

**CSSA B-3 BIOREACTOR OPERATIONS
ANNUAL PERFORMANCE STATUS REPORT
(QUARTER 49 – QUARTER 52, MAY 2019 – APRIL 2020)**

JUNE 11, 2020

This status report summarizes the operation of a bioreactor at Solid Waste Management Unit (SWMU) B-3 from May 2019 through April 2020, comprising the thirteenth year of bioreactor operations and monitoring since system start-up. This status report includes descriptions of current conditions, field observations, analytical results, and an anticipated schedule of activities for the next reporting period. Analytical results from monthly and quarterly regulatory and performance sampling through April 2020 are attached for reference. Parsons personnel responsible for bioreactor operation during the reporting period include Ken Rice, Bradly Dietert, Samantha Elliott, Adrien Lindley, Elisa Rice, Richard Fincke, Fabian Bocanegra, and Scott Pearson.

Executive Summary

For the year (May 2019 through April 2020) a total of 32.58 inches of rain was recorded on site, 0.31 inches above the average. Injection of extracted groundwater continued through the year with few interruptions. Minor interruptions include system maintenance, reaching automatic cut-off levels in the wells and/or storage tank, and B-3 bioreactor system upgrade activities. During the reporting period, pumping at wells B3-EXW02, B3-EXW03, and B3-EXW04 was suspended temporarily for well maintenance. Well maintenance included the replacement of the pump saver component at B3-EXW02, and redevelopment of wells B3-EXW03 and B3-EXW04. Currently, all wells are operational. In addition to shut offs due to well maintenance, injection activities were temporarily suspended while re-mulching efforts were performed within trenches 1, 2, and 6 in November and December 2019. These trenches were excavated, and the old mulch and gravel mixture stockpiled. New deciduous mulch and gravel were emplaced within the open excavation and mixed with stockpiled material. New geotextile fabric was placed atop the mulch and over the reinstalled water distribution lines within each trench. A new gravel cover over the geotextile fabric, distribution lines, and mulch completed the effort. In total, 3,200 CY of new mulch and 610 tons of gravel was added to trenches 1, 2, and 6.

Through the reporting period, approximately 19,557,000 gallons of groundwater, extracted from wells CS-MW16-LGR, CS-MW16-CC, B3-EXW01, B3-EXW02, B3-EXW03, B3-EXW04, and B3-EXW05, were injected into bioreactor trenches 1, 2, and 6. Currently, only trenches 1, 2 and 6 are receiving extracted groundwater.

During the reporting period, most of the injected groundwater, ~5,450,000 gallons, was extracted from B3-EXW03, followed by ~4,482,000 gallons from B3-EXW05. Wells B3-EXW01, EXW02, EXW04 and CS-MW16-LGR were less productive with ~2,435,000, ~1,803,000, ~1,958,000 and ~1,246,000 gallons extracted, respectively, and ~2,183,000 gallons were extracted from well CS-MW16-CC. The total groundwater production for the year (19,557,000 gallons) is approximately 6% less than the previous year's total (20,812,000 gallons). Since the start of normal operations in 2007, approximately 247,000,000 gallons of extracted groundwater have been injected into the bioreactor.

Data from monitoring efforts indicate that the B-3 bioreactor has continued to maintain appropriate geochemical conditions for effective anaerobic dechlorination of chlorinated aliphatic hydrocarbons (CAHs). Geochemical parameters indicating optimal conditions include the following:

- Concentrations of dissolved oxygen (DO) are generally less than 0.5 milligrams per liter (mg/L) and oxidation-reduction potential (ORP) values are less than 100 millivolts (mV), indicating an anaerobic environment conducive to dechlorination of CAHs within the trenches;
- Production of methane indicating that fermentation is occurring; and
- Hydrogen concentrations are greater than 1.0 nanomoles per liter (nmol/L), indicating that there is sufficient electron donor present to stimulate anaerobic dechlorination of CAHs.

Analytical results from trench sumps samples provides evidence that biotic and abiotic dechlorination of tetrachloroethene (PCE) and trichloroethene (TCE) is occurring. The presence of ethene indicates that the biotic reductive dechlorination process appears to be the major degradation pathway for CAHs within the trenches and that complete reductive dechlorination is occurring. Additionally, the presence of reduced iron [Fe(II)] and trans-DCE may indicate the presence of a secondary abiotic process at work within the bioreactor.

Summary of Bioreactor Operation

Analytical results from biannual sampling at the bioreactor sumps indicate that SWMU B-3 trenches contain a range of *cis*-DCE levels (non-detect (ND) to 48 µg/L) as well as concentrations of other dechlorination products (e.g., VC, ethene). A summary of the analytical data collected for the reporting period (year 13) is included in Table 1. A summary of biannual monitoring results from the bioreactor trench sumps are attached, analytical results of the surrounding SWMU B-3 multi-port monitoring wells (MPMW or Westbay®) and monitoring wells are also attached.

Results of volatile organic carbon (VOC) analyses indicate that groundwater from the uppermost saturated zone (LGR-03B) of Westbay® wells CS-WB06 and CS-WB07 contain less than 100 micrograms per liter (µg/L) of PCE and TCE. Well CS-WB08 contains less than 100 µg/L of PCE and greater than 100 µg/L TCE and well CS-WB05 contains less than 100 µg/L of TCE and greater than 100 µg/L PCE. Additionally, wells CS-WB06 and CS-WB08 contain greater than 100 µg/L of *cis*-DCE, and wells CS-WB05 and CS-WB07 contain less than 100 µg/L of *cis*-DCE. Similar analysis of groundwater samples from the extraction well network indicate all seven extraction wells (CS-MW16-LGR, CS-MW16-CC, B3-EXW01, B3-EXW02, B3-EXW03, B3-EXW04, and B3-EXW05) contain less than 100 µg/L of PCE. Wells CS-MW16-LGR, CS-MW16-CC, B3-EXW02, B3-EXW03, and B3-EXW05, additionally contain less than 100 µg/L of TCE, and *cis*-DCE. The remaining two extraction wells (B3-EXW01, B3-EXW04) contain greater than 100 µg/L of TCE and *cis*-DCE.

VOC analytical results from operational bioreactor trench sumps samples indicate slight increases in contaminant mass (total molar concentration) in trench sumps T1-3 and T2-2 and decreases in the remaining sumps in trenches 1, 2, and both sumps in trench 6 since the last reporting period in April 2019. Over the bioreactor operational period (13 years), contaminant mass appears stable or decreasing. Currently, extracted groundwater is being applied to bioreactor trenches 1, 2 and 6. Applications in trench 1 began in 2006 as the bioreactor became operable and has been ongoing for 13 years. Applications in trench 2 began in 2009 (ten years of application), followed by applications in trench 6 in 2010 (nine years), and injections in trenches 3, 4, and 5 began in 2016 and ceased in 2018 (two years of application) due to low water availability during drought conditions.

Water quality field measurements from bioreactor trench 1 sumps indicate average annual values for DO, pH, ORP, and specific conductivity were 0.49 mg/L, 6.52, -97.71 mV, and 1.120 mS/cm, respectively, and temperatures ranged from ~21 °C to ~27 °C.

Field measurements from trench 2 during the year include average DO, pH, ORP, and specific conductivity of 0.56 mg/L, 6.49, -70.65 mV, and 0.860 mS/cm respectively; and temperatures ranged between ~20.5 °C to ~28 °C.

Trench 6 water quality field measurements during the year include average DO, pH, ORP, and specific conductivity of 0.69 mg/L, 6.64, -58.26 mV, and 0.641 mS/cm respectively; and temperatures ranged between 21 °C to 23 °C. While the annual average DO within trench 6 is above 0.50 mg/L, multiple quarterly measurements are recorded near or less than the desired concentration.

The geochemical parameters measured within each of the active trenches indicate adequate conditions exist for reductive anaerobic bioremediation of CAHs in trenches 1, 2, and 6.

Ground water elevation data from the shallow UGR monitoring wells (B3-MW26-UGR – MW34) combined with similar data from the Westbay UGR zones (CS-WB06-UGR-01, CS-WB08-UGR-01) and the bioreactor sumps helped confirm the presence of a groundwater “mound” around the bioreactor trenches. Analyses of samples from these wells indicates the presence of vinyl chloride with concentrations ranging from ND to 19 ppb (WB08-UGR-01) with the highest levels typically found north and west of the bioreactor. B3-MW28-UGR, located southwest of the bioreactor, has been consistently dry and therefore is not sampled. Water quality parameters in UGR wells are collected every 9 months and were collected only one time in the reporting period. In general, DO values at UGR wells ranged from 0.49 to 3.03 mg/L, ORP values ranged from 190 to -190 eV, and pH ranged from 6.69 to 6.82.

During the reporting period, 32.58 inches of precipitation were measured on-post. Over the year, average water thicknesses within active trenches were 8.96, 4.73, and 5.41 feet in trenches 1, 2, and 6, respectively. Average water thickness greater than 1 foot indicate saturated conditions within the active bioreactor trenches are being maintained.

Attached are graphs including: trenches 1 and 6 average water thickness with rainfall data, VOC concentration summaries for extraction wells, storage tanks (UIC), trench 1 and 6 sumps, and in the defined uppermost saturated zones (zone LGR-03B) in the surrounding multi-port monitoring wells, cumulative precipitation, as well as water level elevations in the defined uppermost saturated zone (zone LGR-03B) of the B-3 multi-port monitoring wells with rainfall data.

Quarter 52 - Analytical Data Observations

1. Arsenic (As) was detected in concentrations exceeding the MCL (10 µg/L) in three Westbay well zones, CS-WB05-LGR-04B, CS-WB07-LGR-01, and CS-WB07-LGR-04 (23, 14, and 10 µg/L, respectively) during the year. All other multi-port monitoring well (MPMW) zones reported Arsenic levels below the MCL. The elevated levels are likely due to changing pH conditions of the groundwater and the reduction of naturally occurring arsenic within the limestone media to a more soluble form.
2. DO and ORP values were favorable for the reduction of CAHs, and it is likely that geochemical conditions will remain favorable for continued enhanced anaerobic continue to improve as normal bioreactor operations continue.
3. The volatile organic compound summary for the trenches indicates an end-product (DCE isomer and VC) dominated chemical composition in water. Total molar concentrations within trenches 1, 2 and 6 have fluctuated through the year and indicate a slight increase in total contaminant mass in T1-3 and Trench 2 sumps and, slight decreases in sumps T1-1 and T1-2 and Trench 6 sumps since last year.

4. *Dehalococcoides* (DHC) bacteria have been identified within the trench sumps, indicating the reductive dechlorination of CAHs by microbial activity is occurring. Since the last reporting period, DHC cell counts have risen in each of the active trenches. Comparison of CAH mole fractions of extracted groundwater (prior to injection) and trench sump water (after injection) confirms reductive dechlorination of VOCs is occurring within the bioreactor, with VOC parents (PCE, TCE) representing a higher portion of the total molar concentration pre-injection, and daughter products (DCE, VC, and ethene) representing the higher portion of the total molar concentration post-injection.
5. Saturated conditions within the bioreactor were maintained through the year with thicknesses ranging from 4.73 feet in trench 2 to 8.96 feet in trench 1.

The reductive dechlorination end products VC, ethene, and ethane are present in samples collected from shallow UGR zone wells around the periphery of SWMU B-3 indicating the lateral influence of the bioreactor in the shallow subsurface. VC is present in samples from shallow UGR wells MW26, MW27, MW33, and MW34, (5.1, 0.54, 0.68 and 1.6 µg/L, respectively), and in samples from the MPMW well UGR-01 zones in WB06 and WB08 (2.8 and 0.85 µg/L, respectively). Neither ethene nor ethane was detected in samples from shallow UGR wells during the reporting period.

In addition to reductive dechlorination end products within the UGR, these products are also observed at depth. VC is observed in the LGR-01. 03B, 04A, 04B, and BS-01 zones within WB05 (0.48, 15, 42, 94 and 2.7µg/L, respectively); in the LGR-02 and 03B zones in WB06 (2.0 and 0.22 µg/L, respectively); in WB-07 LGR-02 and 03B zones (1.8, and 0.31 µg/L, respectively); and within WB08 in zones LGR-01 and LGR-02, and 03B (0.47, 0.28, and 0.63 µg/L). Neither ethene nor ethane was observed in samples from any of the WB LGR zones during the reporting period.

Recommendations

Recommendation for further remedial action include:

- Continue monitoring bioreactor and surrounding wells for UIC Permit and Performance parameters.

Anticipated Schedule for Next Period (May 2020 – April 2021):

- Continue monitoring and maintenance activities for delivery of groundwater to the bioreactor trenches.
- Conduct semi-annual monitoring events for the bioreactor system.
- Continue UIC monitoring with annual reporting due July 2020.
- Continue SCADA control and automation integration.

Specific Data Observation Notes for Attachments

- Table 52.1.1 presents field collected data from bioreactor trench sumps, and indicates saturated conditions were maintained during the year.
- Table 52.1.2 shows analytical results from semiannual sampling at sumps within active bioreactor trenches (Trenches 1, 2, and 6) and present data from the thirteenth year of bioreactor operations.
- Data in Table 52.1.2 indicate dechlorination products are being generated within the bioreactor. VC was present at variable concentrations in each of the active trench

sumps, ranging from, 0.37 to 25 µg/L during the year. Ethene and ethane was observed within sump T6-2 at 2.4 and 3.2 µg/L, respectively.

- Table 52.1.3 indicates the presence of Fe(II) at concentrations consistent with alternative degradation pathways.
- Table 52.2.3a indicates VC concentrations of 42 µg/L in WB05-LGR04A and 94 µg/L in WB05-LGR04B, indicating reductive dechlorination is occurring at depth and suggest a connection between this zone and CS-B3-MW01.
- Table 52.4.4 indicates moderate populations of *Dehalococcoides* (DHC) bacteria exist in trenches 1, 2, and 6.
- Figure 52.1.2 presents the changes in molar fraction and total molar concentrations at sumps in trenches 1, 2, and 6 and indicate slight increases in contaminant mass at sumps T1-3 and T2-2 and decreases in contaminant mass in the remaining active trench sumps.
- Table 52.6.2 indicates contaminant mass, provided by seven extraction wells, is available for injection into the bioreactor. Parent products (PCE and TCE) make up the majority of the contaminant mass within LGR wells, though *cis*-DCE is also present. Within the CC extraction well, the DCE isomers provide nearly all available contaminant mass.
- Figure 52.2.5 shows that the water levels in Westbay wells are significantly influenced by drought conditions and precipitation, while pumping at CS-MW16-LGR and CS-B3-EXW01 shows strong influence in the deeper LGR zones. Pumping at CS-MW16-CC appears to have no influence on UGR or upper LGR zones.
- Table 52.7.3 indicates the presence of VC in four of the shallow UGR wells with concentrations ranging from ND to 5.1 µg/L. Additionally, Table 52.7.3 provides evidence of the biotic anaerobic degradation pathway as indicated by elevated concentrations of Mn and CO₂.

Analytical Summary Data

Table 1 Summary of Analysis Presented for Reporting Period

Event	VOCs	TDS	TOC	MEE & CO₂	SO₃²⁻	Chloride, Sulfate	Fe²⁺	Mn	Metals*	H⁺	DHC
Semi-Annual Sampling ^a (Quarter 50)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Semi-Annual Sampling ^a (Quarter 52)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

^a - Semi-annual sampling includes samples from B3-trench sumps, Monitoring Wells, Extraction Wells, and Multi-port (Westbay) wells.

* - Metals analyses were reduced to include only arsenic results beginning with the Month 44 sampling event.

