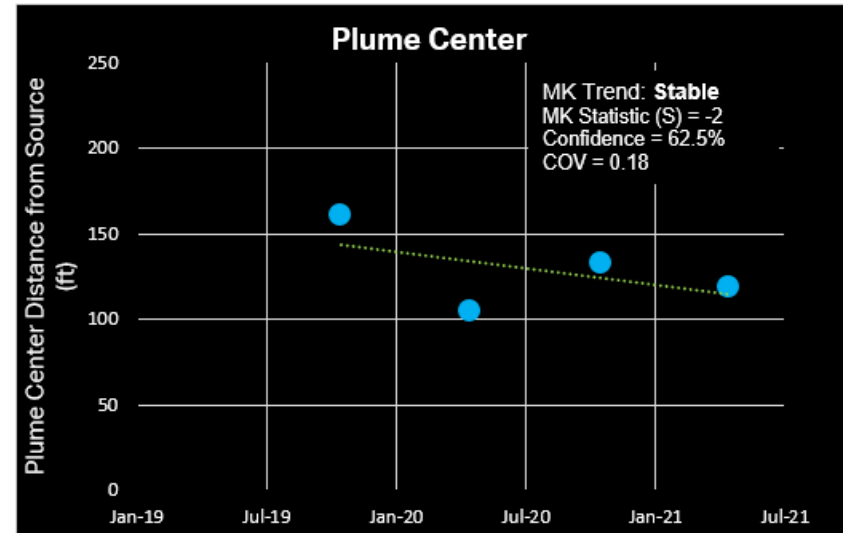
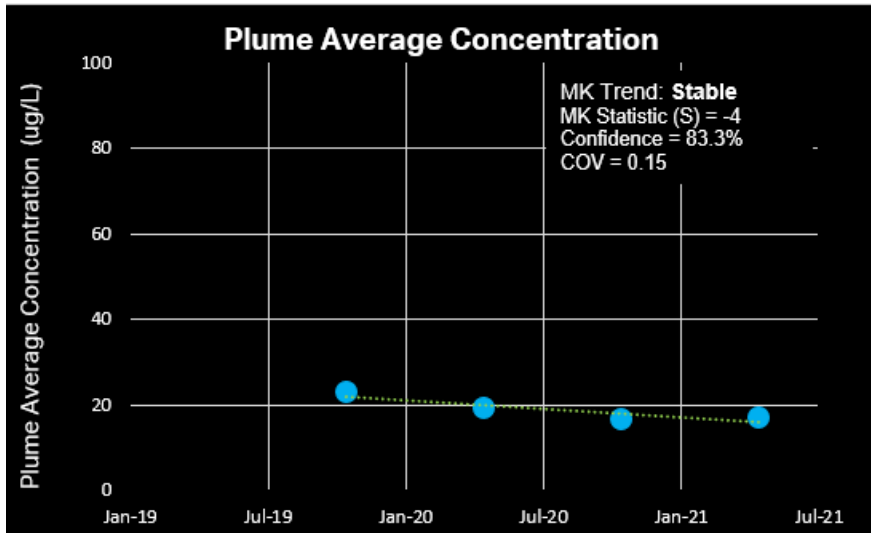
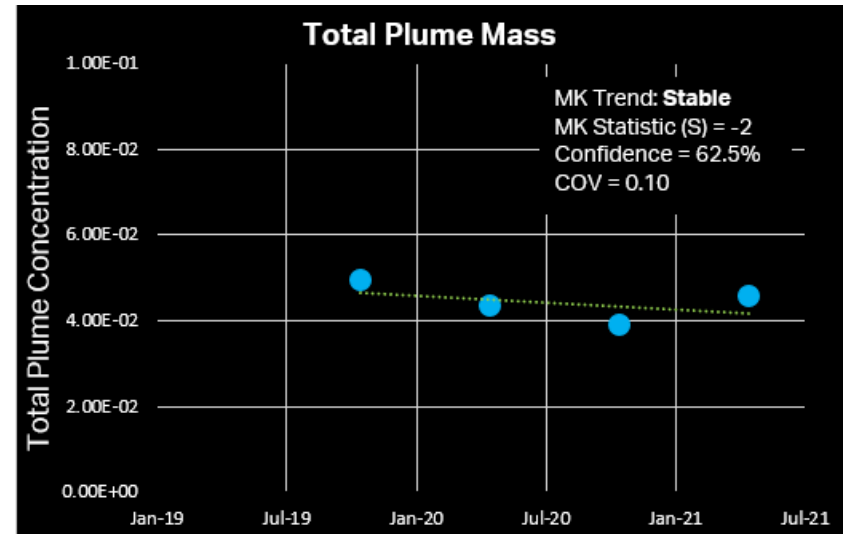
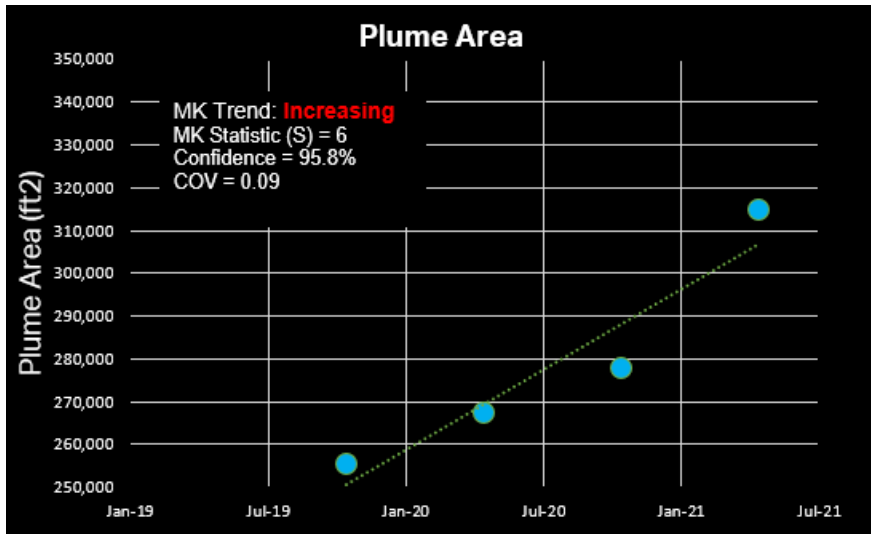
Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.10

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.15

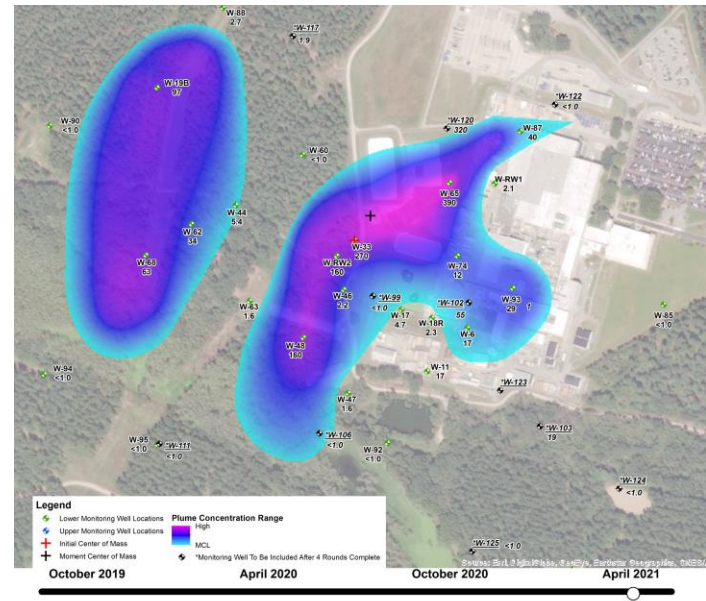
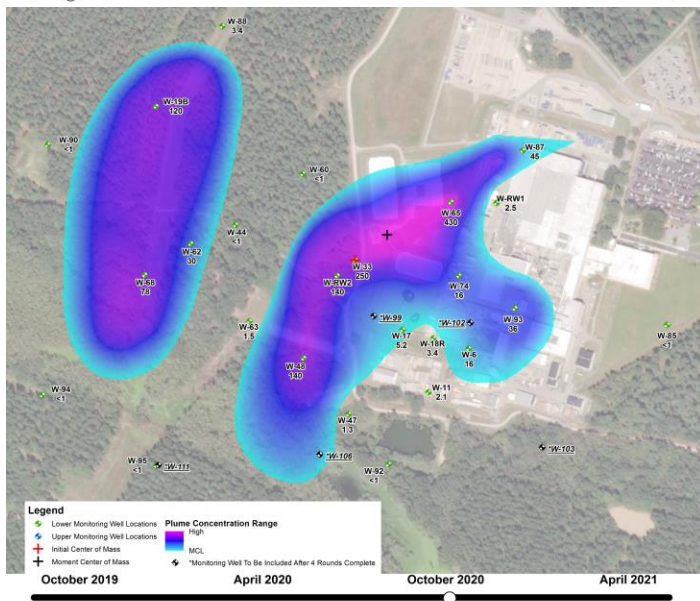
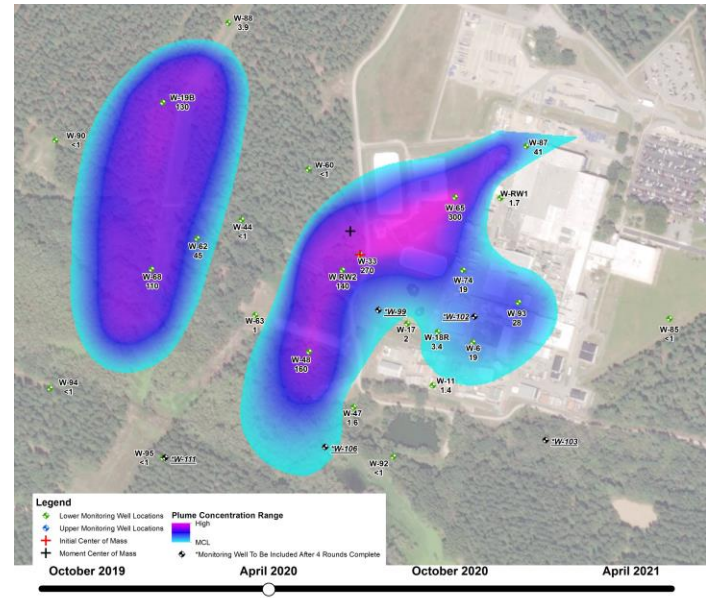
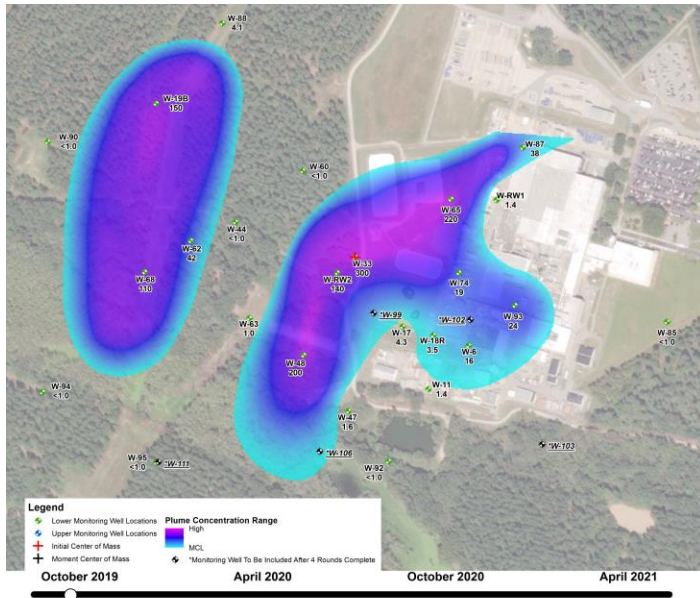
Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.18



# PCE Upper South Plume Graphs (6 ug/L Threshold)



# Plume Analytics – PCE Lower: 9 ug/L (2019-2021)



# PCE Lower: Oct 2019

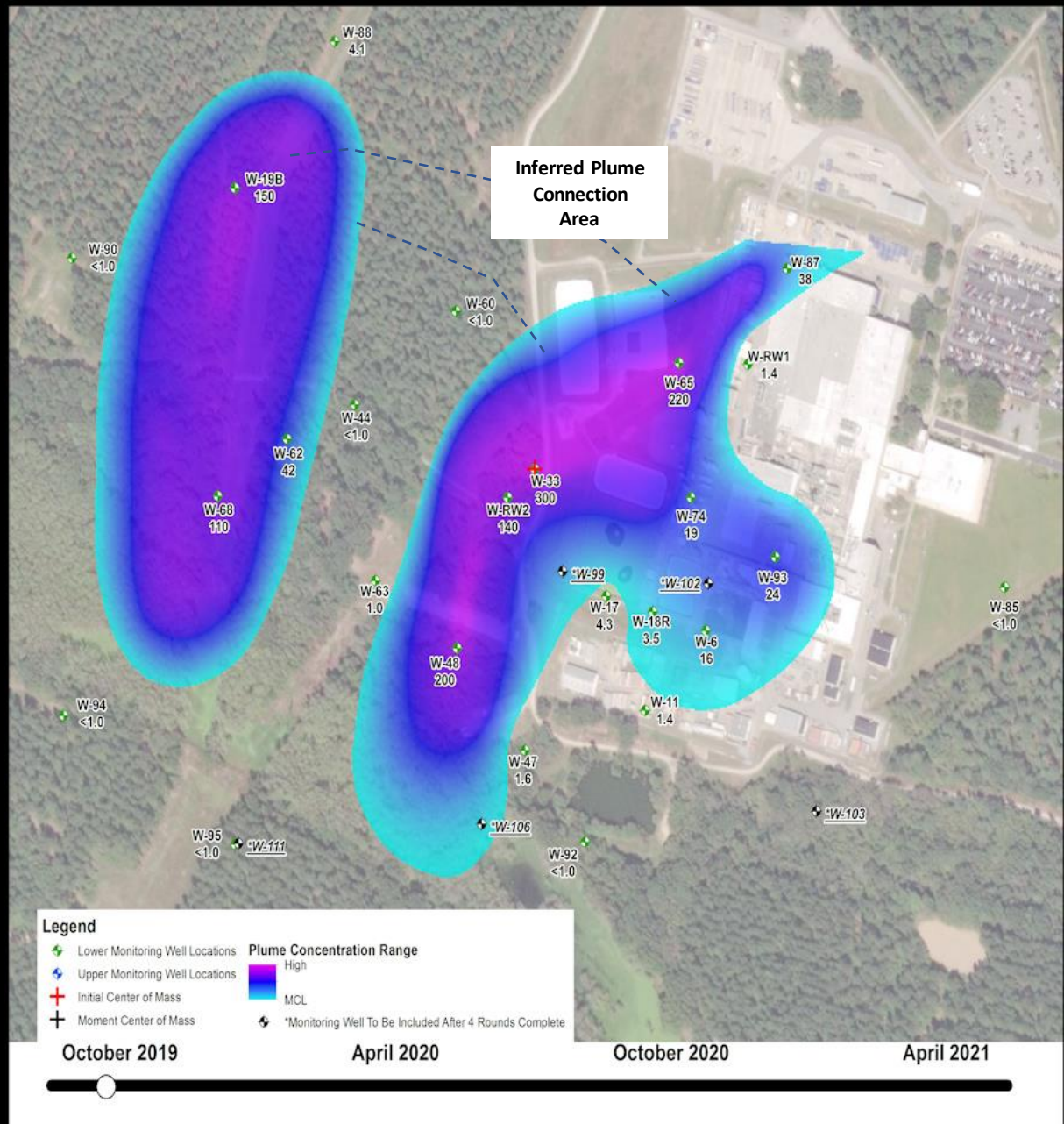
Plume Area: 1,550,173 ft<sup>2</sup>  
Average Concentration: 13 ug/L  
Threshold: 9 ug/L (MCL: 5)

Plume Area:  
MK Trend: **Increasing**  
MK Statistic: 6  
Confidence: 95.8%  
COV: 0.04

Total Plume Mass:  
MK Trend: **Increasing**  
MK Statistic: 6  
Confidence: 95.8%  
COV: 0.05

Plume Average Concentration:  
MK Trend: No Trend  
MK Statistic: 2  
Confidence: 62.5%  
COV: 0.02

Plume Center:  
MK Trend: No Trend  
MK Statistic: -2  
Confidence: 62.5%  
COV: 0.20



# PCE Lower: April 2020

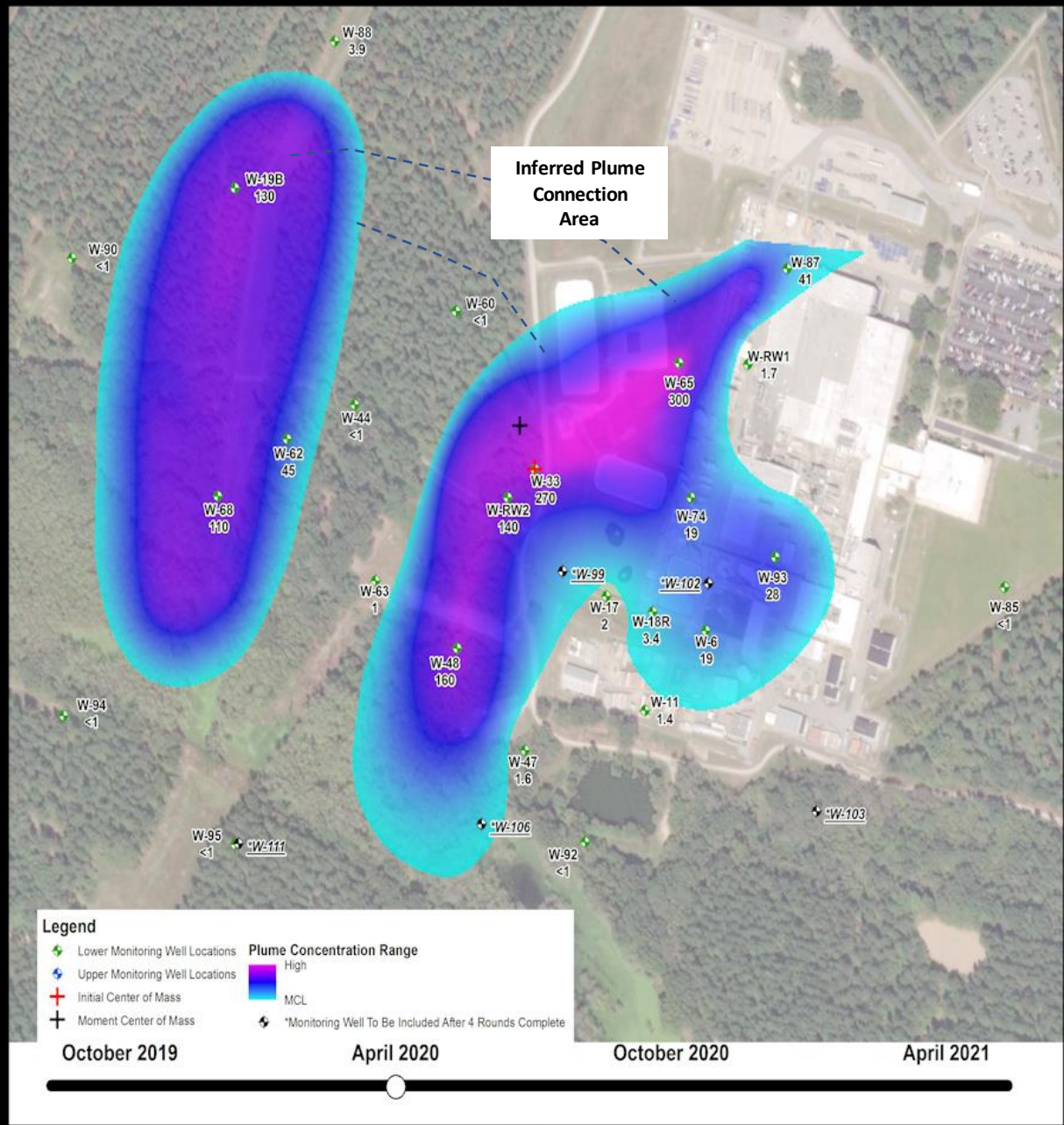
Plume Area: 1,550,758 ft<sup>2</sup>  
 Average Concentration: 14 ug/L  
 Threshold: 9 ug/L (MCL: 5)

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.04

Total Plume Mass:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.05

Plume Average Concentration:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.02

Plume Center:  
 MK Trend: No Trend  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.20





# PCE Lower: Oct 2020

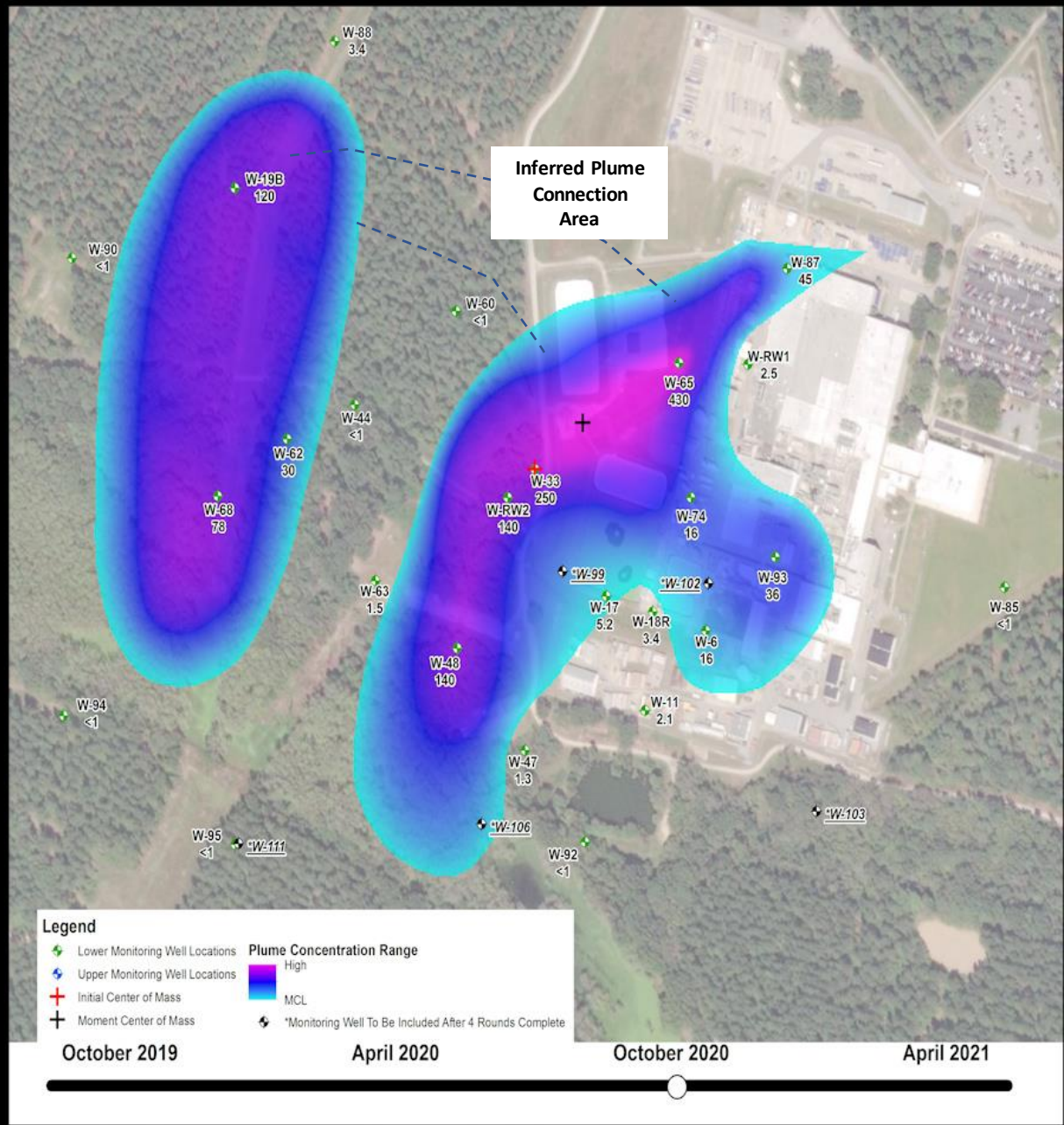
Plume Area: 1,597,425 ft<sup>2</sup>  
 Average Concentration: 14 ug/L  
 Threshold: 9 ug/L (MCL: 5)

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.04

Total Plume Mass:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.05

Plume Average Concentration:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.02

Plume Center:  
 MK Trend: No Trend  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.20



# PCE Lower: April 2021

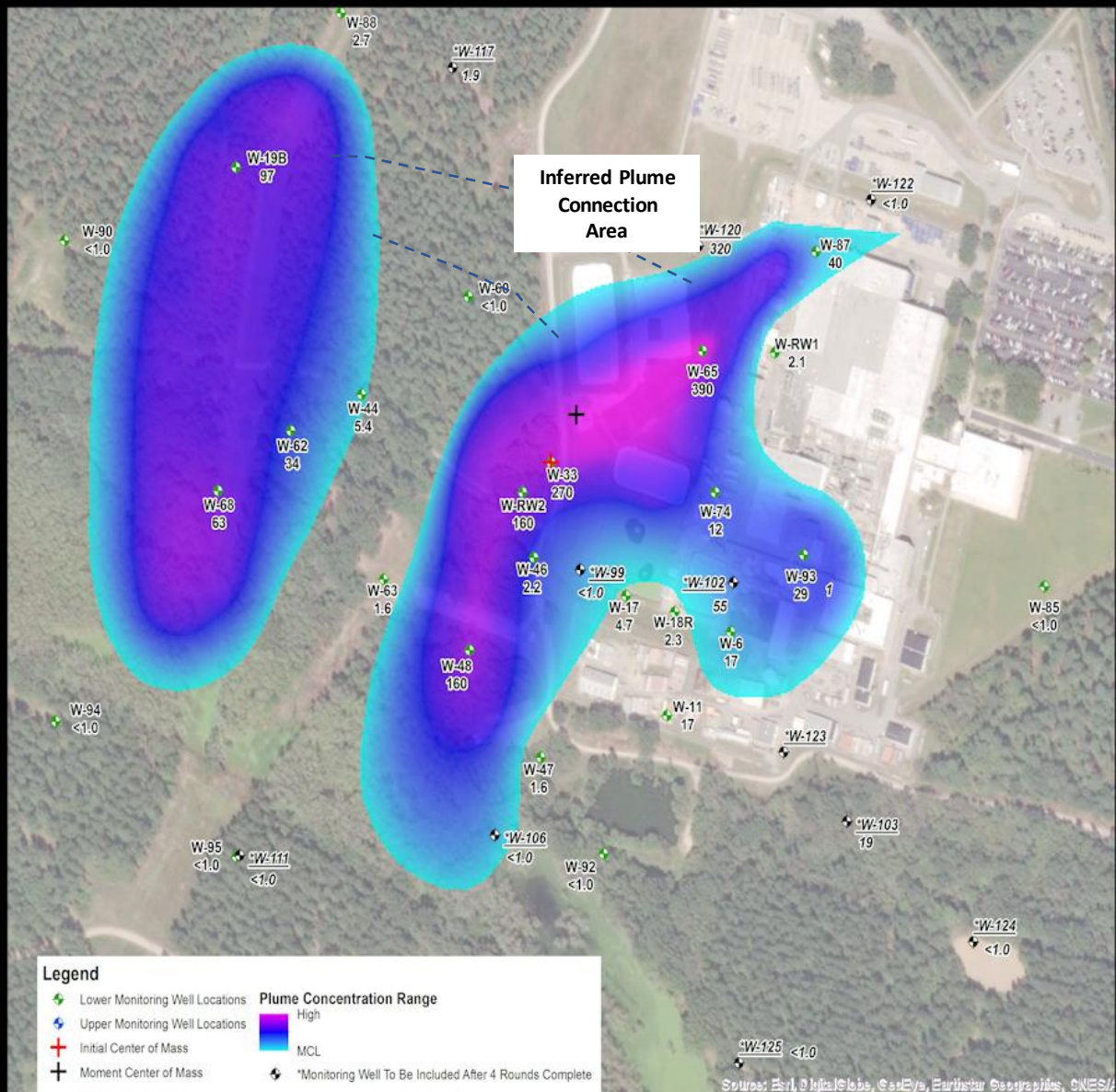
Plume Area: 1,693,727 ft<sup>2</sup>  
 Average Concentration: 14 ug/L  
 Threshold: 9 ug/L (MCL: 5)

