SNOHOMISH COUNTY
Public Works

M E M O R A N D U M

DATE: **1/13/25**

TO: **Ryan Gardiner, PE, Washington State Department of Ecology**

FROM: **Snohomish County Public Works Dept., Solid Waste Division**

SUBJECT: **Environmental Monitoring Summary Report, First Semiannual 2024**

Snohomish County Solid Waste (County) has prepared this letter report to document the ongoing environmental monitoring activities performed at the former Emander Landfill/McCollum Park (Site) during the first half (January-June) of 2024.

The following activities were performed during the current monitoring period:

Landfill Gas System Operation and Monitoring

- The County operates a passive sparker/blower driven landfill gas flare system at the Site. Weekly flare system inspections were performed throughout the monitoring period. Up to 40% methane was measured in the flare manifold during weekly monitoring and the flare was operating as designed throughout the first half of 2024. See attached field inspection forms (Attachment 1) for details.
- Quarterly monitoring of five gas probes (designated GP-14 through GP-16 and GP-18 and GP-19) and the flare manifold was performed on February 16 and May 10, 2024. As shown on the attached monitoring sheets (Attachment 2), none of the gas probes contained detectable concentrations of methane, and up to 7% methane was measured at the flare manifold during these monitoring events.

Groundwater Monitoring

- Quarterly groundwater monitoring was performed at five shallow zone monitoring wells (BH-03A, BH-05, BH-06, BH-07, and BH-08) and eight deep zone monitoring wells (MW-12, MW-14, MW-15, MW-16, MW-17, MW-18, MW-19, and MW-20) during the first and second quarter 2024 monitoring events on March 19 and 20 and June 25 and 26, 2024. The groundwater sampling field sheets are included as Attachment 3.

- Groundwater flow conditions in the shallow and deep zones beneath the site during the first and second quarter 2024 groundwater monitoring events are shown on figures 3A through 3D. In general, the groundwater flow direction (south-southwest to south-southeast) and gradient (0.0044 to 0.0052 foot per foot [ft/ft] in the shallow zone and 0.0016 to 0.0021 ft/ft in the deep zone) in each groundwater zone were consistent with historical data for the site. The groundwater gradient, velocity, and flow direction calculations are included in Attachment 4.
- Groundwater results were compared to the concentration limits in Chapter 173-200 WAC, "Water Quality Standards for Groundwaters".
    - As shown on the attached Tables, exceedances to the groundwater standards in shallow zone wells were limited to five inorganic constituents – conductivity, pH, dissolved arsenic, dissolved iron, and dissolved lead (in one or more wells). Organic constituents that exceeded their respective water quality standards in shallow zone wells during the first semiannual monitoring period included acrylonitrile and vinyl chloride during the second quarter 2024.
    - As shown on the attached Tables, exceedances to the groundwater standards in deep zone wells were limited to five inorganic constituents – conductivity, pH, dissolved arsenic, dissolved iron, and dissolved lead (in one or more wells). Organic constituents that exceeded their respective water quality standards in shallow zone wells during the first semiannual monitoring period included vinyl chloride during the first and second quarters of 2024. Methylene chloride was also detected in deep zone wells during the second quarter 2024 monitoring event, but since methylene chloride is a common laboratory contaminant and was detected in the trip blank associated with the second quarter 2024 monitoring event, the methylene chloride detections appear to be the result of cross-contamination imparted during analysis.
- Statistical analysis is performed using DUMPStat Statistical Software (Version 3.0 by Robert D. Gibbons Ltd., 2018) to determine statistical exceedances and identify statistically significant concentration trends based on historical concentration data. Per Ecology and Snohomish Health District request on similar projects, the statistical prediction limits for each groundwater zone are updated in the first quarter of the year and subsequent data sets are compared against that prediction limit for the remainder of that year.
    - Statistically significant concentration trends were noted in all sampled shallow zone wells during the first semiannual 2024 monitoring events. Decreasing trends in the shallow zone outnumbered increasing trends 21 to 8 during the first quarter and 24 to 10 during the second quarter. Prediction limit exceedances were noted in all five sampled shallow zone wells during the first half of 2024. Inorganic constituent prediction limit exceedances in the shallow zone were most frequently noted for alkalinity, ammonia, bicarbonate, chloride, conductivity, arsenic, iron, and manganese. Organic constituents that exceeded their respective prediction limits

in the shallow zone included chlorobenzene, cis-1,2-dichloroethene, methylene chloride, and vinyl chloride.

- Statistically significant concentration trends were noted in all sampled deep zone wells during the first semiannual 2024 monitoring events. Decreasing trends in the deep zone outnumbered increasing trends 35 to 18 during the first quarter and 37 to 22 during the second quarter. Prediction limit exceedances were noted in all eight sampled deep zone wells during the first half of 2024, although they were mostly limited to downgradient wells MW-12, MW-14, MW-16, MW-17, MW-18, MW-19, and MW-20. Inorganic constituent prediction limit exceedances in the deep zone were most frequently noted for alkalinity, ammonia, bicarbonate, conductivity, nitrite, arsenic, manganese, and nickel. Organic constituents that exceeded their respective prediction limits in the deep zone were limited to vinyl chloride.

Deviations from Scope

- During both monitoring events, upgradient shallow zone well MW-11 did not contain sufficient water for sampling.
- Methylene chloride was detected in several shallow and deep zone wells during the second quarter 2024 monitoring event, but since methylene chloride is a common laboratory contaminant and was detected in the trip blank associated with the second quarter 2024 monitoring event, the methylene chloride detections appear to be the result of cross-contamination imparted during analysis.

If you have any questions regarding this report, please don't hesitate to contact us.

Sincerely,

Brian K. Eytcheson, LG
Snohomish County Solid Waste

Attachments:
Groundwater Analytical Summary Tables
Figures
Attachment 1 – Flare Field Inspection Forms
Attachment 2 – Gas Probe Monitoring Field Sheets
Attachment 3 – Groundwater Sampling Field Sheets
Attachment 4 – Groundwater Flow Calculations
Attachment 5 – Statistical Time Series Plots

Groundwater Analytical Summary Tables

Groundwater Analytical Summary - Shallow Wells: First Quarter 2024
McCollum Park, Snohomish County, WA