Figures

Figure 52.1.2 T1-1

**B-3 Bioreactor Trench 1 Sump 1 VOC Summary
Mar 2019 - Mar 2020**

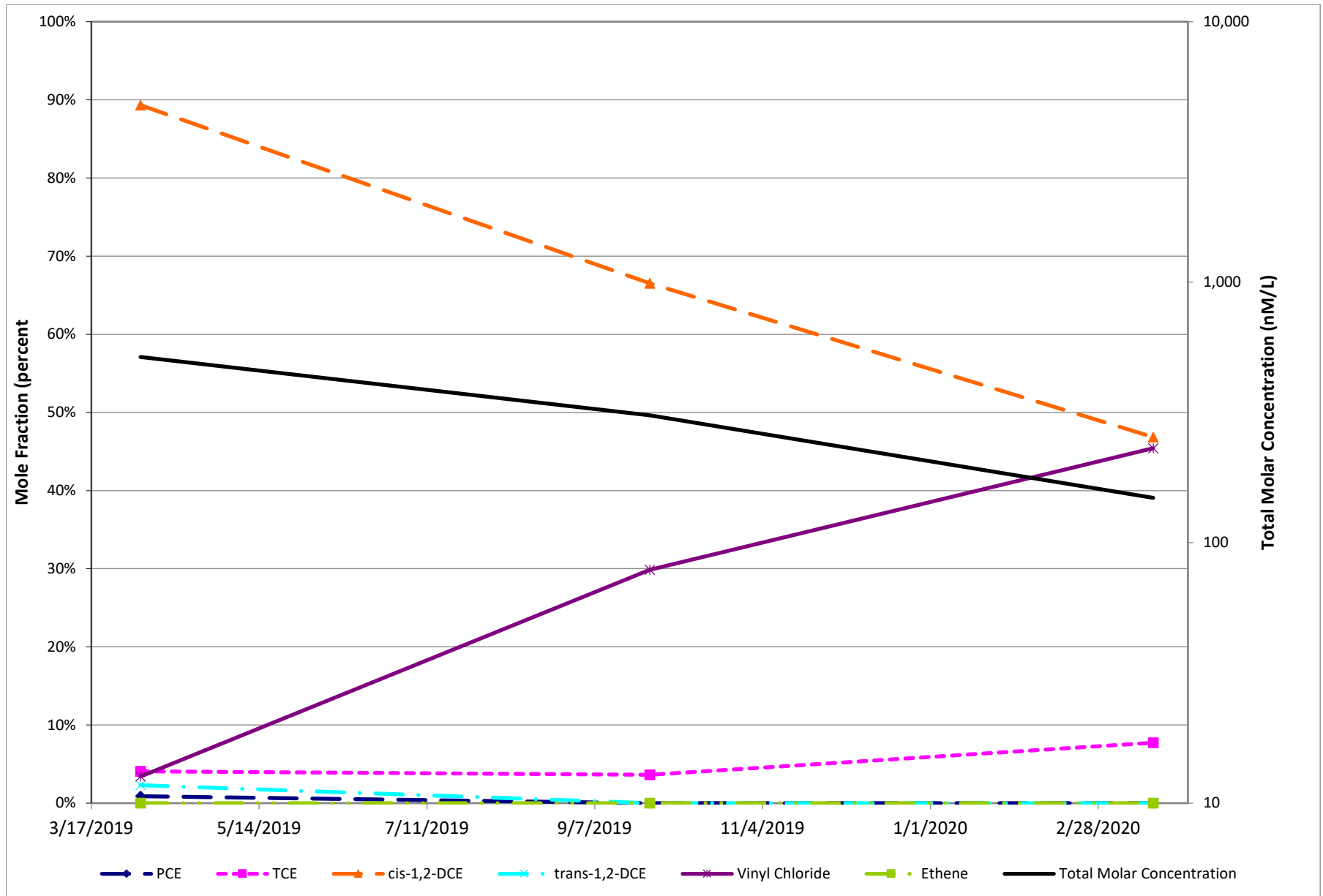


Figure 52.1.2 T1-2

**B-3 Bioreactor Trench 1 Sump 2 VOC Summary
Mar 2019 - Mar 2020**

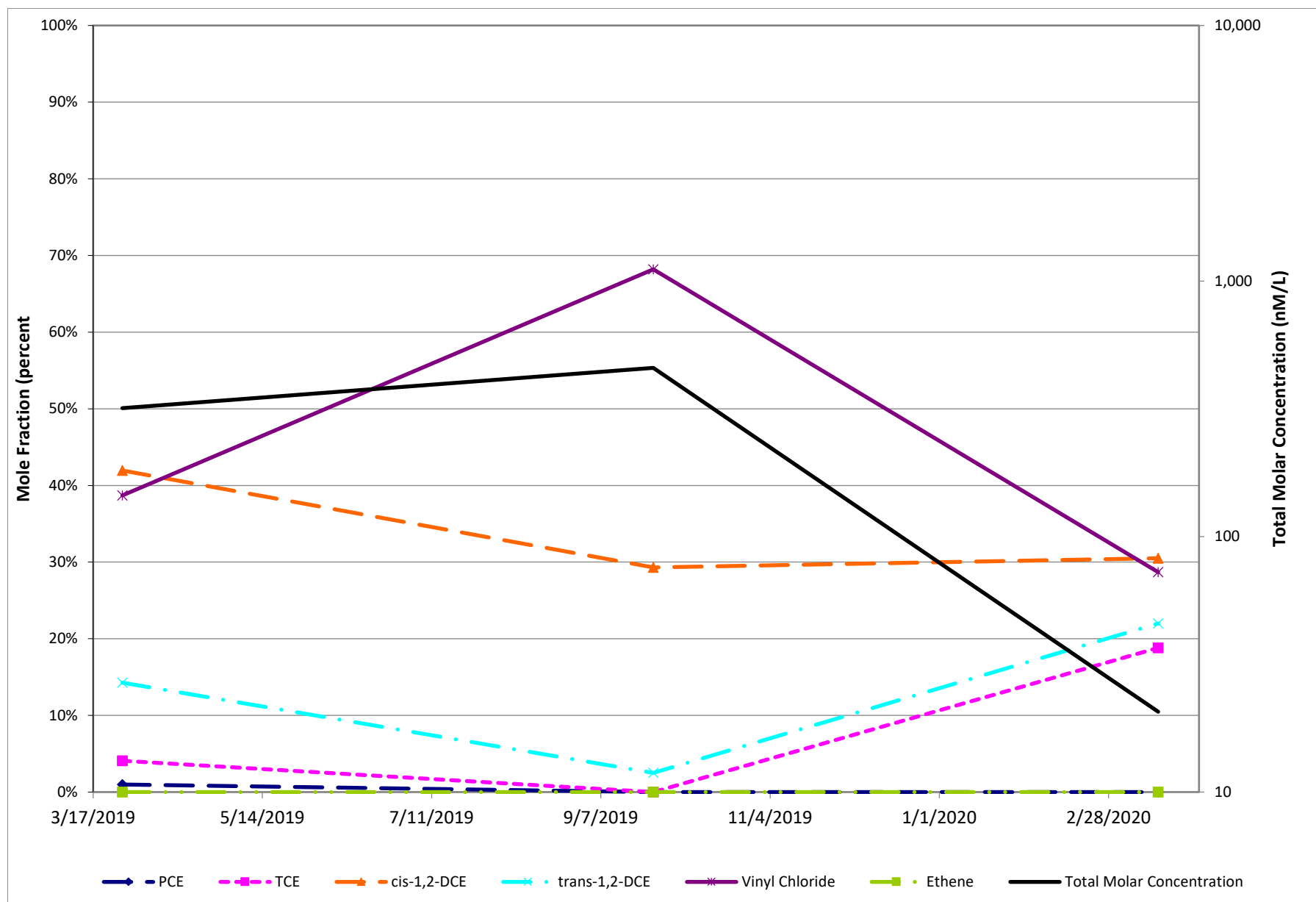


Figure 52.1.2 T1-3

**B-3 Bioreactor Trench 1 Sump 3 VOC Summary
Mar 2019 - Mar 2020**

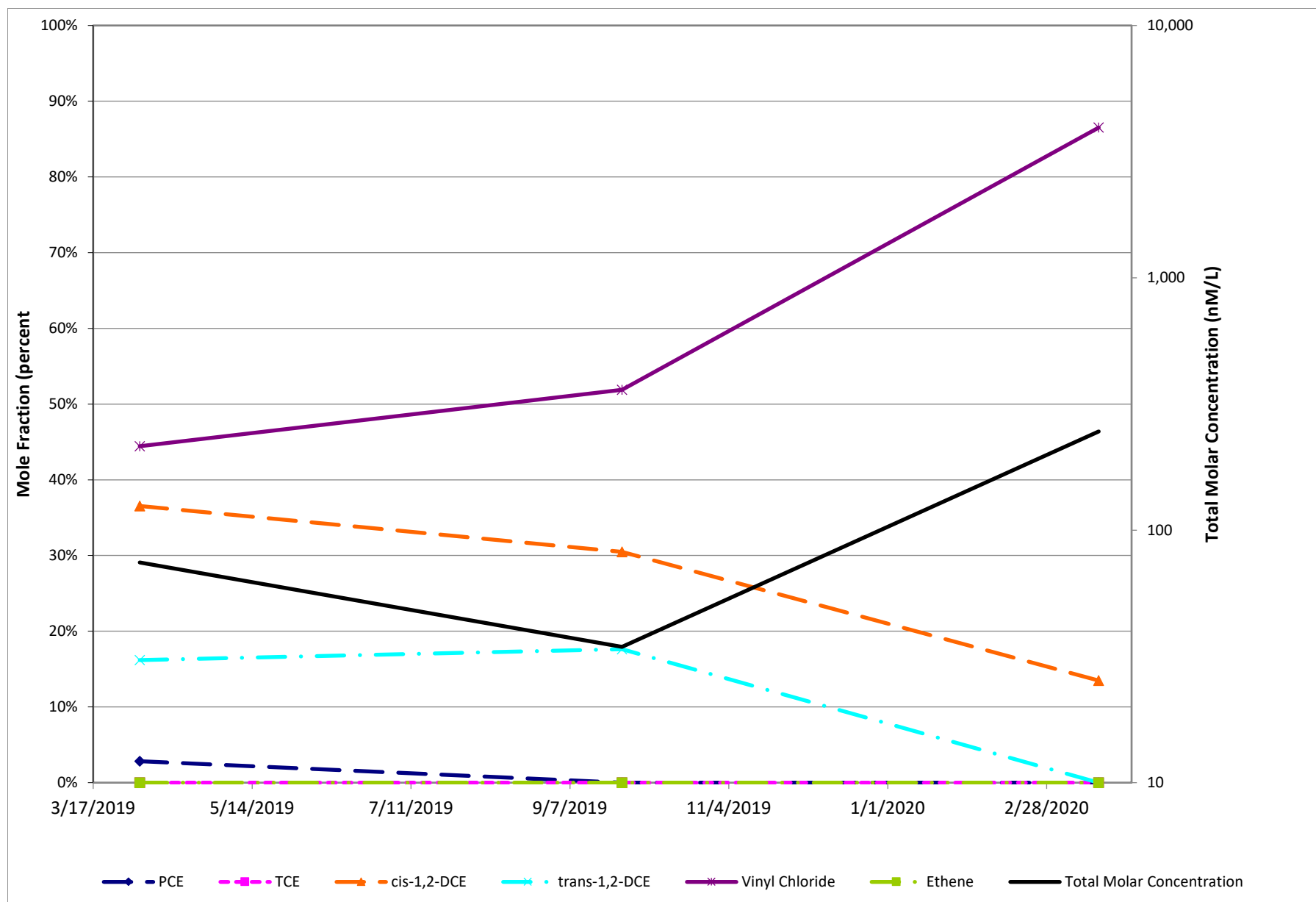


Figure 52.1.2 T2-1

**B-3 Bioreactor Trench 2 Sump 1 VOC Summary
Mar 2019 - Mar 2020**

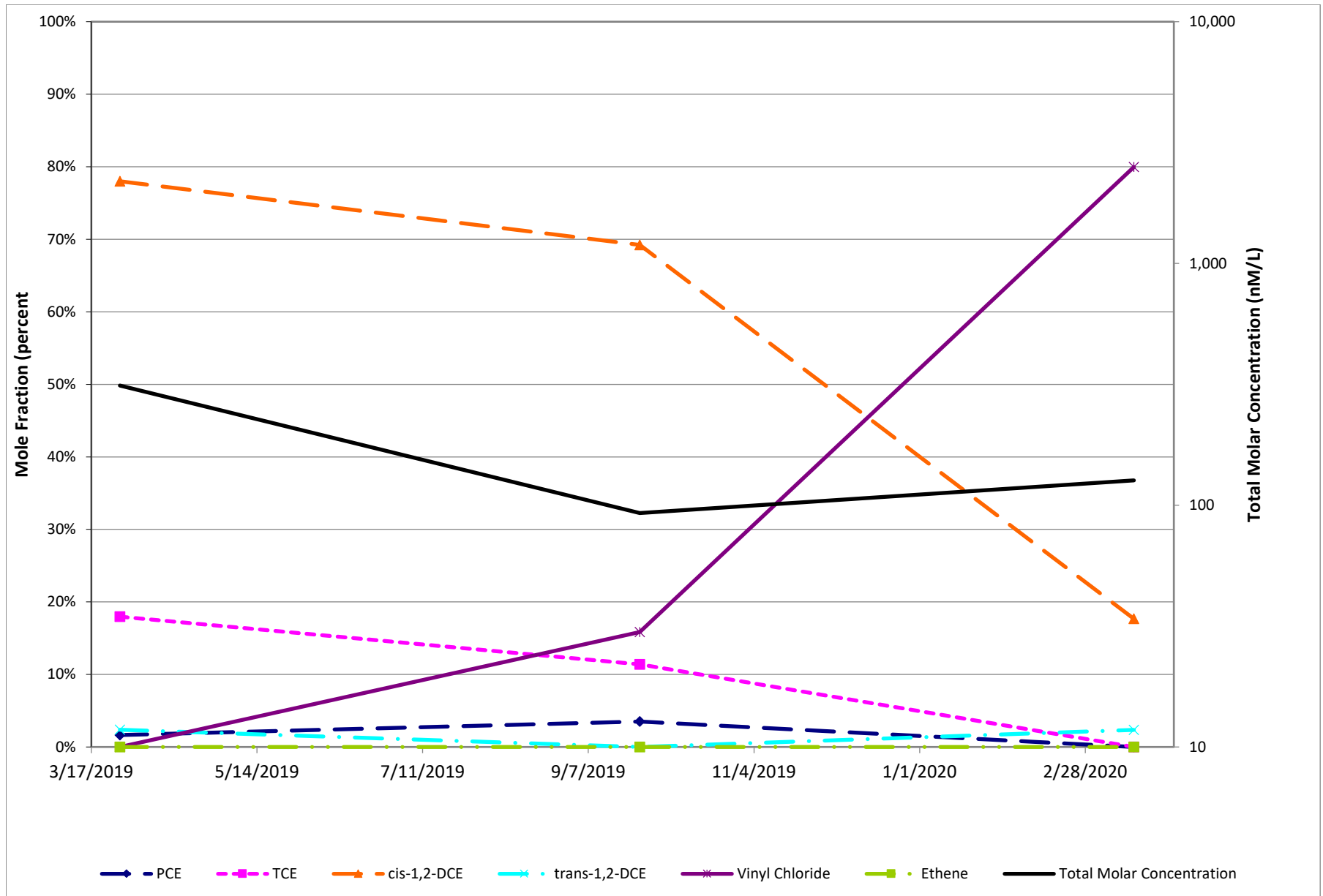


Figure 52.1.2 T2-2

**B-3 Bioreactor Trench 2 Sump 2 VOC Summary
Mar 2019 - Mar 2020**

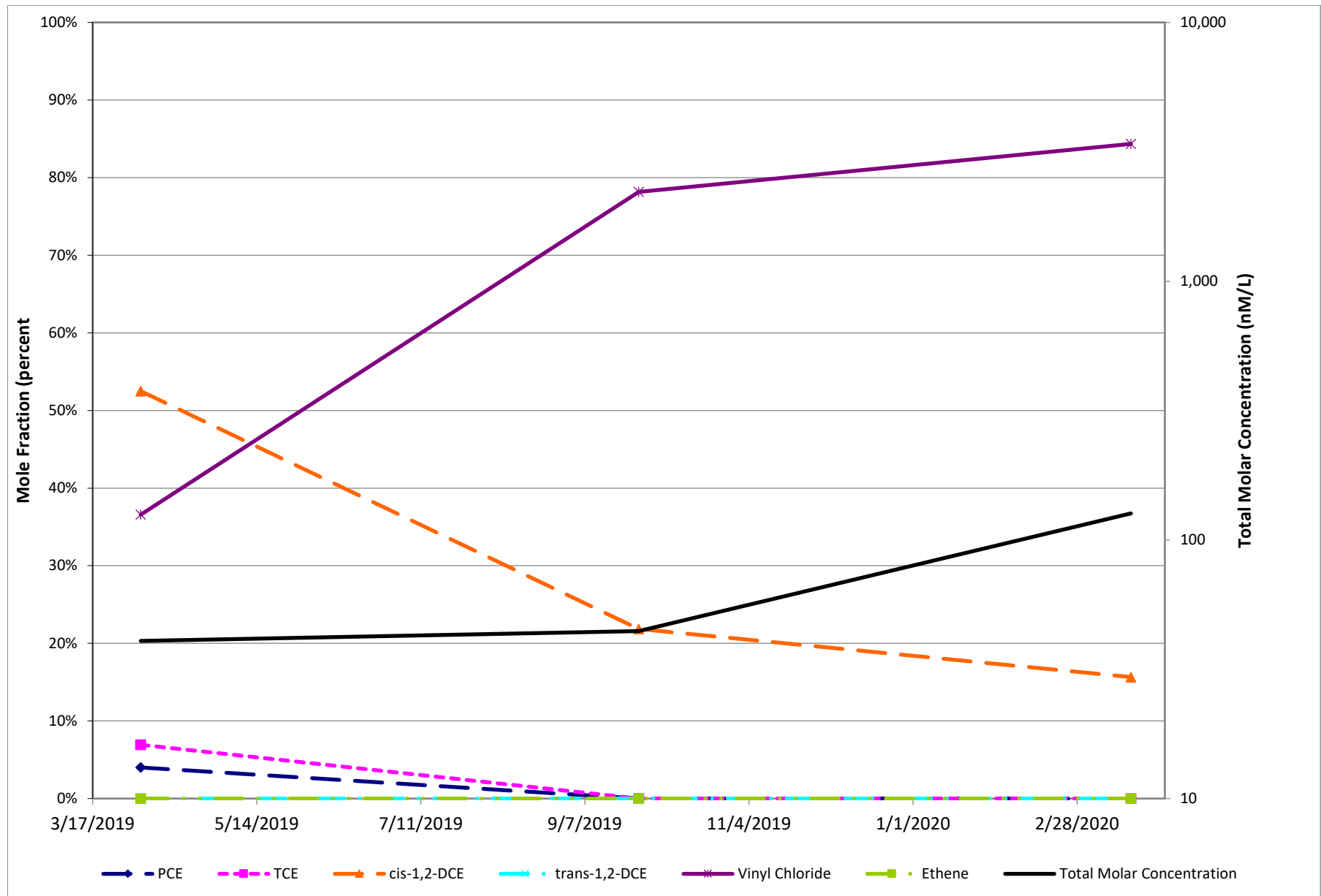


Figure 52.1.2 T6-1

**B-3 Bioreactor Trench 6 Sump 1 VOC Summary
Mar 2019 - Mar 2020**

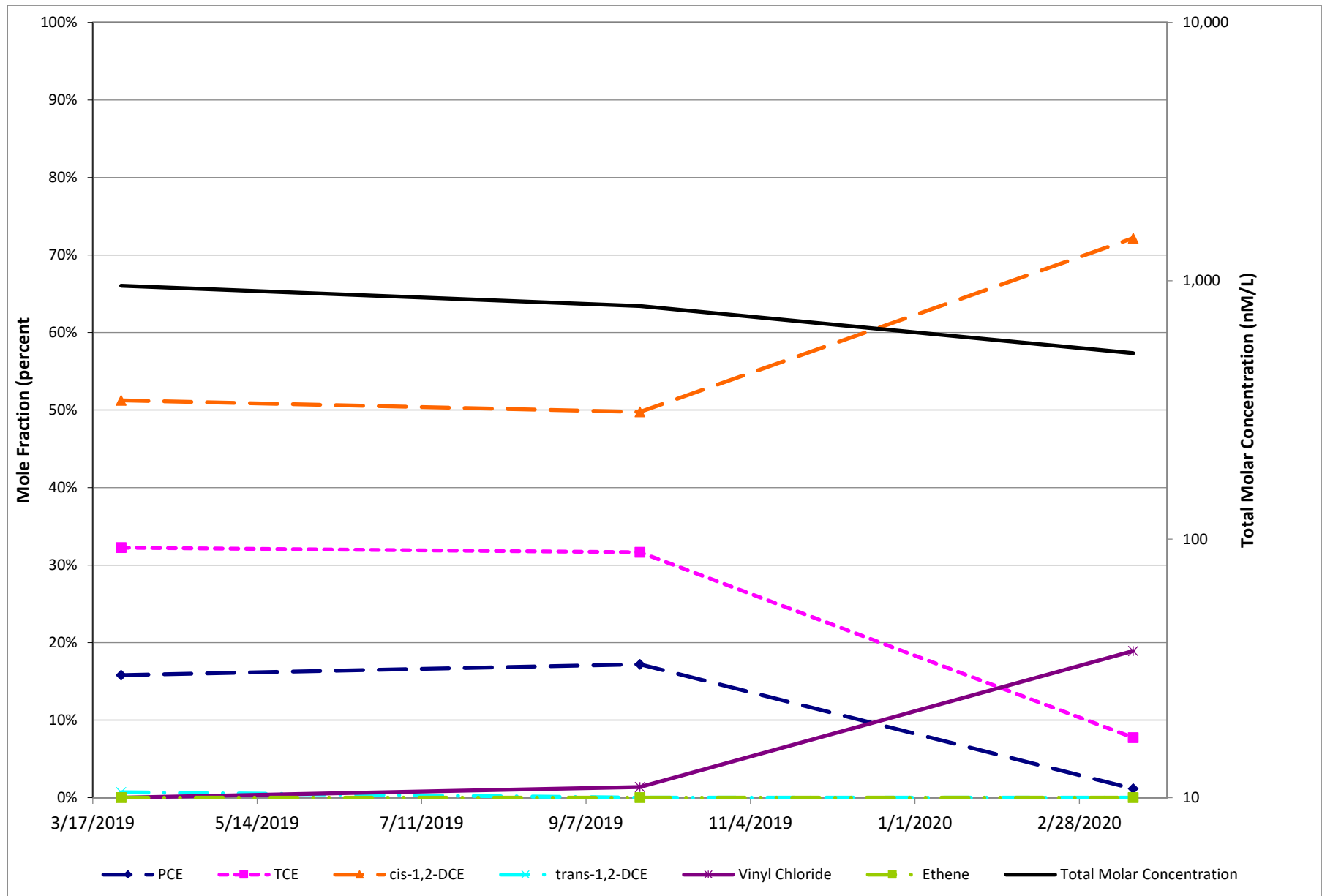