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.04

Total Plume Mass:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.05

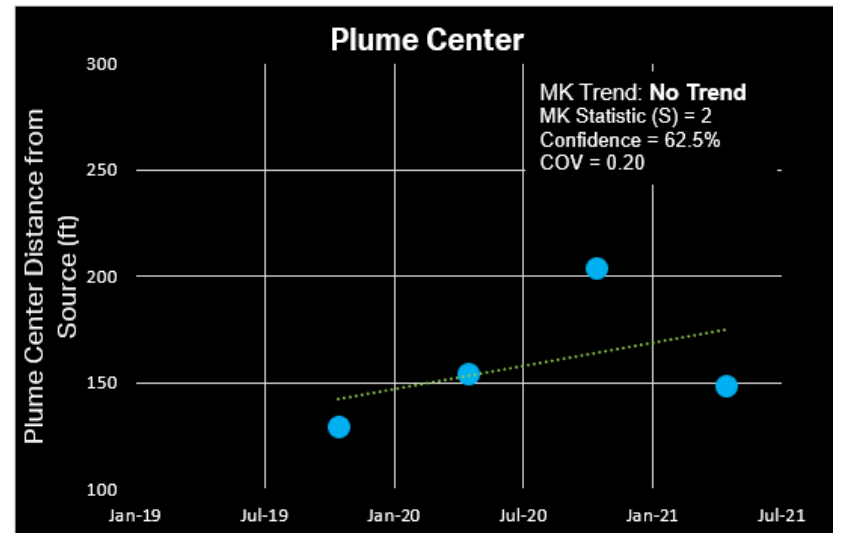
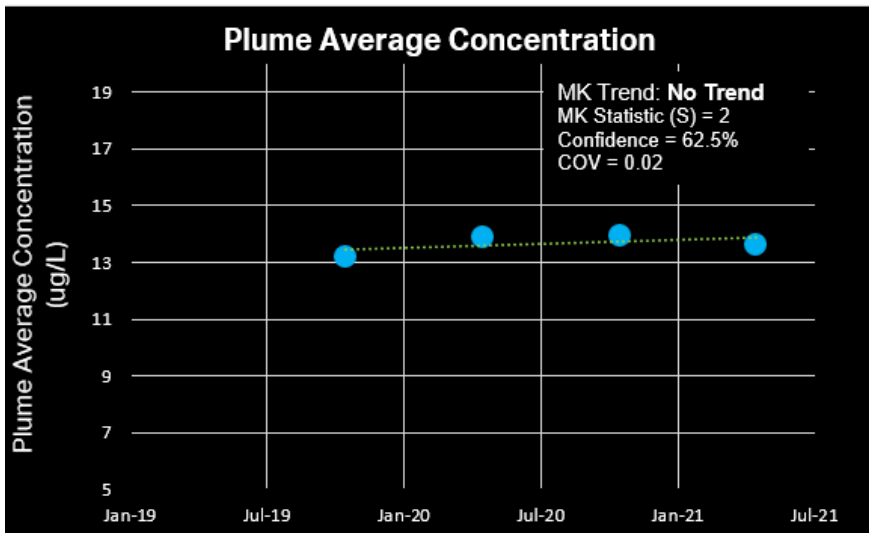
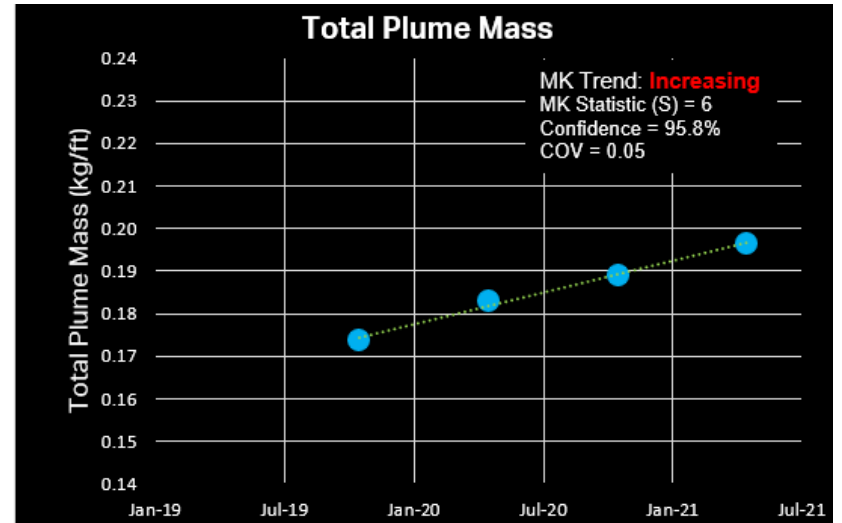
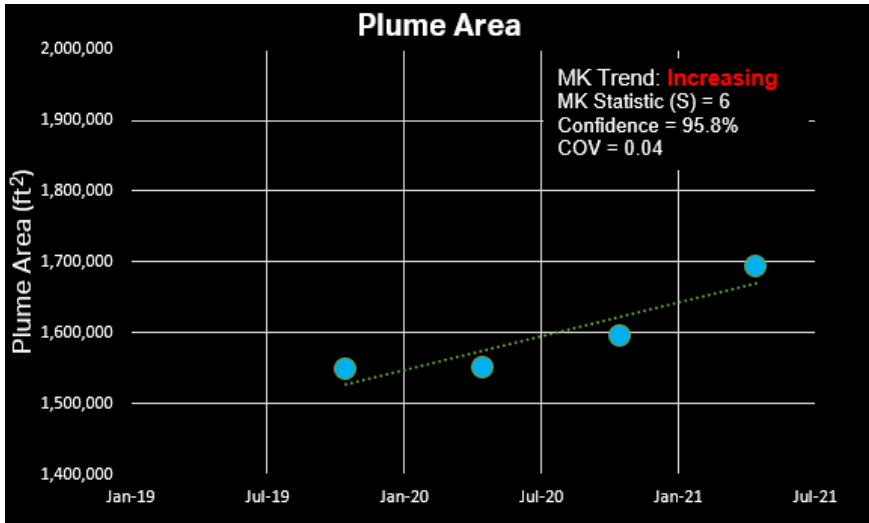
Plume Average Concentration:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.02

Plume Center:  
 MK Trend: No Trend  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.20

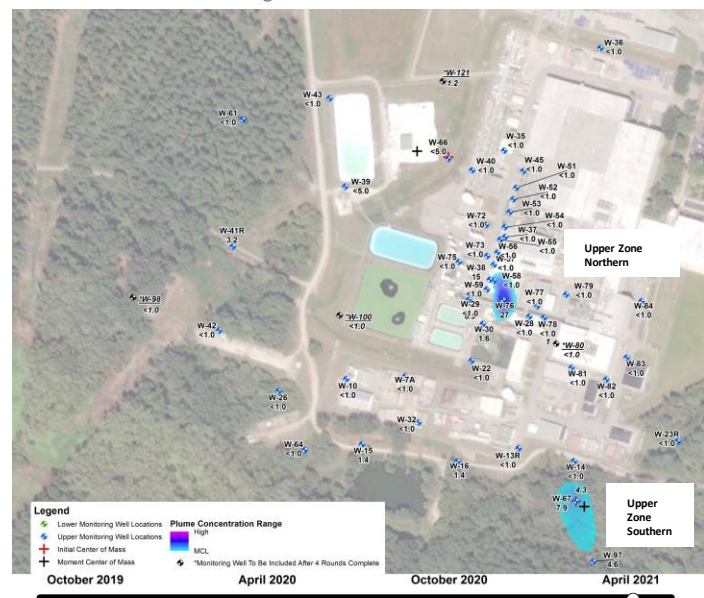
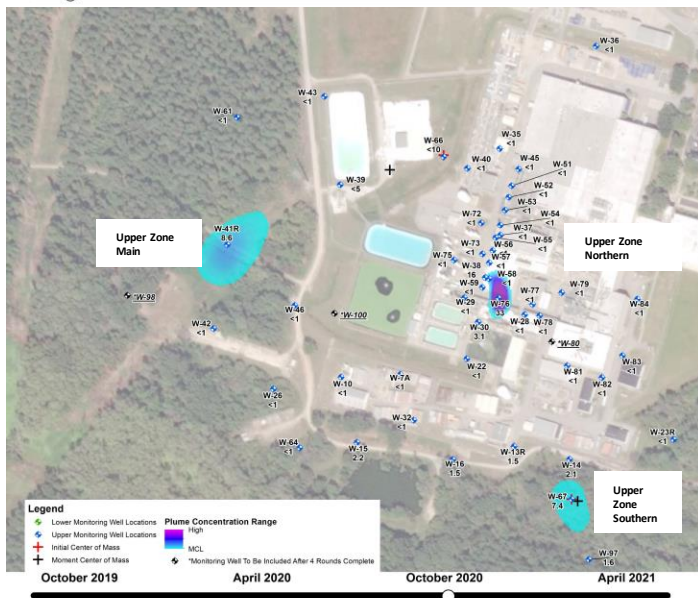
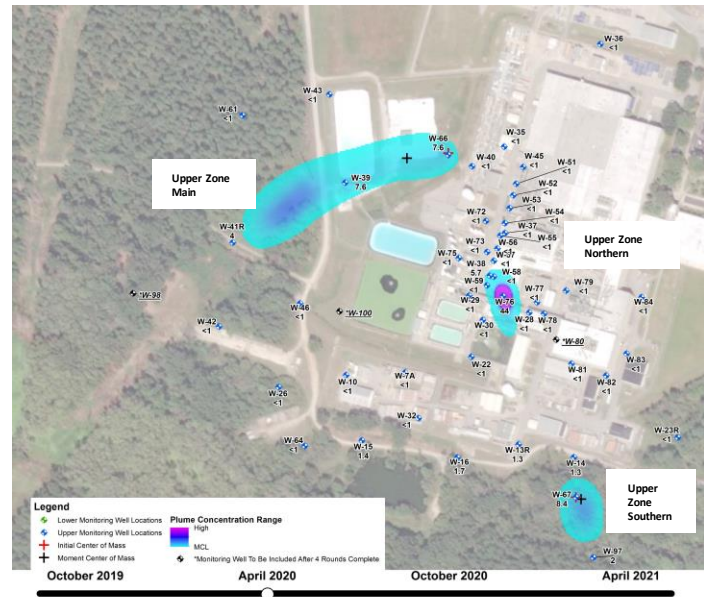
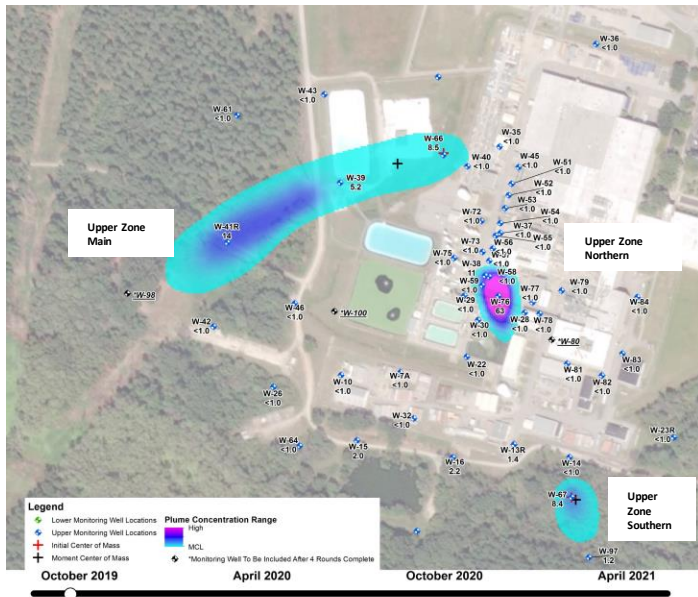


October 2019                      April 2020                      October 2020                      April 2021

# PCE Lower Plume Graphs (9 ug/L Threshold)



# Plume Analytics – TCE Upper (2019-2021)



# TCE Upper North: Oct 2019

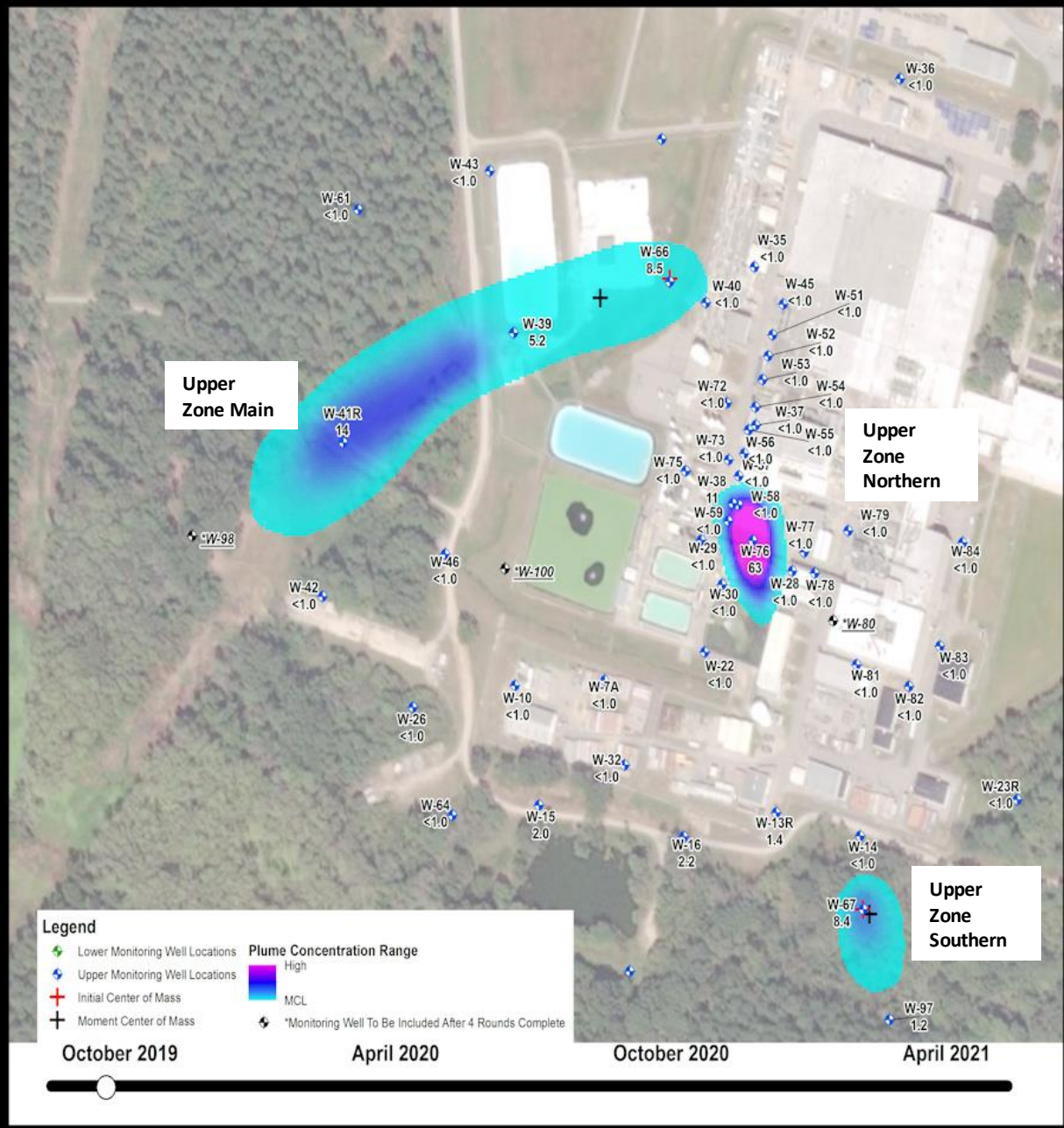
Plume Area: 9,360 ft<sup>2</sup>  
 Average Concentration: 18 ug/L  
 Threshold: 6 ug/L (MCL: 5 ug/L)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.08

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.11

Plume Average Concentration:  
 MK Trend: Decreasing  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.14

Plume Center:  
 MK Trend: No Trend  
 MK Statistic: 4  
 Confidence: 83.3%  
 COV: 0.38



# TCE Upper North: Apr 2020

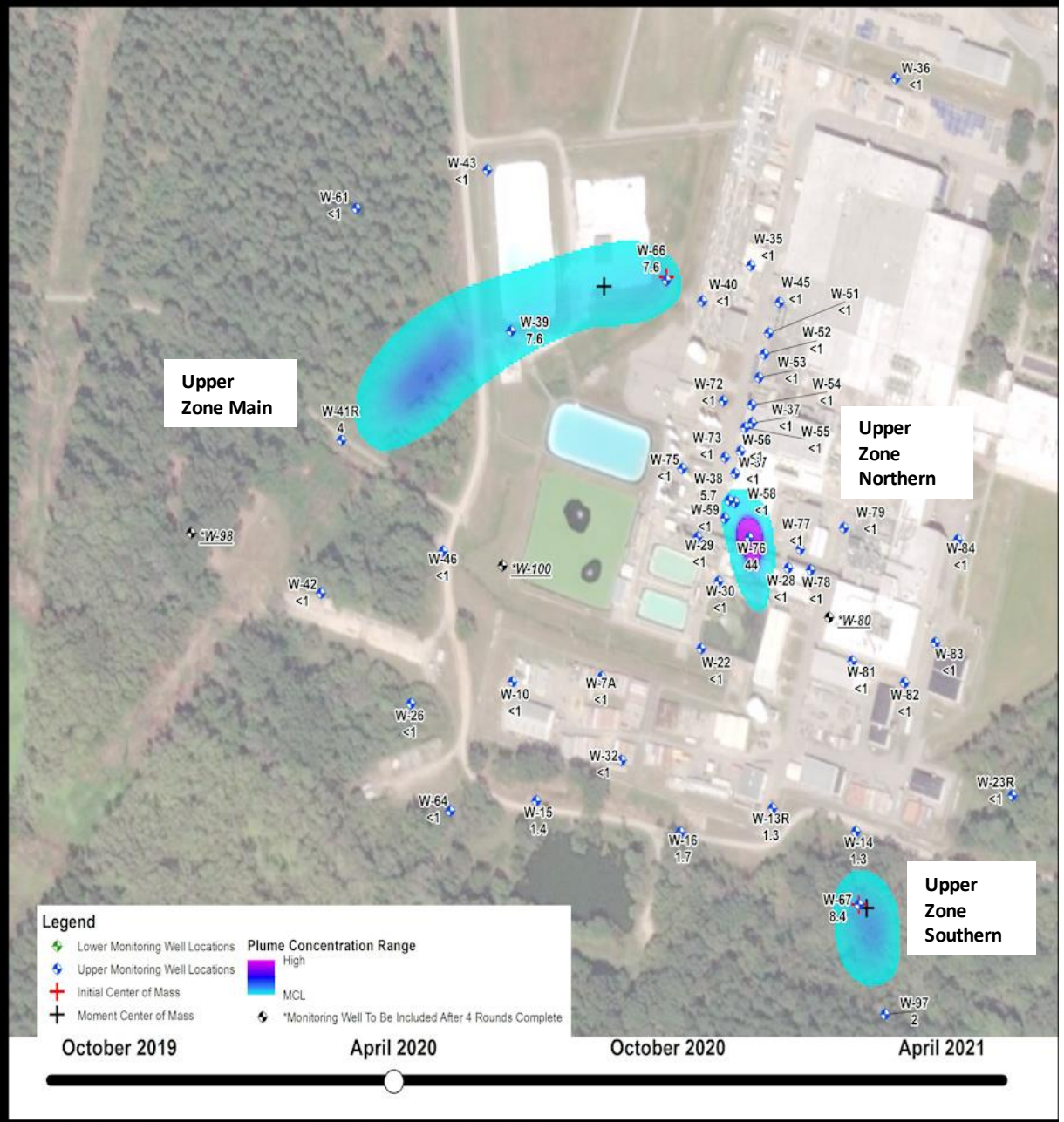
Plume Area: 8,817 ft<sup>2</sup>  
 Average Concentration: 15 ug/L  
 Threshold: 6 ug/L (MCL: 5 ug/L)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.08

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.11

Plume Average Concentration:  
 MK Trend: Decreasing  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.14

Plume Center:  
 MK Trend: No Trend  
 MK Statistic: 4  
 Confidence: 83.3%  
 COV: 0.38



# TCE Upper North: Oct 2020

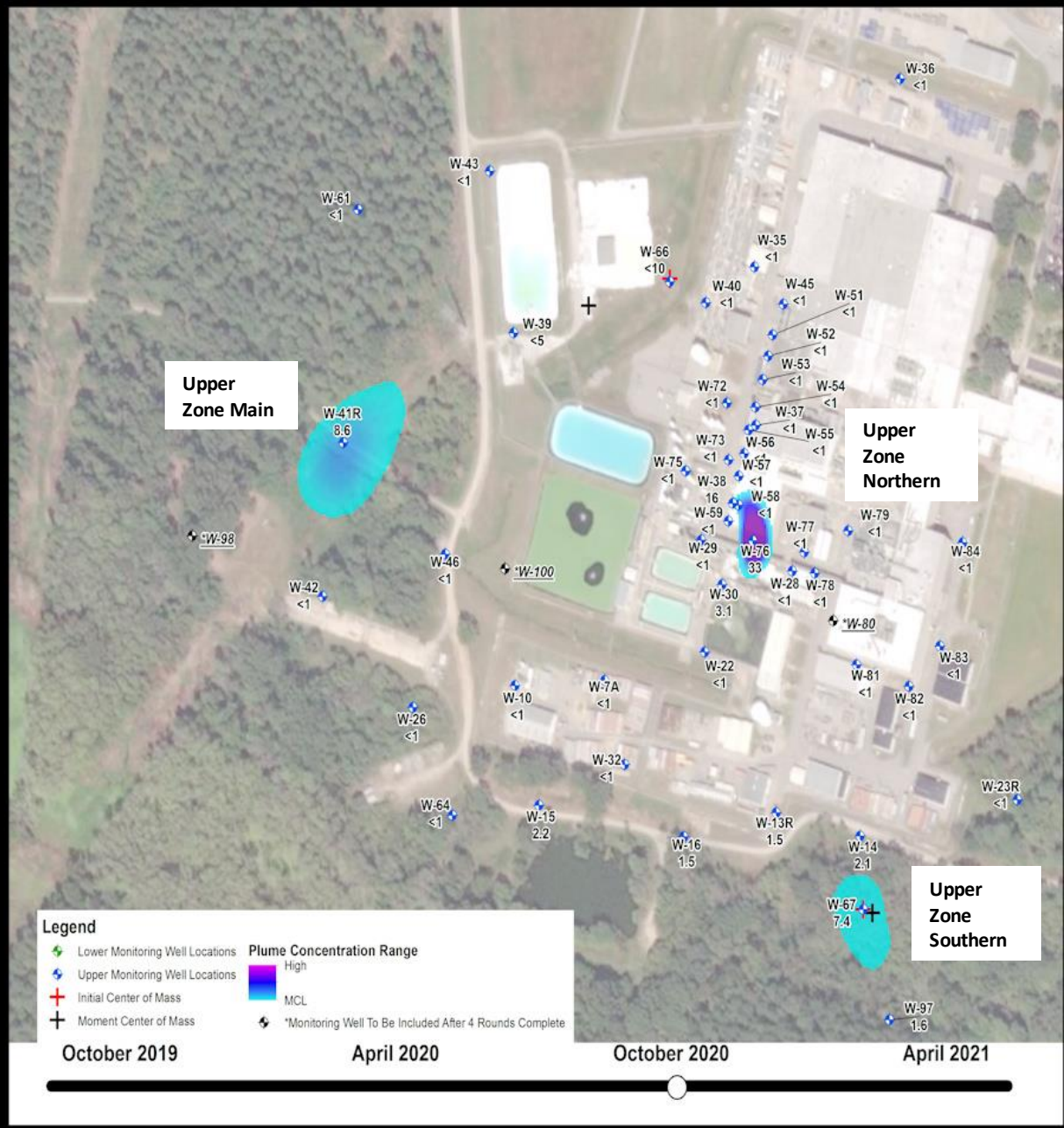
Plume Area: 10,506 ft<sup>2</sup>  
 Average Concentration: 14 ug/L  
 Threshold: 6 ug/L (MCL: 5 ug/L)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.08

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.11

Plume Average Concentration:  
 MK Trend: Decreasing  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.14

Plume Center:  
 MK Trend: No Trend  
 MK Statistic: 4  
 Confidence: 83.3%  
 COV: 0.38



# TCE Upper North: Apr 2021

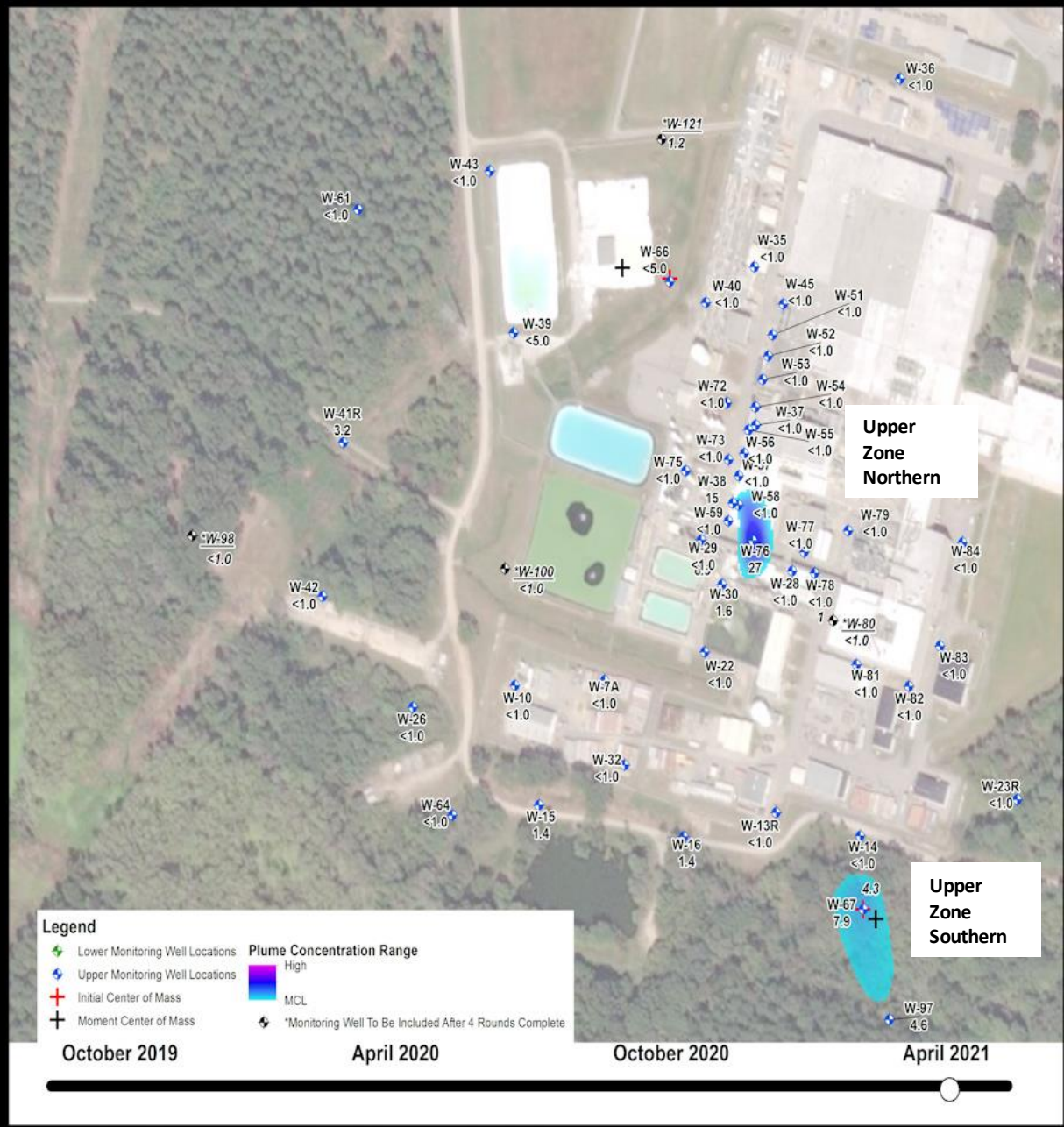
Plume Area: 10,199 ft<sup>2</sup>  
 Average Concentration: 13 ug/L  
 Threshold: 6 ug/L (MCL: 5 ug/L)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.08

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.11

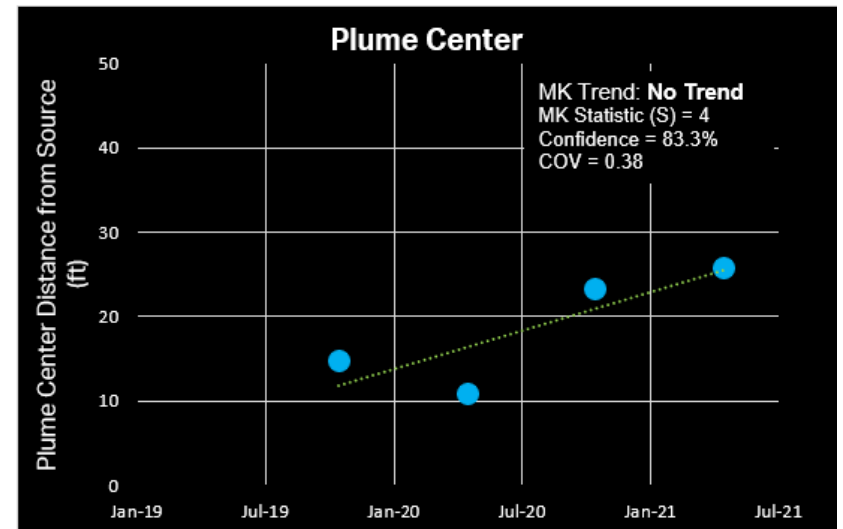
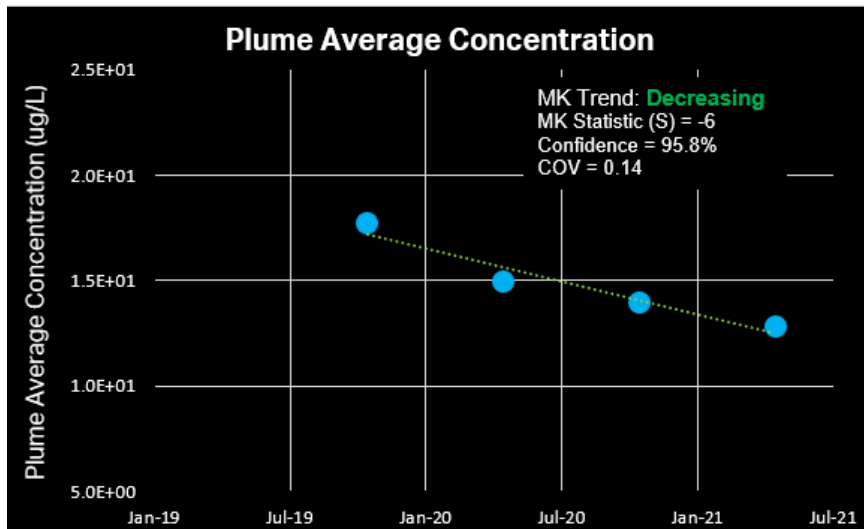
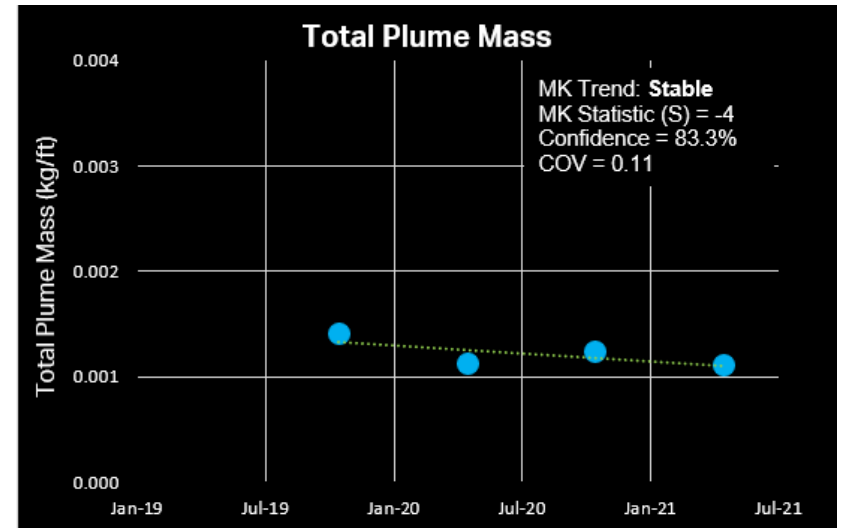
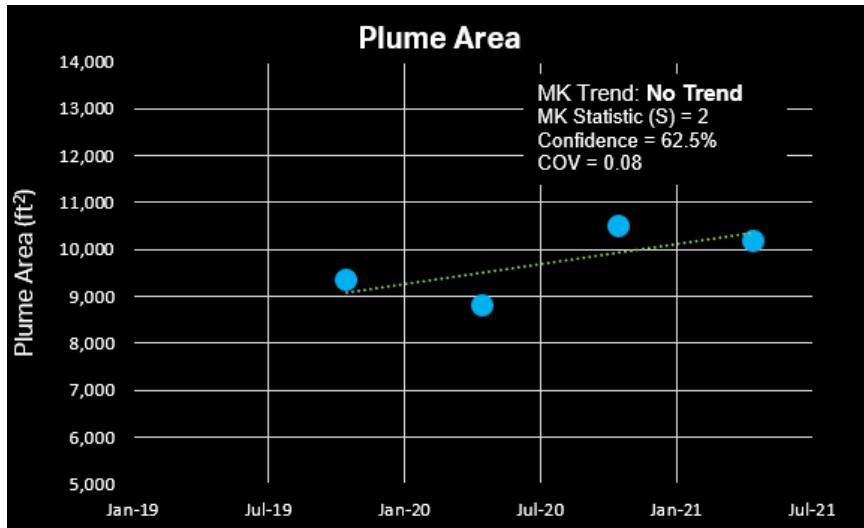
Plume Average Concentration:  
 MK Trend: **Decreasing**  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.14