	Statistical Method	Prediction Limit (a)	GW Stds 173-200	Downgradient Wells																							Upgradient Wells									
				BH-03A					BH-05					BH-06					BH-07					BH-08					MW-10					MW-11				
				3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/20/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch		D	V	Tr	Ch	3/20/24	D	V	Tr	Ch
CONVENTIONAL CHEMISTRY PARAMETERS (mg/L)																																				
Alkalinity (as CaCO3)	lognor	37.8961	--	98		V			41		V			50		V			420		V	D	N	37		P			Well not accessible					Insufficient water for sampling				
Ammonia Nitrogen	nonpar	0.023	--	0.02	U				0.279		V			2.41		V	I	N	43.3		V	D	N	0.027		E											
Bicarbonate	lognor	37.8961	--	98		V			41		V			50		V			420		V	D	N	37		P											
Calcium, Dissolved	normal	14.563	--	14.0			D	N	12.3		P			23.3		V			57.6		V	D	N	10.1													
Chemical Oxygen Demand	nonpar	49	--	10	U				10	U				10	U				26					10	U												
Chloride	normal	10.8143	250	6.92					14.3		V	I	N	57.5		E			18.0		V	D	N	12.9		E	I	N									
Conductivity (umhos/cm)	normal	181.2978	700	210		V			150		P			310		V			890		V	D	N	130													
Magnesium, Dissolved	normal	6.7396	--	12.9		V	D	N	4.99		P			11.9		V			15.2		V	D	N	5.07													
Nitrate Nitrogen (mg-N/L)	lognor	6.6839	10	0.01	U		D	N	0.039					0.043					0.058					0.65			D	N									
Nitrite Nitrogen (mg-N/L)	normal	0.0172	1	0.002	U				0.004					0.004		P			0.035		V			0.002	U												
pH (std units)	normal	4.57-6.66	6.5-8.5	6.73		E			6.09					6.30					5.84					6.01													
Potassium, Dissolved	lognor	2.3933	--	1.46					2.06					5.75		V	I	N	34.0		V	D	N	0.74			D	N									
Sodium, Dissolved	normal	8.8318	20	11.5		V	I	N	7.08			I	Y	4.73					17.3		V	D	Y	6.86													
Sulfate	lognor	45.513	250	6.59			D	N	9.26					9.48				Y	2.49			D	Y	8.27				Y									
Total Dissolved Solids	normal	134.5422	500	140		V			68		P			130		P			210		V	D	Y	56													
Total Organic Carbon	nonpar	13	--	1.4					4.4					6.4					12.0					1.2													
DISSOLVED METALS EPA Methods 200.7/200.8 (mg/L)																																				
Antimony	nonpar	0.0004	0.006	0.0001	U				0.0001	U				0.0001	U				0.00013					0.0001	U				Well not accessible					Insufficient water for sampling				
Arsenic	normal	0.0003	0.00005	0.000349		V			0.00393		V			0.00623		V			0.0152		V			0.00005	U		D	Y									
Barium	normal	0.0583	1	0.01	U				0.0135					0.0307					0.734		V	D	Y	0.01	U												
Beryllium	nonpar	0.0005	0.004	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U												
Cadmium	nonpar	0.0002	0.005	0.00005	U				0.00005	U				0.00005	U				0.000051					0.00005	U												
Chromium	nonpar	0.005	0.05	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U												
Cobalt	nonpar	0.005	--	0.01	U				0.01	U				0.01	U				0.01	U				0.01	U												
Copper	nonpar	0.015	1	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U												
Iron	normal	0.2693	0.3	0.03	U				4.13		V			1.7		V			4.91		V			0.03	U												
Lead	normal	0.0005	0.05	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U												
Manganese	lognor	0.3811	0.05	0.082			I	N	0.611		V			0.936		V			4.29		V	D	N	0.01	U												
Nickel	nonpar	0.005	0.1	0.01	U				0.01	U				0.01	U				0.01	U	P			0.01	U												
Selenium	nonpar	0.0007	0.01	0.0005	U				0.0005	U	P			0.0005	U				0.00199		E	D	Y	0.0005	U												
Silver	nonpar	0.0002	0.05	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U												
Thallium	nonpar	0.0001	0.002	0.00005	U				0.00005	U				0.00005	U				0.000069					0.00005	U												
Vanadium	nonpar	0.01	--	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U												
Zinc	nonpar	0.011	5	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U												
VOLATILE ORGANIC COMPOUNDS (VOCs) EPA Method 8260 (µg/L)																																				
1,1,1-Trichloroethane	NA	NA	200	1	U				1	U				1	U				1	U				1	U				Well not accessible					Insufficient water for sampling				
1,1,2,2-Tetrachloroethane	NA	NA	--	1	U				1	U				1	U				1	U				1	U												
1,1,2-Trichloroethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U												
1,1-Dichloroethane	nonpar	1.0	1	1	U				1	U				1	U				1	U				1	U												
1,1-Dichloroethylene	NA	NA	--	1	U				1	U				1	U				1	U				1	U												
1,2,3-Trichloropropane	NA	NA	--	1	U				1	U				1	U				1	U				1	U												
1,2-Dibromo-3-chloropropane	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U												
1,2-Dibromoethane	NA	NA	0.001	0.01	U				0.01	U				0.01	U				0.01	U				0.01	U												

Groundwater Analytical Summary - Shallow Wells: First Quarter 2024
McCollum Park, Snohomish County, WA

	Statistical Method	Prediction Limit (a)	GW Stds 173-200	Downgradient Wells																						Upgradient Wells									
				BH-03A					BH-05					BH-06					BH-07					BH-08					MW-10					MW-11				
				3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/20/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch		D	V	Tr	Ch	3/20/24	D	V	Tr	Ch
VOLATILE ORGANIC COMPOUNDS (VOCs) EPA Method 8260 (µg/L) (cont.)																																					
1,2-Dichlorobenzene	nonpar	1.0	--	1	U				1	U				1	U				1	U				1	U				Well not accessible					Insufficient water for sampling				
1,2-Dichloroethane	nonpar	0.5	0.5	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U													
1,2-Dichloropropane	NA	NA	0.6	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U													
1,4-Dichlorobenzene	nonpar	1.0	4	1	U				1	U				1	U				1	U				1	U													
2-Butanone	NA	NA	--	5	U				5	U				5	U				5	U				5	U													
2-Hexanone	NA	NA	--	2	U				2	U				2	U				2	U				2	U													
4-Methyl-2-Pentanone (MIBK)	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Acetone	NA	NA	--	5	U				5	U				5	U				5	U				5	U													
Acrylonitrile	NA	NA	0.07	0.05	U				0.05	U				0.05	U				0.05	U				0.05	U													
Benzene	nonpar	1.0	1	0.5	U				0.5	U				0.5	U				0.5	U				0.5	U													
Bromodichloromethane	nonpar	0.3	0.3	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U													
Bromoform	NA	NA	5	2	U				2	U				2	U				2	U				2	U													
Bromomethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U													
Carbon Disulfide	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Carbon Tetrachloride	NA	NA	0.3	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U													
Chlorobenzene	nonpar	0.2	--	0.03	U				0.03	U				0.03	U		I	Y	1.72		V			0.03	U													
Chlorodibromomethane	NA	NA	0.5	0.5	U				0.5	U				0.5	U				0.5	U				0.5	U													
Chloroethane	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Chloroform	nonpar	1.0	7	1	U				1	U				1	U				1	U				1	U													
Chloromethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U													
cis-1,2-Dichloroethene	nonpar	0.2	--	0.44		V			0.03	U				0.03	U				0.03	U				0.03	U													
cis-1,3-Dichloropropene	nonpar	0.2	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U													
Dibromomethane	NA	NA	--	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U													
Ethylbenzene	nonpar	1.0	--	1	U				1	U				1	U				1	U				1	U													
m,p-Xylene	NA	NA	--	5	U				5	U				5	U				5	U				5	U													
Methyl Iodide	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Methylene Chloride	nonpar	4.4	5	3	U				3	U				3	U				3	U				3	U													
o-Xylene	nonpar	1.0	--	1.5	U				1.5	U				1.5	U				1.5	U				1.5	U													
Styrene	nonpar	1.0	--	2	U				2	U				2	U				2	U				2	U													
Tetrachloroethylene	NA	NA	0.8	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U													
Toluene	nonpar	1.0	--	2	U				2	U				2	U	P			2	U				2	U													
trans-1,2-Dichloroethene	NA	NA	--	1	U				1	U				1	U				1	U				1	U													
trans-1,3-Dichloropropene	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U													
trans-1,4-Dichloro-2-butene	nonpar	5.0	--	2	U				2	U				2	U				2	U				2	U													
Trichlorethene (1,1,2-Trichloroethylene)	NA	NA	3	2	U				2	U				2	U				2	U				2	U													
Trichlorofluoromethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U													
Vinyl Acetate	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Vinyl Chloride	nonpar	0.01	0.02	0.01	U	P			0.01	U				0.01	U				0.01	U	P			0.01	U													

D: U = Indicates compound was not detected at the given reporting limit.

V: E= Exceedance, waiting verification based on subsequent lab data; V= Exceedance verified based on previous lab data; P=Passed, previous exceedance not verified based on current lab data.

Tr: I=increasing Trend, D=Decreasing Trend;

Ch: Y indicates a change in trend from previous quarter; N means no change in trend.

The groundwater standards listed are based on the Washington Administrative Code (WAC) 173-200 groundwater limits as modified by the TMS 91-11 standards - the most restrictive of the two is used.

NA: Not applicable - too few data points to evaluate statistically

* = pH lab result; field pH not taken due to meter malfunction

Groundwater Analytical Summary - Deep Wells: First Quarter 2024
McCollum Park, Snohomish County, WA