Figure 52.1.2 T6-2

**B-3 Bioreactor Trench 6 Sump 2 VOC Summary
Mar 2019 - Mar 2020**

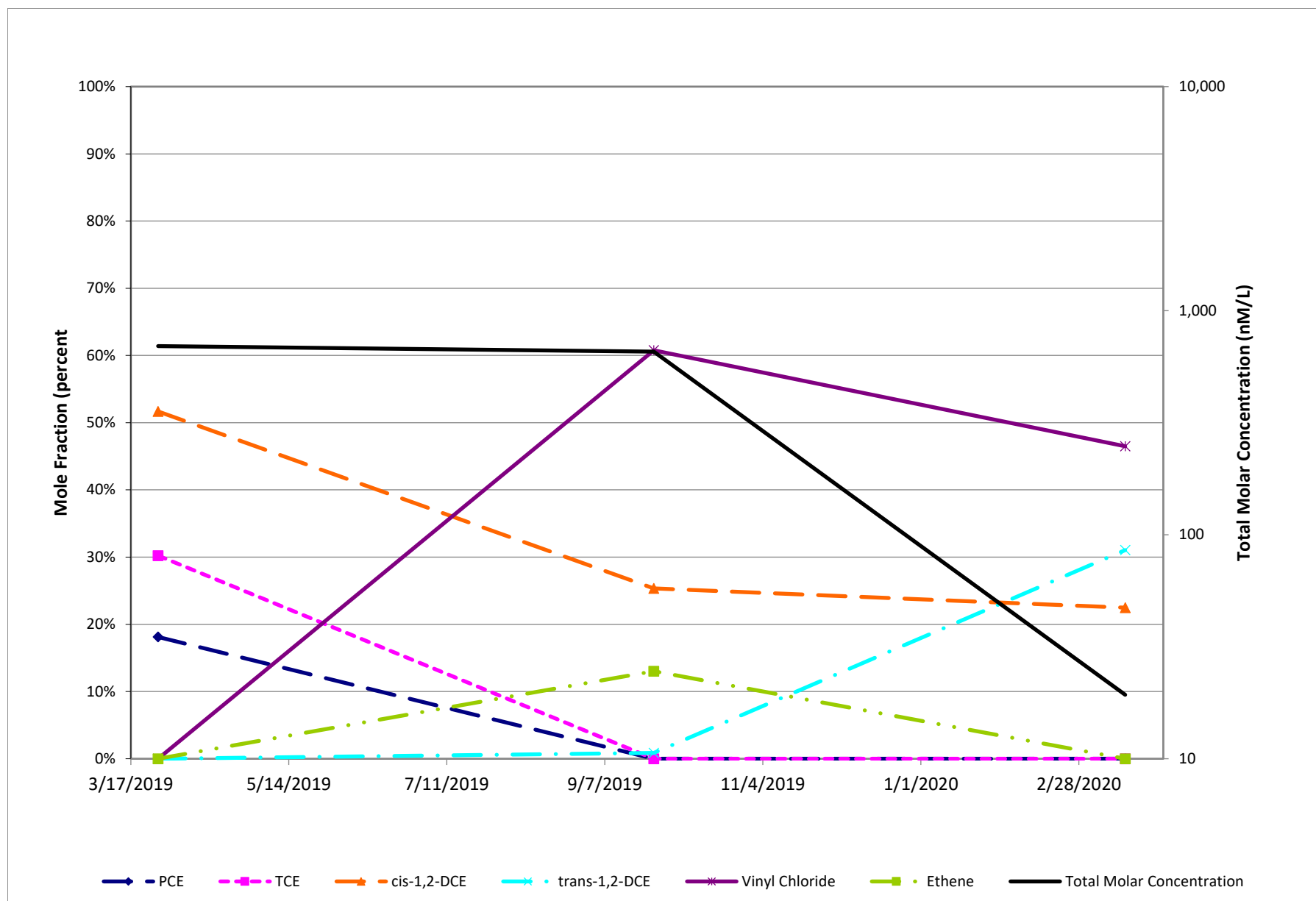


Figure 52.2.2a

CS-WB05-LGR03B VOC Summary
Mar 2019 - Mar 2020

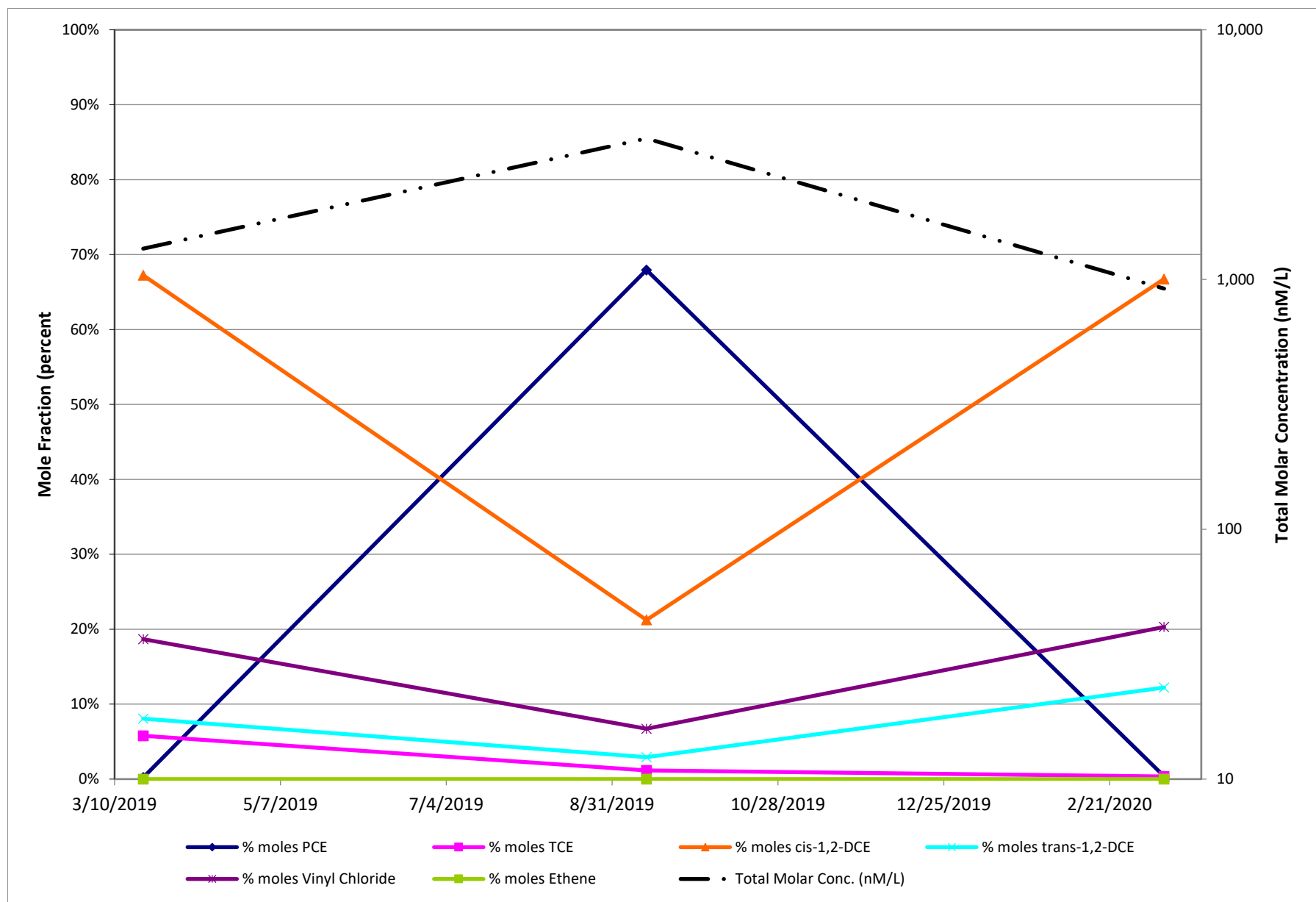


Figure 52.2.2b

CS-WB06-LGR03B VOC Summary
Mar 2019 - Mar 2020

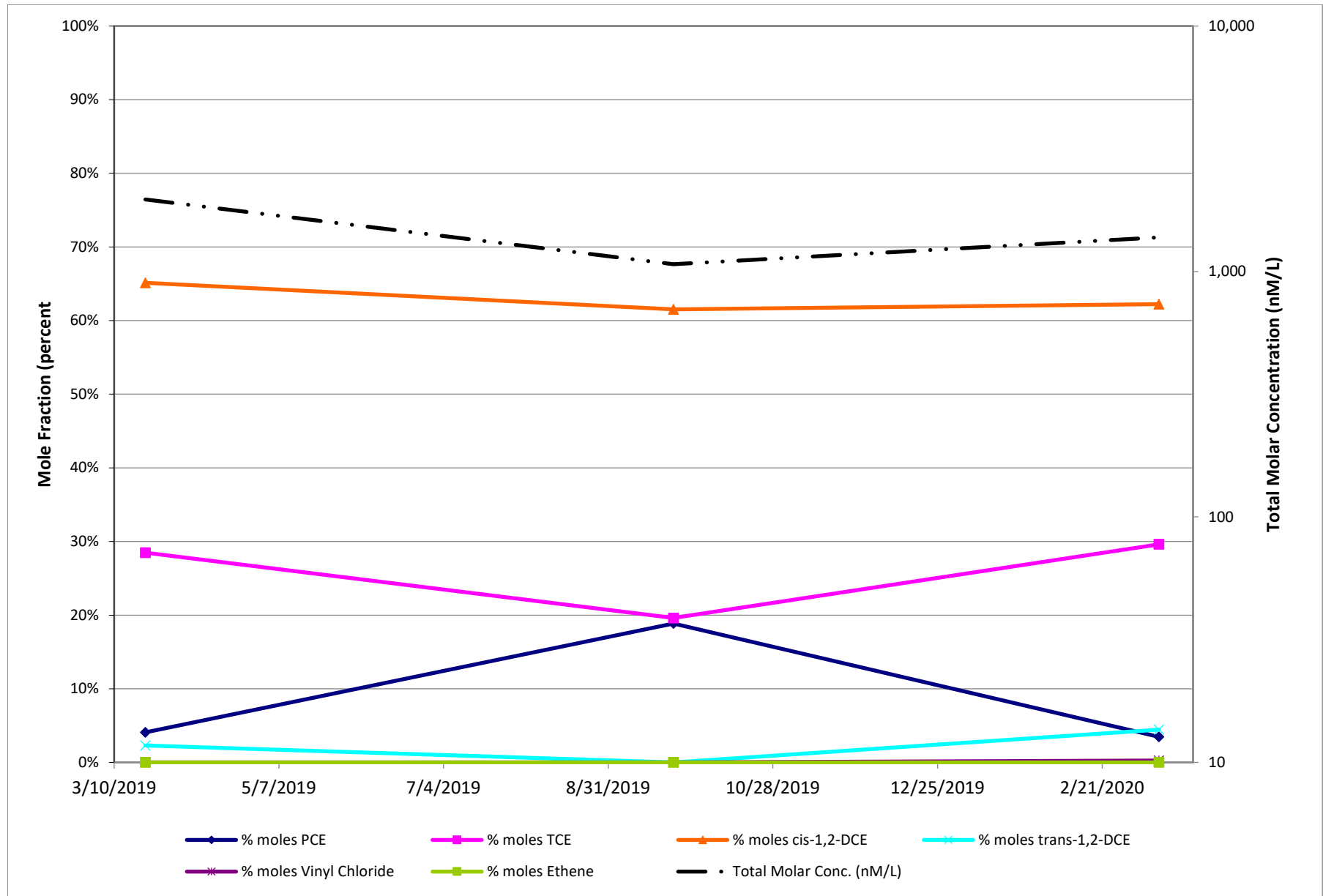


Figure 52.2.2c

CS-WB07-LGR03B VOC Summary Mar 2019 - Mar 2020

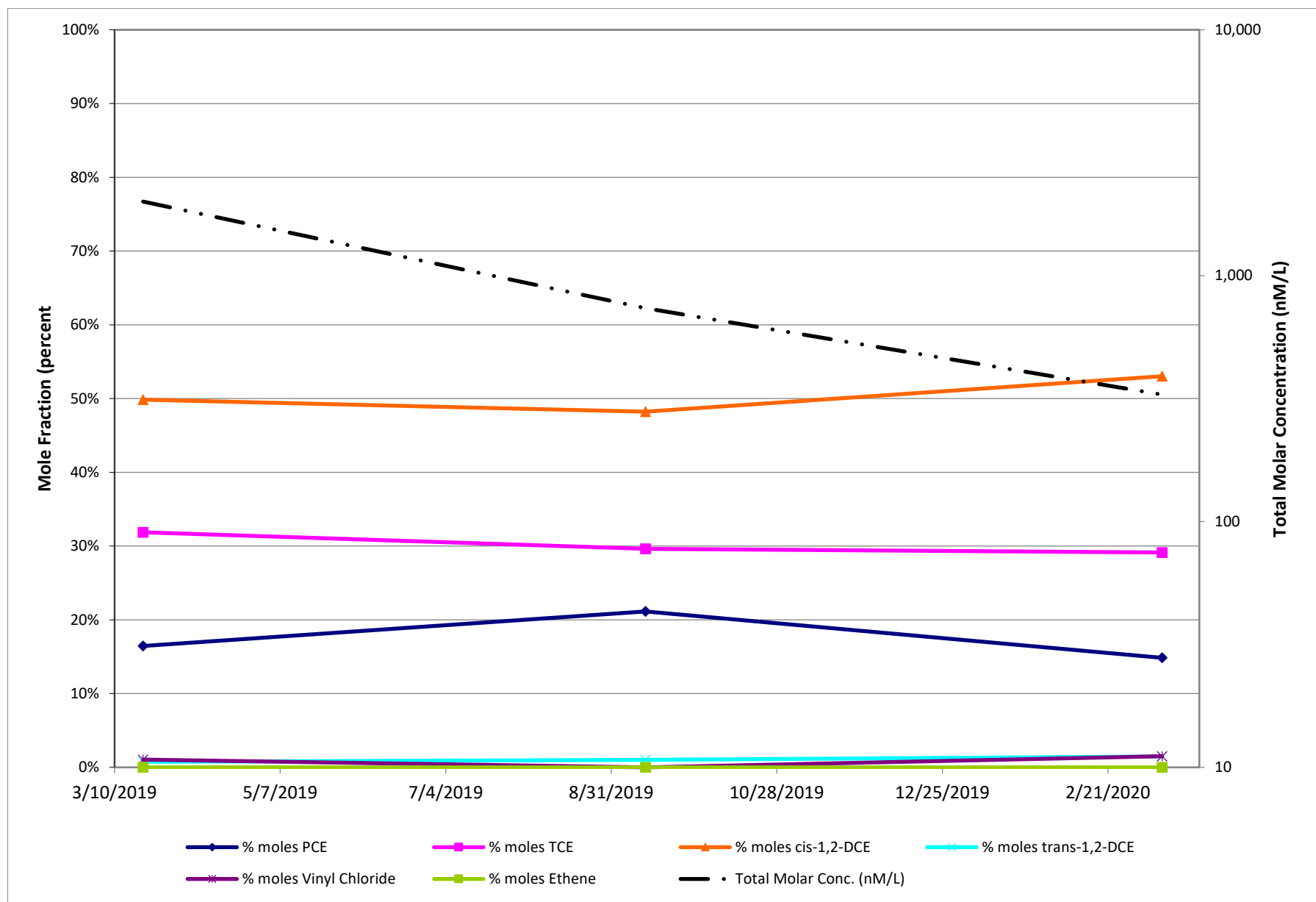


Figure 52.2.2d

CS-WB08-LGR03B VOC Summary
Mar 2019 - Mar 2020

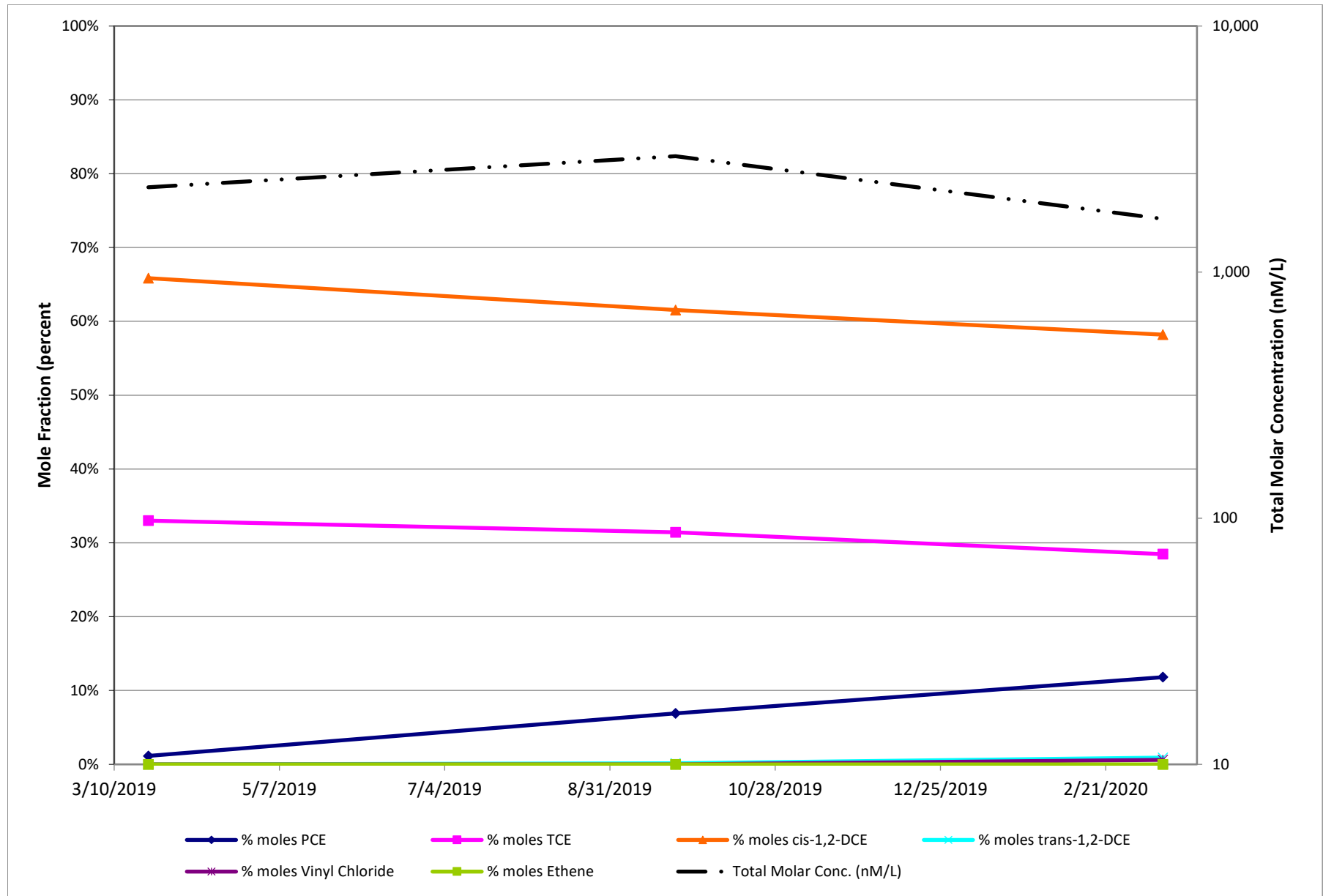


Figure 52.5.2

**Changes in Mole Fraction and Total Molar Concentration at Storage Tank (UIC)
Mar 2019 - Mar 2020**

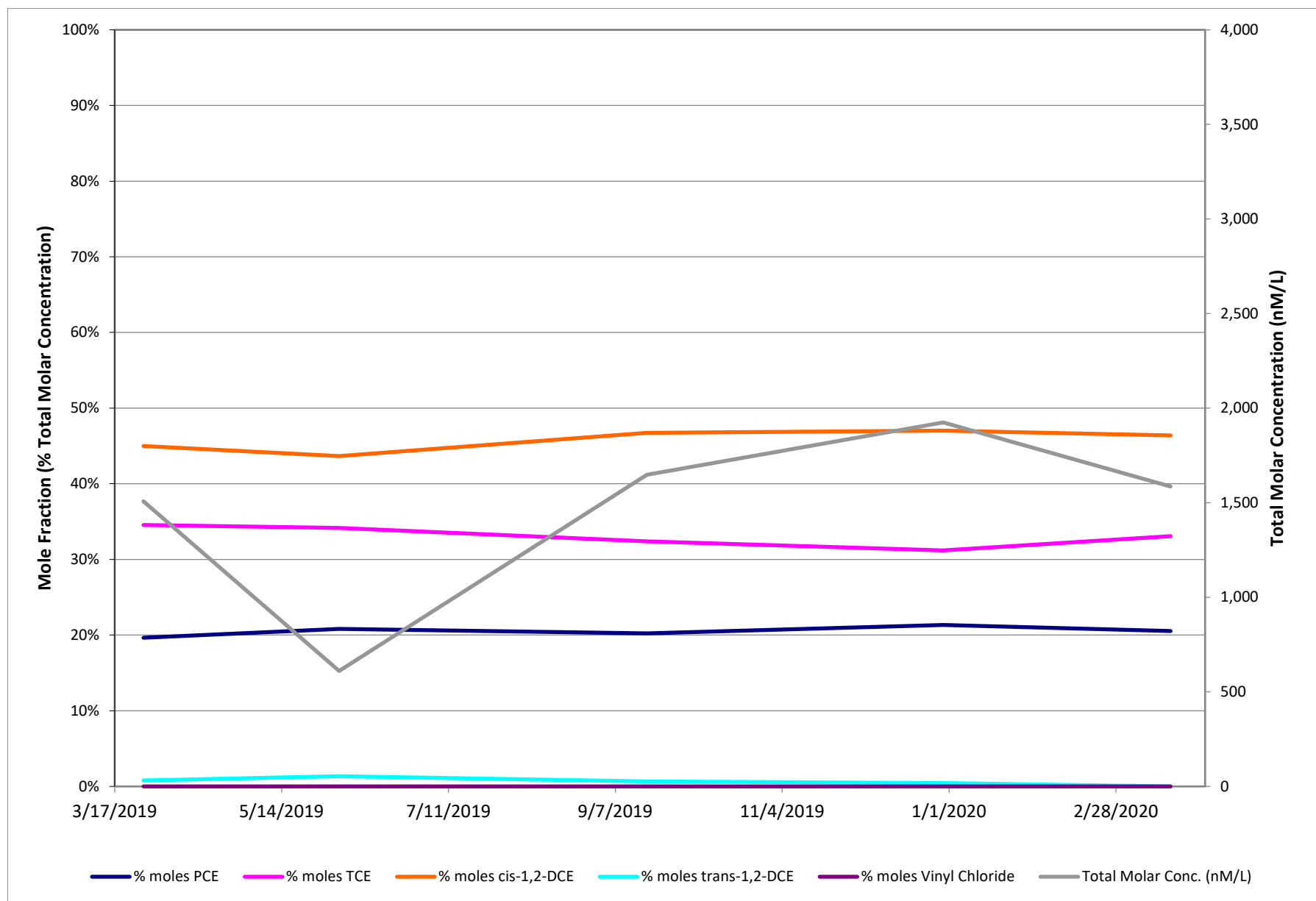


Figure 52.6.2 EXW01

B3-EXW01 VOC Summary
Mar 2019 - Jan 2020