Plume Center:  
 MK Trend: No Trend  
 MK Statistic: 4  
 Confidence: 83.3%  
 COV: 0.38





# TCE Upper North Plume Graphs (6 ug/L Threshold)



# TCE Upper South: Oct 2019

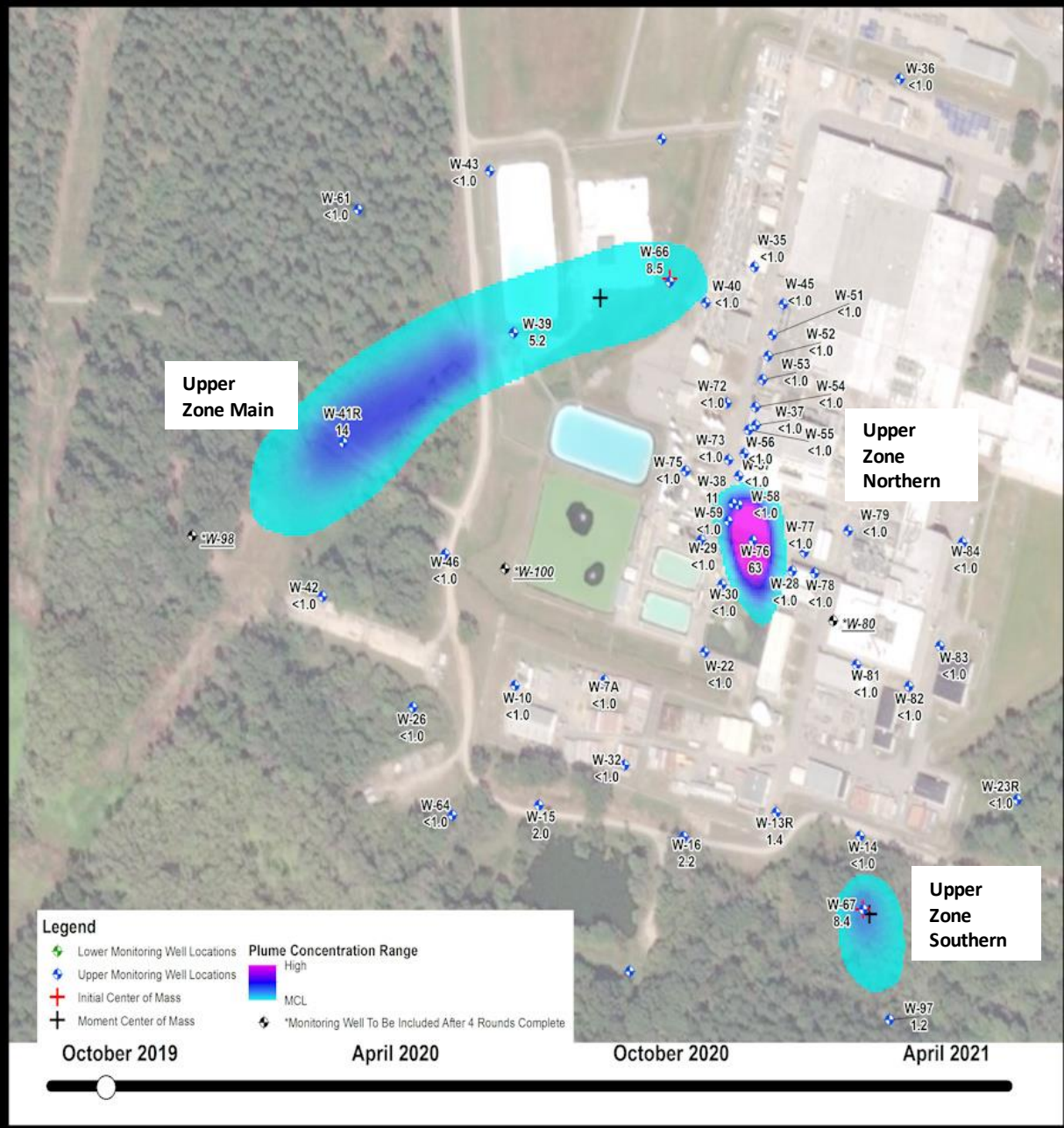
Plume Area: 28,843 ft<sup>2</sup>  
 Average Concentration: 6 ug/L  
 Threshold: 5 ug/L (MCL: 5 ug/L)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 4  
 Confidence: 83.3%  
 COV: 0.10

Total Plume Mass:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.11

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.03

Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.34



# TCE Upper South: Apr 2020

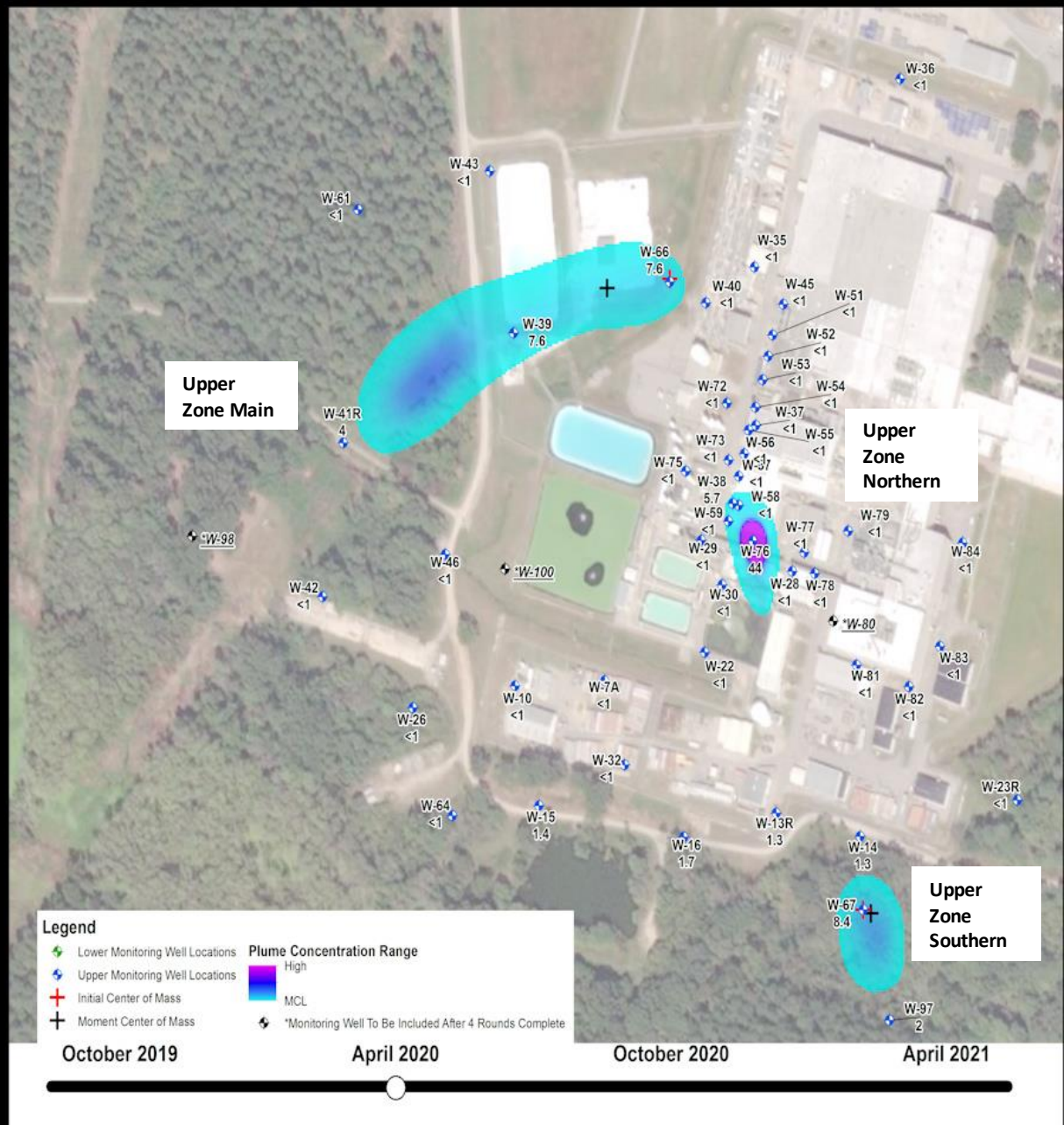
Plume Area: 31,957 ft<sup>2</sup>  
 Average Concentration: 6 ug/L  
 Threshold: 5 ug/L (MCL: 5 ug/L)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 4  
 Confidence: 83.3%  
 COV: 0.10

Total Plume Mass:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.11

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.03

Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.34



# TCE Upper South: Oct 2020

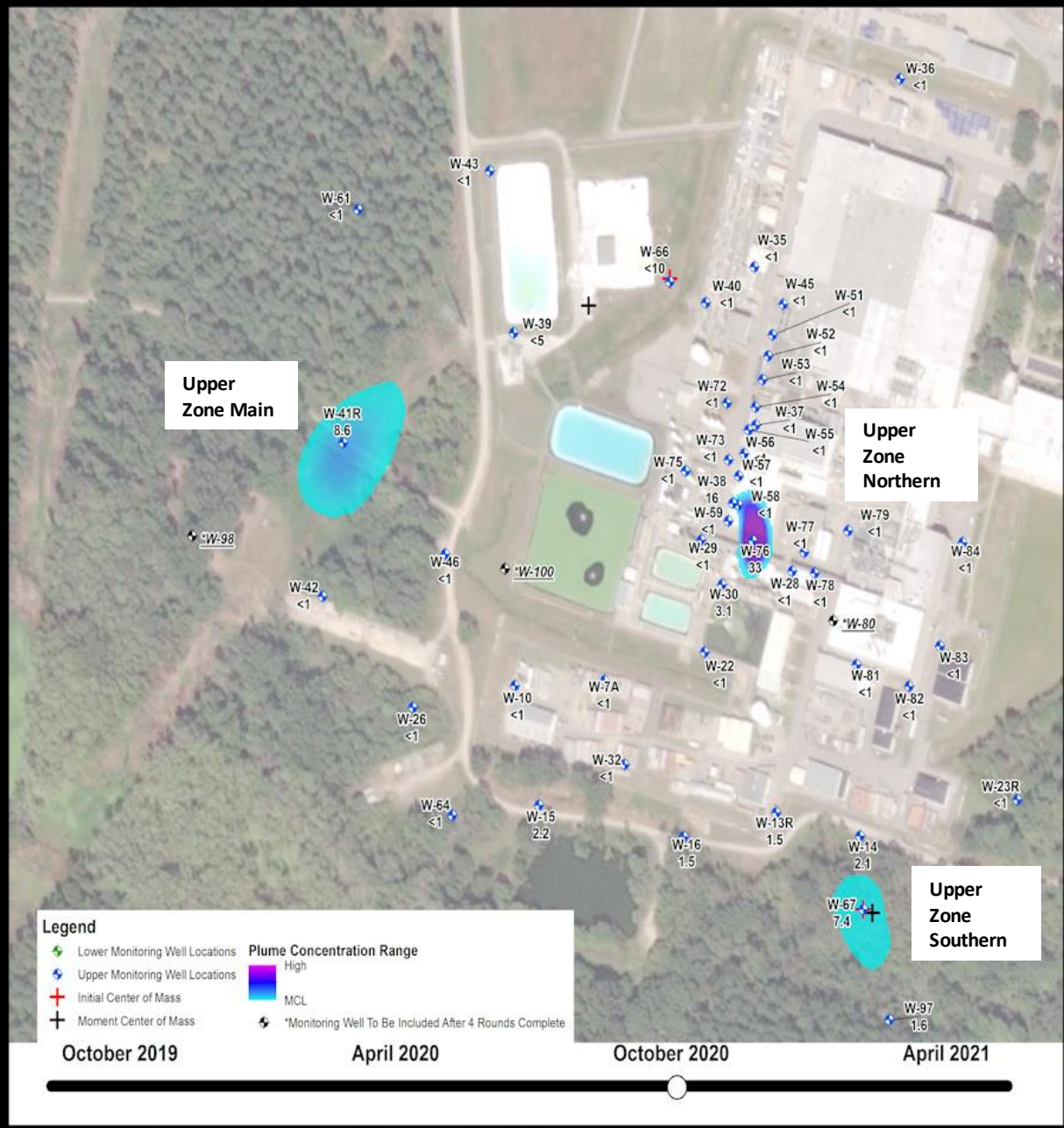
Plume Area: 28,917 ft<sup>2</sup>  
 Average Concentration: 6 ug/L  
 Threshold: 5 ug/L (MCL: 5 ug/L)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 4  
 Confidence: 83.3%  
 COV: 0.10

Total Plume Mass:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.11

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.03

Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.34



# TCE Upper South: Apr 2021

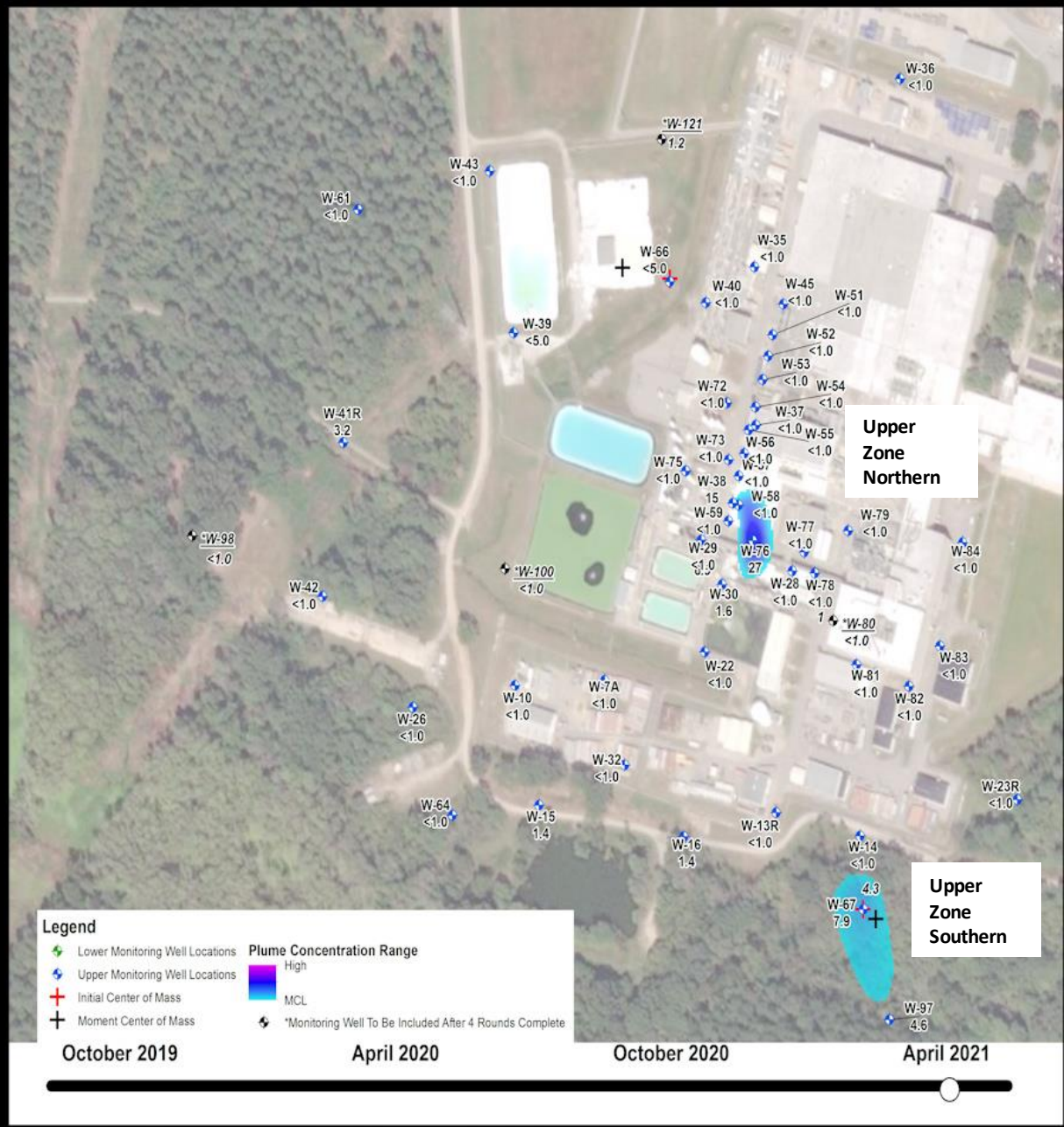
Plume Area: 35,785 ft<sup>2</sup>  
 Average Concentration: 6 ug/L  
 Threshold: 5 ug/L (MCL: 5 ug/L)

Plume Area:  
 MK Trend: No Trend  
 MK Statistic: 4  
 Confidence: 83.3%  
 COV: 0.10

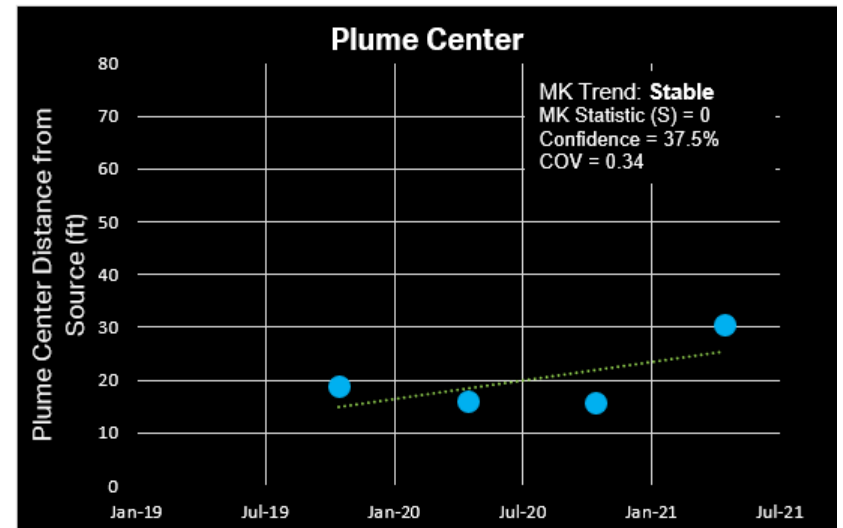
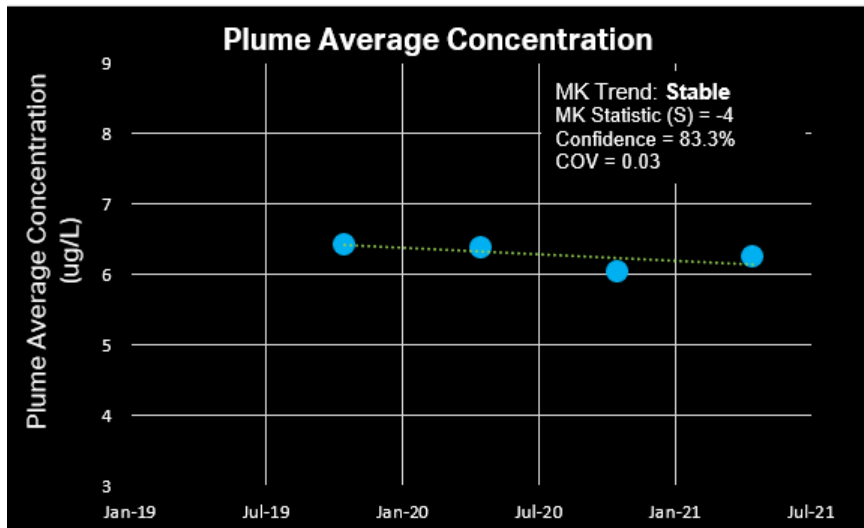
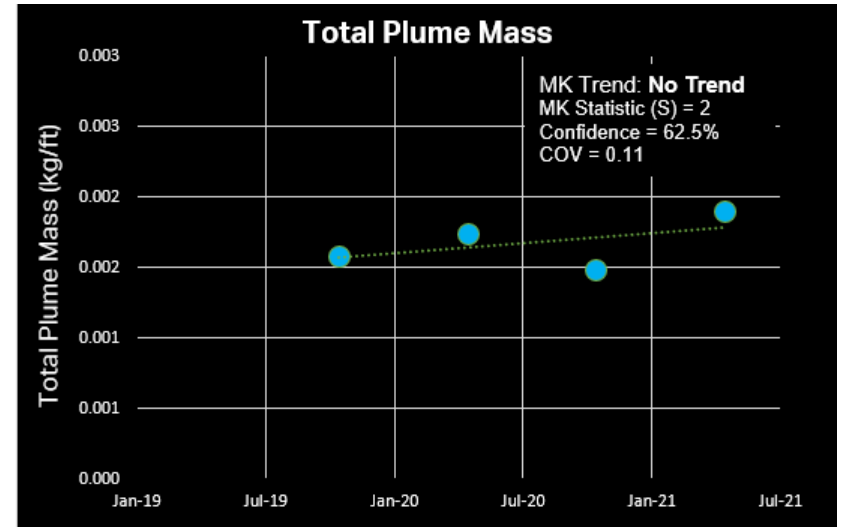
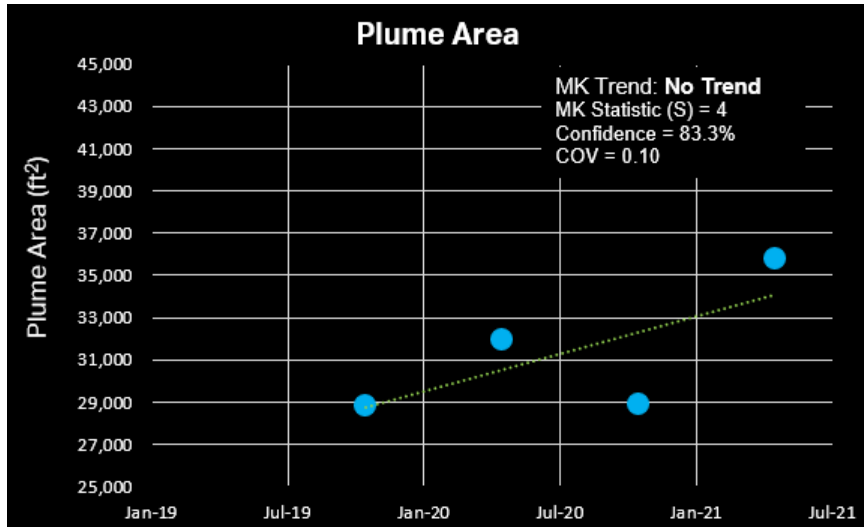
Total Plume Mass:  
 MK Trend: No Trend  
 MK Statistic: 2  
 Confidence: 62.5%  
 COV: 0.11

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.03

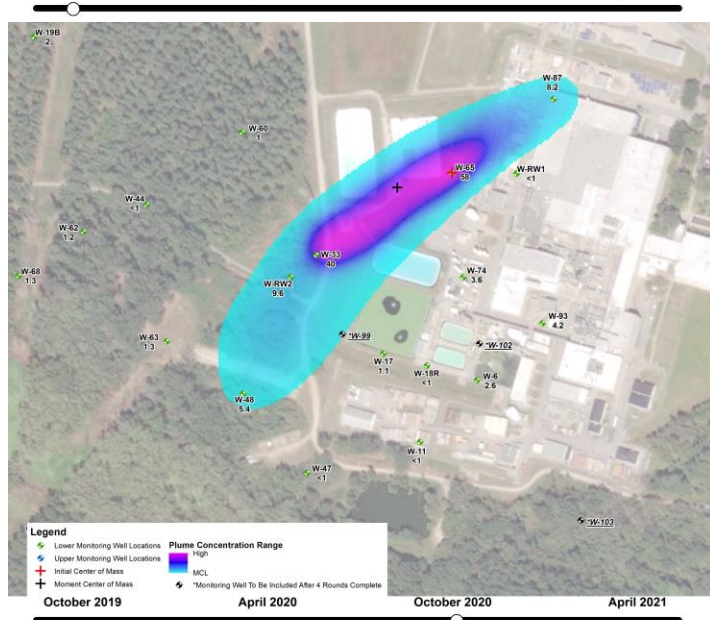
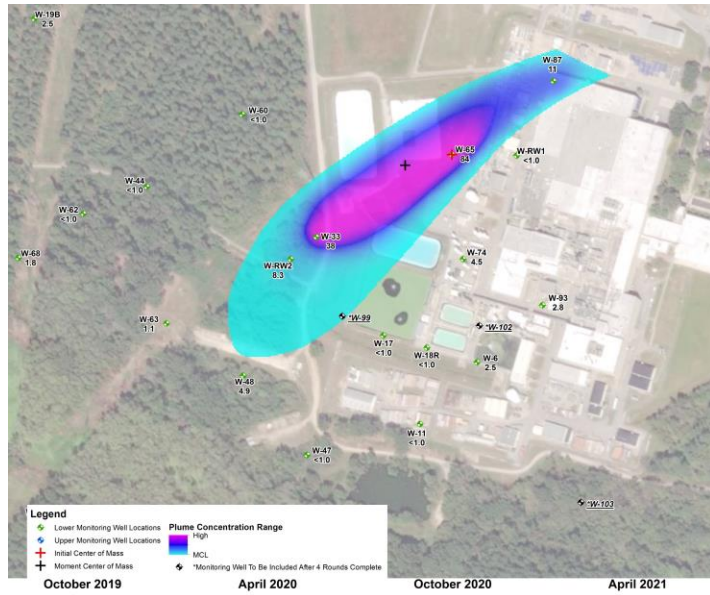
Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.34



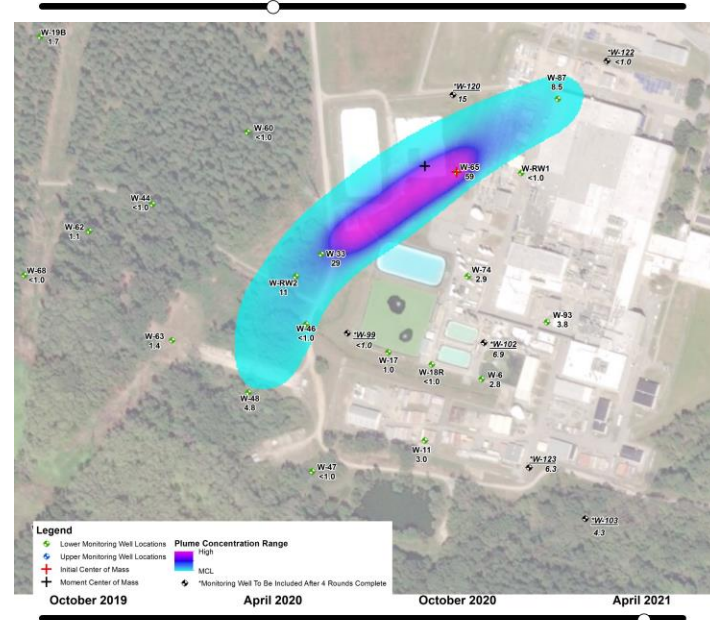
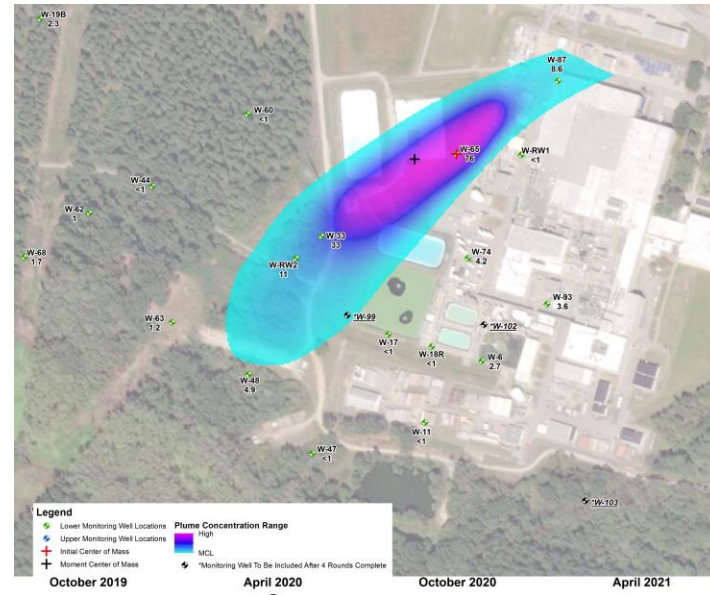
# TCE Upper South Plume Graphs (5 ug/L Threshold)