	Statistical Method	Prediction Limit (a)	GW Stds 173-200	Downgradient Wells																																Upgradient Wells									
				MW-12					MW-14					MW-16					MW-17					MW-18					MW-19					MW-20					MW-13					MW-15				
				3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/20/24	D	V	Tr	Ch	3/20/24	D	V	Tr	Ch	3/20/24	D	V	Tr	Ch		D	V	Tr	Ch	3/20/24	D	V	Tr	Ch
CONVENTIONAL CHEMISTRY PARAMETERS (mg/L)																																													
Alkalinity (as CaCO3)	nonpar	120	--	160		V	I	N	61					280		V	D	N	110		P			470		V	D	N	94			D	N	99			D	Y	Well not accessible					120				
Ammonia Nitrogen	nonpar	0.032	--	0.02	U				0.02					0.053		V		Y	8.36		V	D	N	0.079		V			0.02	U				0.023										0.02	U			
Bicarbonate	nonpar	120	--	160		V	I	N	61					280		V		Y	110		P			470		V	D	N	94			D	N	99			D	Y						120				
Calcium, Dissolved	normal	23.8362	--	26.1		V	I	N	13.9					44.4		V	D	N	19.0					59.6		V	D	N	15.2			D	N	17.2			D	N						22.5				
Chemical Oxygen Demand	nonpar	55	--	10	U				10	U				10	U				11					10	U		D	Y	10	U				10	U									10	U			
Chloride	normal	11.9396	250	9.73			D	N	10.4					8.31					26.9		V	I	N	6.11			D	N	9.41					12.7		V	I	Y						10.0				
Conductivity (umhos/cm)	nonpar	320	700	350		V	I	N	170					520		V			330		V			840		V	D	N	220					240										320			I	N
Magnesium, Dissolved	normal	22.3676	--	24.1		V	I	N	6.91					41.1		V		Y	14.1					63.6		V	D	N	13.8			D	N	14.7			D	N						20.9			I	Y
Nitrate Nitrogen (mg-N/L)	normal	4.0098	10	3.3			I	Y	0.58					0.01	U				0.01	U				0.01	U				0.62			I	N	0.64				Y						3.3				
Nitrite Nitrogen (mg-N/L)	nonpar	0.002	1	0.003		V			0.002					0.003		E			0.002	U				0.003		V			0.002		P			0.002		P								0.002	U			
pH (std units)	normal	5.95-8.22	6.5-8.5	6.95					6.17					6.87					6.82					6.51				Y	6.17					5.92		E								6.77				
Potassium, Dissolved	nonpar	3.38	--	3.64		V	I	N	1.12					2.24					6.47		V			3.91		V	D	N	1.68					1.60										3.28				
Sodium, Dissolved	normal	8.3315	20	8.28			I	N	9.45		V			9.22		V			7.20			D	N	20.5		V	D	N	6.97					7.51										7.74				
Sulfate	normal	18.3732	250	14.5					8.09					2.52			D	N	12.5			D	N	2.64					7.92			D	N	7.54			D	N						15.2				
Total Dissolved Solids	normal	237.1708	500	230		P	I	Y	93					300		V	D	Y	180					480		V	D	N	140					140										190				
Total Organic Carbon	nonpar	12	--	0.75					0.83					1.9					4.4					5.8			D	N	1.1					1.2										0.5	U			
DISSOLVED METALS EPA Methods 200.7/200.8 (mg/L)																																													
Antimony	nonpar	0.0007	0.006	0.0001	U				0.0001	U				0.0001	U				0.0001	U				0.0001	U				0.0001	U				0.0001	U				Well not accessible					0.0001	U			
Arsenic	nonpar	0.0026	0.00005	0.00163					0.000156			D	Y	0.0193		V			0.00851		V	I	Y	0.015		V			0.000436					0.000388										0.0019				
Barium	nonpar	0.0206	1	0.0157			I	N	0.0101					0.0210		V			0.0285		V			0.0362		V	D	N	0.0104			D	N	0.0109										0.01	U			
Beryllium	nonpar	0.0005	0.004	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U									0.0002	U			
Cadmium	nonpar	0.0001	0.005	0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U									0.00005	U			
Chromium	nonpar	0.0113	0.05	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Cobalt	nonpar	0.005	--	0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U									0.01	U			
Copper	nonpar	0.01	1	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Iron	nonpar	0.012	0.3	0.03	U				0.03	U				0.625		V			0.345		V	I	N	0.145		V	D	Y	0.03	U				0.03	U									0.03	U			
Lead	nonpar	0.0004	0.05	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U									0.0002	U			
Manganese	nonpar	0.007	0.05	0.01	U				0.062		V			2.30		V		Y	1.96		V	I	N	1.81		V	D	N	0.01	U				0.01	U									0.01	U			
Nickel	nonpar	0.014	0.1	0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U									0.01	U			
Selenium	lognor	116.5148	0.01	0.00062					0.0005	U				0.0005	U				0.0005	U				0.0005	U				0.0005	U				0.0005	U									0.0005	U			
Silver	nonpar	0.0003	0.05	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U									0.0002	U			
Thallium	nonpar	0.0001	0.002	0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U									0.00005	U			
Vanadium	nonpar	0.021	--	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Zinc	nonpar	0.022	5	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
VOLATILE ORGANIC COMPOUNDS (VOCs) EPA Method 8260 (µg/L)																																													
1,1,1-Trichloroethane	NA	NA	200	1	U				1	U				1	U				1	U				1	U				1	U				1	U				Well not accessible					1	U			
1,1,2,2-Tetrachloroethane	NA	NA	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,1,2-Trichloroethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
1,1-Dichloroethane	nonpar	1.0	1	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,1-Dichloroethylene	NA	NA	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,2,3-Trichloropropane	NA	NA	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,2-Dibromo-3-chloropropane	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
1,2-Dibromoethane	NA	NA	0.001	0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U									0.01	U			
1,2-Dichlorobenzene	nonpar	1.0	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,2-Dichloroethane	NA	NA	0.5	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
1,2-Dichloropropane	nonpar	0.6	0.6	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
1,4-Dichlorobenzene	nonpar	1.0	4	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
2-Butanone	NA	NA	--	5	U				5	U				5	U				5	U				5	U				5	U				5	U									5	U			
2-Hexanone	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			

Groundwater Analytical Summary - Deep Wells: First Quarter 2024
McCollum Park, Snohomish County, WA

	Statistical Method	Prediction Limit (a)	GW Stds 173-200	Downgradient Wells																																Upgradient Wells									
				MW-12					MW-14					MW-16					MW-17					MW-18					MW-19					MW-20					MW-13					MW-15				
				3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/19/24	D	V	Tr	Ch	3/20/24	D	V	Tr	Ch	3/20/24	D	V	Tr	Ch	3/20/24	D	V	Tr	Ch		D	V	Tr	Ch	3/20/24	D	V	Tr	Ch
VOLATILE ORGANIC COMPOUNDS (VOCs) EPA Method 8260 (µg/L) (cont.)																																														
4-Methyl-2-Pentanone (MIBK)	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U				Well not accessible					3	U			
Acetone	NA	NA	--	5	U				5	U				5	U				5	U				**5**	U				5	U				5	U									5	U			
Acrylonitrile	NA	NA	0.07	0.05	U				0.05	U				0.05	U				0.05	U				0.05	U				0.05	U				0.05	U									0.05	U			
Benzene	nonpar	1.0	1	0.5	U				0.5	U				0.5	U				0.5	U				0.5	U				0.5	U				0.5	U									0.5	U			
Bromodichloromethane	nonpar	0.3	0.3	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Bromoform	NA	NA	5	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Bromomethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Carbon Disulfide	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U									3	U			
Carbon Tetrachloride	NA	NA	0.3	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Chlorobenzene	nonpar	0.2	--	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
Chlorodibromomethane	NA	NA	0.5	0.5	U				0.5	U				0.5	U				0.5	U				0.5	U				0.5	U				0.5	U									0.5	U			
Chloroethane	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U									3	U			
Chloroform	nonpar	1.0	7	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
Chloromethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
cis-1,2-Dichloroethene	NA	NA	--	0.03	U				0.03	U				**1.53**					0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
cis-1,3-Dichloropropene	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
Dibromomethane	NA	NA	--	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Ethylbenzene	nonpar	1.0	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
m,p-Xylene	NA	NA	--	5	U				5	U				5	U				5	U				5	U				5	U				5	U									5	U			
Methyl Iodide	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U									3	U			
Methylene Chloride	nonpar	7.4	5	3	U				3	U				3	U				3	U				3	U				3	U				3	U									3	U			
o-Xylene	nonpar	1.0	--	**1.5**	U				**1.5**	U				**1.5**	U				**1.5**	U				**1.5**	U				**1.5**	U				**1.5**	U									**1.5**	U			
Styrene	nonpar	1.0	--	**2**	U				**2**	U				**2**	U				**2**	U				**2**	U				**2**	U				**2**	U									**2**	U			
Tetrachloroethylene	NA	NA	0.8	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
Toluene	nonpar	1.0	--	2	U				2	U				**2**	U				**2**	U				**2**	U				2	U				2	U									2	U			
trans-1,2-Dichloroethene	NA	NA	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
trans-1,3-Dichloropropene	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
trans-1,4-Dichloro-2-butene	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Trichlorethene (1,1,2-Trichloroethylene)	NA	NA	3	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Trichlorofluoromethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Vinyl Acetate	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U									3	U			
Vinyl Chloride	nonpar	0.01	0.02	0.01	U				0.01	U				**0.22**		V			0.01	U				**0.85**		V	D	Y	0.01	U				0.01	U									0.01	U			

D: U = Indicates compound was not detected at the given reporting limit.

V: E= Exceedance, waiting verification based on subsequent lab data; V= Exceedance verified based on previous lab data; P=Passed, previous exceedance not verified based on current lab data.

Tr: I=increasing Trend, D=Decreasing Trend;

The groundwater standards listed are based on the Washington Administrative Code (WAC) 173-200 groundwater limits as modified by the TMS 91-11 standards - the most restrictive of the two is used.