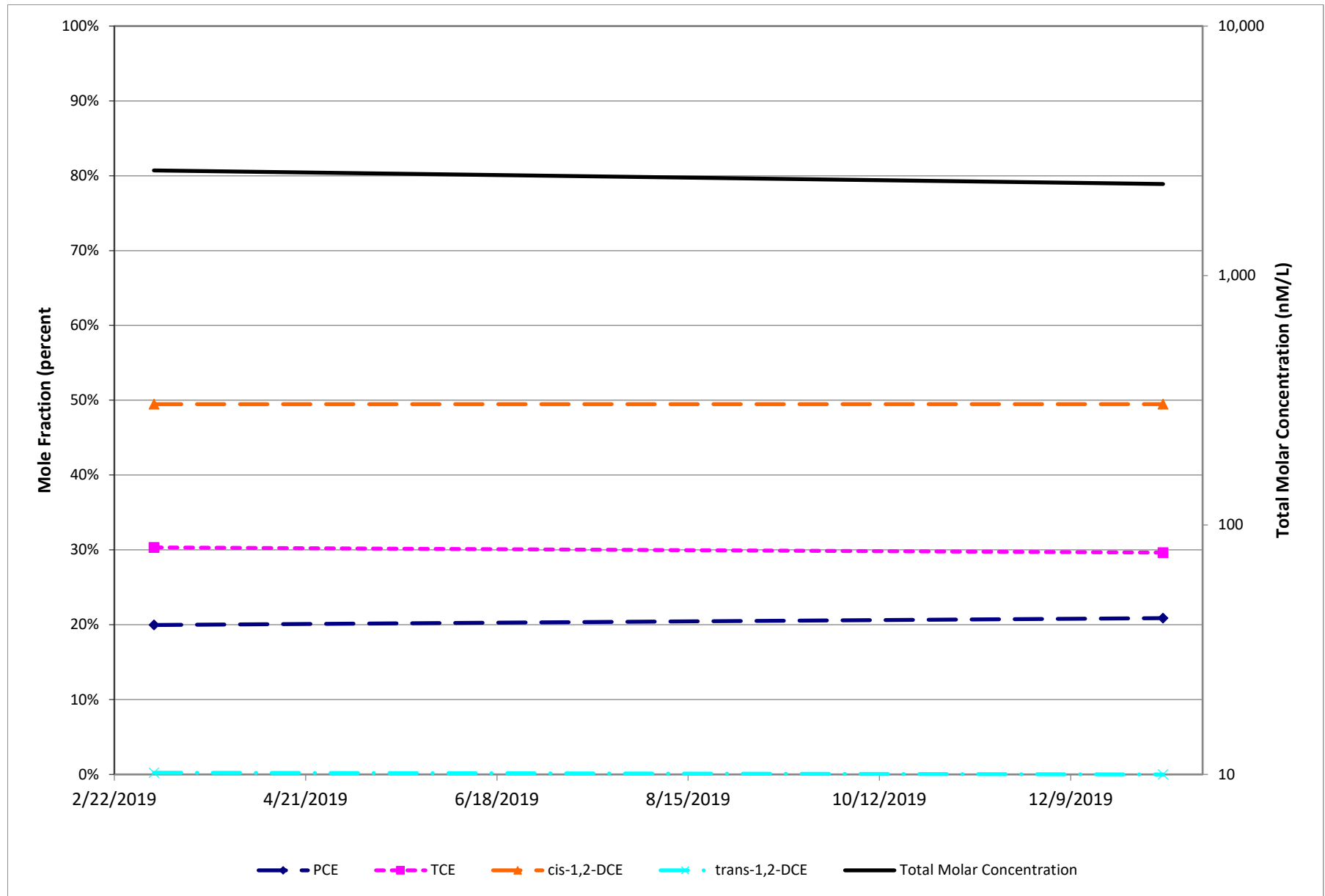


Figure 52.6.2 EXW03

B3-EXW03 VOC Summary
Mar 2019 - Jan 2020

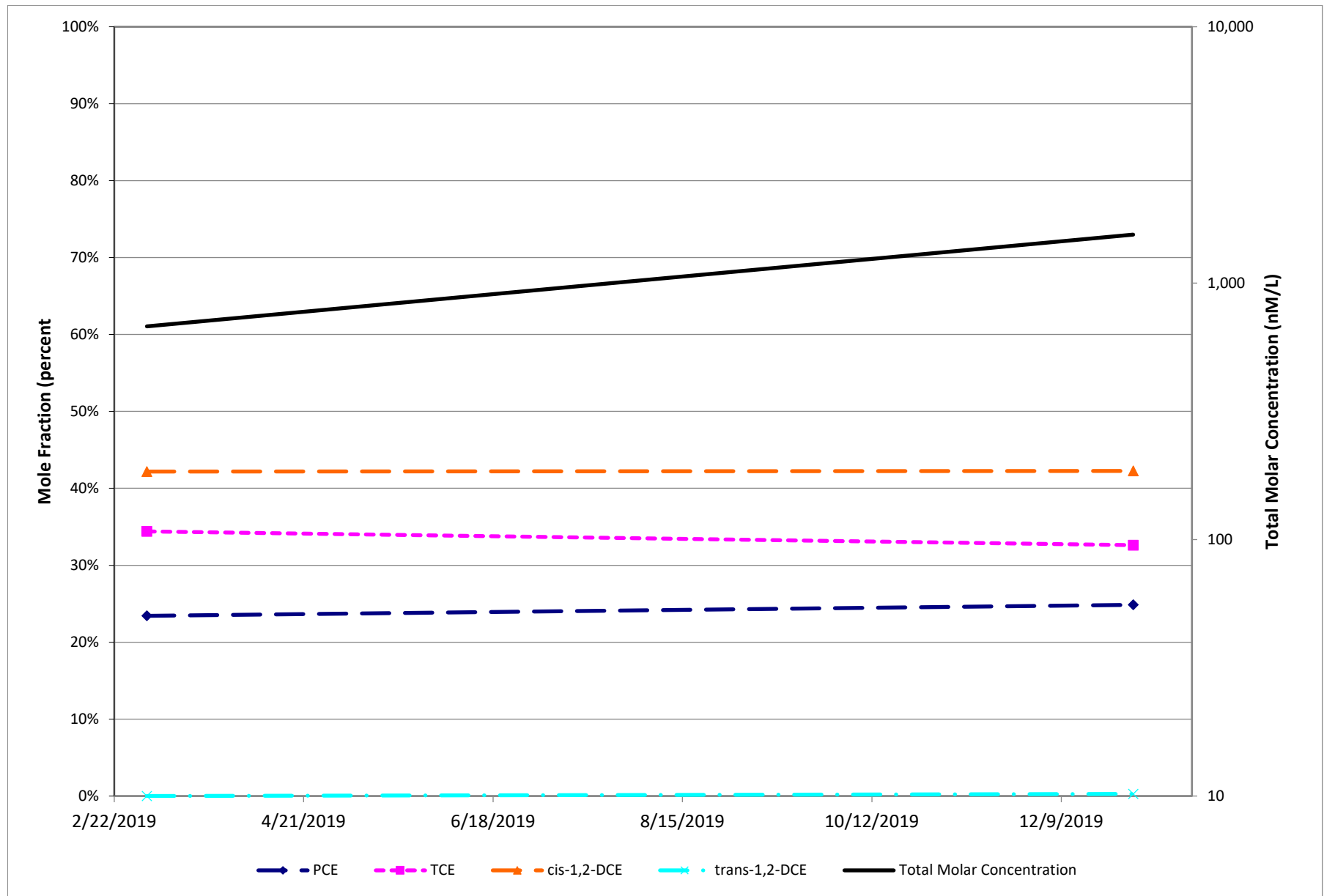


Figure 52.6.2 EXW04

B3-EXW04 VOC Summary
Mar 2019 - Jan 2020

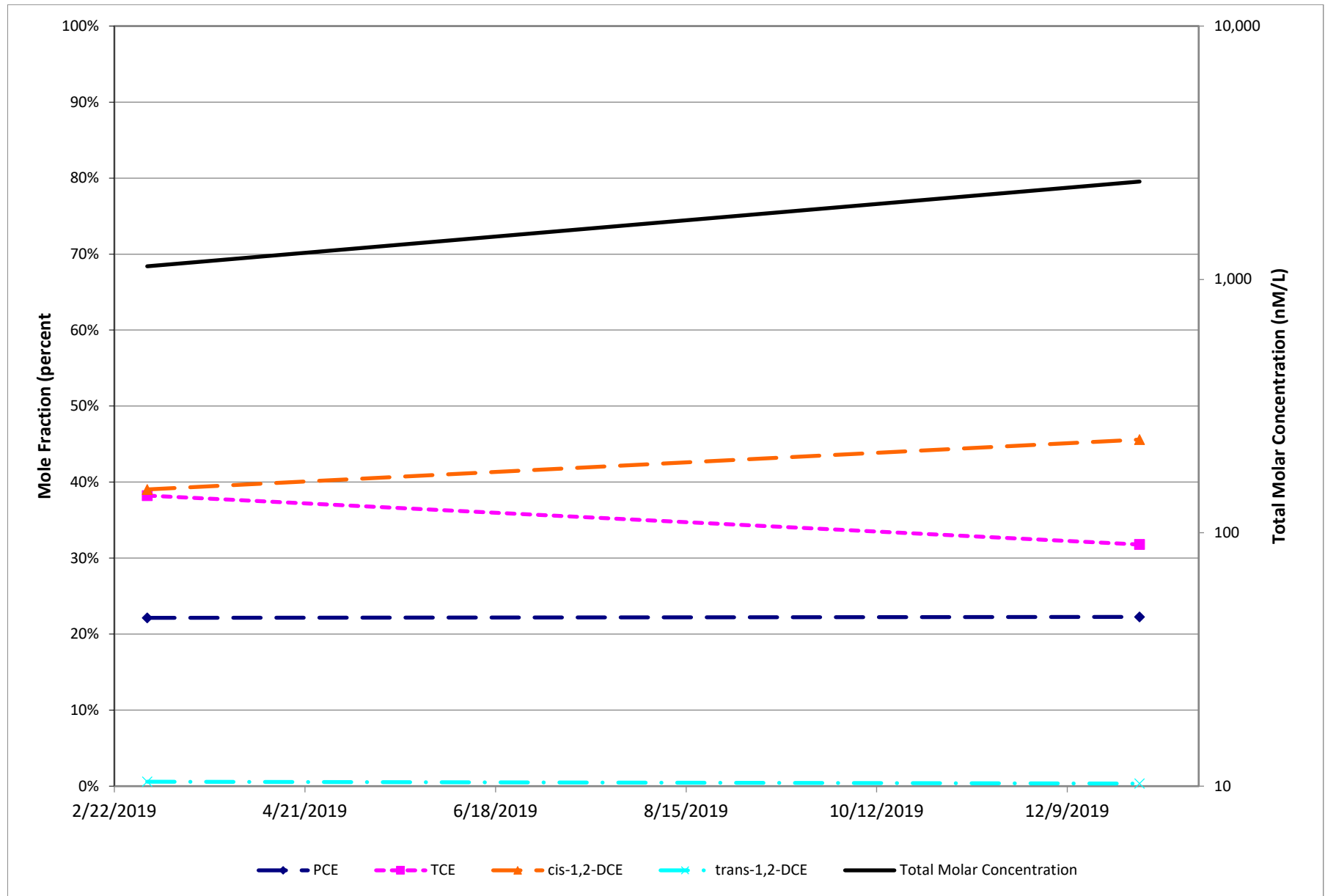


Figure 52.6.2 EXW05

B3-EXW05 VOC Summary
Mar 2019 - Jan 2020

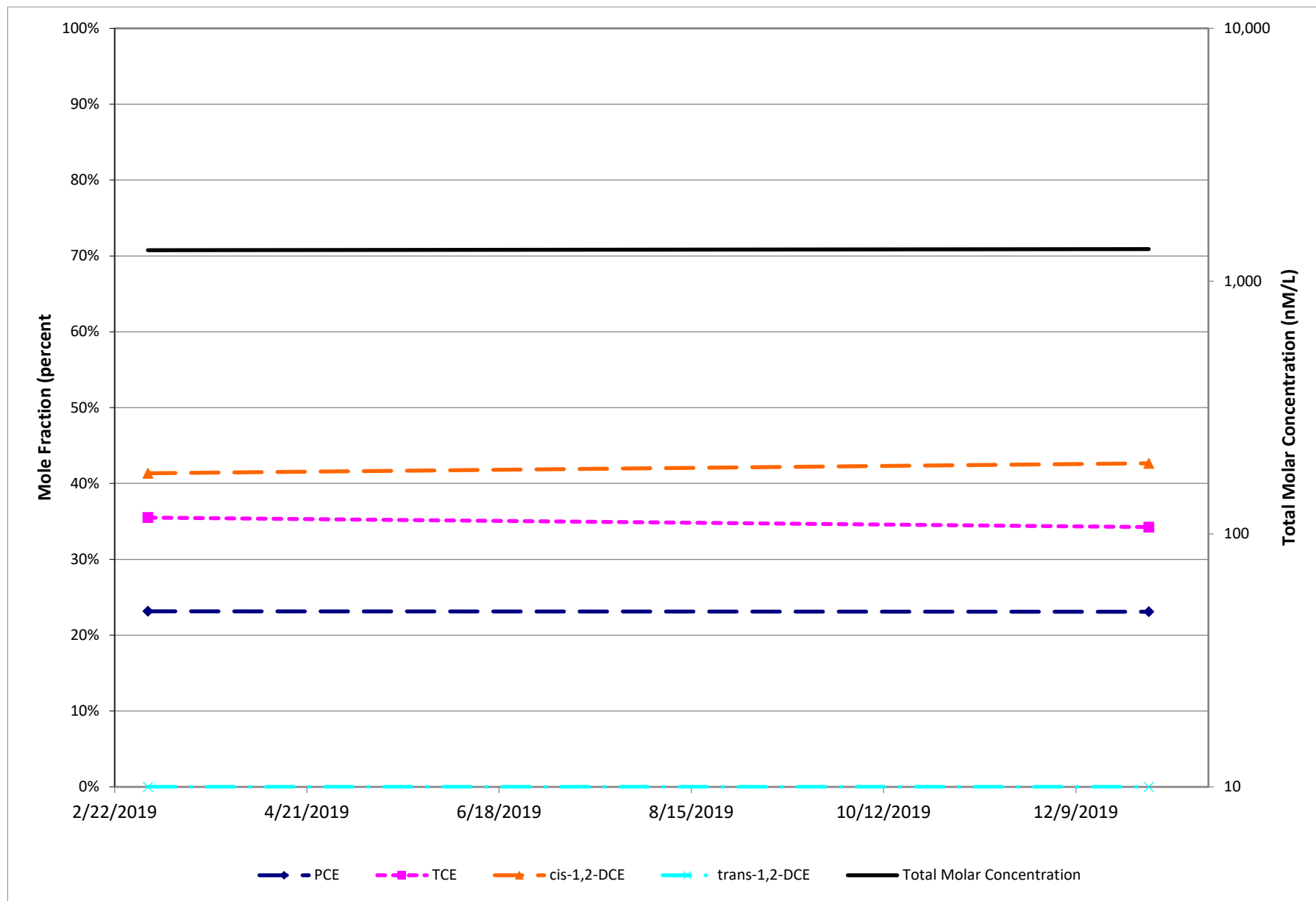


Figure 52.6.2 16-CC

CS-MW16-CC VOC Summary
Mar 2019 - Jan 2020

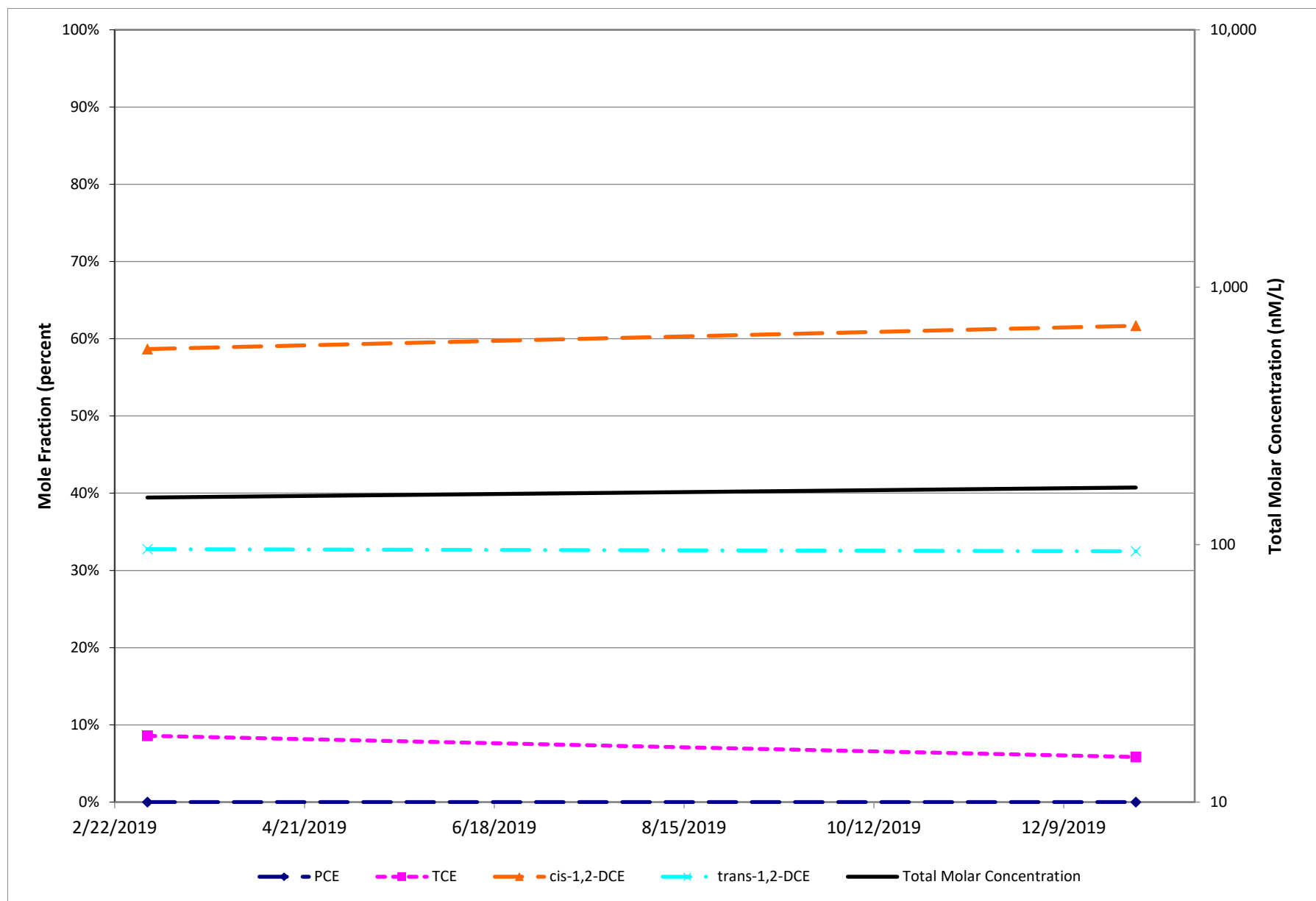


Figure 52.2.5

Lower Glen Rose Groundwater Elevations (feet above MSL) Measured in Westbay Wells May 2014 - April 2020

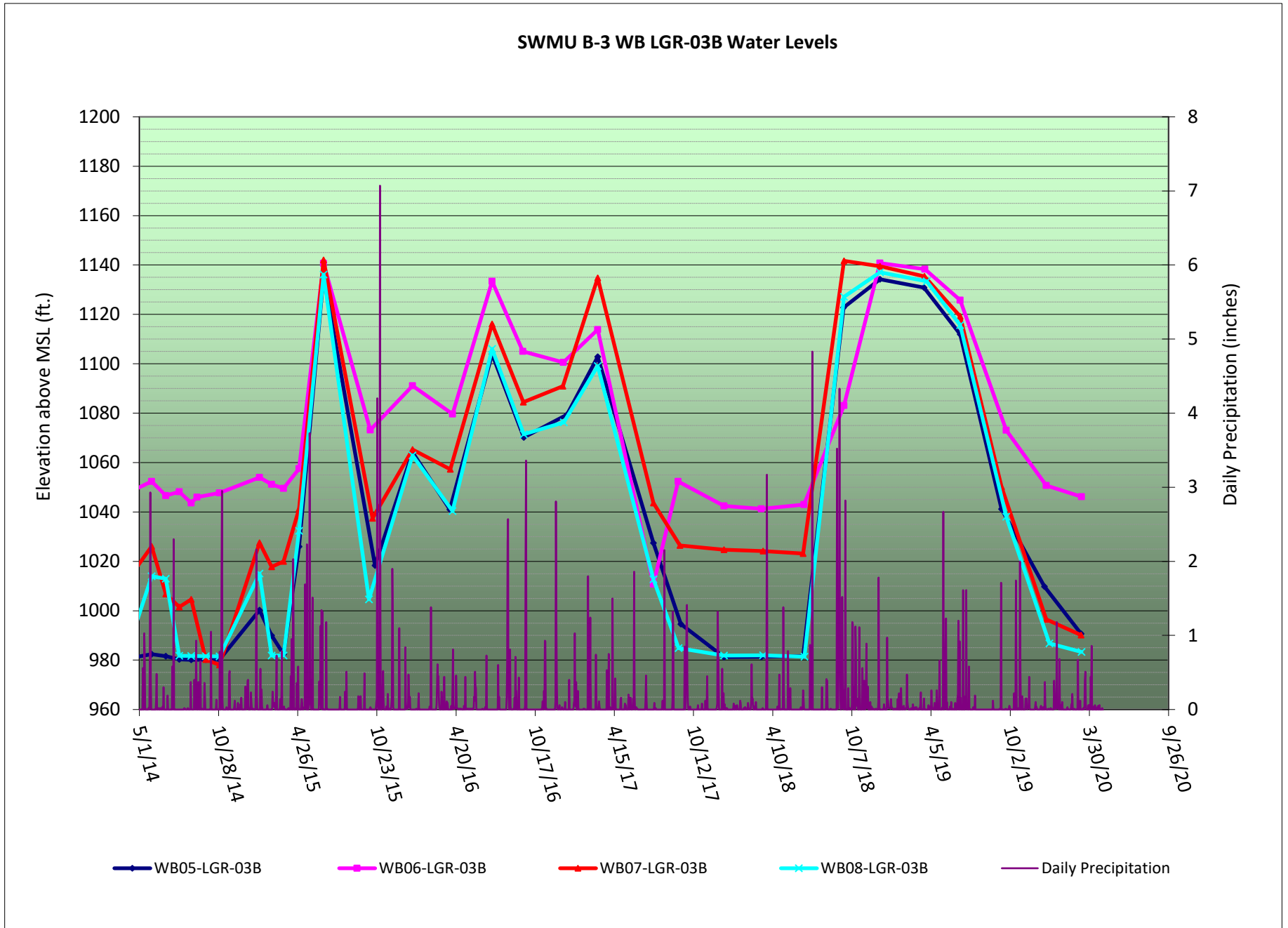
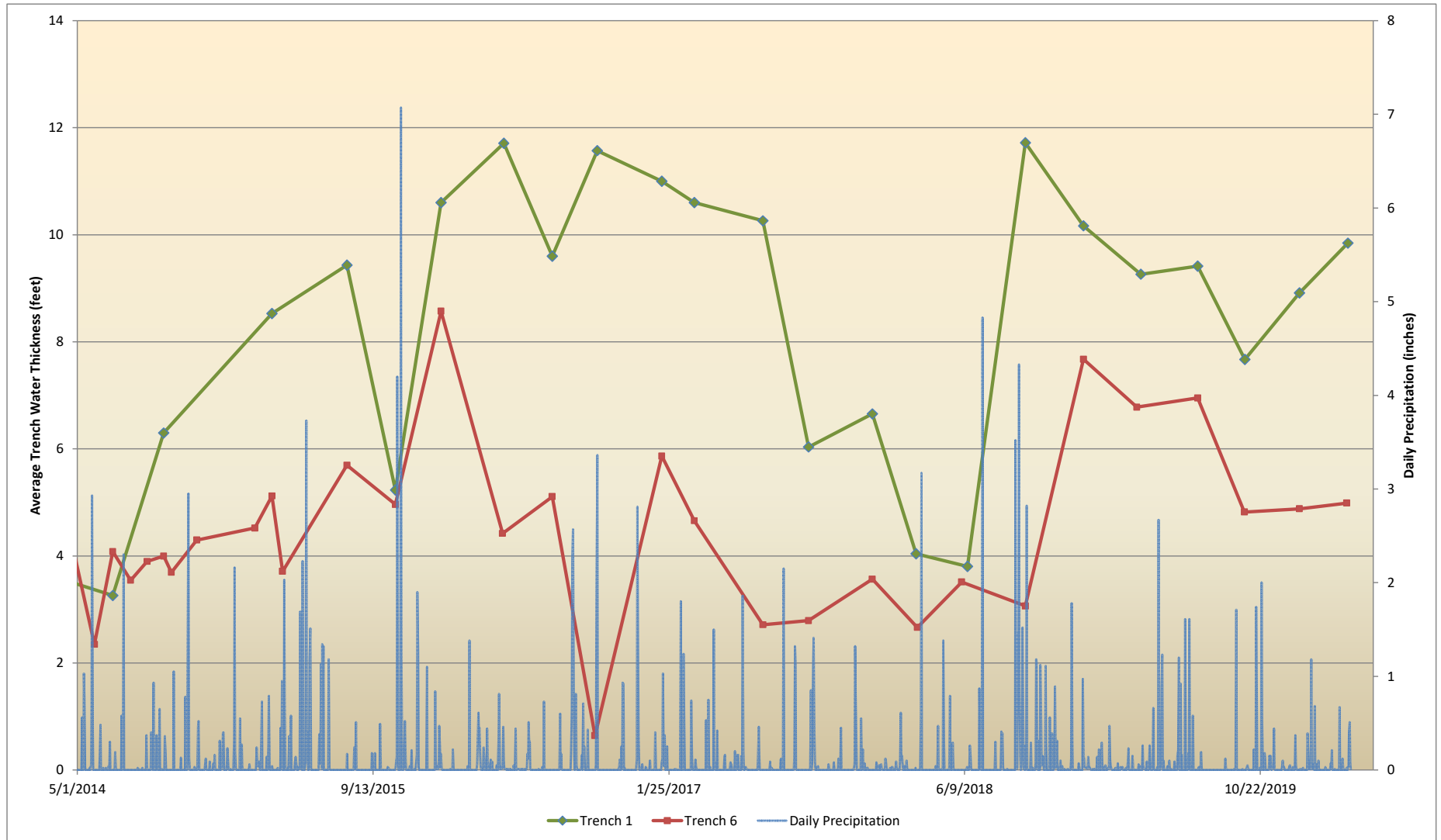


Figure 52.5.6

SWMU B-3 Bioreactor Trench Sump Average Water Thickness/ Daily Precipitation



Tables

Table 52.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2019 - April 2020

TRENCH 1								
Sump 1-1								
Sump Depth: 15.56 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
4/3/2019	1045	6.27	7.00	21.63	0.654	2.03	69.3	9.25
7/8/2019	953	6.17	6.36	23.12	0.802	0.20	87.0	9.35
9/26/2019	845	7.76	6.48	23.27	0.738	1.28	199.1	7.76
12/27/2019	1051	6.65	6.55	21.20	1.215	0.56	-222.4	8.87
3/18/2020	930	6.31	6.34	22.12	0.954	0.21	-160.4	9.64

TRENCH 1								
Sump 1-2								
Sump Depth: 15.52 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/27/2019	1305	6.41	6.84	21.36	0.833	0.57	-158.2	8.56
7/8/2019	940	6.07	6.33	23.98	0.849	0.36	-290.1	8.90
9/25/2019	920	7.67	6.67	24.17	0.713	0.44	-156.9	7.30
12/27/2019	1057	6.45	6.45	22.27	1.264	0.41	-155.7	8.52
3/16/2020	830	5.80	6.84	22.17	0.801	0.52	-134.2	9.72