# Plume Analytics– TCE Lower: 39 ug/L (2019-2021)



October 2019      April 2020      October 2020      April 2021



October 2019      April 2020      October 2020      April 2021

# TCE Lower: Oct 2019

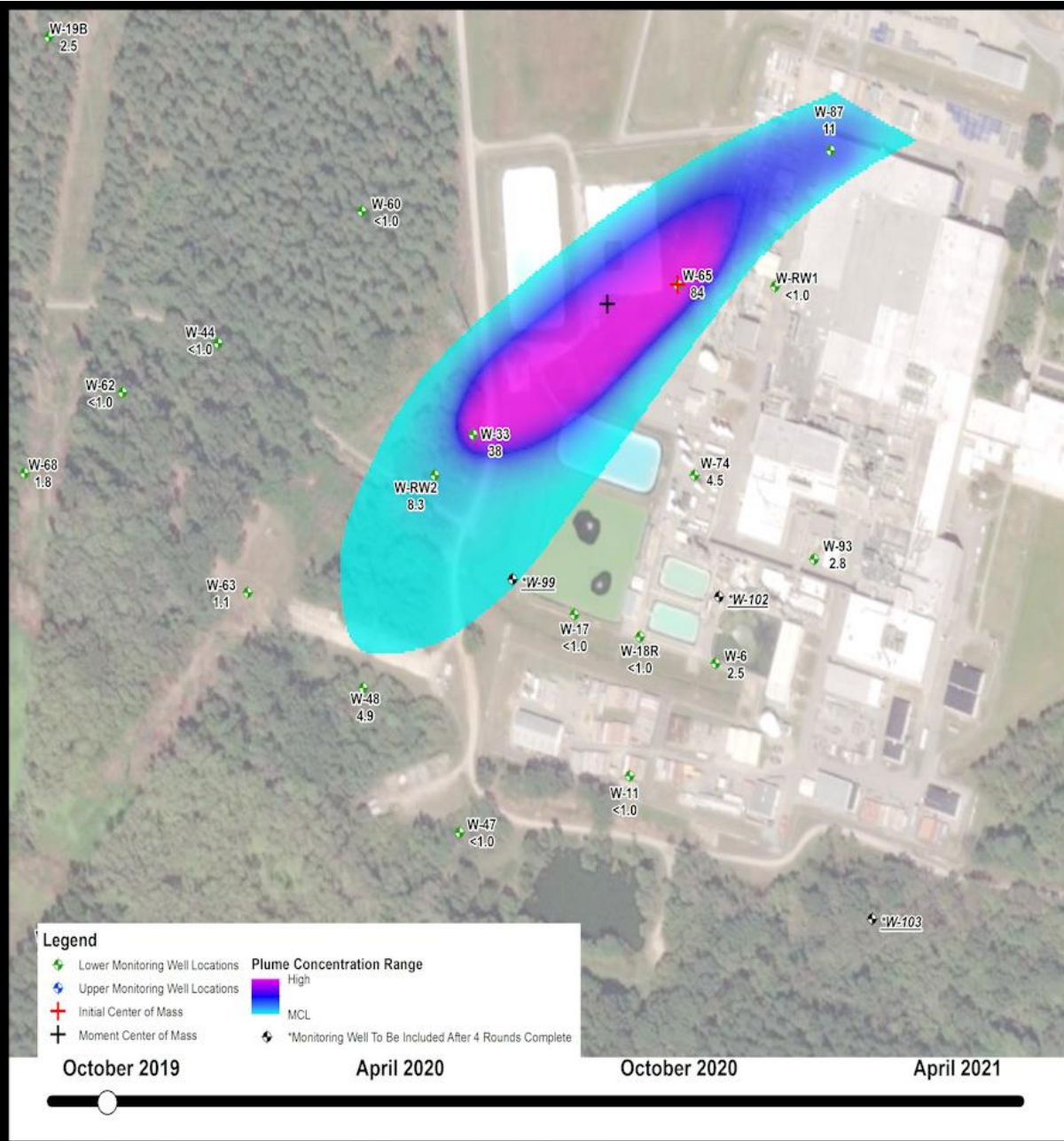
Plume Area: 138,766 ft<sup>2</sup>  
 Average Concentration: 75 ug/L  
 Threshold: 39 ug/L (MCL: 5)

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.23

Total Plume Mass:  
 MK Trend: **Decreasing**  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.25

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.07

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.23





# TCE Lower: April 2020

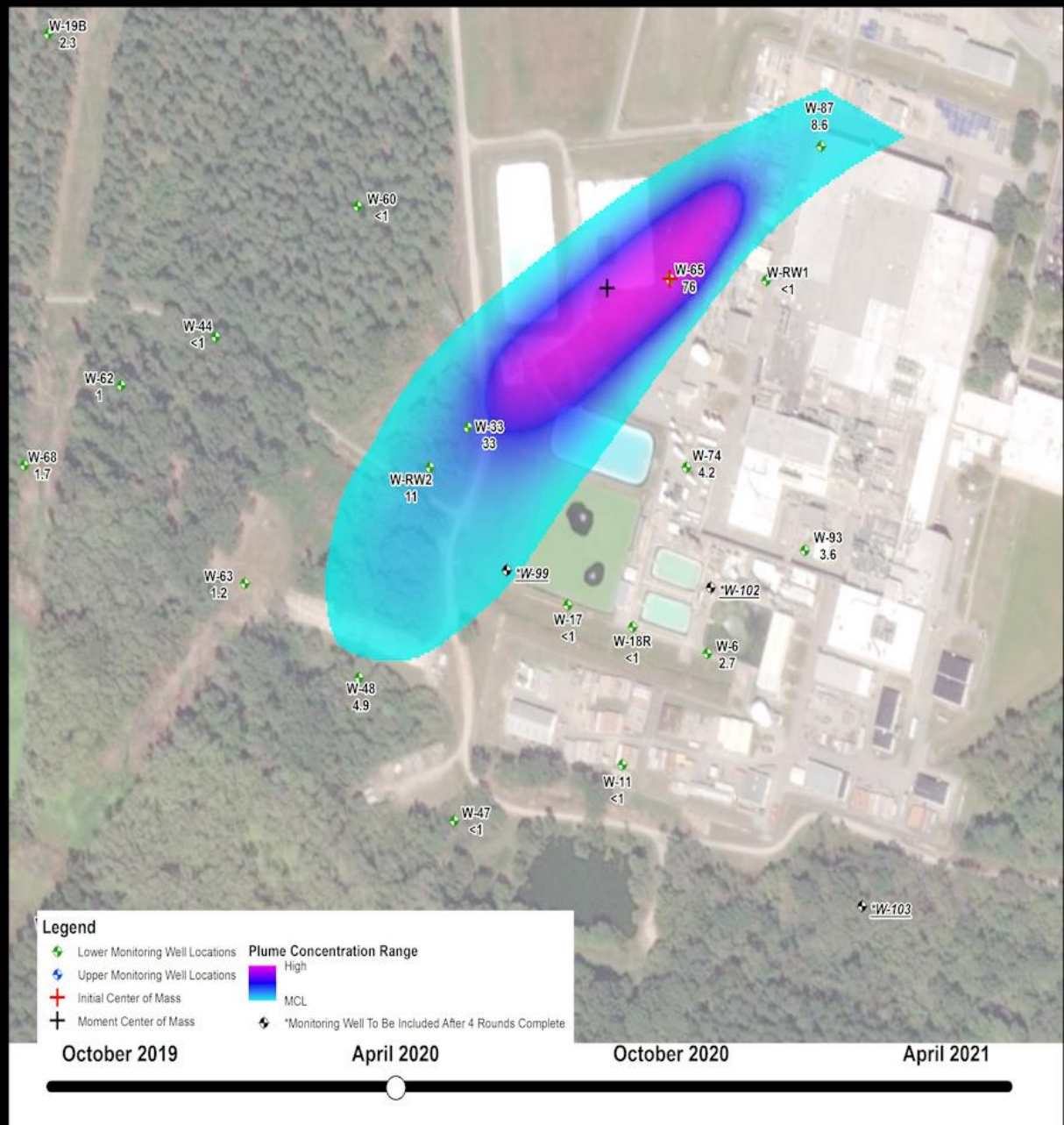
Plume Area: 188,270 ft<sup>2</sup>  
 Average Concentration: 76 ug/L  
 Threshold: 39 ug/L (MCL: 5)

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.23

Total Plume Mass:  
 MK Trend: **Decreasing**  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.25

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.07

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.23



# TCE Lower: Oct 2020

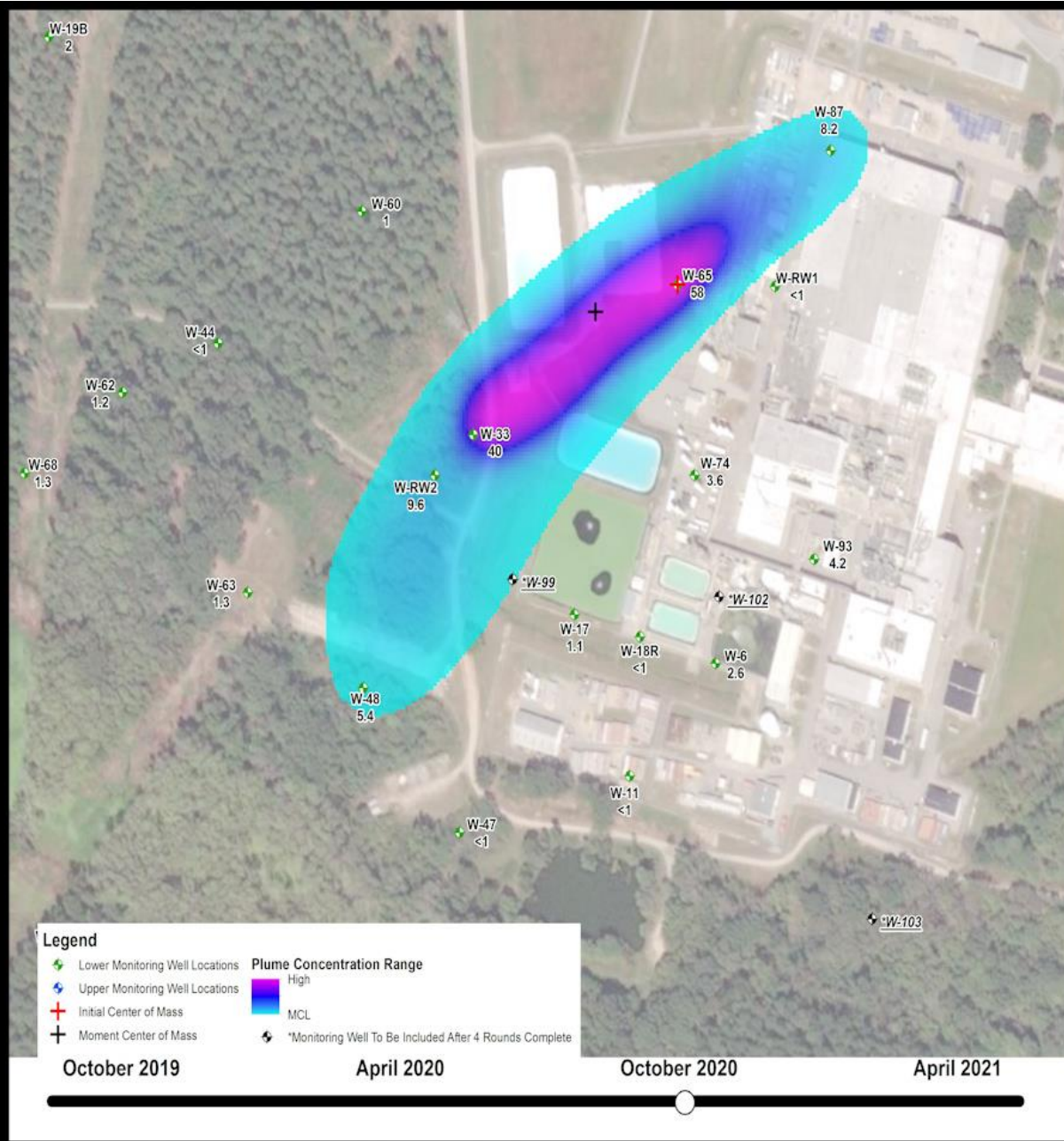
Plume Area: 132,680 ft<sup>2</sup>  
 Average Concentration: 65 ug/L  
 Threshold: 39 ug/L (MCL: 5)

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.23

Total Plume Mass:  
 MK Trend: **Decreasing**  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.25

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.07

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.23



# TCE Lower: April 2021

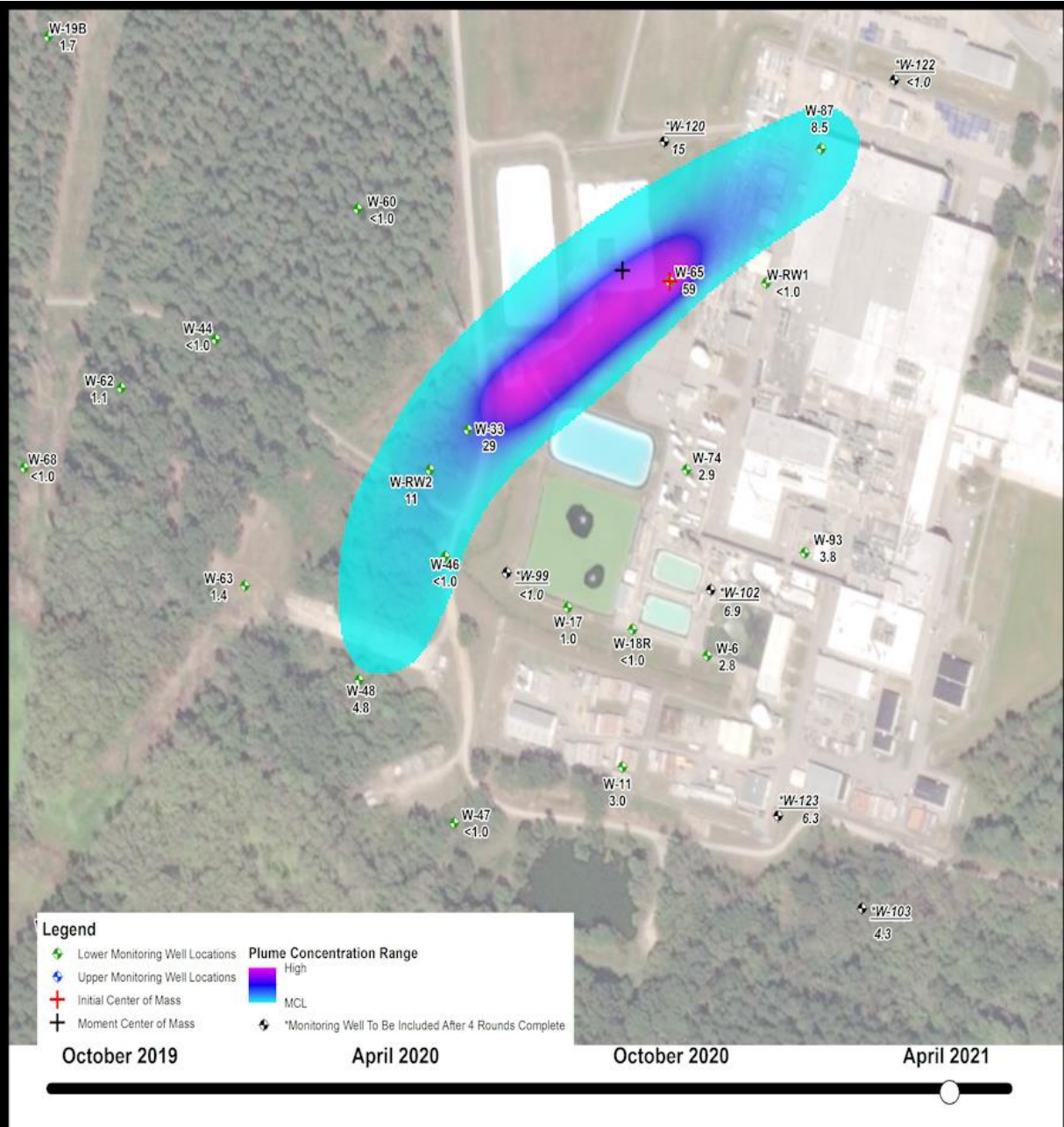
Plume Area: 79,331 ft<sup>2</sup>  
Average Concentration: 68 ug/L  
Threshold: 39 ug/L (MCL: 5)

Plume Area:  
MK Trend: Stable  
MK Statistic: -4  
Confidence: 83.3%  
COV: 0.23

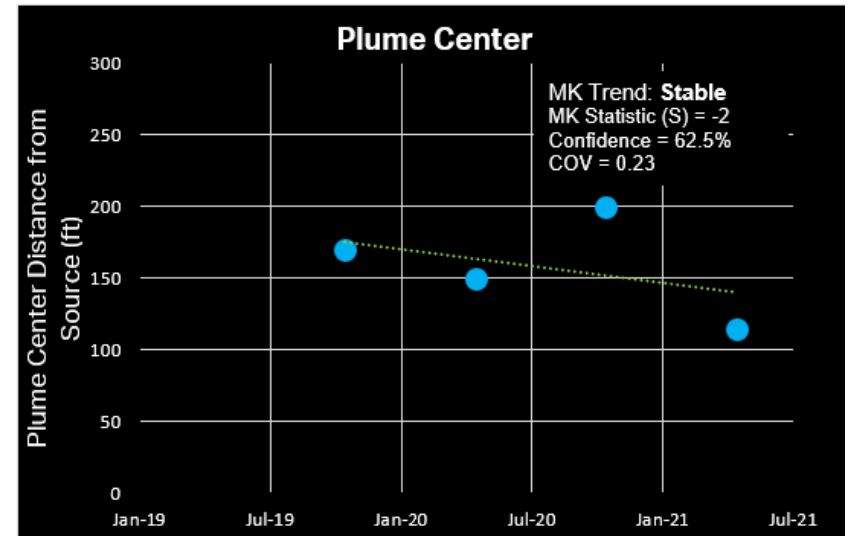
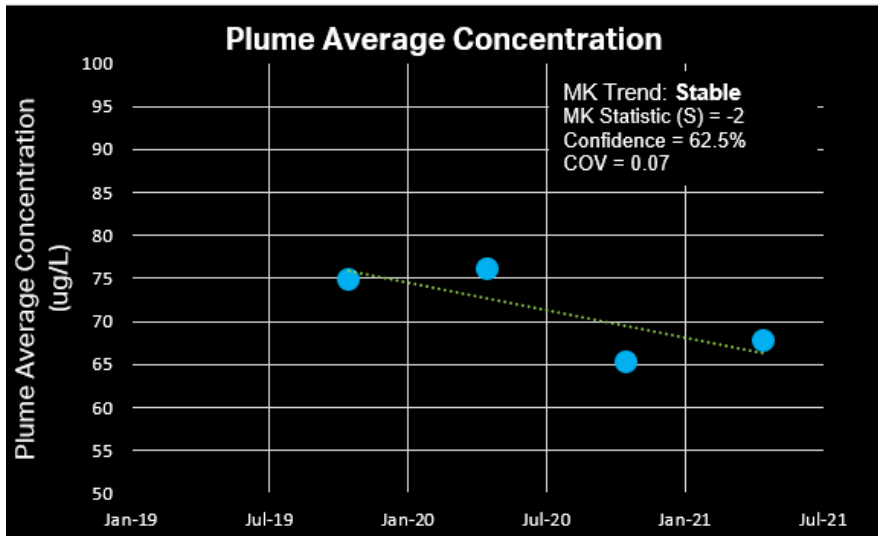
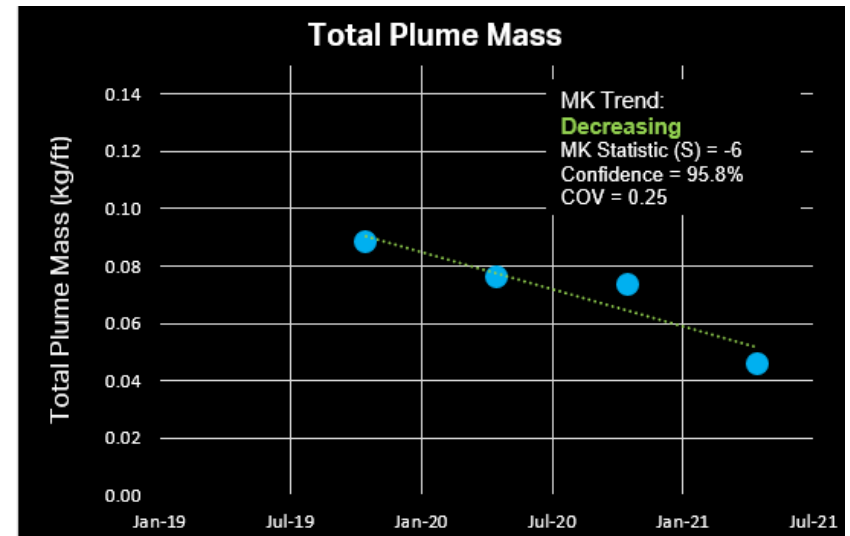
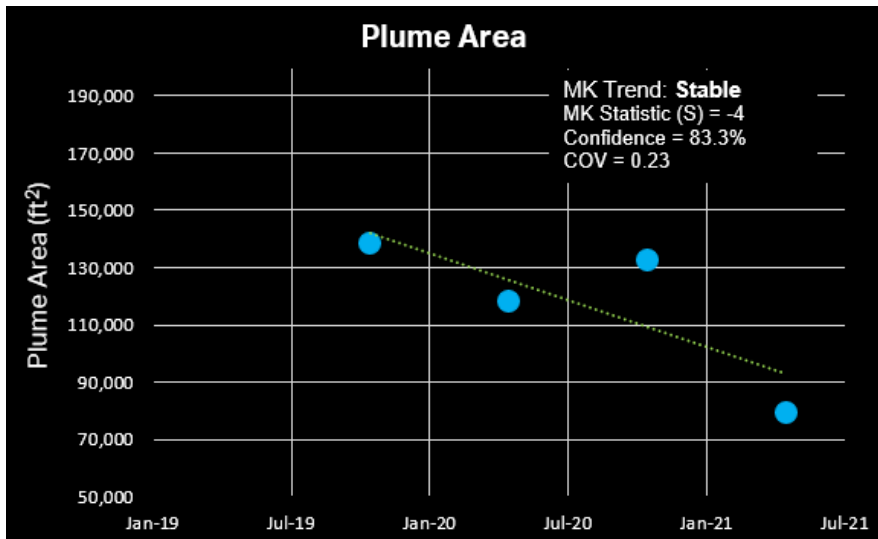
Total Plume Mass:  
MK Trend: **Decreasing**  
MK Statistic: -6  
Confidence: 95.8%  
COV: 0.25

Plume Average Concentration:  
MK Trend: Stable  
MK Statistic: -2  
Confidence: 62.5%  
COV: 0.07

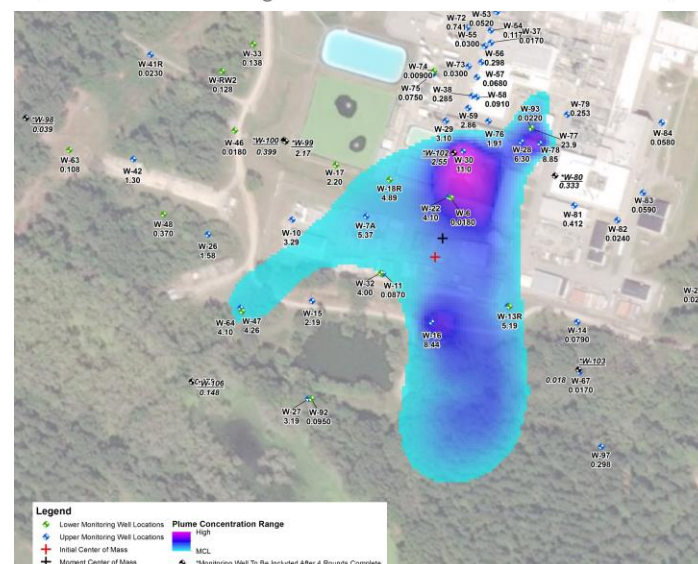
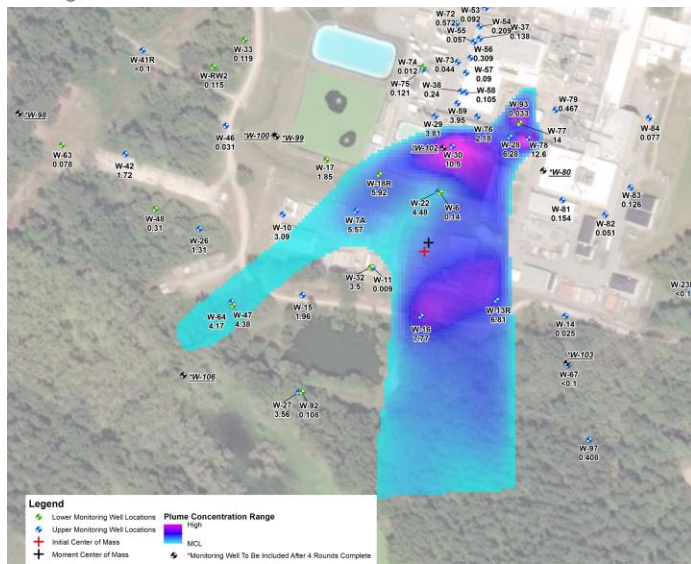
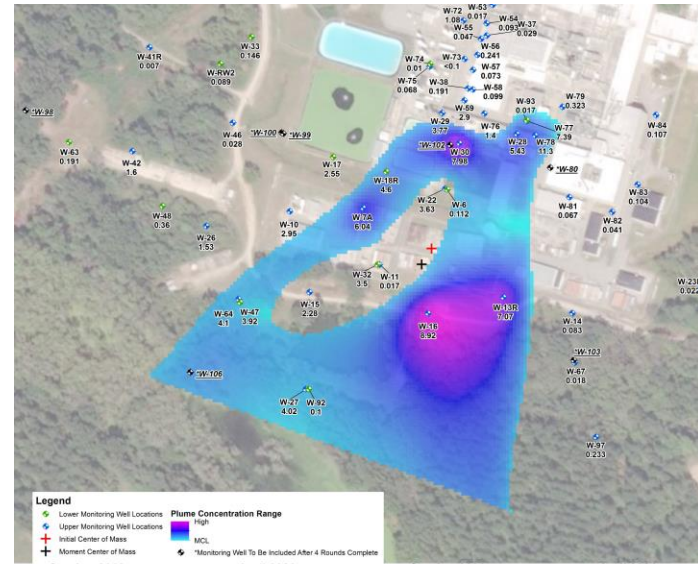
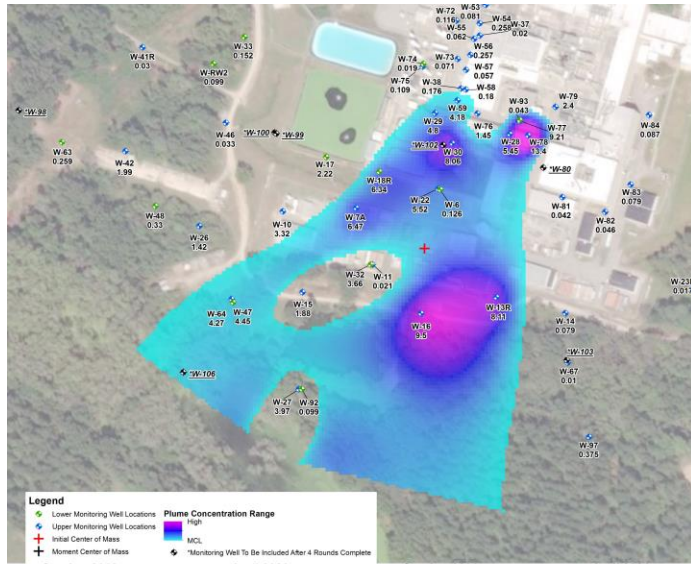
Plume Center:  
MK Trend: Stable  
MK Statistic: -2  
Confidence: 62.5%  
COV: 0.23