NA: Not applicable - too few data points to evaluate statistically

* = pH lab result; field pH not taken due to meter malfunction

Groundwater Analytical Summary - Shallow Wells: Second Quarter 2024
McCollum Park, Snohomish County, WA

	Statistical Method	Prediction Limit (a)	GW Stds 173-200	Downgradient Wells																						Upgradient Wells									
				BH-03A					BH-05					BH-06					BH-07					BH-08					MW-10					MW-11				
				6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/26/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch		D	V	Tr	Ch		D	V	Tr	Ch
CONVENTIONAL CHEMISTRY PARAMETERS (mg/L)																																					
Alkalinity (as CaCO3)	lognor	37.8961	--	80.6		V	I	Y	88		V			103		V			402		V	D	N	35.2			D	Y	Well not accessible					Insufficient water for sampling				
Ammonia Nitrogen	nonpar	0.023	--	0.02	U				0.358		V			4.38		V	I	N	41.9		V	D	N	0.02	U	P												
Bicarbonate	lognor	37.8961	--	80.6		V	I	Y	88		V			103		V			402		V	D	N	35.2			D	Y										
Calcium, Dissolved	normal	14.563	--	8.84			D	N	18.8		E			21.1		V			44.0		V	D	N	7.25													
Chemical Oxygen Demand	nonpar	49	--	10	U				10	U				10	U				12.5					10	U												
Chloride	normal	10.8143	250	7.07					12.5		V	I	N	7.66		P			17.1		V	D	N	10.1		P	I	N									
Conductivity (umhos/cm)	normal	181.2978	700	193		V			280		E			289		V			885		V	D	N	127												
Magnesium, Dissolved	normal	6.7396	--	8.41		V	D	N	7.73		E			8.73		V			11.9		V	D	N	3.82												
Nitrate Nitrogen (mg-N/L)	lognor	6.6839	10	0.02	U		D	N	0.05					0.023					0.093		P			0.353			D	N								
Nitrite Nitrogen (mg-N/L)	normal	0.0172	1	0.009					0.002					0.002	U				0.002					0.002	U											
pH (std units)	normal	4.57-6.66	6.5-8.5	6.45		P	D	Y	5.86					6.06					6.65					5.36												
Potassium, Dissolved	lognor	2.3933	--	1.09					2.42		E			7.83		V	I	N	30.6		V	D	N	0.615			D	N								
Sodium, Dissolved	normal	8.8318	20	9.38		V	I	N	9.76		E	I	N	6.08					15.5		V	D	N	6.26												
Sulfate	lognor	45.513	250	6.49			D	N	23.5					19.9					0.69			D	N	6.39			D	Y								
Total Dissolved Solids	normal	134.5422	500	119		P			165		E			162		E			330		V	D	N	68												
Total Organic Carbon	nonpar	13	--	1.0					3.5					4.9					7.2					1.2												
DISSOLVED METALS EPA Methods 200.7/200.8 (mg/L)																																					
Antimony	nonpar	0.0004	0.006	0.000109					0.0001	U				0.0001	U				0.0001	U				0.0001	U				Well not accessible					Insufficient water for sampling				
Arsenic	normal	0.0003	0.00005	0.0004		V			0.0052		V			0.009114		V			0.01016		V			0.000195				Y									
Barium	normal	0.0583	1	0.01	U				0.022					0.048					0.52		V	D	N	0.01	U												
Beryllium	nonpar	0.0005	0.004	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U												
Cadmium	nonpar	0.0002	0.005	0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U												
Chromium	nonpar	0.005	0.05	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U												
Cobalt	nonpar	0.005	--	0.01	U				0.01	U				0.01	U				0.01	U				0.01	U												
Copper	nonpar	0.015	1	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U												
Iron	normal	0.2693	0.3	0.03	U				6.31		V			4.23		V			2.58		V			0.03	U												
Lead	normal	0.0005	0.05	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U												
Manganese	lognor	0.3811	0.05	0.075			I	N	1.01		V			1.04		V			3.34		V	D	N	0.01	U												
Nickel	nonpar	0.005	0.1	0.046		E			0.065		E			0.067		E			0.072		E			0.01	U												
Selenium	nonpar	0.0007	0.01	0.0005	U				0.0005	U				0.0005	U				0.001493		V	D	N	0.000792		E											
Silver	nonpar	0.0002	0.05	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U												
Thallium	nonpar	0.0001	0.002	0.00005	U				0.00005	U				0.00005	U				0.00005	U	P			0.00005	U												
Vanadium	nonpar	0.01	--	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U												
Zinc	nonpar	0.011	5	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U												
VOLATILE ORGANIC COMPOUNDS (VOCs) EPA Method 8260 (µg/L)																																					
1,1,1-Trichloroethane	NA	NA	200	1	U				1	U				1	U				1	U				1	U				Well not accessible					Insufficient water for sampling				
1,1,2,2-Tetrachloroethane	NA	NA	--	1	U				1	U				1	U				1	U				1	U												
1,1,2-Trichloroethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U												
1,1-Dichloroethane	nonpar	1.0	1	1	U				1	U				1	U				1	U				1	U												
1,1-Dichloroethylene	NA	NA	--	1	U				1	U				1	U				1	U				1	U												
1,2,3-Trichloropropane	NA	NA	--	1	U				1	U				1	U				1	U				1	U												
1,2-Dibromo-3-chloropropane	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U												
1,2-Dibromoethane	NA	NA	0.001	0.01	U				0.01	U				0.01	U				0.01	U				0.01	U												

Groundwater Analytical Summary - Shallow Wells: Second Quarter 2024
McCollum Park, Snohomish County, WA

	Statistical Method	Prediction Limit (a)	GW Stds 173-200	Downgradient Wells																						Upgradient Wells									
				BH-03A					BH-05					BH-06					BH-07					BH-08					MW-10					MW-11				
				6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/26/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch		D	V	Tr	Ch		D	V	Tr	Ch
VOLATILE ORGANIC COMPOUNDS (VOCs) EPA Method 8260 (µg/L) (cont.)																																			
1,2-Dichlorobenzene	nonpar	1.0	--	1	U				1	U				1	U				1	U				1	U				Well not accessible					Insufficient water for sampling				
1,2-Dichloroethane	nonpar	0.5	0.5	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U													
1,2-Dichloropropane	NA	NA	0.6	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U													
1,4-Dichlorobenzene	nonpar	1.0	4	1	U				1	U				1	U				1	U				1	U													
2-Butanone	NA	NA	--	5	U				5	U				5	U				5	U				5	U													
2-Hexanone	NA	NA	--	2	U				2	U				2	U				2	U				2	U													
4-Methyl-2-Pentanone (MIBK)	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Acetone	NA	NA	--	5	U				**5.79**					5	U				**9.71**					5	U													
Acrylonitrile	NA	NA	0.07	0.05	U				0.05	U				0.05	U				2.59					0.05	U													
Benzene	nonpar	1.0	1	0.5	U				0.5	U				0.5	U				0.5	U				0.5	U													
Bromodichloromethane	nonpar	0.3	0.3	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U													
Bromoform	NA	NA	5	2	U				2	U				2	U				2	U				2	U													
Bromomethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U													
Carbon Disulfide	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Carbon Tetrachloride	NA	NA	0.3	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U													
Chlorobenzene	nonpar	0.2	--	0.03	U				0.61		E			0.84		E	I	N	2.72		V			0.03	U													
Chlorodibromomethane	NA	NA	0.5	0.5	U				0.5	U				0.5	U				0.5	U				0.5	U													
Chloroethane	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Chloroform	nonpar	1.0	7	1	U				1	U				1	U				1	U				1	U													
Chloromethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U													
cis-1,2-Dichloroethene	nonpar	0.2	--	**0.33**		V			0.03	U				**0.12**					0.26					0.03	U													
cis-1,3-Dichloropropene	nonpar	0.2	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U													
Dibromomethane	NA	NA	--	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U													
Ethylbenzene	nonpar	1.0	--	1	U				1	U				1	U				1	U				1	U													
m,p-Xylene	NA	NA	--	5	U				5	U				5	U				5	U				5	U													
Methyl Iodide	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Methylene Chloride	nonpar	4.4	5	5.28		E			5.2	U	E			5.02		E			5.56		E			4.83		E												
o-Xylene	nonpar	1.0	--	1.5	U				1.5	U				1.5	U				1.5	U				1.5	U													
Styrene	nonpar	1.0	--	2	U				2	U				2	U				2	U				2	U													
Tetrachloroethylene	NA	NA	0.8	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U													
Toluene	nonpar	1.0	--	2	U				2	U				2	U	P			2	U				2	U													
trans-1,2-Dichloroethene	NA	NA	--	1	U				1	U				1	U				1	U				1	U													
trans-1,3-Dichloropropene	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U													
trans-1,4-Dichloro-2-butene	nonpar	5.0	--	2	U				2	U				2	U				2	U				2	U													
Trichlorethene (1,1,2-Trichloroethylene)	NA	NA	3	2	U				2	U				2	U				2	U				2	U													
Trichlorofluoromethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U													
Vinyl Acetate	NA	NA	--	3	U				3	U				3	U				3	U				3	U													
Vinyl Chloride	nonpar	0.01	0.02	0.07		E			0.01	U				0.01	U				0.29		V			0.01	U													

D: U = Indicates compound was not detected at the given reporting limit.