TRENCH 1								
Sump 1-3								
Sump Depth: 14.97 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
4/3/2019	945	4.99	7.04	21.02	0.752	0.61	-4.5	9.98
7/8/2019	925	4.98	6.58	24.99	0.961	0.18	13.8	9.99
9/26/2019	940	7.02	6.66	26.87	0.842	0.37	-104.2	7.95
12/27/2019	1114	5.62	6.76	24.83	2.791	0.53	-162.4	9.35
3/18/2020	815	4.8	6.24	24.24	1.509	0.76	-86.1	10.17

Table 52.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2019 - April 2020

TRENCH 2								
Sump 2-1								
Sump Depth:			11.78 feet BTOC					
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
3/27/2019	1025	6.89	6.78	20.26	0.842	1.67	42.6	4.89
7/8/2019	1000	6.57	6.20	23.89	0.931	0.15	-39.5	5.21
9/25/2019	1030	8.1	6.38	25.39	0.828	0.76	203.6	3.68
12/27/2019	1043	7.13	6.59	21.91	0.927	0.85	-131.8	4.65
3/16/2020	1015	6.47	7.04	20.51	0.708	1.11	-175.5	5.31

TRENCH 2								
Sump 2-1								
Sump Depth:			11.12 feet BTOC					
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		(feet BTOC)		(°C)	(m-mho/cm)	(mg/L)	(eV)	(feet)
4/3/2019	1015	6.05	6.67	20.30	0.770	0.69	-165.8	5.07
7/8/2019	946	6.05	6.55	24.83	0.927	-241	0.19	5.07
9/26/2019	920	7.6	6.69	28.06	0.880	0.68	62	3.52
12/27/2019	1105	6.11	6.36	21.43	0.731	0.43	-140.4	5.01
3/18/2020	845	5.77	6.09	22.99	0.913	0.29	-102.6	5.35

Table 52.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2019 - April 2020

TRENCH 3 Sump 3-1								
Sump Depth: 11.05 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		<i>(feet BTOC)</i>		<i>(°C)</i>	<i>(m-mho/cm)</i>	<i>(mg/L)</i>	<i>(eV)</i>	<i>(feet)</i>
3/27/2019		8.05	6.71	18.67	0.787	1.32	140.40	3.00
7/8/2019	1017	8.04	6.47	24.01	1.328	0.34	52.20	3.01
9/25/2019		8.52	6.70	27.83	0.844	0.75	76.80	2.53
12/27/2019	1035	8.66	6.62	21.89	1.565	1.69	50.00	2.39
3/18/2020		8.19	6.10	19.10	1.147	1.09	46.60	2.86

TRENCH 3 Sump 3-2									
Sump Depth: 6.7 feet BTOC									
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness	
		<i>(feet BTOC)</i>		<i>(°C)</i>	<i>(m-mho/cm)</i>	<i>(mg/L)</i>	<i>(eV)</i>	<i>(feet)</i>	
3/27/2019		Dry							
7/8/2019	1006	6.90	6.86	26.50	0.963	0.64	133.50	0.50	
9/25/2019		Dry							
12/27/2019	1040	Dry							
3/18/2020		6.45	Dry						

Table 52.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2019 - April 2020

TRENCH 4									
Sump 4-1									
Sump Depth: 8.42 feet BTOC									
Sample Date	Sample Time	Sump H ₂ O Level <i>(feet BTOC)</i>	pH	Temperature <i>(°C)</i>	Specific Conductivity <i>(m-mho/cm)</i>	Dissolved Oxygen <i>(mg/L)</i>	ORP <i>(eV)</i>	Sump H ₂ O Thickness <i>(feet)</i>	
3/27/2019		Dry							
7/8/2019	1011	7.60	6.71	28.06	0.892	0.22	53.8	0.82	
9/25/2019		7.65	6.85	30.41	0.888	0.52	77.0	0.77	
12/27/2019	1028	7.90	7.33	21.71	0.742	8.15	100.6	0.52	
3/18/2020		8.40	Dry						

Table 52.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2019 - April 2020

TRENCH 5 Sump 5-1								
Sump Depth: 11.55 feet BTOC								
Sample Date	Sample Time	Sump H2O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H2O Thickness
		<i>(feet BTOC)</i>		<i>(°C)</i>	<i>(m-mho/cm)</i>	<i>(mg/L)</i>	<i>(eV)</i>	<i>(feet)</i>
3/27/2019		7.85	7.14	20.82	0.695	3.65	413.2	3.70
7/8/2019	1026	8.40	6.81	23.47	0.581	0.32	75.8	3.15
9/25/2019		8.31	6.66	23.96	0.621	0.43	133	3.24
12/27/2019	1013	9.42	6.47	21.20	0.706	0.58	-155.7	2.13
3/18/2020	1005	9.74	6.34	22.08	0.837	0.49	-70.8	1.81

TRENCH 5 Sump 5-2								
Sump Depth: 11.04 feet BTOC								
Sample Date	Sample Time	Sump H2O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H2O Thickness
		<i>(feet BTOC)</i>		<i>(°C)</i>	<i>(m-mho/cm)</i>	<i>(mg/L)</i>	<i>(eV)</i>	<i>(feet)</i>
3/27/2019		10.38	6.52	22.02	1.135	4.38	-198.2	0.66
7/8/2019	1021	8.21	6.59	28.61	0.914	0.21	-188.1	2.83
9/25/2019		8.72	6.65	32.18	0.858	0.39	25.5	2.32
12/27/2019	1020	10.14	6.67	27.41	0.968	3.65	38.7	0.90
3/18/2020		10.95			Dry			

Table 52.1.1

SWMU B-3 Bioreactor Trenches - Field Measurement Data
March 2019 - April 2020

TRENCH 6								
Sump 6-1								
Sump Depth: 14.5 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		<i>(feet BTOC)</i>		<i>(°C)</i>	<i>(m-mho/cm)</i>	<i>(mg/L)</i>	<i>(eV)</i>	<i>(feet)</i>
3/27/2019	1000	8.32	7.00	21.46	0.712	1.85	458.00	6.27
7/8/2019	1037	6.65	6.60	23.05	0.658	0.83	-98.00	7.94
9/26/2019	820	10.40	6.70	23.11	0.616	1.15	208.70	4.19
12/27/2019	955	10.35	6.67	21.26	0.641	1.66	-143.30	4.24
3/18/2020	1030	10.42	6.58	22.23	0.629	0.25	-163.50	4.17

TRENCH 6								
Sump 6-2								
Sump Depth: 15.56 feet BTOC								
Sample Date	Sample Time	Sump H ₂ O Level	pH	Temperature	Specific Conductivity	Dissolved Oxygen	ORP	Sump H ₂ O Thickness
		<i>(feet BTOC)</i>		<i>(°C)</i>	<i>(m-mho/cm)</i>	<i>(mg/L)</i>	<i>(eV)</i>	<i>(feet)</i>
3/27/2019	820	8.21	7.01	21.3	0.711	0.64	394.3	7.29
7/8/2019	1031	9.54	6.46	23.3	0.624	0.13	-216.3	5.96
9/25/2019	820	10.05	6.72	23.29	0.642	0.21	317.4	5.45
12/27/2019	1005	9.98	6.46	21.11	0.704	0.77	-162.4	5.52
3/16/2020	1110	9.7	6.95	22.26	0.614	0.51	-208.7	5.80

Table 52.1.2

B-3 Bioreactor Trench VOC Summary
Mar 2019 - Mar 2020

Q52	T1-1			T1-2			T1-3			
	Date	4/3/2019	9/26/2019	3/18/2020	3/27/2019	9/25/2019	3/16/2020	4/3/2019	9/26/2019	3/18/2020
PCE (µg/L)	0.76	0	0	0.52	0	0	0	0.35	0	0
TCE (µg/L)	2.8	1.5	1.5	1.7	0	0.51	0	0	0	0
cis-1,2-DCE (µg/L)	45	20	6.8	13	13	0.61	2.6	1.0	3.2	0
trans-1,2-DCE (µg/L)	1.1	0	0	4.4	1.1	0.44	1.2	0.59	0	0
Vinyl chloride (µg/L)	1.1	5.8	4.2	7.7	19	0.37	2.1	1.1	13	0
Ethene (µg/L)	0	0	0	0	0	0	0	0	0	0
PCE (nM/L)	4.583	0.000	0.000	3.136	0.000	0.000	2.111	0.000	0.000	0.000
TCE (nM/L)	21.082	11.188	11.493	13.015	0.000	3.882	0.000	0.000	0.000	0.000
cis-1,2-DCE (nM/L)	461.062	204.951	69.624	133.368	133.987	6.292	27.231	10.521	33.213	0.000
trans-1,2-DCE (nM/L)	11.862	0.000	0.000	45.384	11.449	4.538	12.068	6.086	0.000	0.000
Vinyl chloride (nM/L)	17.597	91.985	67.509	123.020	311.790	5.919	33.115	17.917	213.086	0.000
Ethene (nM/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Molar Conc. (nM/L)	516.19	308.12	148.63	317.92	457.23	20.63	74.52	34.52	246.30	0.000
% moles PCE	0.9%	0.0%	0.0%	1.0%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%
% moles TCE	4.1%	3.6%	7.7%	4.1%	0.0%	18.8%	0.0%	0.0%	0.0%	0.0%
% moles cis-1,2-DCE	89.3%	66.5%	46.8%	42.0%	29.3%	30.5%	36.5%	30.5%	13.5%	0.0%
% moles trans-1,2-DCE	2.3%	0.0%	0.0%	14.3%	2.5%	22.0%	16.2%	17.6%	0.0%	0.0%
% moles Vinyl Chloride	3.4%	29.9%	45.4%	38.7%	68.2%	28.7%	44.4%	51.9%	86.5%	0.0%
% moles Ethene	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Date	T2-1			T2-2		
	3/27/2019	9/25/2019	3/16/2020	4/3/2019	9/26/2019	3/18/2020
PCE (µg/L)	0.86	0.54	0	0.27	0	0
TCE (µg/L)	7.4	1.4	0	0.37	0	0
cis-1,2-DCE (µg/L)	24	6.2	2.2	2.1	0.94	1.9
trans-1,2-DCE (µg/L)	0.72	0	0.29	0	0	0
Vinyl chloride (µg/L)	0	0.92	6.3	0.93	2.2	6.7
Ethene (µg/L)	0	0	0	0	0	0
PCE (nM/L)	5.186	3.256	0.000	1.628	0.000	0.000
TCE (nM/L)	56.169	10.579	0.000	2.816	0.000	0.000
cis-1,2-DCE (nM/L)	243.837	64.260	22.383	21.351	9.696	19.804
trans-1,2-DCE (nM/L)	7.427	0.000	2.991	0.000	0.000	0.000
Vinyl chloride (nM/L)	0.000	14.718	101.264	14.878	34.714	106.703
Ethene (nM/L)	0.000	0.000	0.000	0.000	0.000	0.000
Total Molar Conc. (nM/L)	312.62	92.81	126.64	40.67	44.41	126.51
% moles PCE	1.7%	3.5%	0.0%	4.0%	0.0%	0.0%
% moles TCE	18.0%	11.4%	0.0%	6.9%	0.0%	0.0%
% moles cis-1,2-DCE	78.0%	69.2%	17.7%	52.5%	21.8%	15.7%
% moles trans-1,2-DCE	2.4%	0.0%	2.4%	0.0%	0.0%	0.0%
% moles Vinyl Chloride	0.0%	15.9%	80.0%	36.6%	78.2%	84.3%
% moles Ethene	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Date	T6-1			T6-2		
	3/27/2019	9/26/2019	3/18/2020	3/27/2019	9/25/2019	3/16/2020
PCE (µg/L)	25	23	1.0	21	0	0
TCE (µg/L)	41	33	5.3	28	0	0
cis-1,2-DCE (µg/L)	48	39	37	35	16	0.42
trans-1,2-DCE (µg/L)	0.65	0	0	0	0.55	0.58
Vinyl chloride (µg/L)	0	0.69	6.2	0	25	0.56
Ethene (µg/L)	0	0	0	0	2.4	0
PCE (nM/L)	151.179	137.309	6.030	125.852	0.000	0.000
TCE (nM/L)	308.623	252.759	40.642	209.909	0.000	0.000
cis-1,2-DCE (nM/L)	490.665	397.215	378.958	358.948	166.478	4.332
trans-1,2-DCE (nM/L)	6.704	0.000	0.000	0.000	5.673	5.982
Vinyl chloride (nM/L)	0.000	11.038	99.344	0.000	399.136	8.959
Ethene (nM/L)	0.000	0.000	0.000	0.000	85.561	0.000
Total Molar Conc. (nM/L)	957.17	798.32	524.97	694.71	656.85	19.3
% moles PCE	15.8%	17.2%	1.1%	18.1%	0.0%	0.0%
% moles TCE	32.2%	31.7%	7.7%	30.2%	0.0%	0.0%
% moles cis-1,2-DCE	51.3%	49.8%	72.2%	51.7%	25.3%	22.5%
% moles trans-1,2-DCE	0.7%	0.0%	0.0%	0.0%	0.9%	31.0%
% moles Vinyl Chloride	0.0%	1.4%	18.9%	0.0%	60.8%	46.5%
% moles Ethene	0.0%	0.0%	0.0%	0.0%	13.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: 0 sample indicates a non-detect analyte value

Table 52.1.3

B-3 Bioreactor Analytical Summary
Mar 2019 - Mar 2020

Q52		Bioreactor Active Trench Sumps																		
Well ID		Y1-1						Y1-2						Y1-3						
Sample Date	Compound	Units	4/3/2019		9/26/2019		3/18/2020		3/27/2019		9/25/2019		3/16/2020		4/3/2019		9/26/2019		3/18/2020	
			Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L		4.0		5.4		24		11		5.0		25		16		10		56	
Methane	ug/L		1.3		0		2,160		50		847		6,060		2.1		3,580		7,140	
Ethene	ug/L		0		0		0		0		0		0		0		0		0	
Ethane	ug/L		0		0		0		0		0		1.5	F	0		0		0	
Carbon Dioxide	ug/L		7,750		38,200		57,500		54,300		52,700		134,000		8,660		125,000		409,000	
Sulfate	mg/L		31		46		8.0		18		9.9		0		13		21		3.1	
Chloride	mg/L		16		13		17		15		13		16		15		13		25	
Ferrous Iron	mg/L		0.58	F	0.59	F	5.4		11		4.4		9.7		2.7		5.0		15	J
Manganese	ug/L		458		199		323		322		156		470		464		510		1,000	
Hydrogen	nM		0		0		0		1.6		4.4		5.1		0		0		0	
Sulfide	mg/L		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L		396		473		502		426		412		531		482		515		954	
Benzene	ug/L		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	ug/L		0		0		0		0		0		0		0		0		0	
Bromoform	ug/L		0		0		0		0		0		0		0		0		0	
Chloroform	ug/L		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	ug/L		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	ug/L		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	ug/L		0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	ug/L		45		20		6.8		13		13		0.61	F	2.6		1.0	F	3.2	
Dichloroethene, trans-1,2-	ug/L		1.1		0		0		4.4		1.1		0.44	F	1.2		0.59	F	0	
Methylene chloride	ug/L		0		0		0		0		0		0		0		0		0	
Naphthalene	ug/L		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	ug/L		0.76	F	0		0		0.52	F	0		0		0.35	F	0		0	
Toluene	ug/L		0		0		1.3		0		0		0		0		0		22	
Trichloroethene	ug/L		2.8		1.5		1.5		1.7		0		0.51	F	0		0		0	
Vinyl chloride	ug/L		1.1		5.8		4.2		7.7		19		0.37	F	2.1		1.1		13	
Arsenic	ug/L		10	F	6.2	F	3.3	F	0.70	F	2.5	F	0.50	F	9.0	F	0		4.9	F
			Month 143		Month 149		Month 155		Month 143		Month 149		Month 155		Month 143		Month 149		Month 155	

Well ID		T2-1						T2-2						
Sample Date	Compound	Units	3/27/2019		9/25/2019		3/16/2020		4/3/2019		9/26/2019		3/18/2020	
			Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L		5.0		4.6		21		7.2		18		11	
Methane	ug/L		0		724		1,360		2,110		1,650		5,220	
Ethene	ug/L		0		0		0		0		0		0	
Ethane	ug/L		0		0		0		0		0		0	
Carbon Dioxide	ug/L		55,900		92,700		61,000		63,300		115,000		386,000	
Sulfate	mg/L		21		14		2.7		2.1		17		5.3	
Chloride	mg/L		15		14		16		15		13		14	
Ferrous Iron	mg/L		0.78	F	0.62	F	4.8		5.1		9.7		10	J
Manganese	ug/L		168		203		340		543		363		503	
Hydrogen	nM		1.1		3.5		6.4		0		0		0	
Sulfide	mg/L		0		0		0		0		0		0	
Total Dissolved Solids	mg/L		419		481		487		450		568		513	
Benzene	ug/L		0		0		0		0		0		0	
Bromodichloromethane	ug/L		0		0		0		0		0		0	
Bromoform	ug/L		0		0		0		0		0		0	
Chloroform	ug/L		0		0		0		0		0		0	
Dibromochloromethane	ug/L		0		0		0		0		0		0	
Dichlorodifluoromethane	ug/L		0		0		0		0		0		0	
Dichloroethene, 1,1-	ug/L		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	ug/L		24		6.2		2.2		2.1		0.94	F	1.9	
Dichloroethene, trans-1,2-	ug/L		0.72		0		0.29	F	0		0		0	
Methylene chloride	ug/L		0		0		0		0		0		0	
Naphthalene	ug/L		0		0		0		0		0		0	
Tetrachloroethene	ug/L		0.86	F	0.54	F	0		0.27	F	0		0	
Toluene	ug/L		0		0		0		0		0		15	
Trichloroethene	ug/L		7.4		1.4		0		0.37	F	0		0	
Vinyl chloride	ug/L		0		0.92	F	6.3		0.93	F	2.2		6.7	
Arsenic	ug/L		0		0		0.80	F	0		6.9	F	3.7	F
			Month 143		Month 149		Month 155		Month 143		Month 149		Month 155	