# TCE Lower Plume Graphs (39 ug/L Threshold)



# Plume Analytics – Fluoride: 4 mg/L (2019-2021)



# Fluoride: October 2019

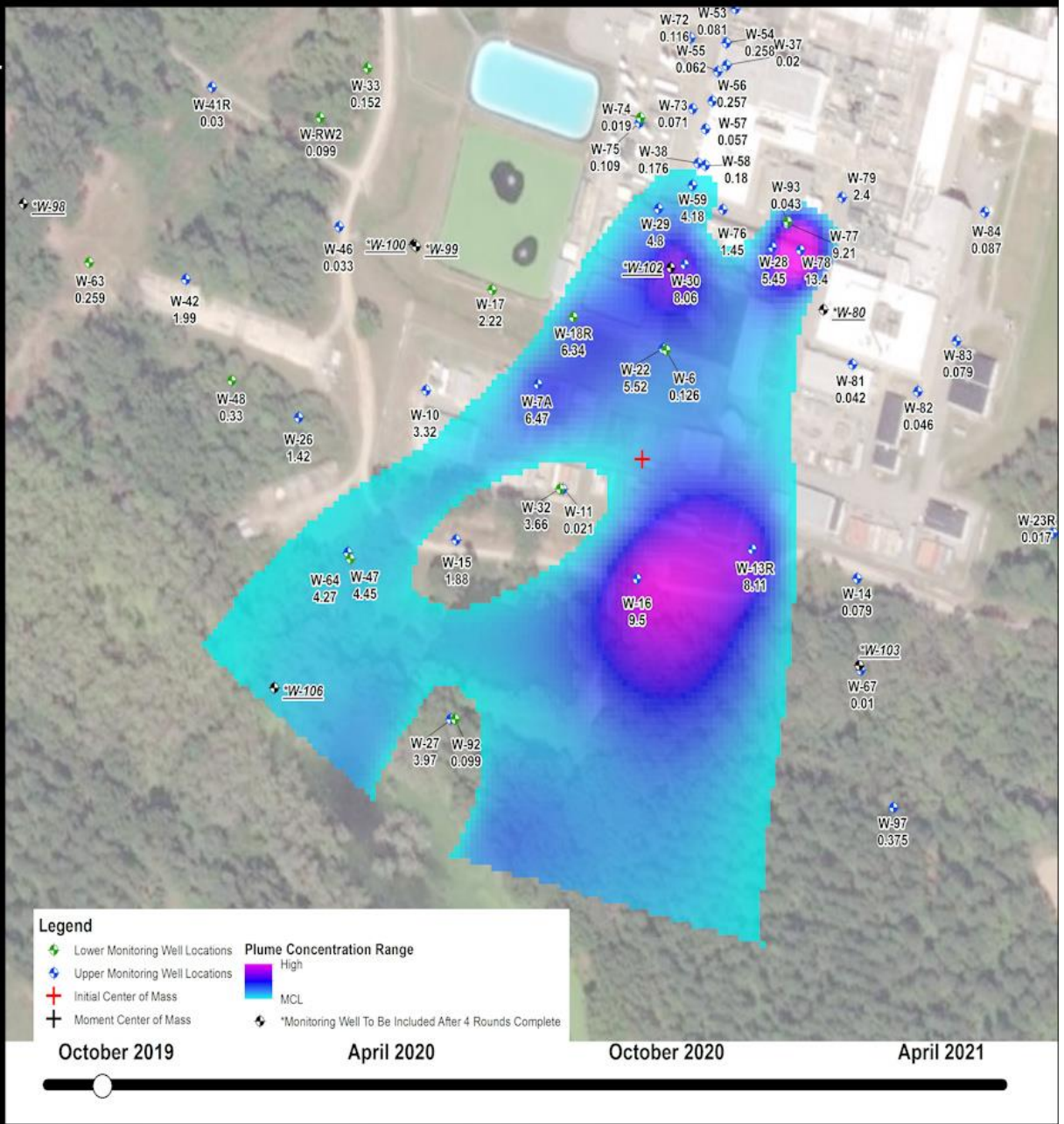
Plume Area: 237,158 ft<sup>2</sup>  
 Average Concentration: 7 ug/L  
 Threshold: 4 ug/L

Plume Area:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.12

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.12

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.04

Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.07



# Fluoride: April 2020

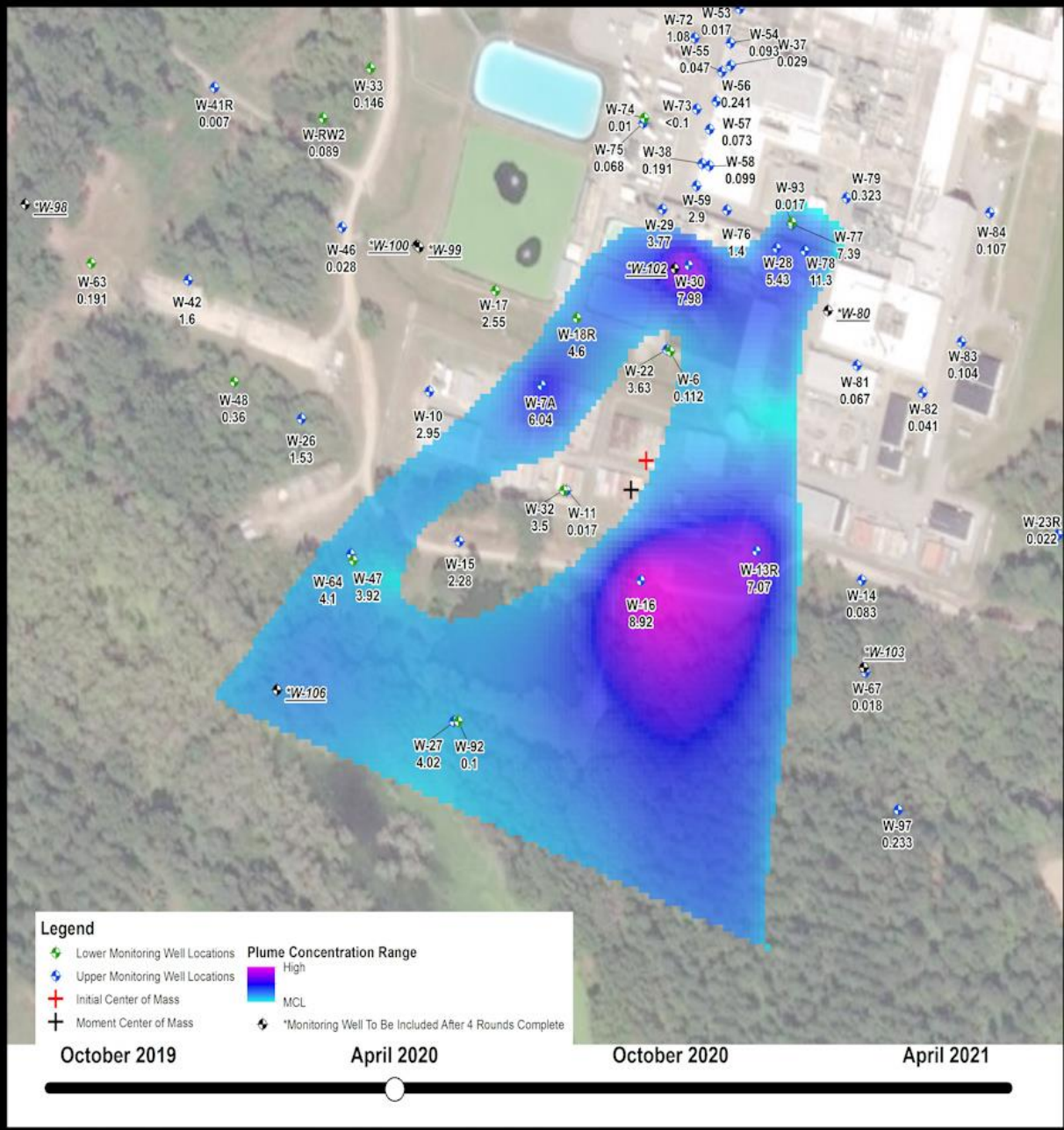
Plume Area: 181,519 ft<sup>2</sup>  
 Average Concentration: 7 ug/L  
 Threshold: 4 ug/L

Plume Area:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.12

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.12

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.04

Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.07



# Fluoride: October 2020

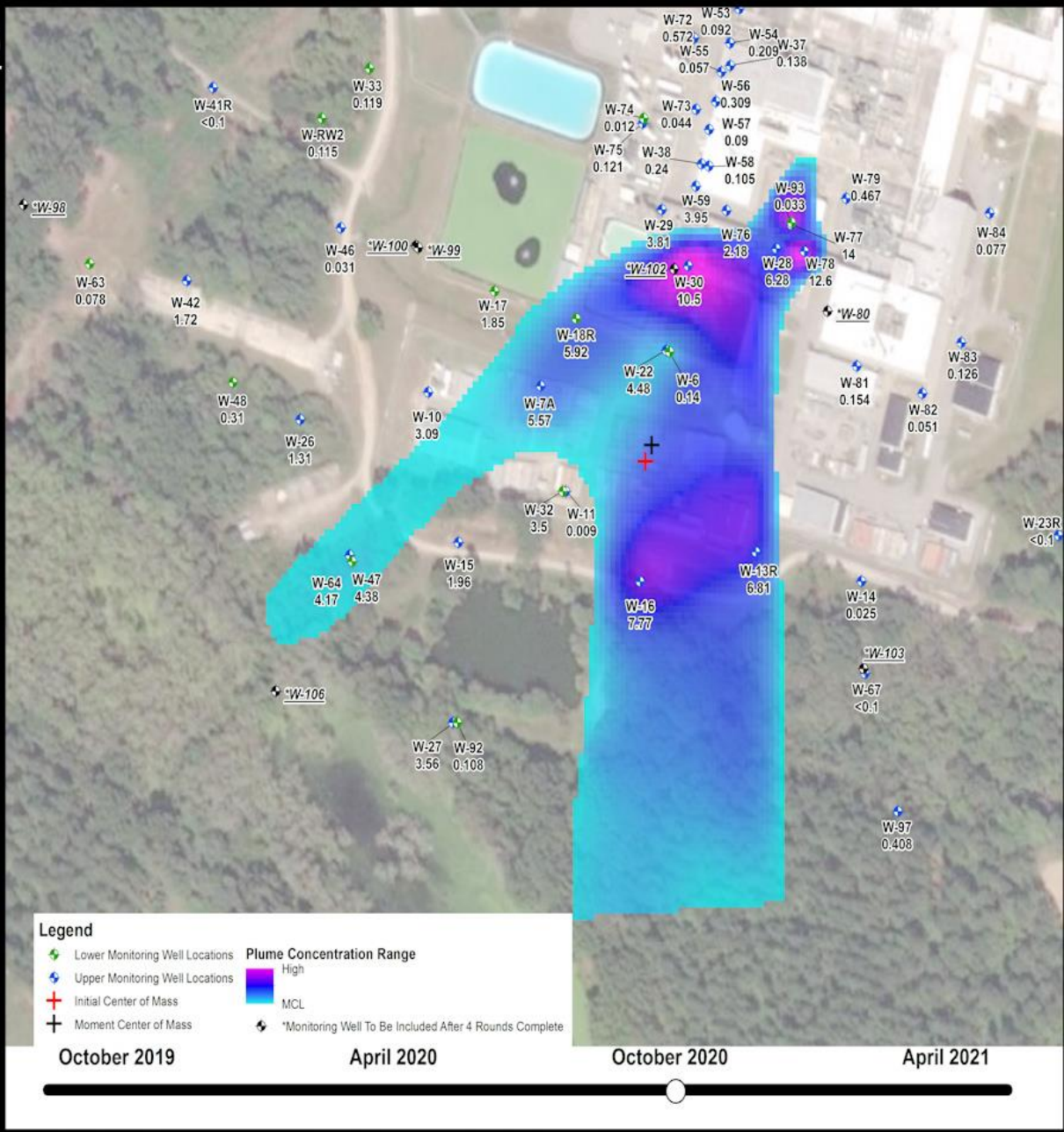
Plume Area: 193,860 ft<sup>2</sup>  
 Average Concentration: 7 ug/L  
 Threshold: 4 ug/L

Plume Area:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.12

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.12

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.04

Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.07





# Fluoride: April 2021

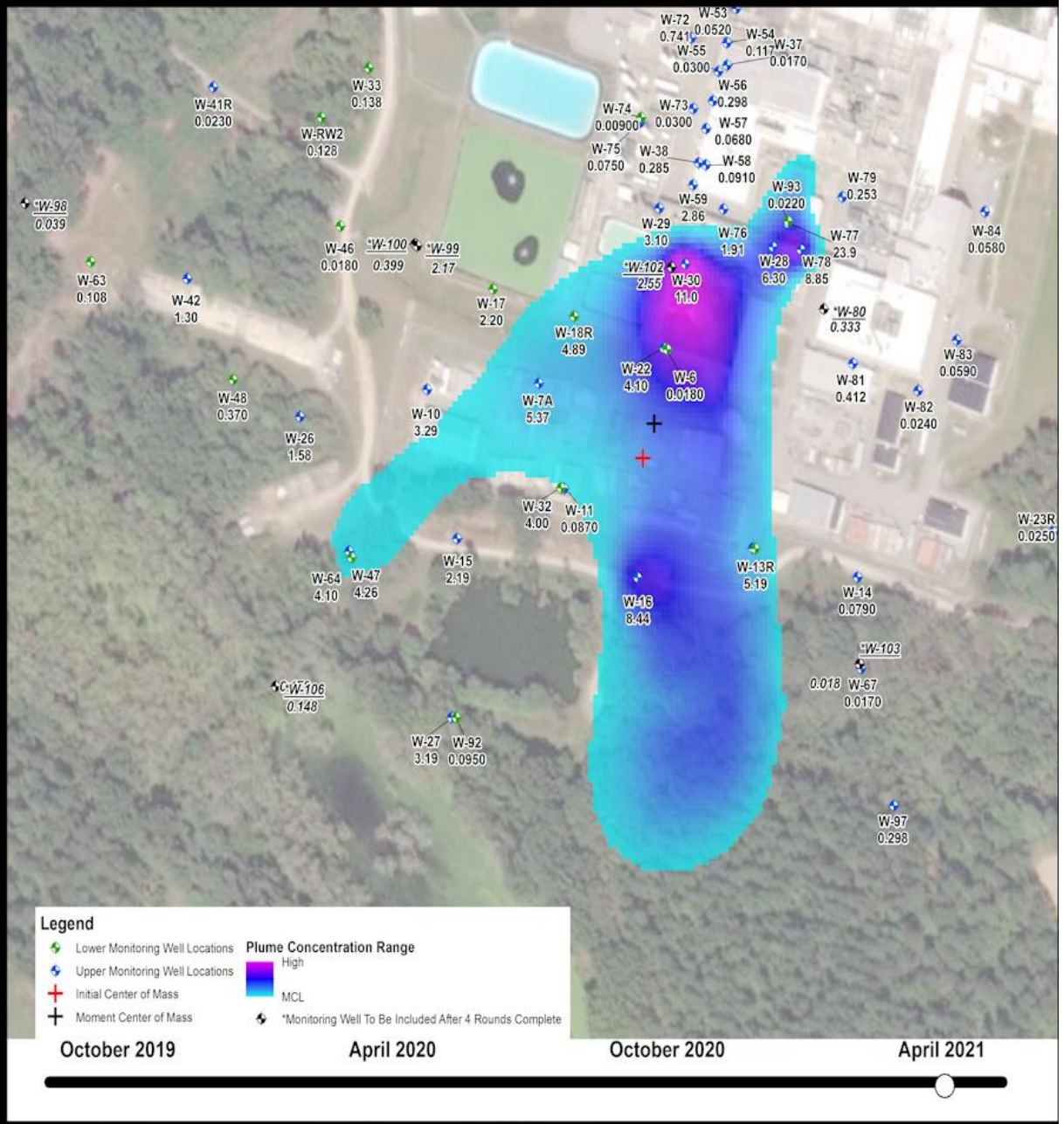
Plume Area: 205,799 ft<sup>2</sup>  
 Average Concentration: 7 ug/L  
 Threshold: 4 ug/L

Plume Area:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.12

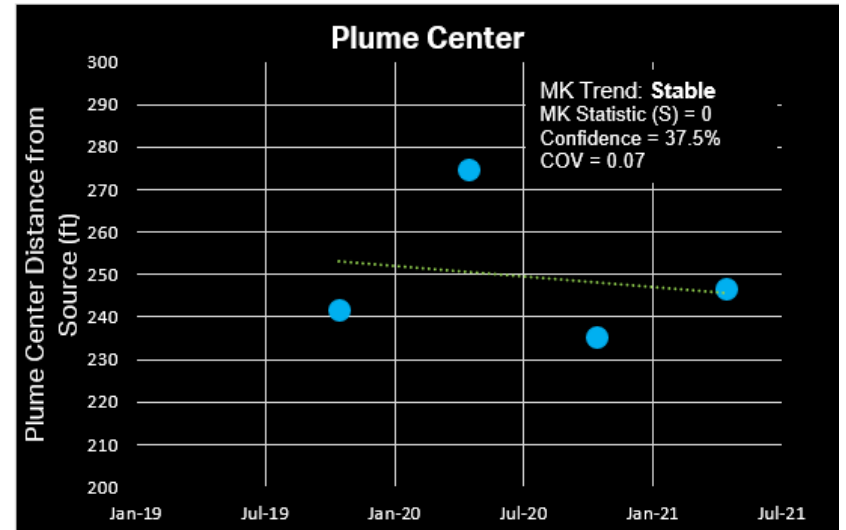
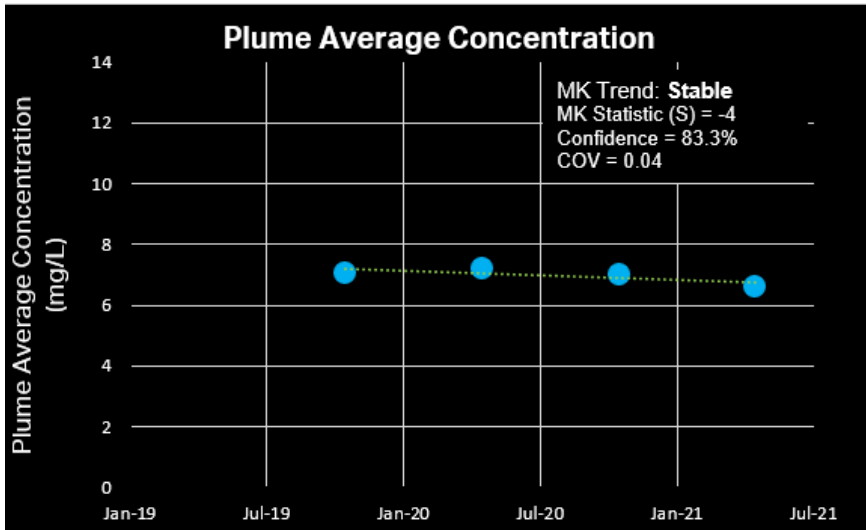
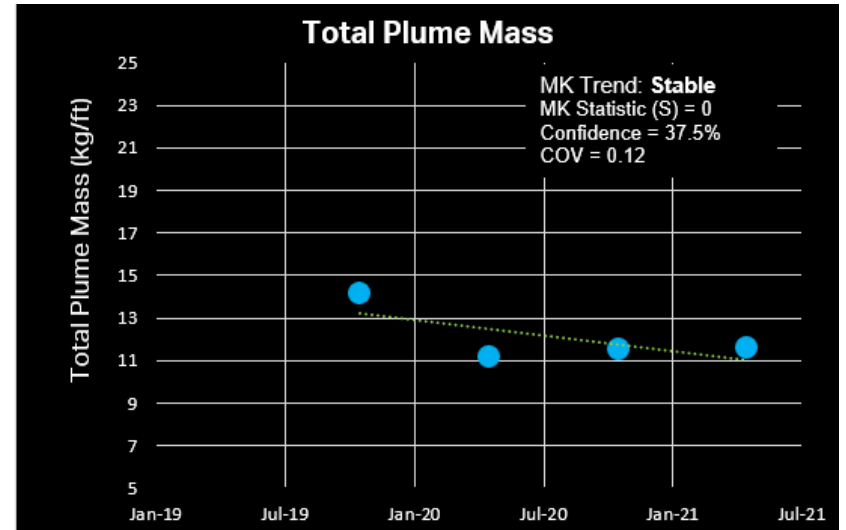
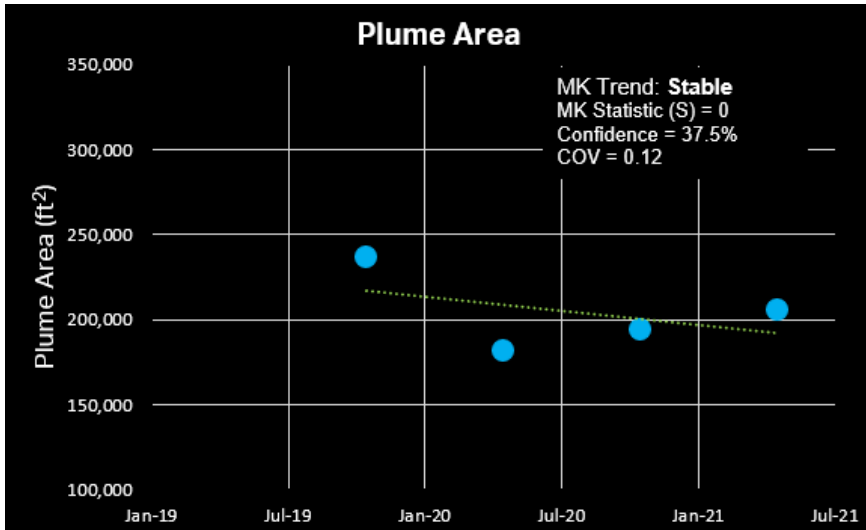
Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.12

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.04

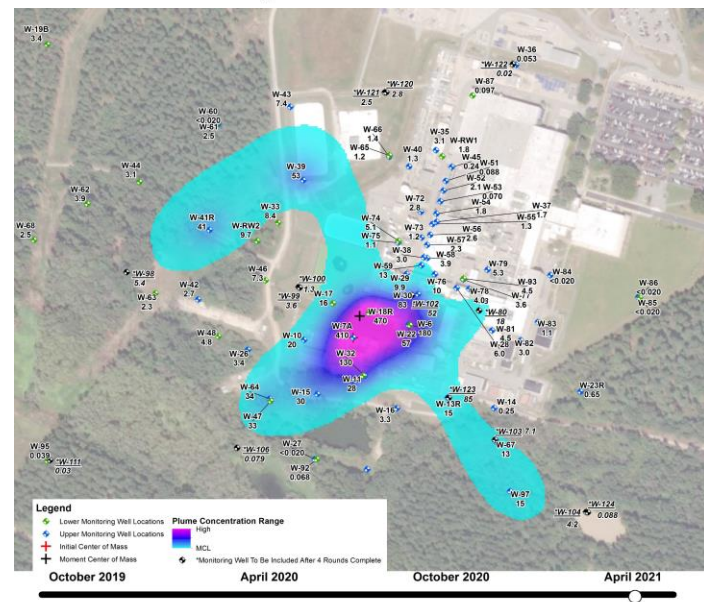
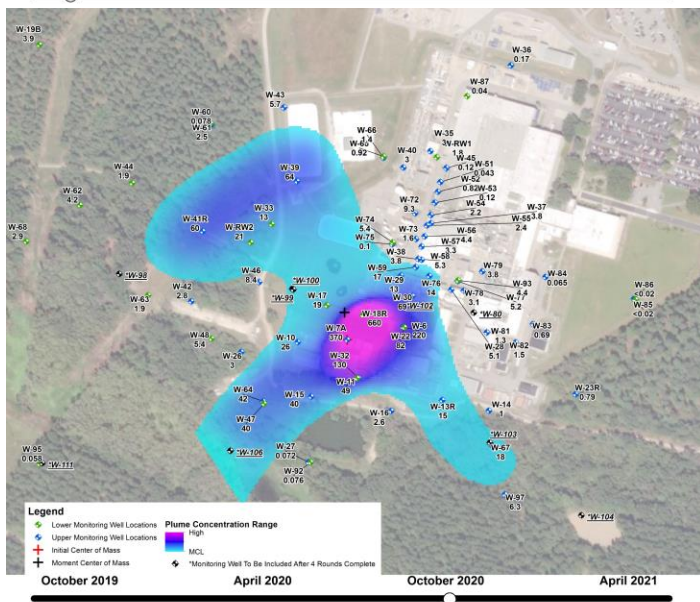
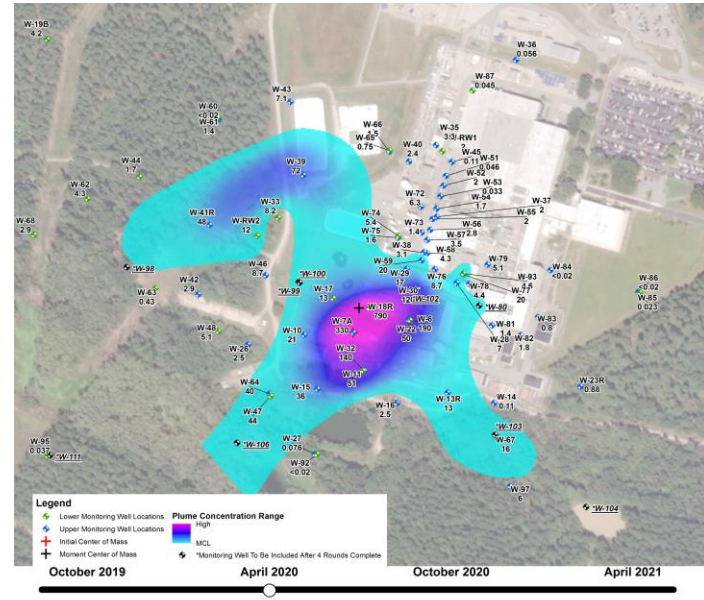
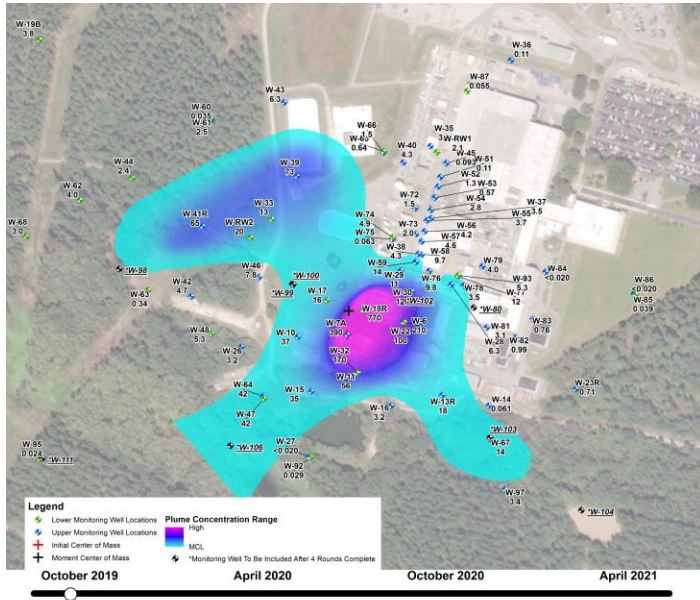
Plume Center:  
 MK Trend: Stable  
 MK Statistic: 0  
 Confidence: 37.5%  
 COV: 0.07



# Fluoride Plume Graphs (4 mg/L Threshold)



# Plume Analytics – Nitrate: 15 mg/L (2019-2021)



# Nitrate: October 2019

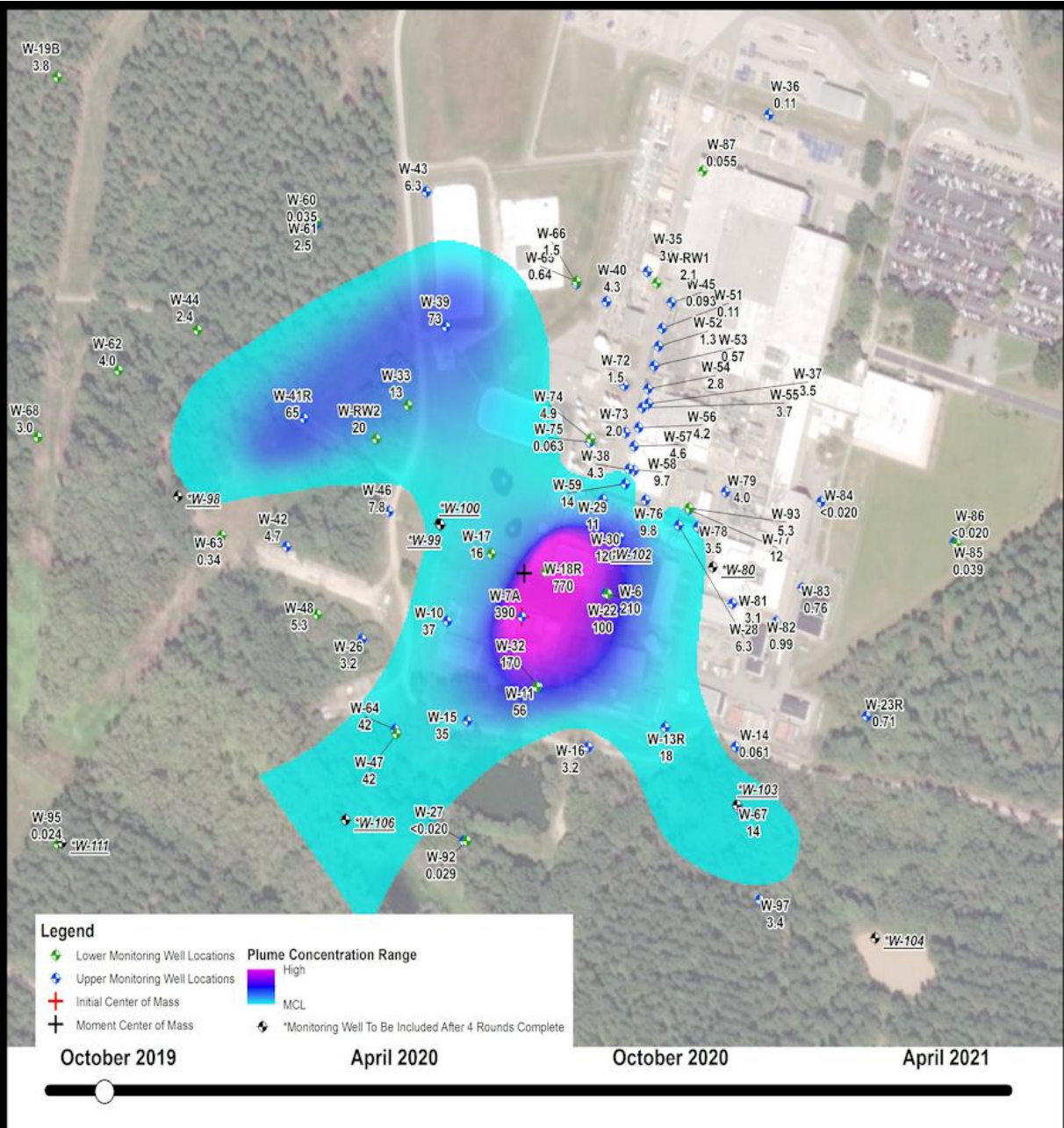
Plume Area: 622,743 ft<sup>2</sup>  
 Average Concentration: 82 mg/L  
 Threshold: 15 mg/L (MCL 10 mg/L)

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.04

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.10

Plume Average Concentration:  
 MK Trend: **Decreasing**  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.06