V: E= Exceedance, waiting verification based on subsequent lab data; V= Exceedance verified based on previous lab data; P=Passed, previous exceedance not verified based on current lab data.

Tr: I=increasing Trend, D=Decreasing Trend;

Ch: Y indicates a change in trend from previous quarter; N means no change in trend.

The groundwater standards listed are based on the Washington Administrative Code (WAC) 173-200 groundwater limits as modified by the TMS 91-11 standards - the most restrictive of the two is used.

NA: Not applicable - too few data points to evaluate statistically

* = pH lab result; field pH not taken due to meter malfunction

Groundwater Analytical Summary - Deep Wells: Second Quarter 2024
McCollum Park, Snohomish County, WA

	Statistical Method	Prediction Limit (a)	GW Stds 173-200	Downgradient Wells																														Upgradient Wells									
				MW-12					MW-14					MW-16					MW-17					MW-18					MW-19					MW-20					MW-13					MW-15				
				6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/26/24	D	V	Tr	Ch	6/26/24	D	V	Tr	Ch	6/26/24	D	V	Tr	Ch		D	V	Tr	Ch	6/26/24	D	V	Tr	Ch
CONVENTIONAL CHEMISTRY PARAMETERS (mg/L)																																												
Alkalinity (as CaCO3)	nonpar	120	--	157		V	I	N	58.2					274		V	D	N	122		E			470		V	D	N	88.2			D	N	87.6			D	N	Well not accessible					118			I	Y
Ammonia Nitrogen	nonpar	0.032	--	0.02	U				0.02	U				0.055		V	I	N	8.19		V	D	N	0.052		V			0.02	U				0.02	U									0.02	U			
Bicarbonate	nonpar	120	--	157		V	I	N	58.2					274		V		Y	122		E			470		V	D	N	88.2			D	N	87.6			D	N						118			I	Y
Calcium, Dissolved	normal	23.8362	--	22.6		P	I	N	10.4					32.7		V	D	N	15.8			I	Y	48.7		V	D	N	11.8			D	N	13.5			D	N						17.5				
Chemical Oxygen Demand	nonpar	55	--	10	U				10	U				10	U				10	U				10	U		D	N	10	U				62.9		E								10	U			
Chloride	normal	11.9396	250	9.45			D	N	9.99					7.88					17.4		V	I	N	5.72			D	N	9.48					13.2		V	I	N						9.69				
Conductivity (umhos/cm)	nonpar	320	700	405		V	I	N	180					526		V			355		V			850		V	D	N	226					238										311			I	N
Magnesium, Dissolved	normal	22.3676	--	21.2		P	I	N	5.33					31.2		V		Y	12.0			I	Y	52.1		V	D	N	10.9			D	N	11.8			D	N						16.4				Y
Nitrate Nitrogen (mg-N/L)	normal	4.0098	10	3.5			I	N	0.504					0.02	U				0.02	U				0.02	U				0.605			I	N	0.629										3.37				
Nitrite Nitrogen (mg-N/L)	nonpar	0.002	1	0.003		V			0.003		E			0.003		V			0.002					0.002		P			0.003		E			0.003		E								0.0				
pH (std units)	normal	5.95-8.22	6.5-8.5	6.86					5.87		E			6.65			D	Y	6.72					7.14					7.37					7.23		P								7.52				
Potassium, Dissolved	nonpar	3.38	--	3.17		P	I	N	0.944					1.88					5.35		V			3.24		P	D	N	1.42					1.33										2.69				
Sodium, Dissolved	normal	8.3315	20	7.86			I	N	8.29		P			8.3					6.67			D	N	18.4		V	D	N	6.40					6.79										6.90				
Sulfate	normal	18.3732	250	14.2					7.63					2.38			D	N	15.2			D	N	2.59					7.68			D	N	7.13			D	N						14.7				
Total Dissolved Solids	normal	237.1708	500	233			I	N	112					311		V	D	N	183					478		V	D	N	150					151										185				
Total Organic Carbon	nonpar	12	--	0.6					0.5	U				2.0					3.3					4.2		P	D	N	0.5					0.5	U									0.5	U			
DISSOLVED METALS EPA Methods 200.7/200.8 (mg/L)																																												
Antimony	nonpar	0.0007	0.006	0.0001	U				0.0001	U				0.0001	U				0.0001	U				0.0001	U				0.0001	U				0.0001	U				Well not accessible					0.0001	U			
Arsenic	nonpar	0.0026	0.00005	0.001774					0.000213			D	N	0.01985		V			0.008356		V	I	N	0.01507		V			0.000552					0.000537										0.002025				
Barium	nonpar	0.0206	1	0.015			I	N	0.01	U				0.018		E			0.025		V			0.034		V	D	N	0.01	U		D	N	0.01			D	Y						0.01	U			
Beryllium	nonpar	0.0005	0.004	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U									0.0002	U			
Cadmium	nonpar	0.0001	0.005	0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U									0.00005	U			
Chromium	nonpar	0.0113	0.05	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Cobalt	nonpar	0.005	--	0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U									0.01	U			
Copper	nonpar	0.01	1	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Iron	nonpar	0.012	0.3	0.03	U				0.03	U				0.478		V			0.112		V	I	N	0.03	U	P	D	N	0.03	U				0.03	U									0.03	U			
Lead	nonpar	0.0004	0.05	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U									0.0002	U			
Manganese	nonpar	0.007	0.05	0.01	U				0.048		V			1.8		V			1.67		V	I	N	1.49		V	D	N	0.01	U				0.01	U									0.01	U			
Nickel	nonpar	0.014	0.1	0.069		E			0.047					0.051					0.07		E			0.072		E			0.069		E			0.069		E								0.068				
Selenium	lognor	116.5148	0.01	0.000842					0.0005	U				0.0005	U				0.0005	U				0.0005	U				0.0005	U				0.0005	U									0.0005	U			
Silver	nonpar	0.0003	0.05	0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U				0.0002	U									0.0002	U			
Thallium	nonpar	0.0001	0.002	0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U				0.00005	U									0.00005	U			
Vanadium	nonpar	0.021	--	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Zinc	nonpar	0.022	5	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
VOLATILE ORGANIC COMPOUNDS (VOCs) EPA Method 8260 (µg/L)																																												
1,1,1-Trichloroethane	NA	NA	200	1	U				1	U				1	U				1	U				1	U				1	U				1	U				Well not accessible					1	U			
1,1,2,2-Tetrachloroethane	NA	NA	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,1,2-Trichloroethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
1,1-Dichloroethane	nonpar	1.0	1	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,1-Dichloroethylene	NA	NA	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,2,3-Trichloropropane	NA	NA	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,2-Dibromo-3-chloropropane	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
1,2-Dibromoethane	NA	NA	0.001	0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U				0.01	U									0.01	U			
1,2-Dichlorobenzene	nonpar	1.0	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
1,2-Dichloroethane	NA	NA	0.5	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
1,2-Dichloropropane	nonpar	0.6	0.6	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
1,4-Dichlorobenzene	nonpar	1.0	4	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
2-Butanone	NA	NA	--	5	U				5	U				5	U				5	U				5	U				5	U				5	U									5	U			
2-Hexanone	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			

Groundwater Analytical Summary - Deep Wells: Second Quarter 2024
McCollum Park, Snohomish County, WA