Well ID		T6-1						T6-2						
Sample Date	Compound	Units	3/27/2019		9/26/2019		3/18/2020		3/27/2019		9/25/2019		3/16/2020	
			Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L		2.1		2.4		2.8		2.2		2.9		5.2	
Methane	ug/L		0		2.3		65		0.50	F	127		1,570	
Ethene	ug/L		0		0		0		0		2.4	F	0	
Ethane	ug/L		0		0		0		0		0		3.2	
Carbon Dioxide	ug/L		12,800		10,100		12,700		8,420		33,100		69,800	
Sulfate	mg/L		26		22		21		28		15		13	
Chloride	mg/L		17		13		14		17		13		15	
Ferrous Iron	mg/L		0.28	F	0.60	F	3.0		0.37	F	2.6		0.99	F
Manganese	ug/L		12		51		82		24		32		86	
Hydrogen	nM		0		0		0		1.1		3.1		8.1	
Sulfide	mg/L		0		0		0		0		0		0	
Total Dissolved Solids	mg/L		362		378		326		366		370		349	
Benzene	ug/L		0		0		0		0		0		0	
Bromodichloromethane	ug/L		0		0		0		0		0		0	
Bromoform	ug/L		0		0		0		0		0		0	
Chloroform	ug/L		0		0		0		0		0		0	
Dibromochloromethane	ug/L		0		0		0		0		0		0	
Dichlorodifluoromethane	ug/L		0		0		0		0		0		0	
Dichloroethene, 1,1-	ug/L		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	ug/L		48		39		37		35		16		0.42	F
Dichloroethene, trans-1,2-	ug/L		0.65		0		0		0		0.55	F	0.58	F
Methylene chloride	ug/L		0		0		0		0		0		0	
Naphthalene	ug/L		0		0		0		0		0		0	
Tetrachloroethene	ug/L		25		23		1.0	F	21		0		0	
Toluene	ug/L		0		0		0.19	F	0		0		1.1	F
Trichloroethene	ug/L		41		33		5.3		28		0		0	
Vinyl chloride	ug/L		0		0.69	F	6.2		0		25		0.56	F
Arsenic	ug/L		0		0		0		7.0	F	0		0.80	F
			Month 143		Month 149		Month 155		Month 143		Month 149		Month 155	

Note: 0 sample indicates a non-detect analyte value

Table 52.2.2

Upper Saturated Zone (Zone 03B) VOC Summary
Mar 2019 - Mar 2020

Q52 Date	CS-WB05-LGR03B			CS-WB06-LGR03B			CS-WB07-LGR03B			CS-WB08-LGR03B		
	3/20/2019	9/12/2019	3/11/2020	3/21/2019	9/23/2019	3/12/2020	3/20/2019	9/12/2019	3/11/2020	3/22/2019	9/23/2019	3/12/2020
PCE (µg/L)	0.47	414	0.57	13	33	7.9	55	26	8.1	4.2	34	32
TCE (µg/L)	10	5.6	0.43	74	28	54	84	29	13	96	122	62
cis-1,2-DCE (µg/L)	87	76	60	124	64	83	97	34	17	141	177	93
trans-1,2-DCE (µg/L)	10	10	11	4.4	0	5.9	1.5	0.73	0.47	0	0.41	1.5
Vinyl chloride (µg/L)	16	15	12	0	0	0.22	1.3	0	0.31	0	0	0.63
Ethene (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
PCE (nM/L)	2.834	2495.990	3.437	80.263	201.894	47.820	329.494	155.943	48.725	25.327	203.883	194.356
TCE (nM/L)	76.870	42.545	3.273	559.632	210.062	408.022	637.796	218.510	95.593	730.878	929.371	468.681
cis-1,2-DCE (nM/L)	893.450	780.093	614.234	1279.835	658.690	857.246	997.731	355.750	174.007	1458.174	1820.629	958.123
trans-1,2-DCE (nM/L)	107.272	107.581	112.429	45.384	0.000	61.269	15.059	7.530	4.848	0.000	4.229	15.059
Vinyl chloride (nM/L)	248.280	247.000	186.850	0.000	0.000	3.519	20.957	0.000	4.959	0.000	0.000	10.078
Ethene (nM/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Molar Conc. (nM/L)	1328.71	3673.21	920.22	1965.11	1070.65	1377.88	2001.04	737.73	328.13	2214.38	2958.11	1646.3
% moles PCE	0.2%	68.0%	0.4%	4.1%	18.9%	3.5%	16.5%	21.1%	14.8%	1.1%	6.9%	11.8%
% moles TCE	5.8%	1.2%	0.4%	28.5%	19.6%	29.6%	31.9%	29.6%	29.1%	33.0%	31.4%	28.5%
% moles cis-1,2-DCE	67.2%	21.2%	66.7%	65.1%	61.5%	62.2%	49.9%	48.2%	53.0%	65.9%	61.5%	58.2%
% moles trans-1,2-DCE	8.1%	2.9%	12.2%	2.3%	0.0%	4.4%	0.8%	1.0%	1.5%	0.0%	0.1%	0.9%
% moles Vinyl Chloride	18.7%	6.7%	20.3%	0.0%	0.0%	0.3%	1.0%	0.0%	1.5%	0.0%	0.0%	0.6%
% moles Ethene	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: 0 sample indicates a non-detect analyte value

Table 52.2.3a

B-3 Bioreactor Multi-Port Well CS-WB05 Analytical Summary
Mar 2019 - Mar 2020

Q52		CS-WB05																																			
Well ID		CS-WB05-LGR-01				CS-WB05-LGR-02		CS-WB05-LGR03A		CS-WB05-LGR03B				CS-WB05-LGR-04A				CS-WB05-LGR-04B				CS-WB05-BS-01				CS-WB05-CC-01				CS-WB05-CC-02							
Sample Date		3/20/2019		12/19/2019		3/20/2019		3/20/2019		3/20/2019		9/12/2019		3/11/2020		3/18/2019		12/19/2019		3/18/2019		12/19/2019		3/18/2019		12/19/2019		3/18/2019		12/18/2019		3/18/2019		12/18/2019			
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag		
Total Organic Carbon	mg/L	6.2		1.1	F	5.7		5.5		6.0		1.4		1.4	F	1.1		1.0	F	1.4		1.4	F	0.94	F	2.6		1.0		3.1		0.97	F	1.7	F		
Methane	µg/L	0		1.7		31		12		10		11		21		194		127		194		194		4.6		11		0		5.9		1.2		3.9			
Ethene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Carbon Dioxide	µg/L	22,900		9,550		25,800		4,960		5,880		5,240		8,830		5,700		5,100		11,600		8,170		5,380		5,900		4,380		5,460		4,270		5,220			
Sulfate	mg/L	121	J	98		114	J	45		45		48		39		25		11		32		20		11		8.4		104	J	81		124	J	42			
Chloride	mg/L	13		15		12		11		11		11		11		21		12		13		11		36		17		20		19		36					
Ferrous Iron	mg/L	0		0		0		0		0		0.19	F	0.20	F	0.28	F	0.22	F	1.0		0		0		0		0.23	F	0.20	F	0.20	F	0.57	F		
Manganese	µg/L	0		5.0		0		0		0		0		0		4.0	F	7.0		32		37		0		28		0		2.0	F	0		5.0			
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Total Dissolved Solids	mg/L	503		603		460		339		346		372		449		320		426		291		374		321		456		404		452		408		506			
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Dichloroethene, cis-1,2-	µg/L	4.7		5.6		32		90		87		76		60		321		167	J	399		267	J	28		17		0		0.76	F	7.9		8.1			
Dichloroethene, trans-1,2-	µg/L	1.6		1.4		9.2		10		10		10		11		16		13		30		14		0		0		0		5.6		5.4					
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Tetrachloroethene	µg/L	0		0.76	F	0		0.34	F	0.47	F	414	J	0.57	F	0.45	F	1.1	F	51		96		0		0.89	F	0		0.58	F	0		0.95	F		
Toluene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0		0			
Trichloroethene	µg/L	0		0.83	F	0		12		10		5.6		0.43	F	1.1		0.96	F	222		139	J	0		0		0		0		0		0			
Vinyl chloride	µg/L	0		0.48	F	2.9		15		16		15		12		54		42		51		94		2.8		2.7		0		0		0		0			
Arsenic	µg/L	2.7	F	0.90	F	4.0	F	9.5	F	9.5	F	8.2	F	0		8.7	F	0.90	F	23	F	7.6	F	1.1	F	0.70	F	0.30	F	0.50	F	0		0.70	F		
		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q48-Month 143		Q48-Month 143		Q50-Month 149		Q52-Month 155		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143	

Note: 0 sample indicates a non-detect analyte value

Table 52.2.3b

B-3 Bioreactor Multi-Port Well CS-WB06 Analytical Summary
Mar 2019 - Mar 2020

Q52		CS-WB06																									
Well ID	Sample Date	CS-WB06-UGR-01				CS-WB06-LGR-01				CS-WB06-LGR-02				CS-WB06-LGR03A				CS-WB06-LGR03B				CS-WB06-LGR-04					
		3/22/2019	12/30/2019	3/22/2019	12/23/2019	3/22/2019	12/23/2019	3/22/2019	12/23/2019	3/22/2019	12/23/2019	3/21/2019	9/23/2019	3/12/2020	3/21/2019	12/23/2019											
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag				
Total Organic Carbon	mg/L	2.4		3.5		2.6		2.8		1.5		0.91	F	1.6		0.84	F	1.3		1.5		1.2	F	1.8		1.4	F
Methane	µg/L	8.6		57		3.1		0		7.6		6.3		54		16		76		0		25		598		3.6	
Ethene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	30,700		39,500		11,300		10,400		4,990		4,910		4,810		5,350		7,170		22,500		7,130		36,200		12,500	
Sulfate	mg/L	22		6.9		20		9.5		28		27		23		25		23		21		22		14		14	
Chloride	mg/L	15		16		13		17		9.7		11		12		13		12		12		12		15		16	
Ferrous Iron	mg/L	1.2		3.9		0		0		0		0		0		0		0		0		0		0		0	
Manganese	µg/L	494		1,080		34		9.0		0		2.0	F	0		2.0	F	0		2.0	F	0		0		10	
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	405		459		402		518		345		425		333		401		322		384		413		356		429	
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	42		9.1		18		3.5		33		23		139		96		124		64		83		86		51	
Dichloroethene, trans-1,2-	µg/L	0		0.56	F	0		0		0		0.65		3.7		6.1		4.4		0		5.9		1.3		0	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	0.50	F	0		1.3	F	5.3		0		0		13		5.3		13		33		7.9		42		22	
Toluene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0	
Trichloroethene	µg/L	4.4		0		0		4.5		0		1.0		82		54		74		28		54		38		17	
Vinyl chloride	µg/L	2.2		2.8		0.24	F	0		1.1	F	2.0		0.26	F	0		0		0		0.22	F	1.9		0	
Arsenic	µg/L	5.9	F	8.0	F	0		0.60	F	5.2	F	0.60	F	0		0.60	F	0		2.0	F	0		9.7	F	1.1	F
		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q50-Month 149		Q52-Month 155		Q48-Month 143		Q51-Month 152	

Note: 0 sample indicates a non-detect analyte value

Table 52.2.3c

B-3 Bioreactor Multi-Port Well CS-WB07 Analytical Summary
Mar 2019 - Mar 2020

Q52		CS-WB07																			
Well ID		CS-WB07-LGR-01				CS-WB07-LGR-02				CS-WB07-LGR03A				CS-WB07-LGR03B				CS-WB07-LGR-04			
Sample Date		3/21/2019		12/23/2019		3/21/2019		12/23/2019		3/21/2019		3/20/2019		9/12/2019		3/11/2020		3/20/2019		12/23/2019	
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L	3.9		29		1.3		0.85	F	1.3		6.6		1.3		1.0	F	4.9		0.82	F
Methane	µg/L	627		873		42		39		111		431		62		217		0		0	
Ethene	µg/L	0		0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	37,400		107,000		5,490		5,320		3,730		12,300		8,320		6,350		9,540		7,510	
Sulfate	mg/L	16		0.36	F	40		40		19		19		22		22		10		10	
Chloride	mg/L	18		22		13		14		10		11		10		9.6		12		14	
Ferrous Iron	mg/L	2.3		6.5		0.39	F	0.38	F	0		0.30	F	0		0		0		0	
Manganese	µg/L	851		1,190		12		14		0		0		3.0	F	2.0	F	0		3.0	F
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	451		755		351		448		328		316		335		389		292		363	
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	105		0.44	F	1.4		2.3		65		97		34		17		414		277	
Dichloroethene, trans-1,2-	µg/L	2.5		1.8		0		0		0.96		1.5		0.73		0.47	F	1.5		0.65	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	0		0.45	F	0		1.7		26		55		26		8.1		259		178	
Toluene	µg/L	0		10		0		0		0		0		0		0		0		0	
Trichloroethene	µg/L	0		0.26	F	0		1.4		44		84		29		13		347		232	
Vinyl chloride	µg/L	22		0		0.75	F	1.8		0.64	F	1.3		0		0.31	F	0		0	
Arsenic	µg/L	14	F	2.6	F	0		0.60	F	0		1.5	F	6.8	F	3.9	F	10	F	0.80	F
		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q48-Month 143		Q50-Month 149		Q52-Month 155		Q48-Month 143		Q51-Month 152	

Note: 0 sample indicates a non-detect analyte value

Table 52.2.3d

B-3 Bioreactor Multi-Port Well CS-WB08 Analytical Summary
Mar 2019 - Mar 2020

Q52		CS-WB08																							
Well ID	Sample Date	CS-WB08-UGR-01				CS-WB08-LGR-01				CS-WB08-LGR-02				CS-WB08-LGR03A		CS-WB08-LGR03B				CS-WB08-LGR-04					
		3/26/2019	12/30/2019	3/26/2019	12/30/2019	3/26/2019	12/30/2019	3/26/2019	12/30/2019	3/26/2019	12/30/2019	3/26/2019	12/30/2019	3/22/2019	9/23/2019	3/12/2020	3/22/2019	12/30/2019							
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag				
Total Organic Carbon	mg/L	2.1		3.3		1.5		0.98	F	1.5		1.2		1.7		1.7		1.3		1.1	F	2.8		3.0	
Methane	µg/L	82		998		0.60	F	0		24		12		766		704		144		215		2.0		2.7	
Ethene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	9,090		51,800		7,080		7,250		5,990		6,470		11,000		29,300		10,700		12,400		30,600		47,500	
Sulfate	mg/L	19		0.61	F	128	J	130	J	128	J	131	J	18		18		16		18		19		7.7	
Chloride	mg/L	16		15		12		12		11		12		12		12		11		11		15		17	
Ferrous Iron	mg/L	1.4		7.8		0		1.7		0		0.20	F	0.45	F	0.33	F	0.23	F	3.2		0		0	
Manganese	µg/L	697		791		0		2.0	F	0		2.0	F	29		38		32		26		85		562	
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	360		450		540		604		535		578		415		371		394		402		402		487	
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	80		1.5		13		12		5.2		8.5		126		141	J	177		93		18		5.3	
Dichloroethene, trans-1,2-	µg/L	1.3		0.62		0		0.49	F	0		0.38	F	0.72		0		0.41	F	1.5		0		0	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	1.0	F	0		0		0		0		0.90	F	5.6		4.2		34		32		4.6		2.6	
Toluene	µg/L	0.63	F	7.0		1.4		0		2.5		0		4.0		0		0		0		0		0	
Trichloroethene	µg/L	0.66	F	0		0		0		1.3		1.1		95		96		122		62		5.9		2.8	
Vinyl chloride	µg/L	19		0.85	F	0.88	F	0.47	F	0		0.28	F	0		0		0		0.63	F	0		0	
Arsenic	µg/L	0		5.5	F	0		1.2	F	3.2	F	2.1	F	0		8.0	F	0		0		3.6	F	1.0	F
		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q51-Month 152		Q48-Month 143		Q48-Month 143		Q50-Month 149		Q52-Month 155		Q48-Month 143		Q51-Month 152	

Note: 0 sample indicates a non-detect analyte value

Table 52.3.3

B-3 Bioreactor Monitoring Well Analytical Summary
Mar 2019 - Mar 2020

Q52		Monitoring Wells																	
Well ID		CS-MW1-LGR						CS-D						CS-MW5-LGR					
Sample Date		3/6/2019		9/5/2019		3/2/2020		3/6/2019		9/5/2019		3/2/2020		3/6/2019		9/5/2019		3/2/2020	
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L	1.3		1.2		1.1		1.0		1.0		0.90	F	1.1		1.0		0.97	F
Methane	µg/L	0		0		0.63	F	0		0.80	F	0		3.0		0		0	
Ethene	µg/L	0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	7,910		10,800		9,020		6,260		10,100		6,110		12,400		9,320		6,800	
Sulfate	mg/L	21		17		15		22		20		20		17		17		15	
Chloride	mg/L	9.7		9.6		9.3		9.9		10		10		7.9		8.7		8.8	
Ferrous Iron	mg/L	0.25	F	0		0		0.23	F	0		0		0.23	F	0		0	
Manganese	µg/L	0		2.0	F	0		7.0		5.0		0		2.0	F	5.0		0	
Hydrogen	nM	1.9	F	1.2		1.9													
Sulfide	mg/L	0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	336		330		320		311		320		337		311		328		336	
Benzene	µg/L	0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	17		19		14		2.1		3.4		3.1		2.0		6.2		7.1	
Dichloroethene, trans-1,2-	µg/L	0		0		0		0		0		0		0.67		1.4		1.4	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	12		16		11		3.0		4.3		4.1		0		1.2	F	1.8	
Toluene	µg/L	0		0		0		0		0		0		0		0		0	
Trichloroethene	µg/L	17		29		22		3.3		5.3		4.7		1.1		4.7		5.3	
Vinyl chloride	µg/L	0		0		0		0		0		0		0		0		0	
Arsenic	µg/L	0		3.5	F	0.80	F	0		0		2.0	F	14	F	5.1	F	0	