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.05



# Nitrate: April 2020

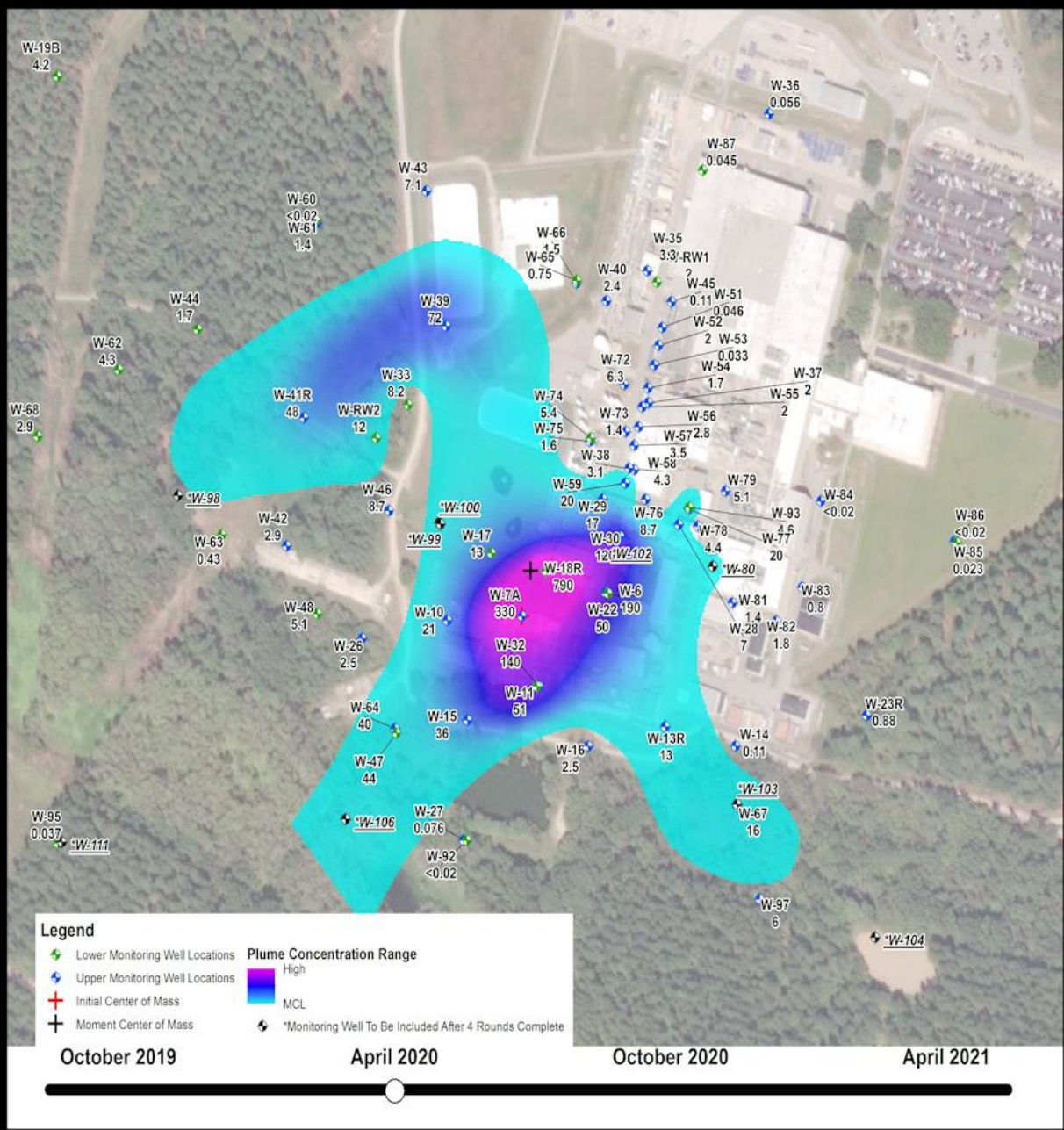
Plume Area: 573,885 ft<sup>2</sup>  
 Average Concentration: 77 mg/L  
 Threshold: 15 mg/L (MCL 10 mg/L)

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.04

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.10

Plume Average Concentration:  
 MK Trend: **Decreasing**  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.06

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.05



# Nitrate: October 2020

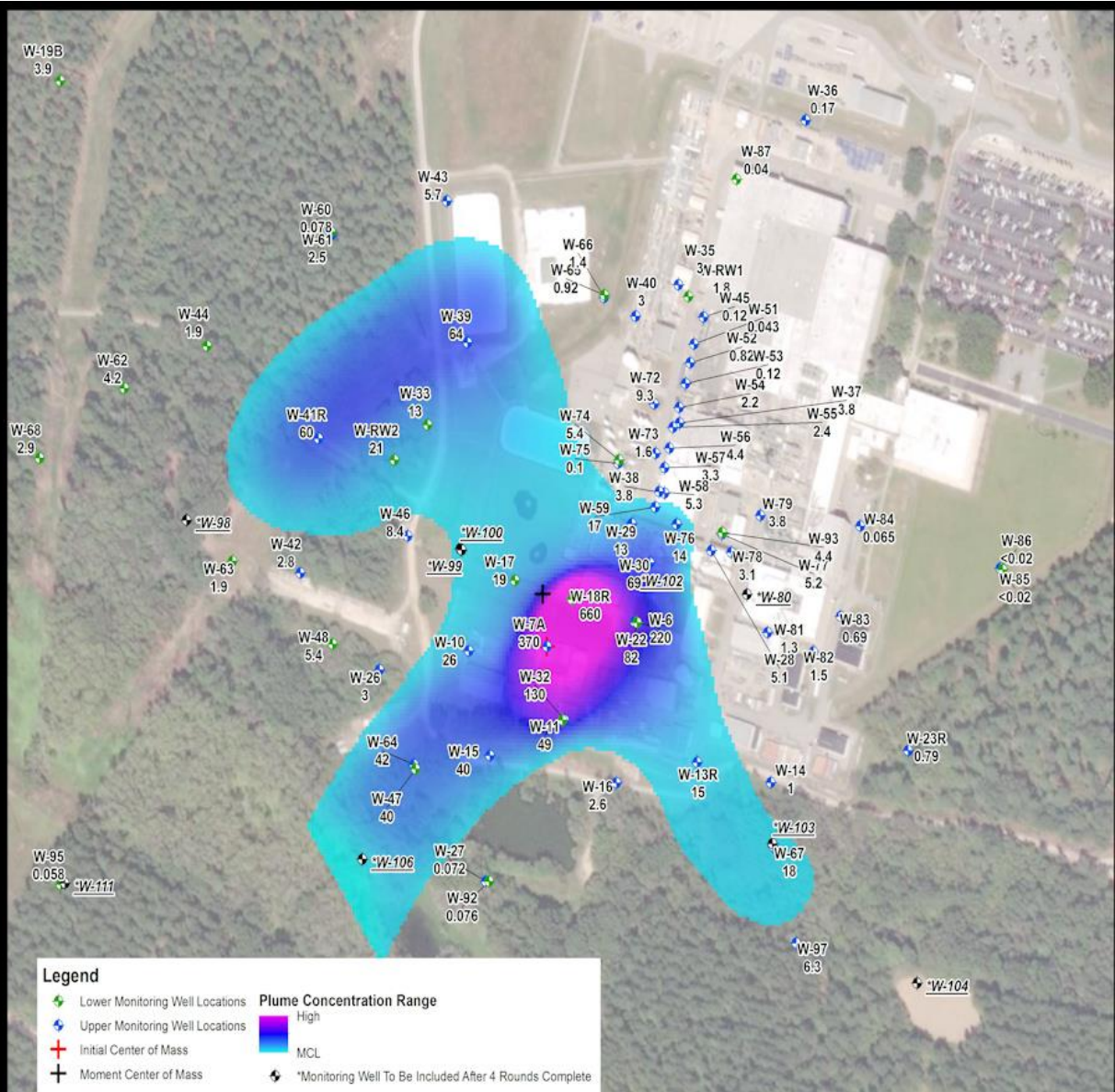
Plume Area: 605,597 ft<sup>2</sup>  
 Average Concentration: 73 mg/L  
 Threshold: 15 mg/L (MCL 10 mg/L)

**Plume Area:**  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.04

**Total Plume Mass:**  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.10

**Plume Average Concentration:**  
 MK Trend: **Decreasing**  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.06

**Plume Center:**  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.05



# Nitrate: April 2021

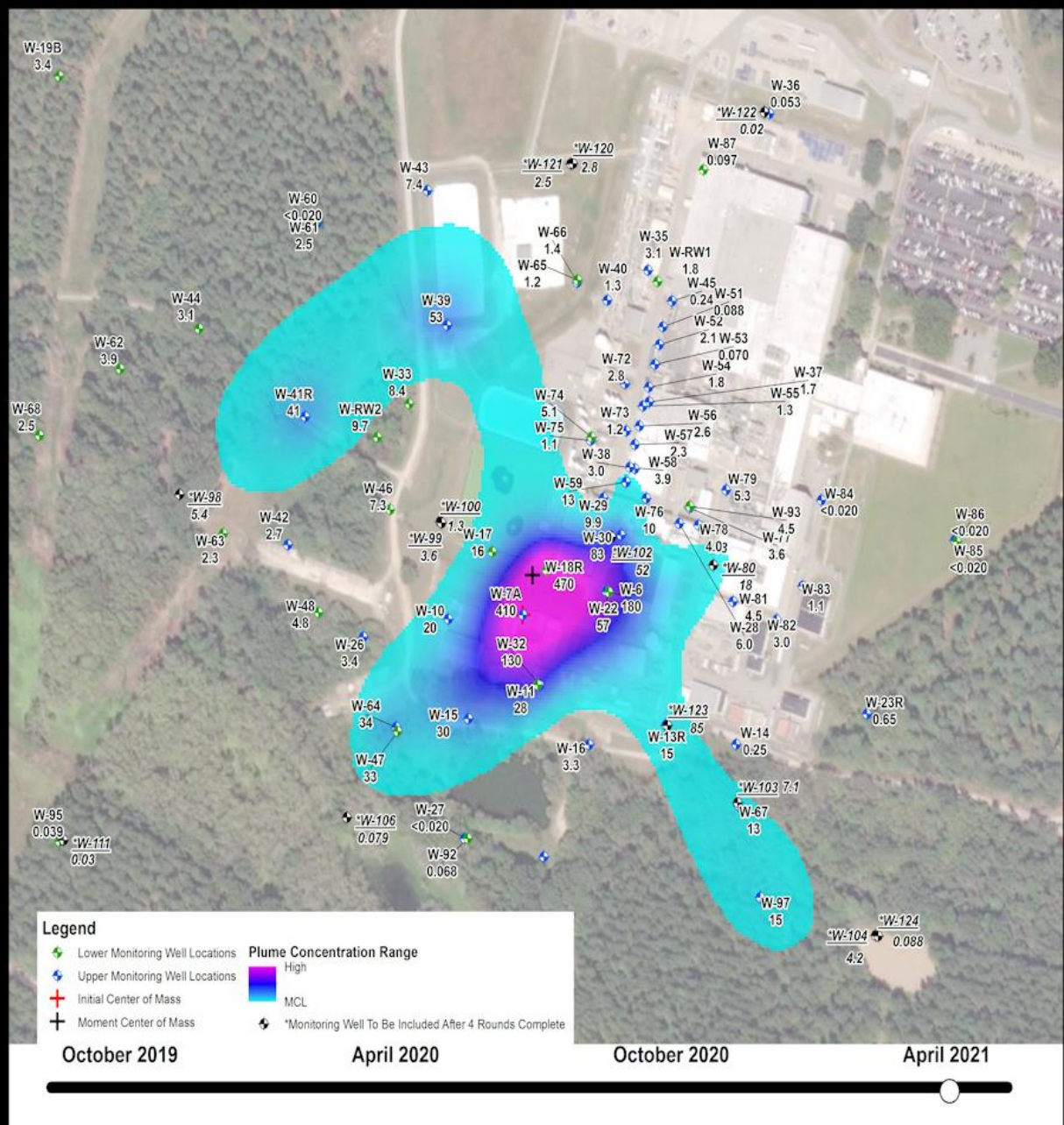
Plume Area: 569,699 ft<sup>2</sup>  
 Average Concentration: 72 mg/L  
 Threshold: 15 mg/L (MCL 10 mg/L)

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.04

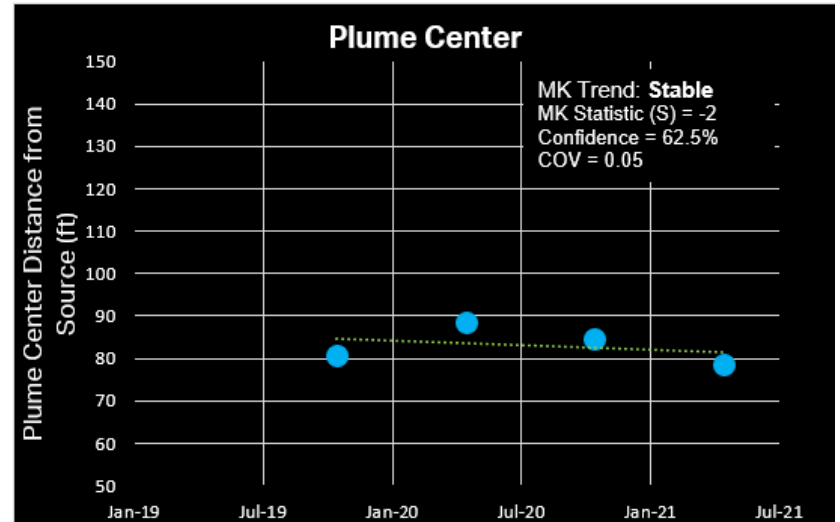
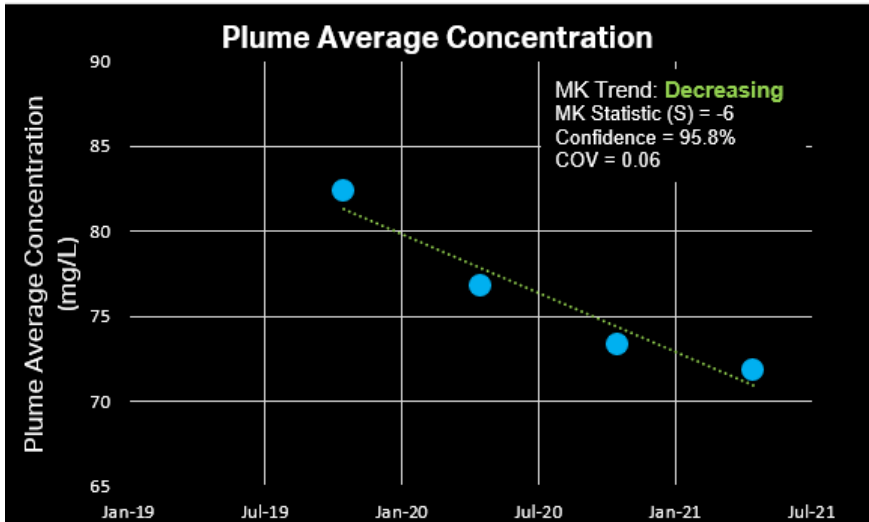
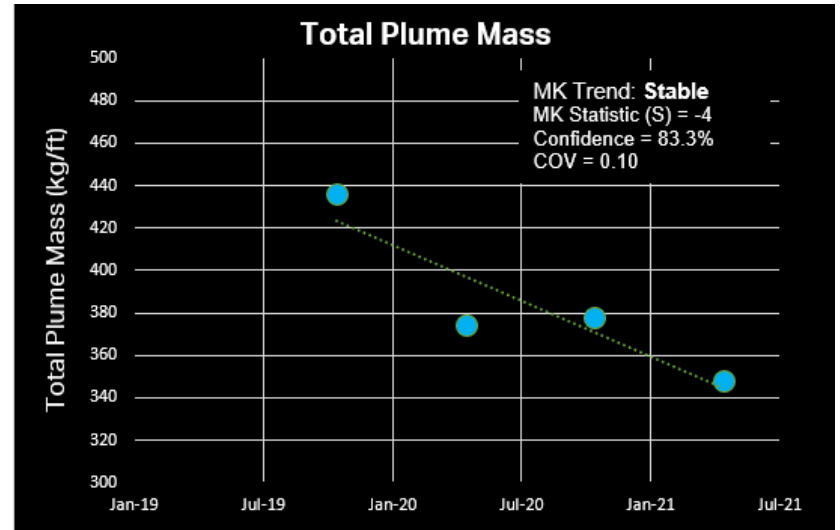
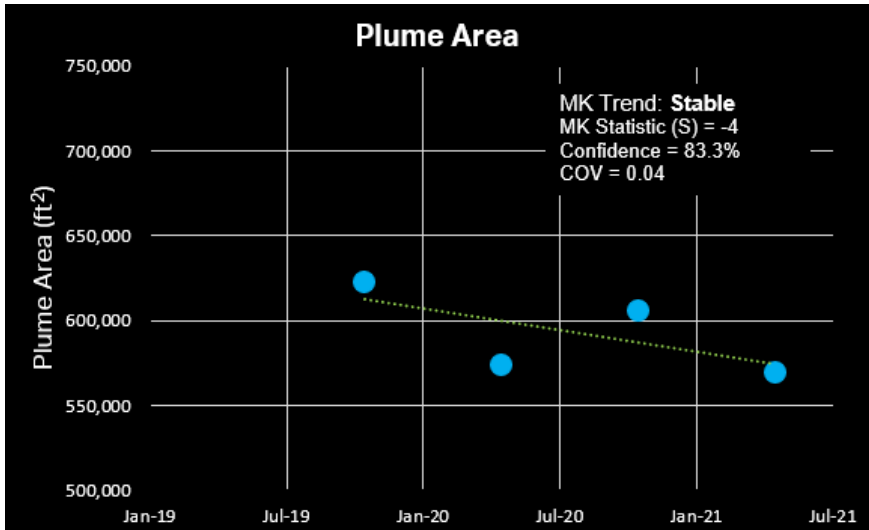
Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 83.3%  
 COV: 0.10

Plume Average Concentration:  
 MK Trend: **Decreasing**  
 MK Statistic: -6  
 Confidence: 95.8%  
 COV: 0.06

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.05

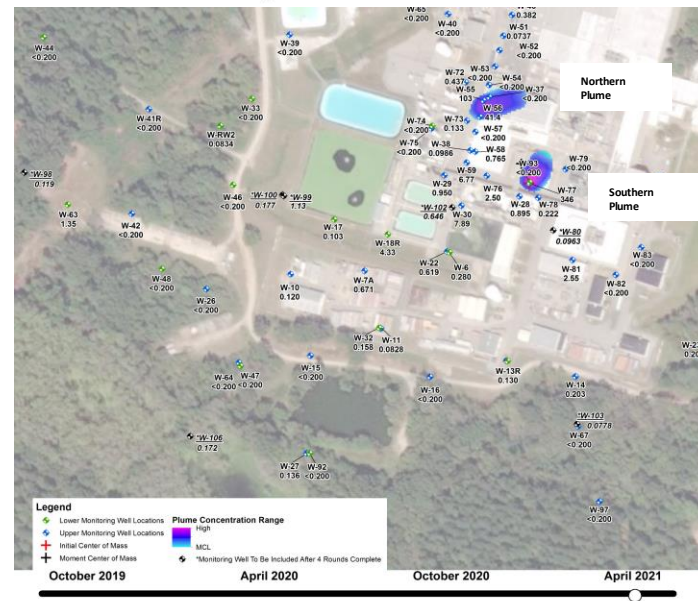
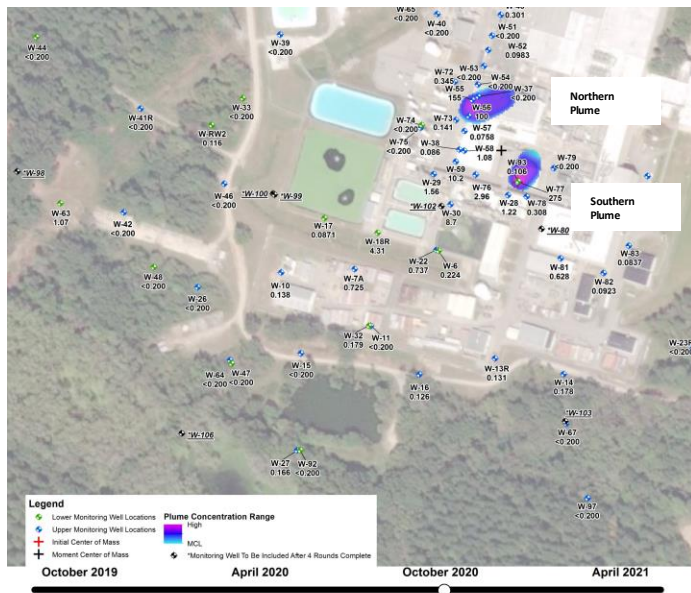
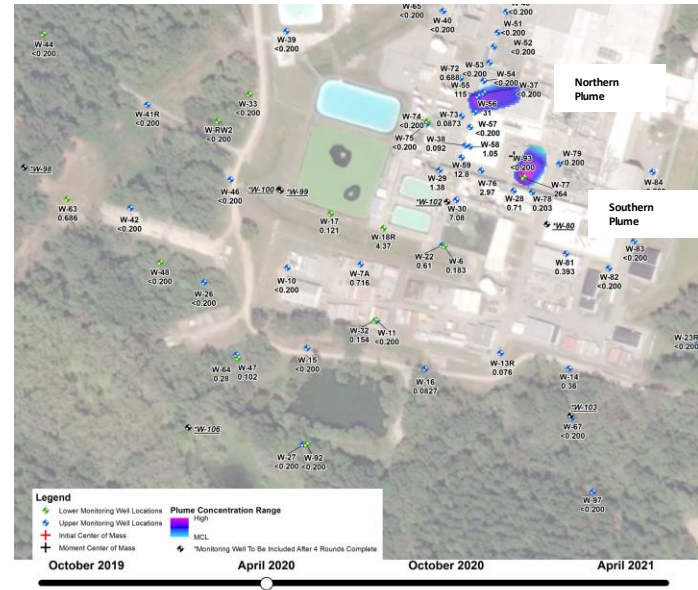
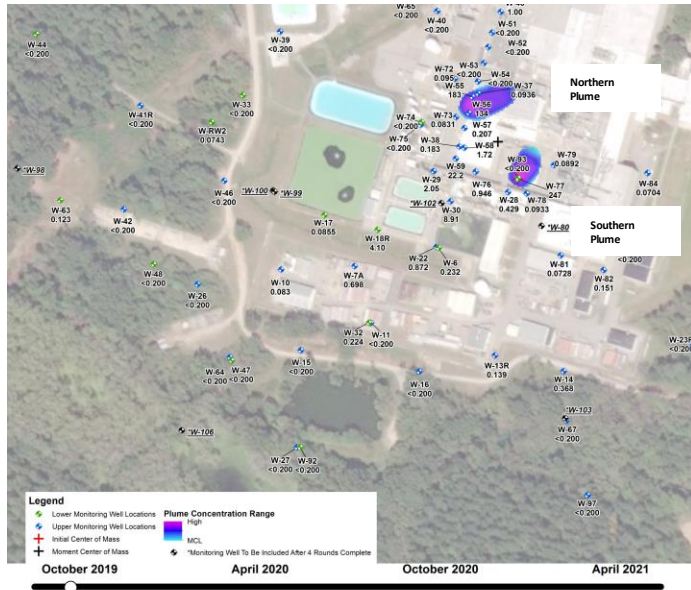


# Nitrate Plume Graphs (15 mg/L Threshold)





# Plume Analytics – Total Uranium: 30 ug/L (2019-2021)



# Uranium North: Oct 2019

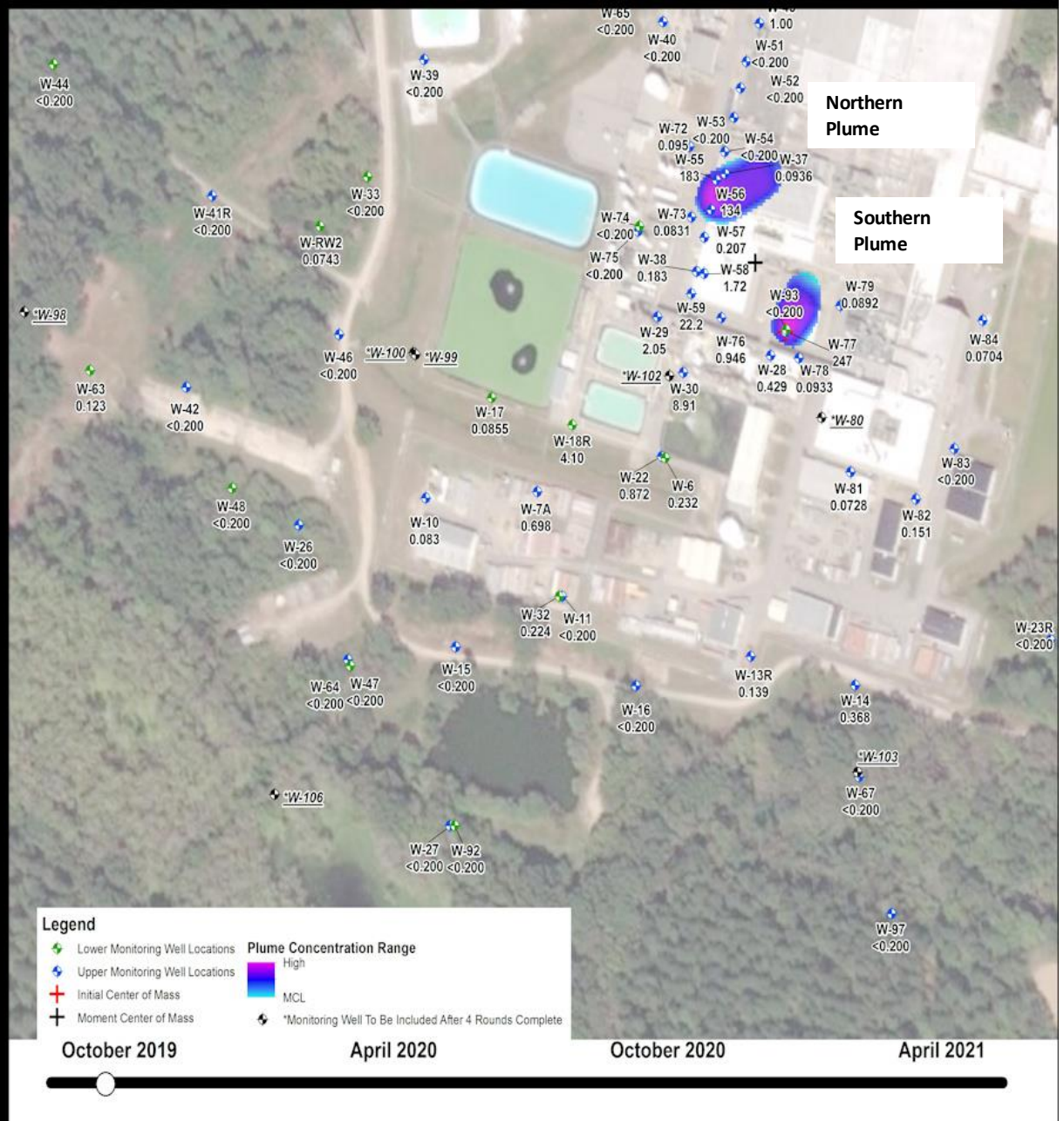
Plume Area: 4,704 ft<sup>2</sup>  
 Average Concentration: 267 ug/L  
 Threshold: 30 ug/L

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.20

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.60

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.41

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.10



# Uranium North: Apr 2020

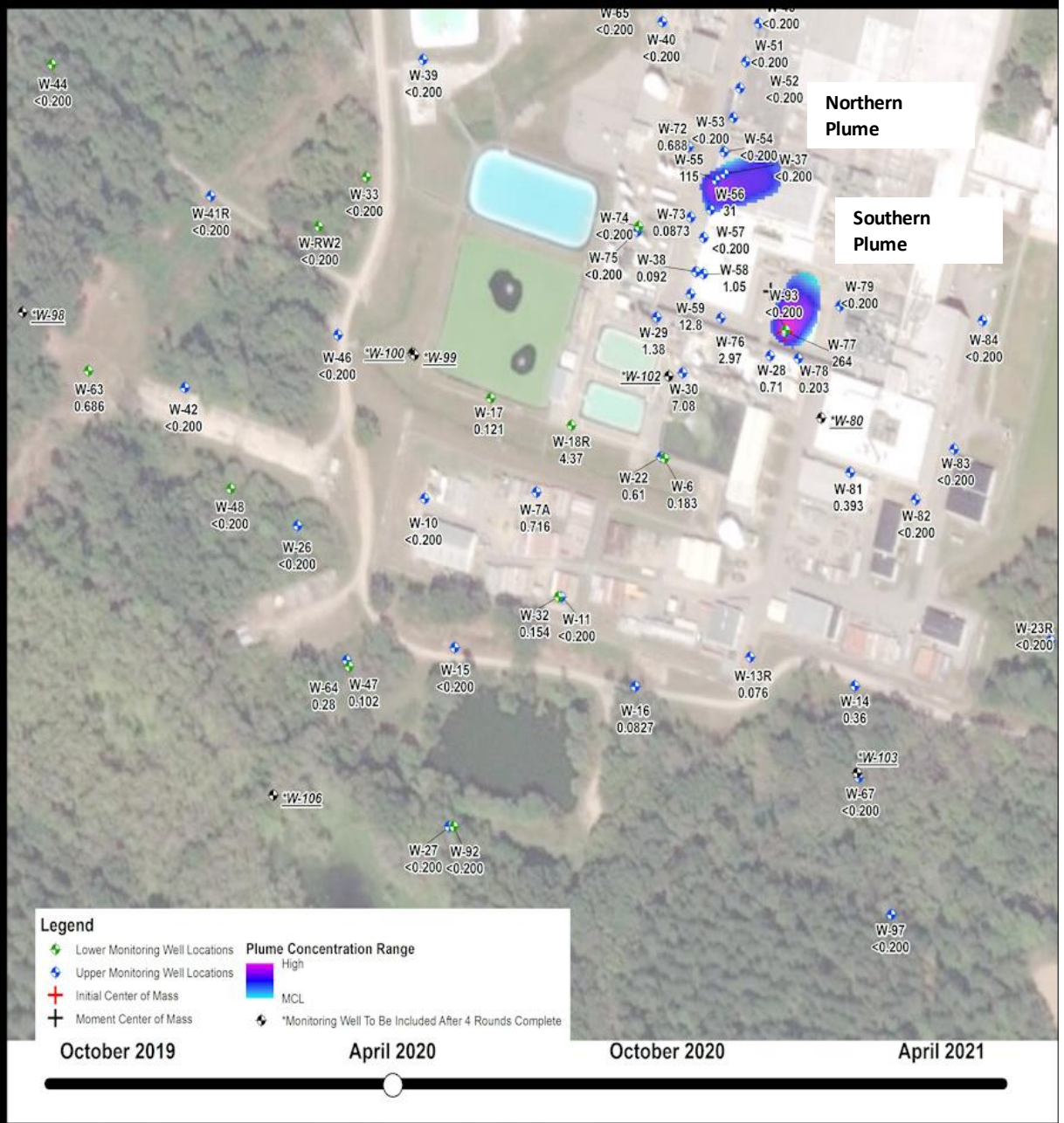
Plume Area: 3,103 ft<sup>2</sup>  
 Average Concentration: 115 ug/L  
 Threshold: 30 ug/L