	Statistical Method	Prediction Limit (a)	GW Stds 173-200	Downgradient Wells																												Upgradient Wells									
				MW-12					MW-14					MW-16					MW-17					MW-18					MW-19					MW-20					MW-13					MW-15				
				6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/25/24	D	V	Tr	Ch	6/26/24	D	V	Tr	Ch	6/26/24	D	V	Tr	Ch	6/26/24	D	V	Tr	Ch		D	V	Tr	Ch	6/26/24	D	V	Tr	Ch
VOLATILE ORGANIC COMPOUNDS (VOCs) EPA Method 8260 (µg/L) (cont.)																																													
4-Methyl-2-Pentanone (MIBK)	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U				Well not accessible					3	U			
Acetone	NA	NA	--	**6.47**					5	U				5	U				**6.27**					**7.68**					**8.00**					**7.07**										**6.17**				
Acrylonitrile	NA	NA	0.07	0.05	U				0.05	U				0.05	U				0.05	U				0.05	U				0.05	U				0.05	U									0.05	U			
Benzene	nonpar	1.0	1	0.5	U				0.5	U				0.5	U				0.5	U				0.5	U				0.5	U				0.5	U									0.5	U			
Bromodichloromethane	nonpar	0.3	0.3	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Bromoform	NA	NA	5	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Bromomethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Carbon Disulfide	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U									3	U			
Carbon Tetrachloride	NA	NA	0.3	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Chlorobenzene	nonpar	0.2	--	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
Chlorodibromomethane	NA	NA	0.5	0.5	U				0.5	U				0.5	U				0.5	U				0.5	U				0.5	U				0.5	U									0.5	U			
Chloroethane	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U									3	U			
Chloroform	nonpar	1.0	7	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
Chloromethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
cis-1,2-Dichloroethene	NA	NA	--	0.03	U				0.03	U				**1.31**					0.03	U				**0.54**					0.03	U				0.03	U									0.03	U			
cis-1,3-Dichloropropene	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
Dibromomethane	NA	NA	--	0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U				0.02	U									0.02	U			
Ethylbenzene	nonpar	1.0	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
m,p-Xylene	NA	NA	--	5	U				5	U				5	U				5	U				5	U				5	U				5	U									5	U			
Methyl Iodide	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U									3	U			
Methylene Chloride	nonpar	7.4	5	5.24					5.00					4.93					4.77					5.31					5.30					5.11										5.18				
o-Xylene	nonpar	1.0	--	**1.5**	U				**1.5**	U				**1.5**	U				**1.5**	U				**1.5**	U				**1.5**	U				**1.5**	U									**1.5**	U			
Styrene	nonpar	1.0	--	**2**	U				**2**	U				**2**	U				**2**	U				**2**	U				**2**	U				**2**	U									**2**	U			
Tetrachloroethylene	NA	NA	0.8	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
Toluene	nonpar	1.0	--	2	U				2	U				**2**	U				**2**	U				**2**	U				2	U				2	U									2	U			
trans-1,2-Dichloroethene	NA	NA	--	1	U				1	U				1	U				1	U				1	U				1	U				1	U									1	U			
trans-1,3-Dichloropropene	NA	NA	0.2	0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U				0.03	U									0.03	U			
trans-1,4-Dichloro-2-butene	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Trichlorethene (1,1,2-Trichloroethylene)	NA	NA	3	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Trichlorofluoromethane	NA	NA	--	2	U				2	U				2	U				2	U				2	U				2	U				2	U									2	U			
Vinyl Acetate	NA	NA	--	3	U				3	U				3	U				3	U				3	U				3	U				3	U									3	U			
Vinyl Chloride	nonpar	0.01	0.02	0.01	U				0.01	U				**0.15**		V			0.01	U				**0.72**		V	D	N	0.01	U				0.01	U									0.01	U			

D: U = Indicates compound was not detected at the given reporting limit.

V: E= Exceedance, waiting verification based on subsequent lab data; V= Exceedance verified based on previous lab data; P=Passed, previous exceedance not verified based on current lab data.

Tr: I=increasing Trend, D=Decreasing Trend;

The groundwater standards listed are based on the Washington Administrative Code (WAC) 173-200 groundwater limits as modified by the TMS 91-11 standards - the most restrictive of the two is used.

NA: Not applicable - too few data points to evaluate statistically

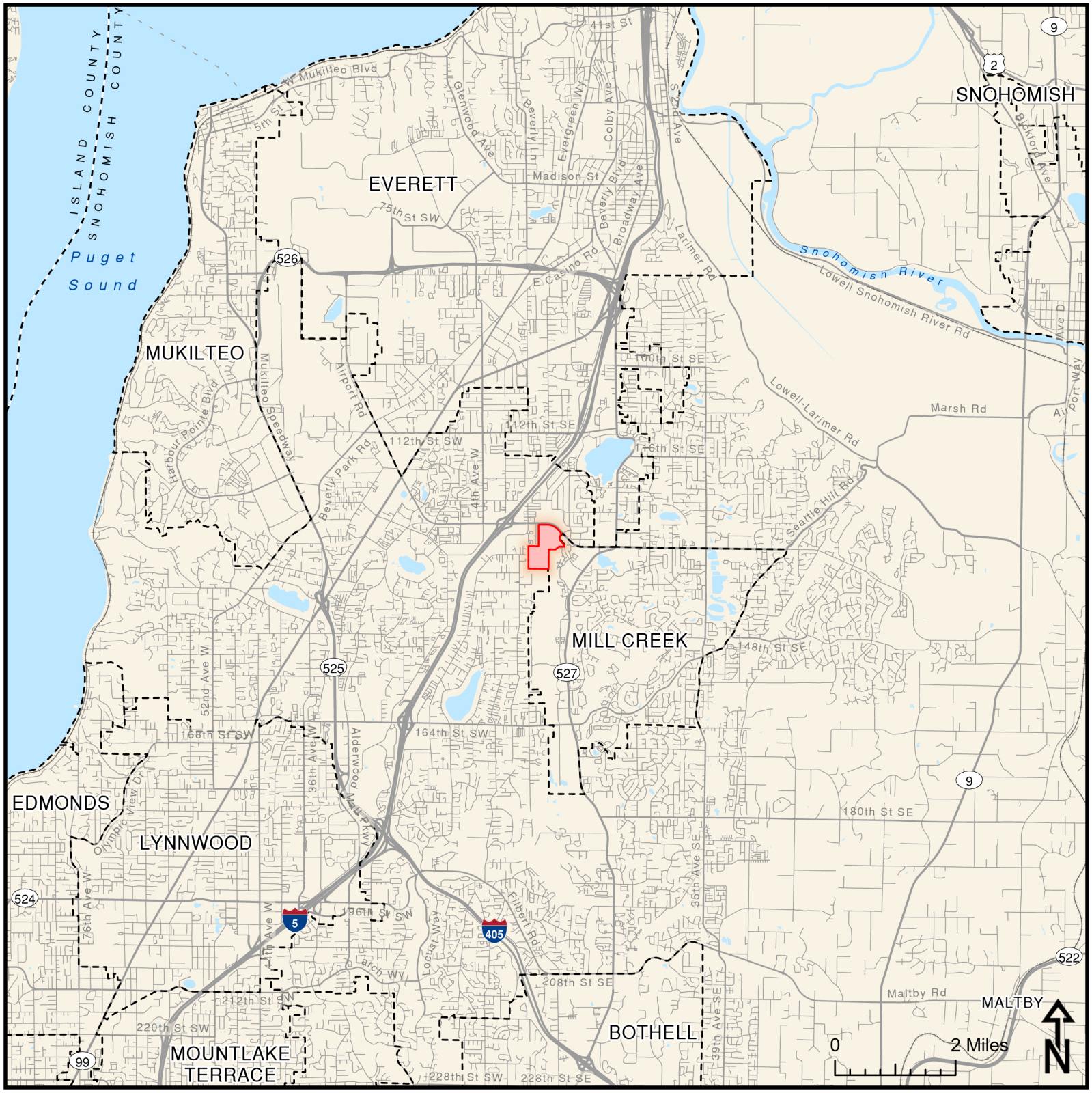
* = pH lab result; field pH not taken due to meter malfunction

Figures

Figure 1

McCollum Park
(Emander Landfill)