Note: 0 sample indicates a non-detect analyte value

Table 52.4.4

SWMU B-3 Microbial Data Summary
Mar 2019 - Mar 2020

Trench Sump					
B3-T1-2	Sample Date:	3/27/2019	9/25/2019	Not Sampled	3/16/2020
Dechlorinating Bacteria	Units				
Dehalococcoides spp (1)	cells/mL	8.35E+02	1.62E+03	--	2.38E+03
Functional Genes	Units				
TCE R-Dase (1)	cells/mL	9.21E+02	7.56E+01	--	1.32E+02
BAV1 VC R-Dase (1)	cells/mL	4.23E+01	1.04E+02	--	3.40E+00
VC R-Dase	cells/mL	1.73E+02	2.63E+02	--	5.36E+02
B3-T2-1	Sample Date:	3/27/2019	9/25/2019	Not Sampled	3/16/2020
Dechlorinating Bacteria	Units				
Dehalococcoides spp (1)	cells/mL	3.70E+00	3.58E+02	--	1.97E+03
Functional Genes	Units				
TCE R-Dase (1)	cells/mL	1.27E+01	2.58E+01	--	2.54E+02
BAV1 VC R-Dase (1)	cells/mL	< 5.00E-01	1.00E-01 F	--	< 5.00E-01
VC R-Dase	cells/mL	2.59E+01	1.06E+02	--	4.99E+02
B3-T6-2	Sample Date:	3/27/2019	9/25/2019	Not Sampled	3/16/2020
Dechlorinating Bacteria	Units				
Dehalococcoides spp (1)	cells/mL	4.03E+01	3.45E+03	--	2.08E+03
Functional Genes	Units				
TCE R-Dase (1)	cells/mL	1.68E+01	8.02E+01	--	8.51E+01
BAV1 VC R-Dase (1)	cells/mL	4.00E-01 F	1.51E+02	--	2.63E+01
VC R-Dase	cells/mL	3.86E+01	4.62E+02	--	3.21E+02

Extraction Wells					
CS-MW16-LGR	Sample Date:	Not Sampled	Not Sampled	1/6/2020	Not Sampled
Dechlorinating Bacteria	Units				
Dehalococcoides spp (1)	cells/mL	--	--	< 5.00E-01	--
Functional Genes	Units				
TCE R-Dase (1)	cells/mL	--	--	< 5.00E-01	--
BAV1 VC R-Dase (1)	cells/mL	--	--	< 5.00E-01	--
VC R-Dase	cells/mL	--	--	< 5.00E-01	--
B3-EXW01	Sample Date:	3/6/2019	Not Sampled	1/6/2020	Not Sampled
Dechlorinating Bacteria	Units				
Dehalococcoides spp (1)	cells/mL	6.50E+00	--	4.40E+00	--
Functional Genes	Units				
TCE R-Dase (1)	cells/mL	1.40E+00	--	1.20E+00	--
BAV1 VC R-Dase (1)	cells/mL	< 5.00E-01	--	< 5.00E-01	--
VC R-Dase	cells/mL	1.00E+00	--	7.00E-01	--

Monitoring Wells					
CS-MW1-LGR	Sample Date:	3/6/2019	9/5/2019	Not Sampled	3/2/2020
Dechlorinating Bacteria	Units				
Dehalococcoides spp (1)	cells/mL	4.00E-01 F	< 5.00E-01		3.00E-01 F
Functional Genes	Units				
TCE R-Dase (1)	cells/mL	< 5.00E-01	< 5.00E-01		< 5.00E-01
BAV1 VC R-Dase (1)	cells/mL	< 5.00E-01	< 5.00E-01		< 5.00E-01
VC R-Dase	cells/mL	< 5.00E-01	< 5.00E-01		< 5.00E-01

Westbay Multi-Port Wells					
CS-WB05-LGR-04B	Sample Date:	3/18/2019	Not Sampled	12/19/2019	Not Sampled
Dechlorinating Bacteria	Units				
Dehalococcoides spp (1)	cells/mL	2.00E-01 F	--	9.00E-01	--
Functional Genes	Units				
TCE R-Dase (1)	cells/mL	1.00E-01 F	--	3.00E-01 F	--
BAV1 VC R-Dase (1)	cells/mL	< 5.00E-01	--	< 5.00E-01	--
VC R-Dase	cells/mL	2.00E-01 F	--	2.00E-01 F	--

Table 52.5.2

Storage Tank (UIC) VOC Summary
Mar 2019 - Mar 2020

Q52 Date	B3-UIC				
	3/27/2019	6/3/2019	9/18/2019	12/30/2019	3/18/2020
PCE (µg/L)	49	21	55	68	54
TCE (µg/L)	68	27	70	79	69
cis-1,2-DCE (µg/L)	66	26	75	88	71
trans-1,2-DCE (µg/L)	1.2	0.80	1.1	0.83	0
Vinyl chloride (µg/L)	0	0	0	0	0
Ethene (µg/L)	0	0	0	0	0
Separator					
PCE (nM/L)	296.267	127.118	333.173	410.601	325.635
TCE (nM/L)	520.968	208.539	533.754	600.198	524.165
cis-1,2-DCE (nM/L)	678.391	266.529	770.294	904.796	735.637
trans-1,2-DCE (nM/L)	12.068	8.252	11.037	8.561	0.000
Vinyl chloride (nM/L)	0.000	0.000	0.000	0.000	0.000
Ethene (nM/L)	0.000	0.000	0.000	0.000	0.000
Total Molar Conc. (nM/L)	1507.7	610.4	1648.3	1924.2	1585.4
% moles PCE	19.7%	20.8%	20.2%	21.3%	20.5%
% moles TCE	34.6%	34.2%	32.4%	31.2%	33.1%
% moles cis-1,2-DCE	45.0%	43.7%	46.7%	47.0%	46.4%
% moles trans-1,2-DCE	0.8%	1.4%	0.7%	0.4%	0.0%
% moles Vinyl Chloride	0.0%	0.0%	0.0%	0.0%	0.0%
% moles Ethene	0.0%	0.0%	0.0%	0.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%

Note: 0 sample indicates a non-detect analyte value

Table 52.5.3

SWMU B3-UIC Analytical Summary Table
Mar 2019 - Mar 2020

Q52		B3-UIC									
Well ID											
Sample Date		3/27/2019		6/3/2019		9/18/2019		12/30/2019		3/18/2020	
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Dissolved Solids	mg/L	353		400		363		345		302	
Benzene	µg/L	0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	66		26		75		88		71	
Dichloroethene, trans-1,2-	µg/L	1.2		0.80		1.1		0.83		0	
Methylene chloride	µg/L	0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0	
Tetrachloroethene	µg/L	49		21		55		68		54	
Toluene	µg/L	0		0		0		0		0	
Trichloroethene	µg/L	68		27		70		79		69	
Vinyl chloride	µg/L	0		0		0		0		0	

Table 52.6.2

B-3 Bioreactor Extraction Well VOC Summary
Mar 2019 - Jan 2020

Q51	16-LGR	16-CC		EXW01		EXW02	EXW03		EXW04		EXW05	
Date	1/6/2020	3/4/2019	12/31/2019	3/6/2019	1/6/2020	12/31/2019	3/4/2019	12/31/2019	3/4/2019	12/31/2019	3/4/2019	12/31/2019
PCE (µg/L)	30	0	0	87	81	44	26	64	41	90	51	51
TCE (µg/L)	35	1.7	1.3	105	91	63	31	66	57	102	62	60
cis-1,2-DCE (µg/L)	32	8.7	10.0	127	112	47	28	63	43	108	53	55
trans-1,2-DCE (µg/L)	0	4.8	5.2	0.59	0	0.47	0	0.41	0.64	0.81	0	0
Vinyl chloride (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
Ethene (µg/L)	0	0	0	0	0	0	0	0	0	0	0	0
PCE (nM/L)	182.235	0.000	0.000	526.684	485.980	264.910	158.958	384.430	249.533	542.001	307.001	309.293
TCE (nM/L)	267.524	13.091	9.742	800.061	689.779	480.174	233.427	504.529	430.779	773.727	470.812	458.863
cis-1,2-DCE (nM/L)	328.623	89.428	102.837	1305.003	1151.418	480.970	286.230	653.739	439.917	1109.644	548.324	571.429
trans-1,2-DCE (nM/L)	0.000	49.923	54.152	6.086	0.000	4.848	0.000	4.229	6.601	8.355	0.000	0.000
Vinyl chloride (nM/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Ethene (nM/L)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Molar Conc. (nM/L)	778.4	152.44	166.73	2637.83	2327.18	1230.90	678.62	1546.93	1126.83	2433.73	1326.14	1339.58
% moles PCE	23.4%	0.0%	0.0%	20.0%	20.9%	21.5%	23.4%	24.9%	22.1%	22.3%	23.2%	23.1%
% moles TCE	34.4%	8.6%	5.8%	30.3%	29.6%	39.0%	34.4%	32.6%	38.2%	31.8%	35.5%	34.3%
% moles cis-1,2-DCE	42.2%	58.7%	61.7%	49.5%	49.5%	39.1%	42.2%	42.3%	39.0%	45.6%	41.3%	42.7%
% moles trans-1,2-DCE	0.0%	32.7%	32.5%	0.2%	0.0%	0.4%	0.0%	0.3%	0.6%	0.3%	0.0%	0.0%
% moles Vinyl Chloride	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
% moles Ethene	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
sum % moles	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Note: 0 sample indicates a non-detect analyte value

Table 52.6.3

B-3 Bioreactor Extraction Well Analytical Summary
Mar 2019 - Jan 2020

Well ID	Extraction Wells																								
	CS-MW16-LGR		CS-MW16-CC				B3-EXW01				B3-EXW02		B3-EXW03				B3-EXW04				B3-EXW05				
	Sample Date	Units	1/6/2020	3/4/2019	12/31/2019	3/6/2019	1/6/2020	12/31/2019	3/4/2019	12/31/2019	3/4/2019	12/31/2019	3/4/2019	12/31/2019	3/4/2019	12/31/2019	3/4/2019	12/31/2019	3/4/2019	12/31/2019	3/4/2019	12/31/2019			
Compound		Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag				
Total Organic Carbon	mg/L	0.73	F	1.0		0.99	F	1.5		1.1		1.0		1.7		2.5		2.8		1.3		1.2		0.81	F
Methane	µg/L	0		1.9		1.1		156		54		0		0		0.70	F	0		0		4.3		0	
Ethene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	9,500		8,550		7,040		11,600		11,700		35,500		11,800		54,500		12,100		33,300		10,800		9,680	
Sulfate	mg/L	20		91	J	91	J	13		13		17		20		9.0		12		9.9		16		16	
Chloride	mg/L	12		19		22		13		14		14		21		15		12		14		9.9		11	
Ferrous Iron	mg/L	0		0.31	F	0.44	F	0.32	F	0		0.19	F	0		0		0.53	F	0		0.30	F	4.1	
Manganese	µg/L	0		0		3.0	F	0		4.0	F	4.0	F	9.0		34		238		3.0	F	29		0	
Hydrogen	nM	1.4						1.6		37															
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	345		418		455		371		384		383		403		416		350		387		345		337	
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	32		8.7		10.0		127		112		47		28		63		43		108		53		55	
Dichloroethene, trans-1,2-	µg/L	0		4.8		5.2		0.59	F	0		0.47	F	0		0.41	F	0.64		0.81		0		0	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	30		0		0		87		81		44		26		64		41		90		51		51	
Toluene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Trichloroethene	µg/L	35		1.7		1.3		105		91		63		31		66		57		102		62		60	
Vinyl chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0	
Arsenic	µg/L	0.70	F	5.3	F	2.0	F	3.2	F	1.6	F	1.4	F	11	F	1.3	F	6.6	F	0.70	F	11	F	1.3	F

Note: 0 sample indicates a non-detect analyte value

B3-MW-26								
Elev (ft. MSL)		1238.49		Total Depth: 20.32 feet BTOC				
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
6/4/2018	833	14.19	6.27	20.57	0.723	2.36	45.40	1224.30
3/7/2019	1033	10.55	6.71	19.54	0.746	0.90	24.40	1227.94
1/2/2020	805	13.07	6.71	21.64	0.674	1.23	190.00	1225.42

B3-MW-28								
Elev (ft. MSL)		1226.67		Total Depth: 18.33 feet BTOC				
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
6/4/2018	Not enough water for field readings							
3/7/2019	Not enough water for field readings							
1/2/2020	Not enough water for field readings							

B3-MW-30								
Elev (ft. MSL)		1246.01		Total Depth: 23.90 feet BTOC				
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
6/4/2018	1318	23.00	6.17	20.93	0.845	5.35	232.3	1223.01
3/7/2019	1322	21.65	6.87	21.45	0.758	8.21	100.4	1224.36
1/2/2020	1020	22.02	6.77	21.79	0.734	2.72	111.2	1223.99

B3-MW-32								
Elev (ft. MSL)		1266.98		Total Depth: 58.45 feet BTOC				
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
6/4/2018	935	55.40	6.40	21.14	0.671	1.59	54.1	1211.58
3/7/2019	1130	38.38	6.85	20.59	0.69	3.27	108.00	1228.60
1/2/2020	915	52.15	6.80	20.80	0.602	3.03	50.7	1214.83

B3-MW-34								
Elev (ft. MSL)		1244.51		Total Depth: 25.40 feet BTOC				
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
6/4/2018	852	19.45	6.65	21.45	0.707	0.59	5.8	1225.06
3/7/2019	1052	15.75	6.66	20.81	0.512	7.96	75.3	1228.76
1/2/2020	840	18.23	6.72	22.29	0.754	1.24	-76.6	1226.28

B3-MW-27								
Elev (ft. MSL)		1233.42		Total Depth: 17.00 feet BTOC				
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
6/4/2018	815	10.18	6.31	20.93	0.791	2.00	19.9	1223.24
3/7/2019	1015	6.30	6.69	18.58	0.758	8.74	47.2	1227.12
1/2/2020	820	9.67	6.82	22.15	0.730	0.87	-191.2	1223.75

B3-MW-29								
Elev (ft. MSL)		1233.25		Total Depth: 19.30 feet BTOC				
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
6/4/2018	Dry							
3/7/2019	1340	14.34	6.78	19.76	0.548	9.25	113.3	1233.45
1/2/2020	1040	19.12	Not enough water for field readings					

B3-MW-31								
Elev (ft. MSL)		1257.20		Total Depth: 39.06 feet BTOC				
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
6/4/2018	1303	34.81	6.22	21.55	0.908	0.65	99.8	1222.39
3/7/2019	1302	32.17	6.79	21.62	0.764	2.18	89.6	1225.03
1/2/2020	1000	35.18	6.69	21.08	0.729	0.97	3.6	1222.02

B3-MW-33								
Elev (ft. MSL)		1249.55		Total Depth: 29.55 feet BTOC				
Sample Date	Sample Time	Depth to H ₂ O (ft. BTOC)	pH	Temperature (°C)	Specific Conductivity (m-mho/cm)	Dissolved Oxygen (mg/L)	ORP (eV)	H ₂ O Elevation (feet)
6/4/2018	913	24.44	6.49	21.27	0.855	1.50	8.3	1225.11
3/7/2019	1108	20.46	6.87	21.01	0.343	8.14	95.4	1229.09
1/2/2020	900	23.05	6.77	21.39	0.741	0.49	-78.9	1226.50

Table 52.7.3

B-3 Bioreactor UGR Well Analytical Summary
Mar 2019 - Jan 2020

Q52		Shallow UGR Wells																													
Well ID		B3-MW26-UGR				B3-MW27-UGR				B3-MW29-UGR		B3-MW30-UGR				B3-MW31-UGR				B3-MW32-UGR				B3-MW33-UGR				B3-MW34-UGR			
Sample Date		3/7/2019		1/2/2020		3/7/2019		1/2/2020		3/7/2019		3/7/2019		1/2/2020		3/7/2019		1/2/2020		3/7/2019		1/2/2020		3/7/2019		1/2/2020		3/7/2019		1/2/2020	
Compound	Units	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag	Value	Flag
Total Organic Carbon	mg/L	3.5		4.8		3.4		12		2.0		3.6		3.9		4.5		3.8		8.0		2.0		2.3		3.4		3.0		9.6	
Methane	µg/L	810		117		3,200		808		10		1.2		0		2.8		0		3.0		0		0		9.2		0		3,060	
Ethene	µg/L	0		0		1.3	F	0		0		0		0		0		0		0		0		0		0		0		0	
Ethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Carbon Dioxide	µg/L	62,300		71,300		67,400		82,900		6,600		38,400		97,000		70,300		111,000		54,700		40,700		51,400		98,900		94,900		115,000	
Sulfate	mg/L	18		7.8		19		1.4		33		27		25		45		44		17		17		27		19		27		1.8	
Chloride	mg/L	20		17		17		18		25		12		10		11		11		12		13		16		16		36		16	
Ferrous Iron	mg/L	0.64	F	0.25	F	0.96	F	3.0		0		0		0.44	F	0.62	F	1.9		0.37	F	0.22	F	0		0.32	F	0		7.0	
Manganese	µg/L	1,090		1,160		298		299		5.0		17		51		70		179		122		119		39		435		179		985	
Sulfide	mg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Total Dissolved Solids	mg/L	473		441		483		471		342		479		494		497		484		460		391		400		472		534		498	
Benzene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Bromodichloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Bromoform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Chloroform	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Dibromochloromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichlorodifluoromethane	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, 1,1-	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Dichloroethene, cis-1,2-	µg/L	10.0		6.9		7.2		0		0		2.7		0		5.0		3.0		11		7.0		34		8.3		22		1.2	
Dichloroethene, trans-1,2-	µg/L	1.0		1.2		1.1		1.1		0		0		0		0		0.58	F	0		0		0		0		0		1.3	
Methylene chloride	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Naphthalene	µg/L	0		0		0		0		0		0		0		0		0		0		0		0		0		0		0	
Tetrachloroethene	µg/L	0		0.68	F	0		0		0		3.2		2.6		2.4		2.6		0.95	F	1.1	F	15		3.2		0		0	
Toluene	µg/L	0		0		0		0.96	F	0		0		0		0		0		0		0		0		0		0		0	
Trichloroethene	µg/L	0		0.52	F	0		0		0		2.8		0.54	F	1.7		1.5		0.85	F	0.85	F	21		3.4		1.2		0	
Vinyl chloride	µg/L	4.8		5.1		8.4		0.54	F	0		0		0		0		0		0		0		0		0.68	F	0		1.6	
Arsenic	µg/L	8.8	F	2.7	F	15	F	4.6	F	9.8	F	18	F	0.80	F	4.6	F	2.6	F	1.1	F	0.80	F	14	F	1.6	F	15	F	5.5	F

Note: 0 sample indicates a non-detect analyte value