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.20

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.60

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.41

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.10



# Uranium North: Oct 2020

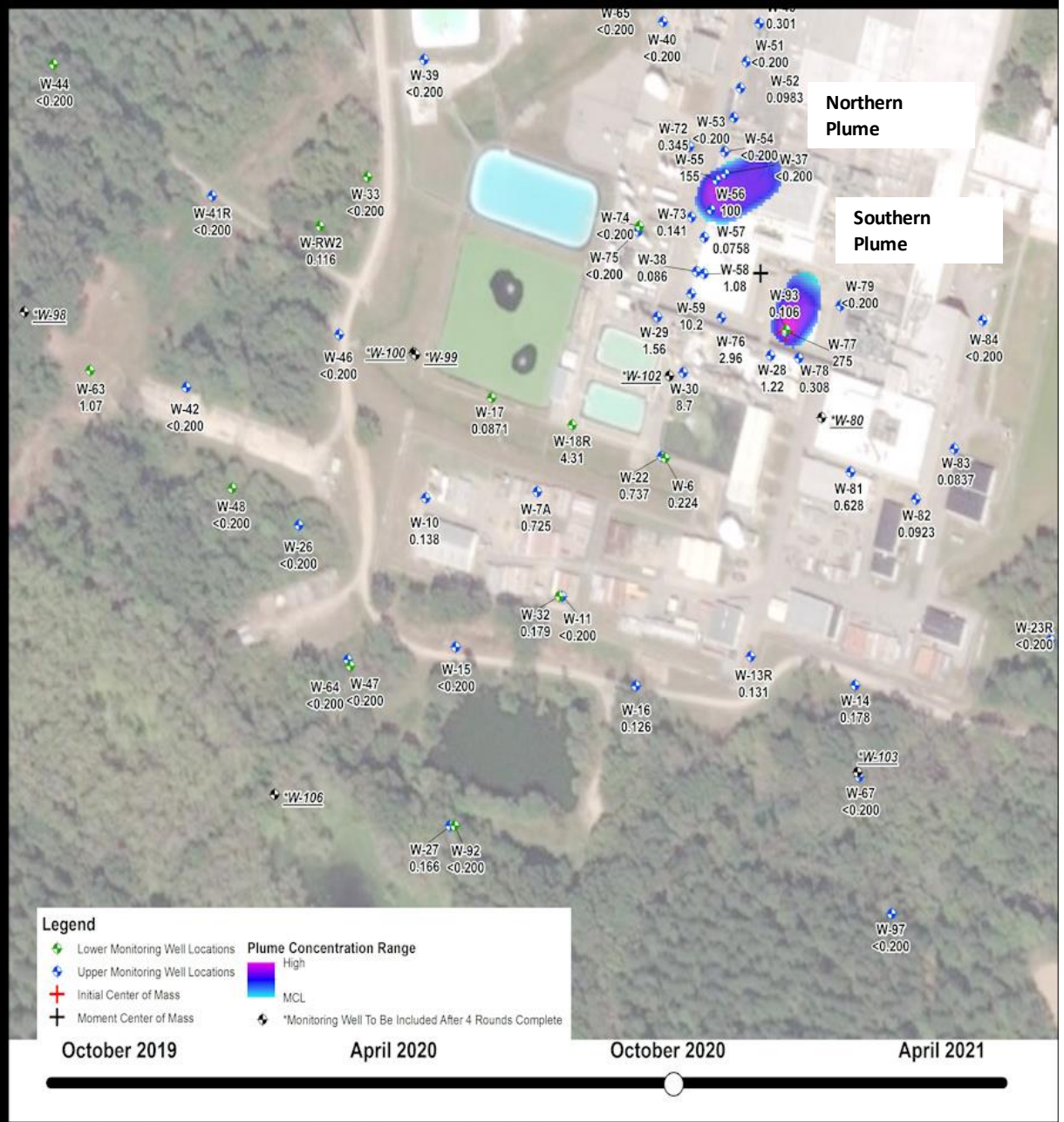
Plume Area: 4,083 ft<sup>2</sup>  
 Average Concentration: 213 ug/L  
 Threshold: 30 ug/L

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.20

Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.60

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.41

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.10



# Uranium North: Apr 2021

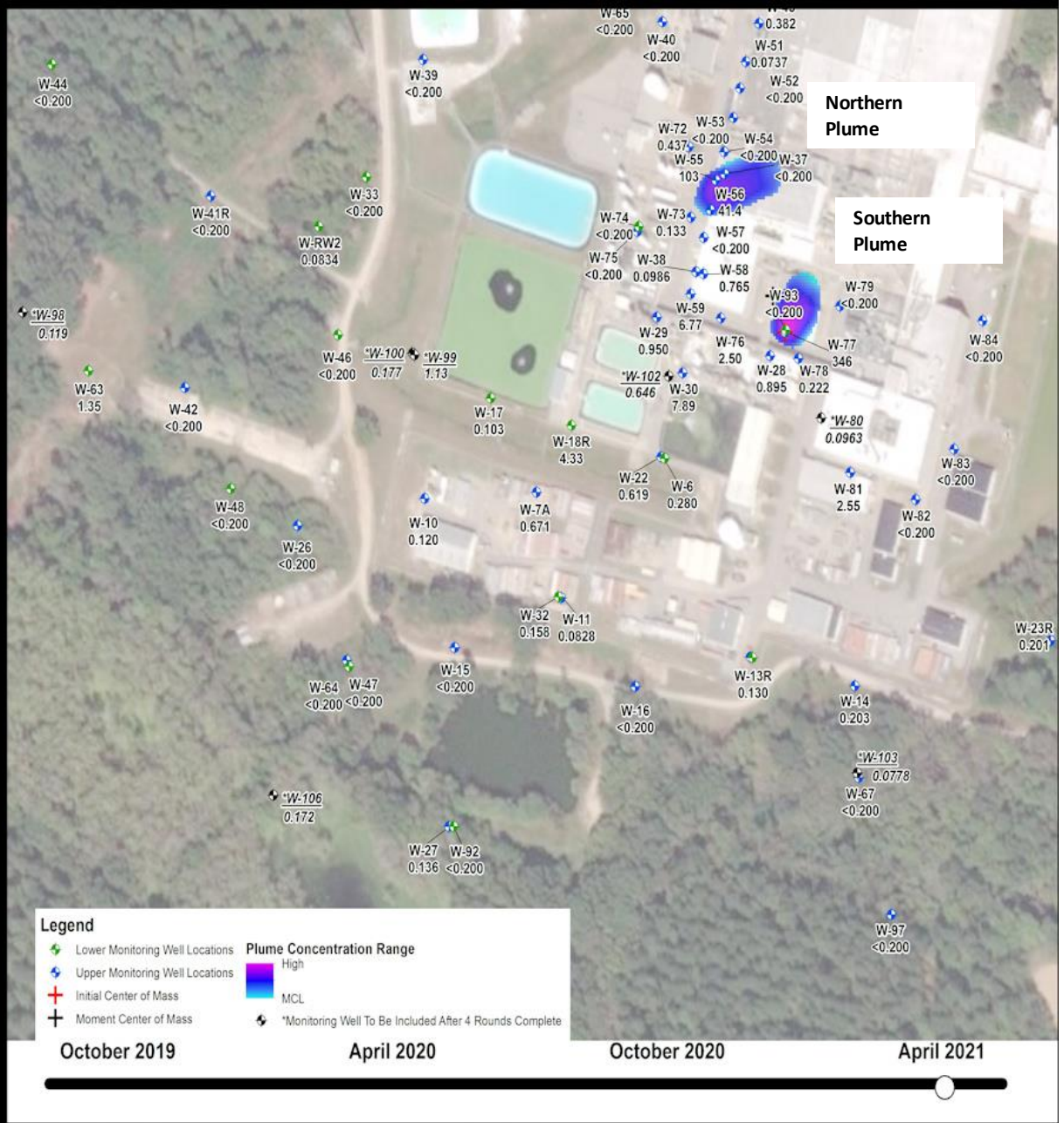
Plume Area: 3,244 ft<sup>2</sup>  
 Average Concentration: 120 ug/L  
 Threshold: 30 ug/L

Plume Area:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.20

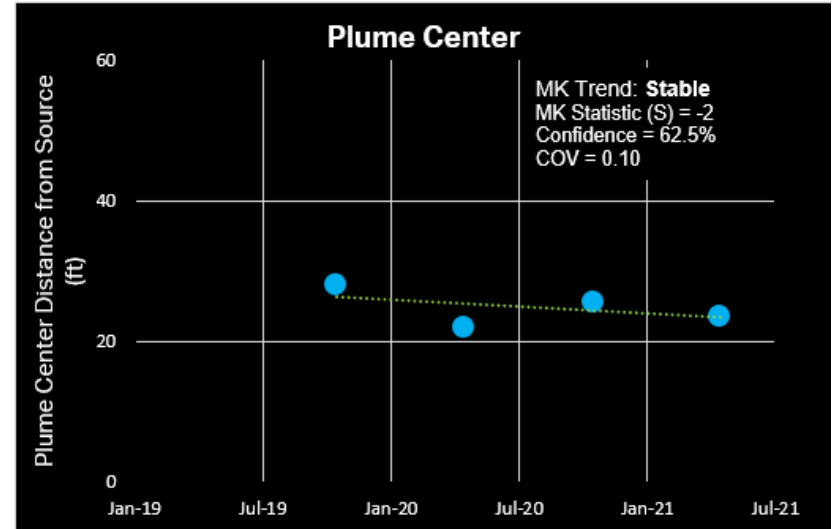
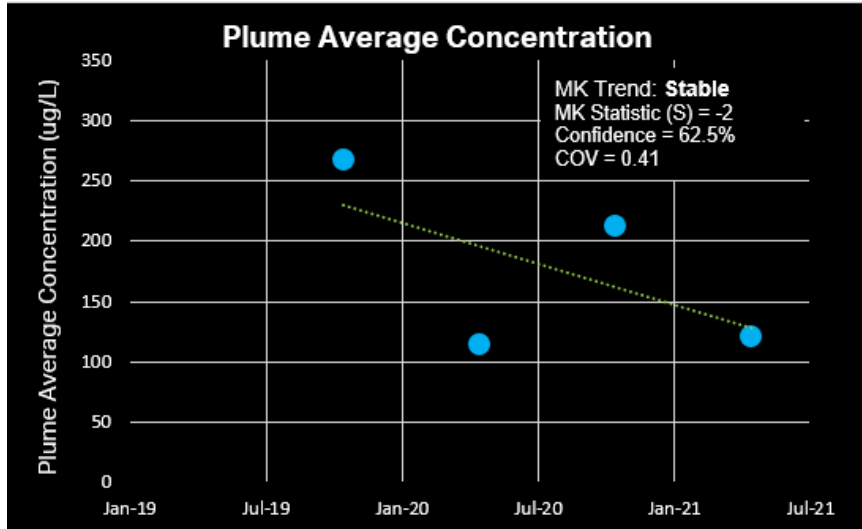
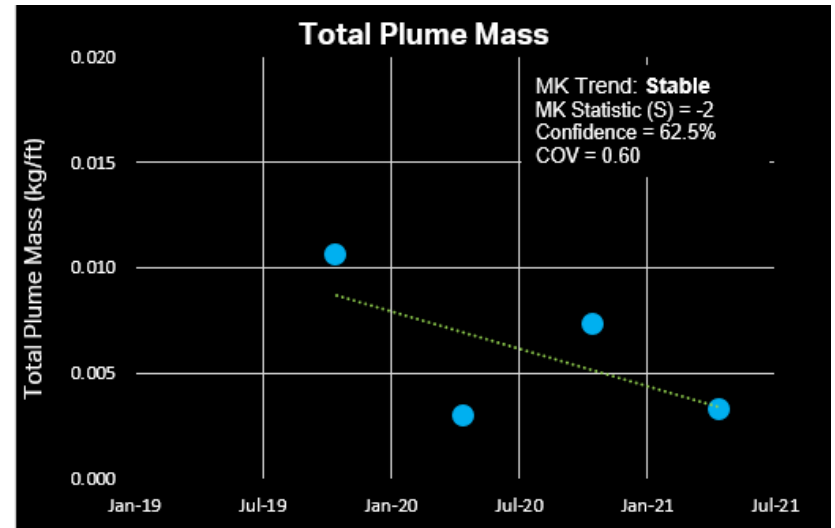
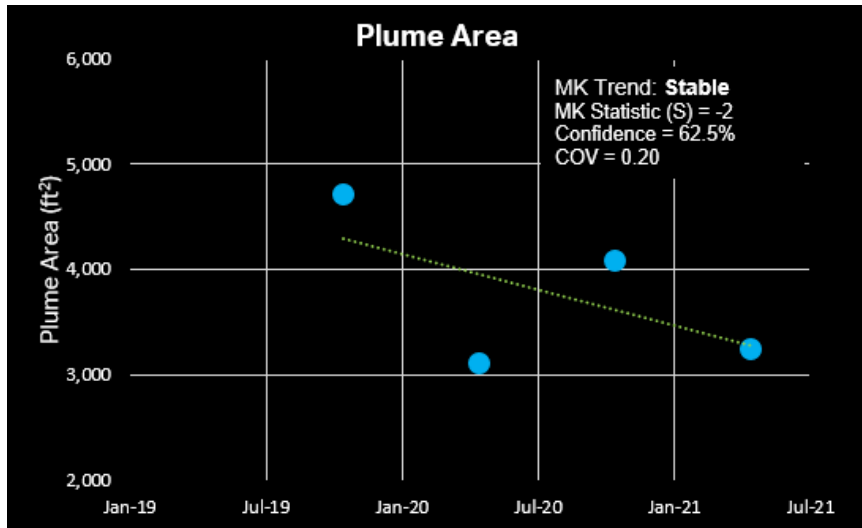
Total Plume Mass:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.60

Plume Average Concentration:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.41

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.10



# Uranium North Plume Graphs (30 ug/L Threshold)



# Uranium South: Oct 2019

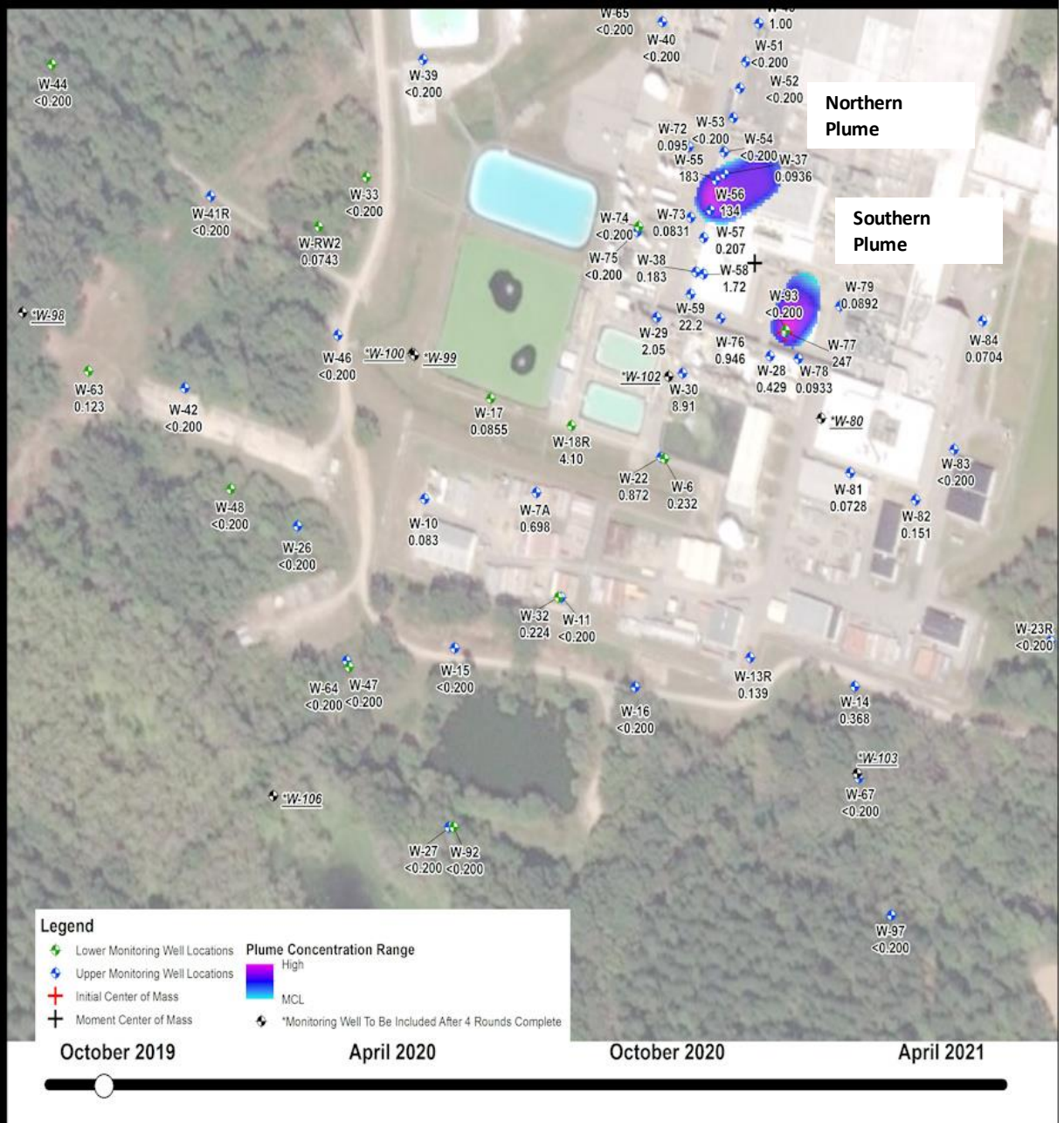
Plume Area: 2,342 ft<sup>2</sup>  
 Average Concentration: 101 ug/L  
 Threshold: 30 ug/L

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.10

Total Plume Mass:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.18

Plume Average Concentration:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.08

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.04



# Uranium South: Apr 2020

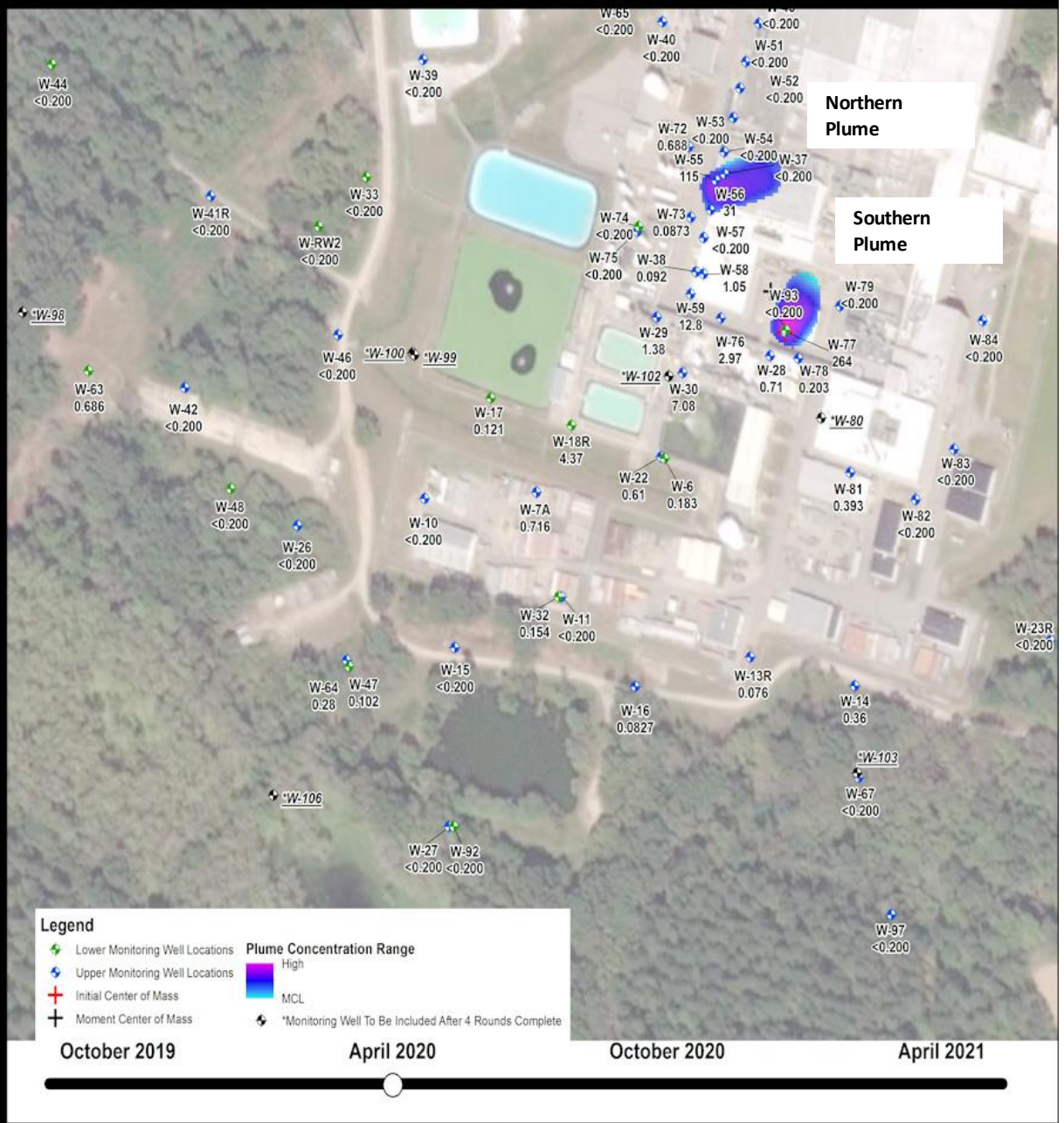
Plume Area: 2,447 ft<sup>2</sup>  
 Average Concentration: 102 ug/L  
 Threshold: 30 ug/L

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.10

Total Plume Mass:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.18

Plume Average Concentration:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.08

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.04





# Uranium South: Oct 2020

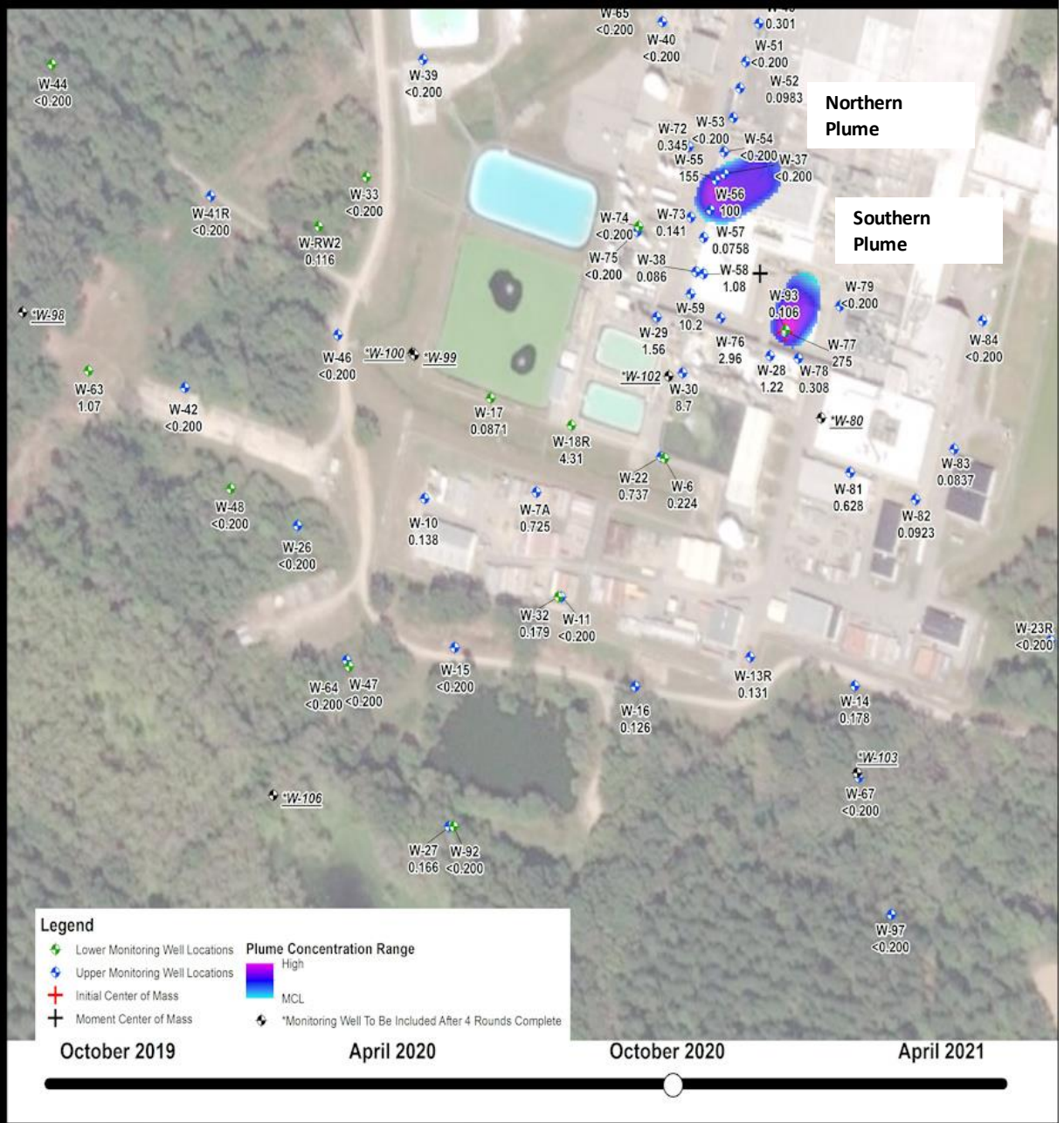
Plume Area: 2,616 ft<sup>2</sup>  
 Average Concentration: 104 ug/L  
 Threshold: 30 ug/L

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.10

Total Plume Mass:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.18

Plume Average Concentration:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.08

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.04



# Uranium South: Apr 2021

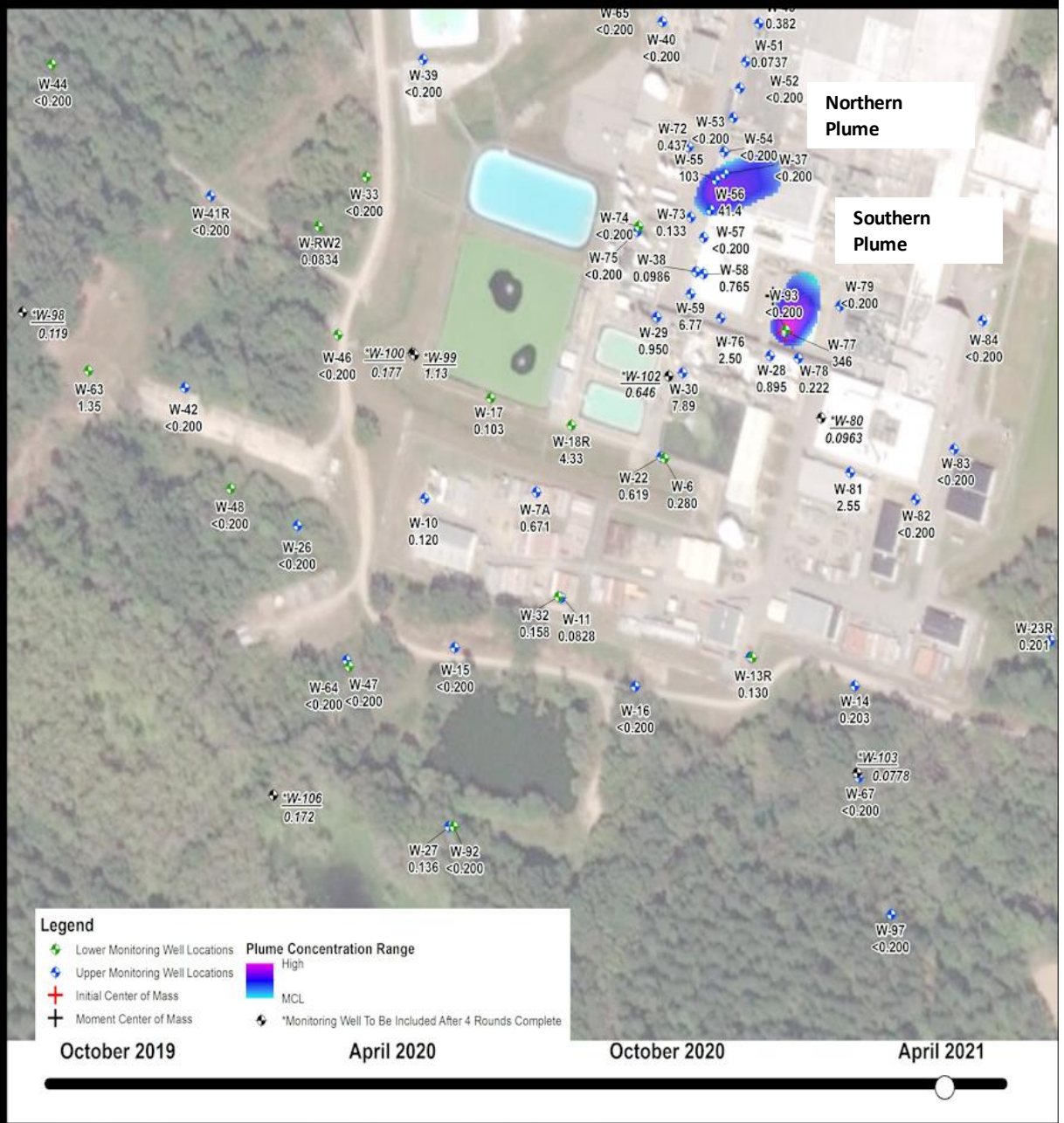
Plume Area: 2,925 ft<sup>2</sup>  
 Average Concentration: 120 ug/L  
 Threshold: 30 ug/L