Site Location



Subject Property Boundary

Snohomish County
Public Works
Solid Waste Division
Jan 2025

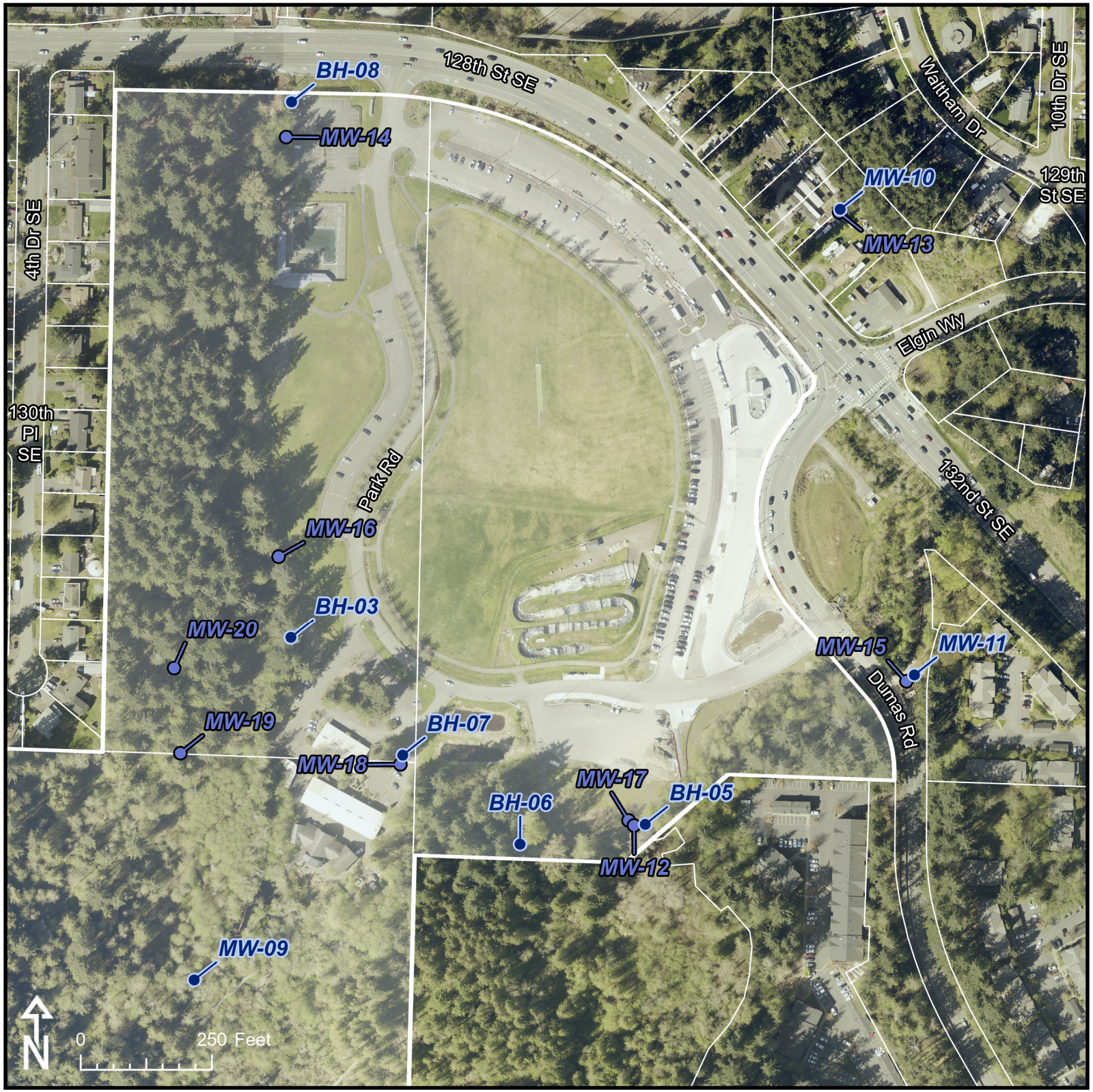


Figure 2

McCollum Park
(Emander Landfill)

Groundwater Monitoring Well Locations

Parcel Boundaries

Subject Property Boundary

Aquifer Unit

- Shallow Aquifer
- Deep Aquifer

Snohomish County
Public Works
Solid Waste Division
Jan 2025

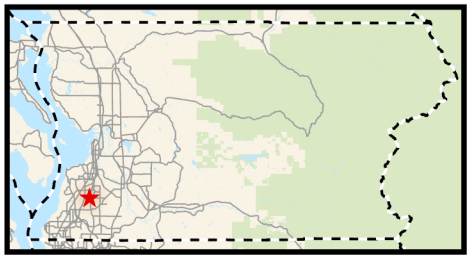
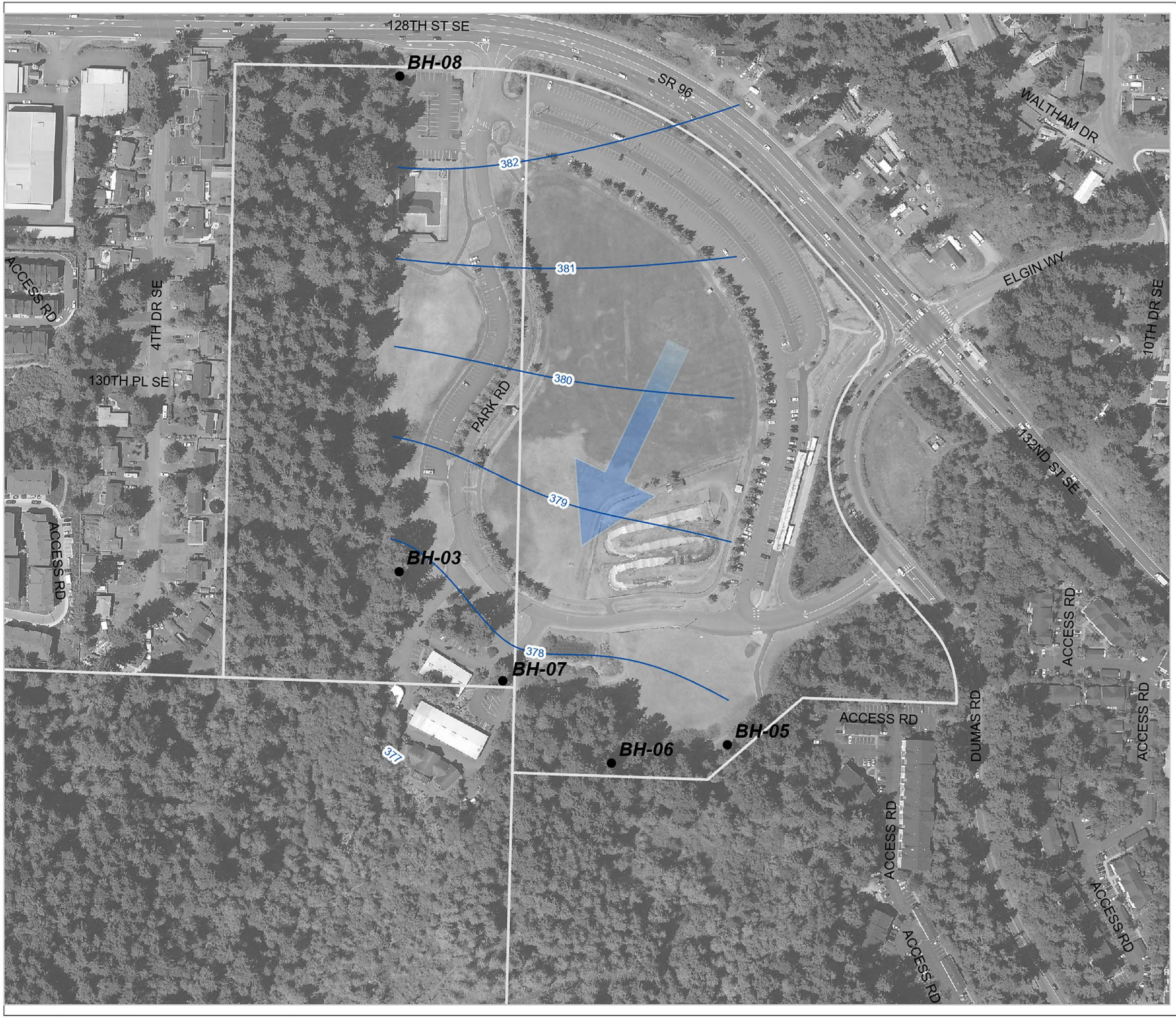


Figure 3A

McCollum Park Landfill

Shallow Aquifer Groundwater Contour Map First Quarter 2024



GROUNDWATER FLOW
0.02652 ft / day
9.68 ft / year
-115.72 degrees to the positive x - axis

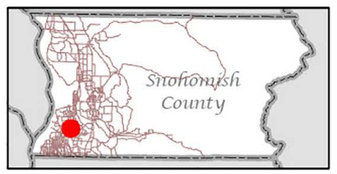
PARCEL BOUNDARY

WELL LOCATION

CONTOURS

WELL ID	DATE	GW ELEVATION
BH-03A	3/19/2024	377.77
BH-05	3/19/2024	377.75
BH-06	3/19/2024	377.29
BH-07	3/19/2024	377.80
BH-08	3/19/2024	382.86

0 60 100 200 300 400 600 700
Feet



N

Snohomish County Public Works
Date: 1/7/2025

Document Path: K:\pw\swaste\Projects\Groundwater Contours.aprx

Figure 3B

McCollum Park Landfill

Deep Aquifer Groundwater Contour Map First Quarter 2024

GROUNDWATER FLOW
0.10978 ft / day
40.07 ft / year
-100.09 degrees to the positive x - axis

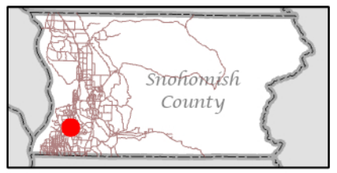
PARCEL BOUNDARY

WELL LOCATION

CONTOURS

WELL ID	DATE	GW ELEVATION
MW-12	3/19/2024	377.68
MW-14	3/19/2024	380.05
MW-15	3/19/2024	378.74
MW-16	3/19/2024	378.68
MW-17	3/19/2024	377.66
MW-18	3/19/2024	377.13
MW-19	3/19/2024	377.86
MW-20	3/19/2024	378.32