Plume Area:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.10

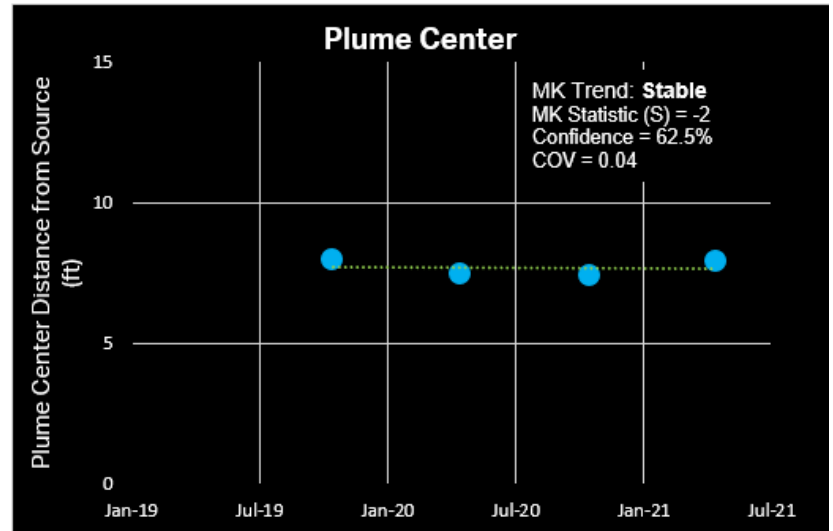
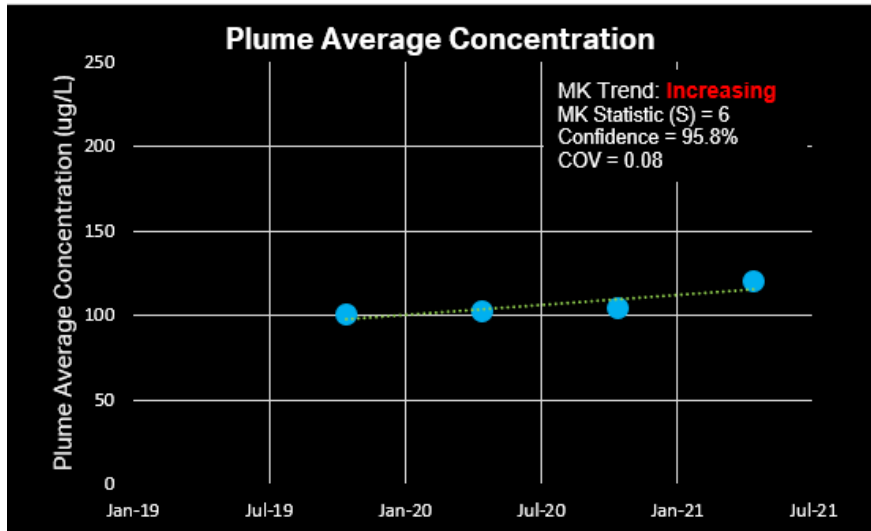
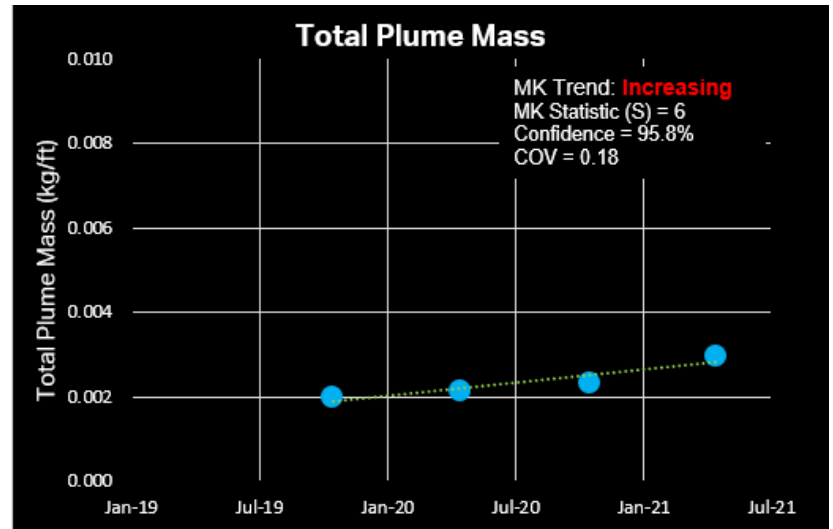
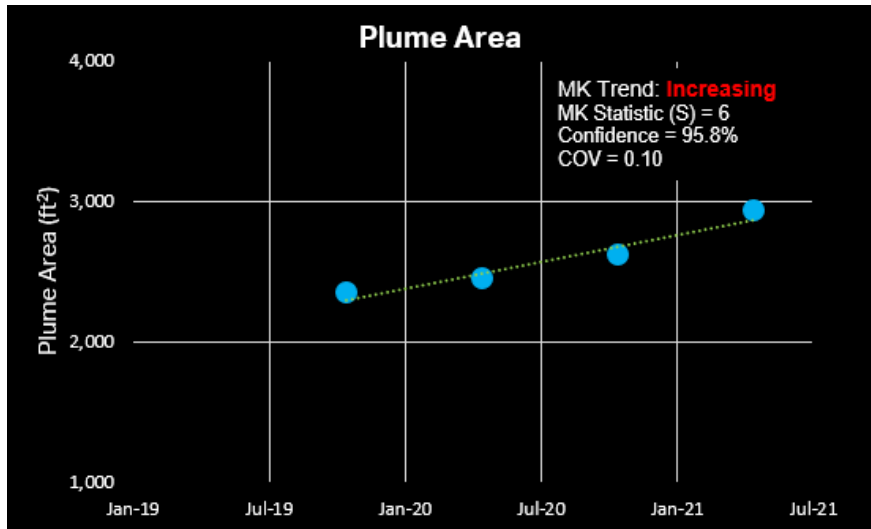
Total Plume Mass:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.18

Plume Average Concentration:  
 MK Trend: **Increasing**  
 MK Statistic: 6  
 Confidence: 95.8%  
 COV: 0.08

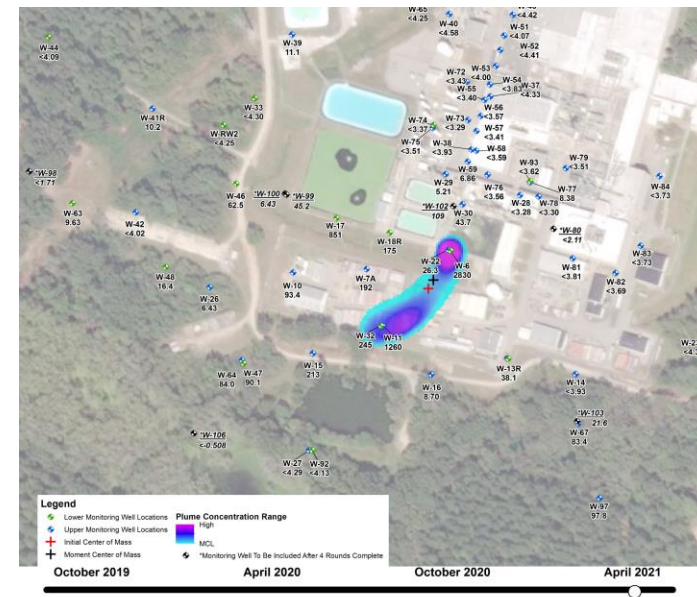
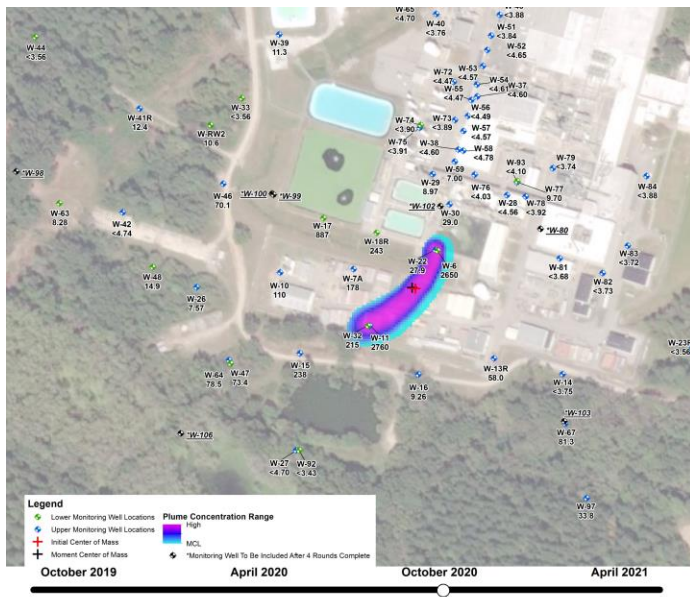
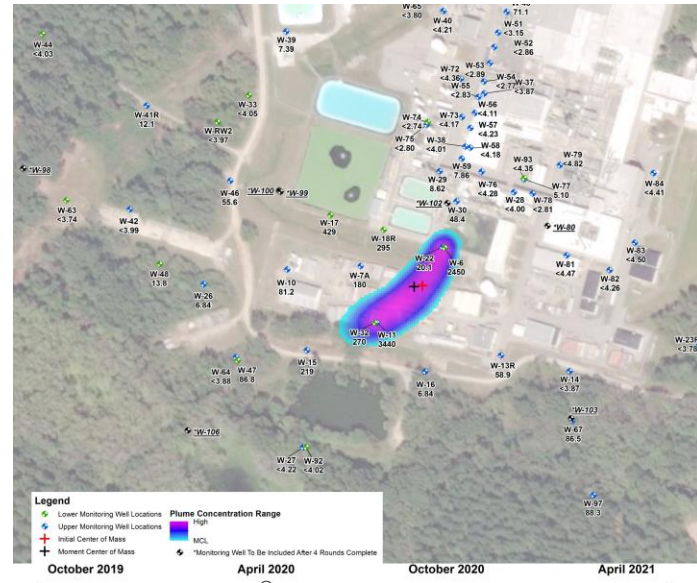
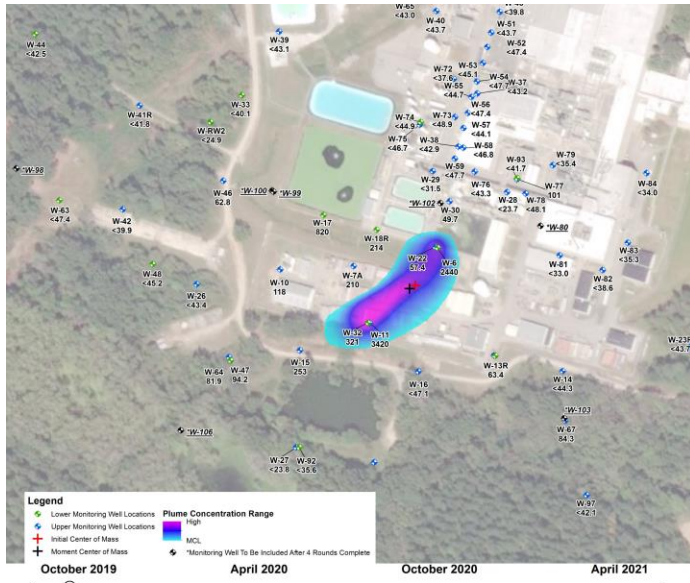
Plume Center:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 62.5%  
 COV: 0.04



# Uranium South Plume Graphs (30 ug/L Threshold)



# Plume Analytics – Tc-99: 900 pCi/L (2019-2021)



# Tc-99: October 2019

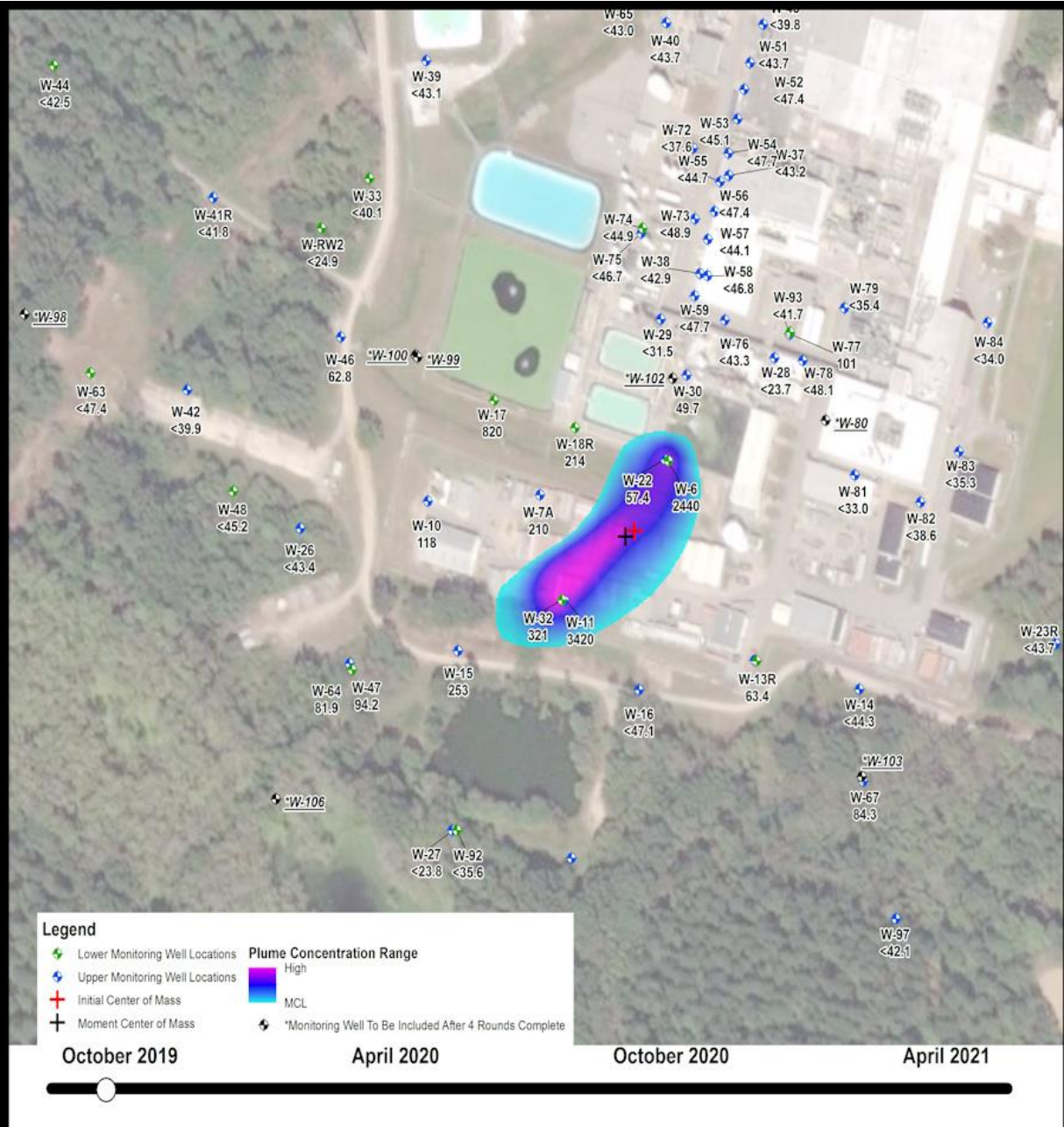
Plume Area: 82,526 ft<sup>2</sup>  
 Average Activity: 2,647 pCi/L  
 Threshold: 900 pCi/L

Plume Area:  
 MK Trend: **Decreasing**  
 MK Statistic: -8  
 Confidence: 95.8%  
 COV: 0.12

Total Plume Activity:  
 MK Trend: **Decreasing**  
 MK Statistic: -8  
 Confidence: 95.8%  
 COV: 0.15

Plume Average Activity:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 59.2%  
 COV: 0.08

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 75.8%  
 COV: 0.14



# Tc-99: April 2020

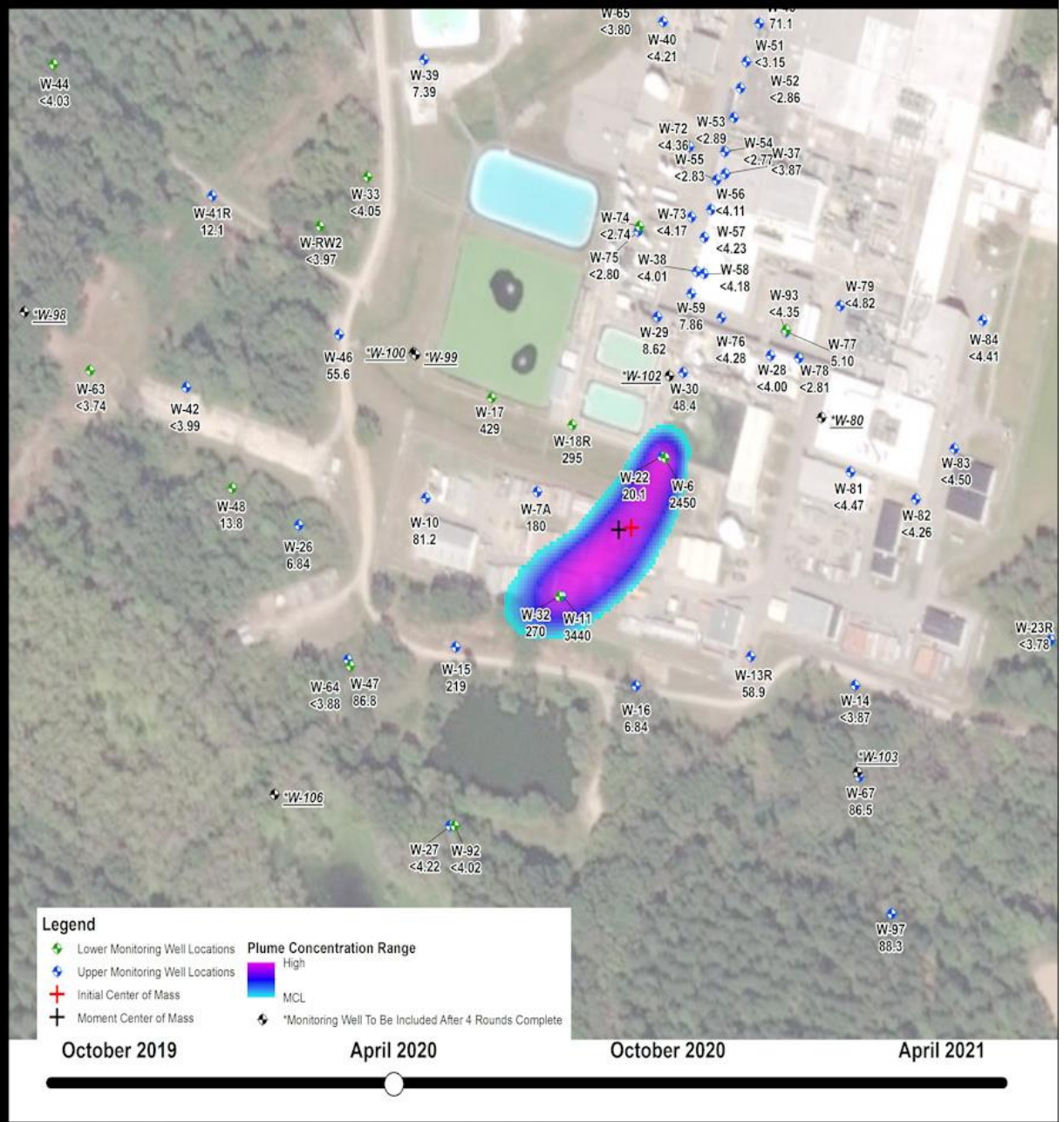
Plume Area: 75,548 ft<sup>2</sup>  
 Average Activity: 2,589 pCi/L  
 Threshold: 900 pCi/L

Plume Area:  
 MK Trend: **Decreasing**  
 MK Statistic: -8  
 Confidence: 95.8%  
 COV: 0.12

Total Plume Activity:  
 MK Trend: **Decreasing**  
 MK Statistic: -8  
 Confidence: 95.8%  
 COV: 0.15

Plume Average Activity:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 59.2%  
 COV: 0.08

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 75.8%  
 COV: 0.14



# Tc-99: October 2020

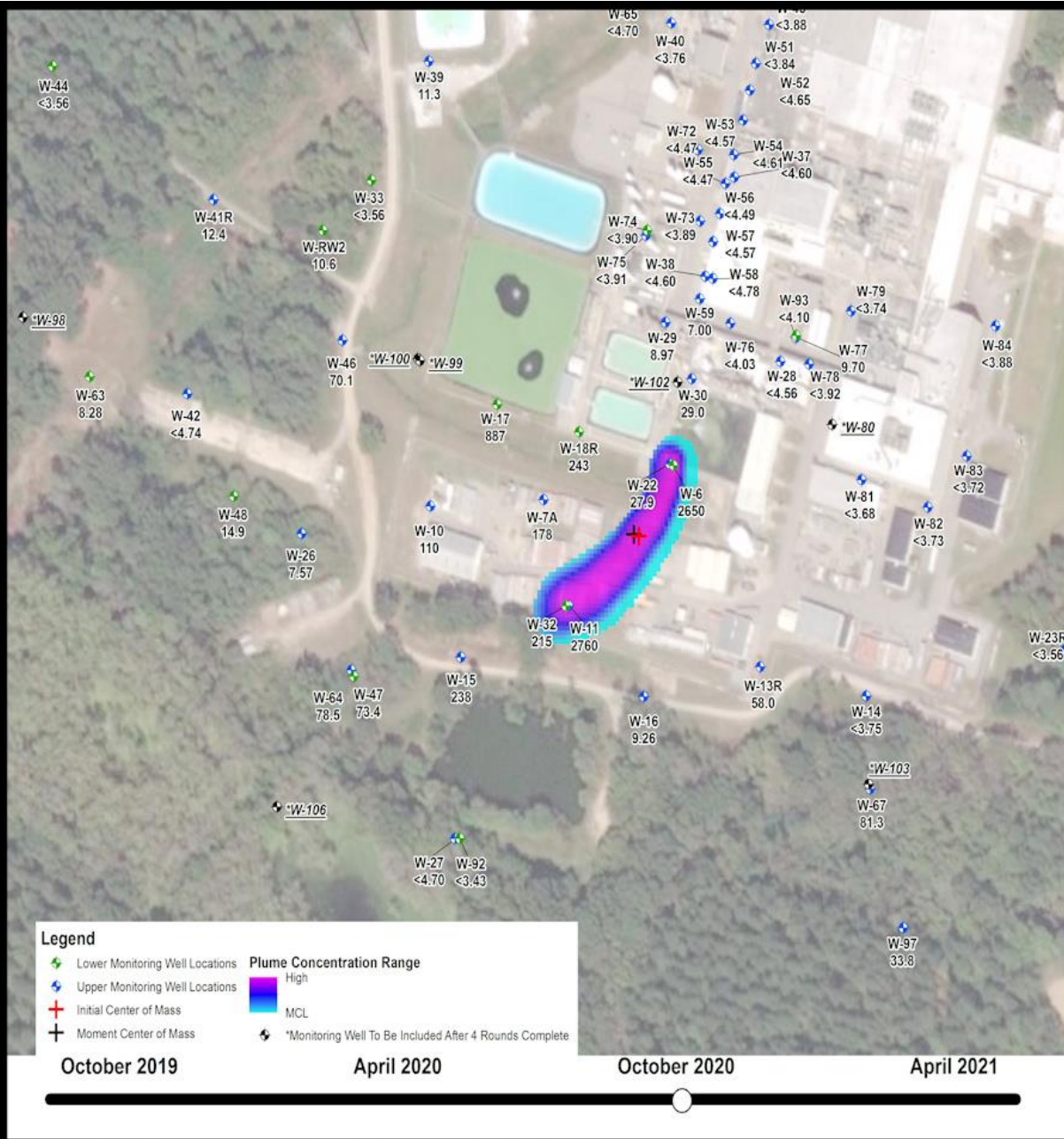
Plume Area: 75,007 ft<sup>2</sup>  
 Average Activity: 2,876 pCi/L  
 Threshold: 900 pCi/L

Plume Area:  
 MK Trend: **Decreasing**  
 MK Statistic: -8  
 Confidence: 95.8%  
 COV: 0.12

Total Plume Activity:  
 MK Trend: **Decreasing**  
 MK Statistic: -8  
 Confidence: 95.8%  
 COV: 0.15

Plume Average Activity:  
 MK Trend: Stable  
 MK Statistic: -2  
 Confidence: 59.2%  
 COV: 0.08

Plume Center:  
 MK Trend: Stable  
 MK Statistic: -4  
 Confidence: 75.8%  
 COV: 0.14



# Tc-99: April 2021

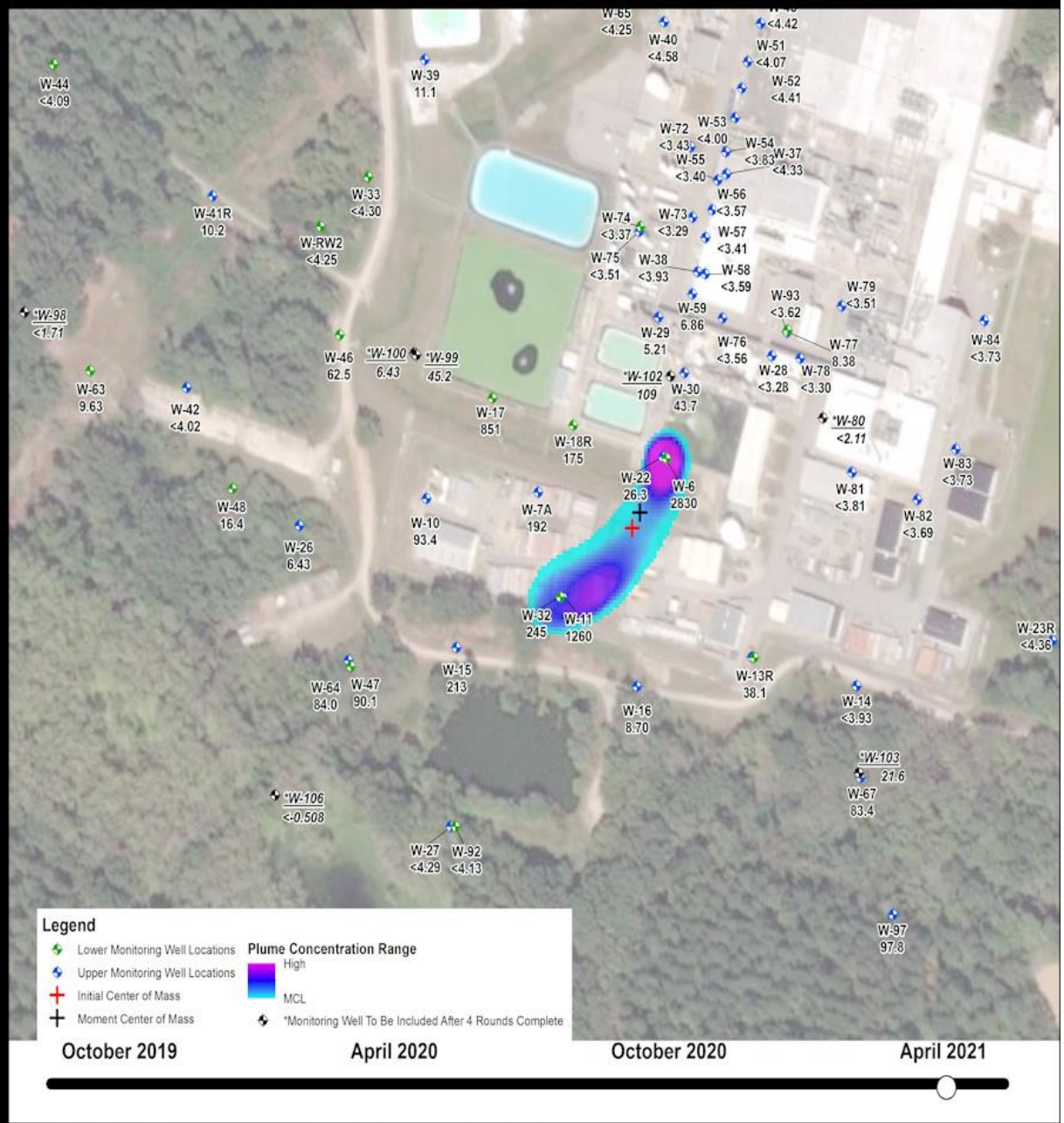
Plume Area: 60,073 ft<sup>2</sup>  
Average Activity: 2,671 pCi/L  
Threshold: 900 pCi/L

Plume Area:  
MK Trend: **Decreasing**  
MK Statistic: -8  
Confidence: 95.8%  
COV: 0.12

Total Plume Activity:  
MK Trend: **Decreasing**  
MK Statistic: -8  
Confidence: 95.8%  
COV: 0.15

Plume Average Activity:  
MK Trend: Stable  
MK Statistic: -2  
Confidence: 59.2%  
COV: 0.08

Plume Center:  
MK Trend: Stable  
MK Statistic: -4  
Confidence: 75.8%  
COV: 0.14





# Tc-99 Plume Graphs (900 pCi/L Threshold)