0 60 100 200 300 400 600 700
Feet



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Snohomish County Public Works Solid Waste Division
Date: 1/7/2025

Document Path: I:\pw\swaste\Projects\Groundwater Contours.aprx

Figure 3C

McCollum Park Landfill

Shallow Aquifer Groundwater Contour Map Second Quarter 2024

GROUNDWATER FLOW
0.02274 ft / day
8.3 ft / year
-117.09 degrees to the positive x - axis

PARCEL BOUNDARY

WELL LOCATION

CONTOURS

WELL ID	DATE	GW ELEVATION
BH-03	6/25/2024	377.14
BH-05	6/25/2024	377.09
BH-06	6/25/2024	376.82
BH-07	6/25/2024	376.90
BH-08	6/25/2024	381.36

0 60 100 200 300 400 600 700
Feet

Snohomish County

N

Snohomish County Public Works
Date: 1/7/2025

Document Path: K:\pw\swaste\Projects\Groundwater Contours.aprx

Figure 3D

McCollum Park Landfill

Deep Aquifer Groundwater Contour Map Second Quarter 2024

GROUNDWATER FLOW
0.08352 ft / day
30.49 ft / year
-70.19 degrees to the positive x - axis

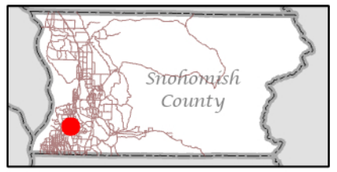
PARCEL BOUNDARY

WELL LOCATION

CONTOURS

WELL ID	DATE	GW ELEVATION
MW-12	6/25/2024	376.77
MW-14	6/25/2024	379.10
MW-15	6/25/2024	376.11
MW-16	6/25/2024	378.05
MW-17	6/25/2024	377.21
MW-18	6/25/2024	377.20
MW-19	6/25/2024	377.15
MW-20	6/25/2024	376.81

0 60 100 200 300 400 600 700
Feet



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Snohomish County Public Works Solid Waste Division
Date: 1/7/2025

Document Path: I:\pw\swaste\Projects\Groundwater Contours.aprx

Attachment 1

Flare Field Inspection Forms

McCOLLUM PARK LANDFILL - WEEKLY GAS PROBE MONITORING DATA

DATE	MILITARY TIME	METHANE %	OXYGEN %	CO2 %	VELOCITY (Ft/Min)	LEL SENSORS	BL-1	BL-2	FLARE	Comments		READERS INITIALS
							Check if system is on					
1-5-24	0750	0	20	0	—	MAN- — BLR- —	OFF	OFF	OUT	GP 14 - 0 BAR- 29.59	POWER IS SHUT OFF	ML DB
1-12-24	10:15	0	20	0	—	MAN- 0 BLR- 0	OFF	OFF	OUT	GP 14 - 0 BAR- 29.49	SPARKER GOOD	TA
1-19-24	1315	7	12	7	—	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.27	BL#2 STARTED @ 0830 BL#2 STOPPED @ 1320 SPARKER GOOD	TA
1-26-24	1000	0	20	0	—	MAN- 0 BLR- 0	OFF	OFF	OUT	GP 14 - 0 BAR- 29.41	SPARKER GOOD	TA
2-2-24	1130	0	20	0	—	MAN- 0 BLR- 0	off	off	out	GP 14 - 0 BAR- 2907	spark good	DB
2-9-24	1100	5	11	6	—	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.47	BL#2 STARTED 0900 TURN OFF BL#2 1100	ML
2-16-24	1220	0	21	0	10	MAN- 0 BLR- 0	Off	OFF	OUT	GP 14 - 0 BAR- 29.66	SPARK GOOD	ML
2-23-24	0915	0	21	0	—	MAN- 0 BLR- 0	OFF	OFF	OUT	GP 14 - 0 BAR- 29.64	SPARK GOOD	ML
3-1-24	0900	17	0	11	—	MAN- 0 BLR- 0	off	off	out	GP 14 - 0 BAR- 29.84	Spark Good	MB
3-8-24	0800	0	21	0	—	MAN- 0 BLR- 0	OFF	OFF	OUT	GP 14 - 0 BAR- 29.49	SPARKER GOOD	TA
3-15-24	1232	3	3	10	—	MAN- 0 BLR- 0	off	off	out	GP 14 - 0 BAR- 29.57	Spark OK	DB
3-22-24	1015	2	5	8	—	MAN- 0 BLR- 0	off	off	out	GP 14 - 0 BAR- 29.23	spark ok	DB
3-29-24	1201	6	11	6	—	MAN- 0 BLR- 0	off	on	out	GP 14 - 0 BAR- 29.28	spk ok	DB
4-5-24	1400	12	1	12	-	MAN- 0 BLR- 0	off	off	out	GP 14 - 0 BAR- 29.18	spark ok	DB
4-12-24	0930	10	4	12	—	MAN- 0 BLR- 0	OFF	OFF	OUT	GP 14 - 0 BAR- 29.28	SPARK GOOD	TA
4-19-24	1030	4	12	6	—	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.56	SPARK GOOD TURNED BLOWER #2 OFF	ML/TA
4-26-24	11:20	0	20	0	—	MAN- 0 BLR- 0	OFF	OFF	OUT	GP 14 - 0 BAR- 29.23	SPARKER GOOD	ML/TA

McCOLLUM PARK LANDFILL - WEEKLY GAS PROBE MONITORING DATA

DATE	MILITARY TIME	METHANE %	OXYGEN %	CO2 %	VELOCITY (Ft/Min)	LEL SENSORS	BL-1	BL-2	FLARE	Comments		READERS INITIALS
							Check if system is on					
5/3/24	1410	37	05	12.5	—	MAN- 0 BLR- 0	off	off	off	GP 14 - 0 BAR- 29.23	spark ok	DB
5-10-24	11:07	7	1	12	0	MAN- 0 BLR- 0	OFF	OFF	OUT	GP 14 - 0 BAR- 29.58	SPARKER GOOD	DB/TA
5-17-24	10:05	0	21	0	—	MAN- 0 BLR- 0	OFF	OFF	OUT	GP 14 - 0 BAR- 29.44	SPARKER GOOD BL2 @ 1125	TA
5-24-24	09:20	19	8	11	327	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.68	LIT FLARE, BL#2	ML
5-31-24	09:20	16	8	9	—	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.54	NOT ENOUGH GAS SHUT OFF BLOWER	TA
6-7-24	1145	40	1	18	12	MAN- 0 BLR- 0	OFF	OFF	ON	GP 14 - 0 BAR- 29.39	TURN ON BL#2	ML/TA
6-14-24	0950	16	9	11	356	MAN- 0 BLR- 0	OFF	ON	ON	GP 14 - 0 BAR- 29.52	SPARKER GOOD	TA
6-21-24	1130	16	9	11	685	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.36	SPARKER GOOD	ML/TA
6-28-24	1055	39	0	18	—	MAN- — BLR- —	—	—	ON	GP 14 - 0 BAR- 29.43	SPARKER GOOD POWER OFF	TA
7-5-24	0855	15	8	11	300	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.59	SPARKER GOOD	ML/TA
7-12-24	0950	15	8	11	295	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.47	SPARKER GOOD	TA
7-19-24	1015	14	8	11	350	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.63	SOMETHING WRONG W/ SPARKER. TURNED OFF BL#2	TA
7-26-24	0930	39	0	19	35	MAN- 0 BLR- 0	OFF	OFF	ON	GP 14 - 0 BAR- 29.49	SPARKER GOOD STARTED BL #2	TA
8-2-24	1130	16	7	11	516	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.57	NOT ENOUGH GAS SHUT OF BLOWER. SPARKER GOOD	TA
8-9-24	1150	0	20	0	—	MAN- 0 BLR- 0	OFF	OFF	OUT	GP 14 - 0 BAR- 29.39	NO GAS	ML
8-16-24	1021	29	4	16	13	MAN- 0 BLR- 0	OFF	OFF	ON	GP 14 - 0 BAR- 29.46	STARTED BL# 2 SPARKER GOOD	ML/TA
8-23-24	1210	13	8	12	365	MAN- 0 BLR- 0	OFF	ON	OUT	GP 14 - 0 BAR- 29.17	NO GAS / NO SPARK TURNED OFF BL-2	TA

Attachment 2

Gas Probe Monitoring Field Sheets

Snohomish County Department of Public Works

Solid Waste Division

Gas Probe Monitoring Data

QUARTERLY GAS ROUND
DATE: 02/16/24

Site	Location: Probe	Time (Military)	Methane (% VOL)	Oxygen (% VOL, % LEL, PPM)	Carbon Diox. (% VOL)	Velocity	Barometric Pressure	Comments
LK STEVENS	GP-1	0905	0%	21%	0%		29.73	
	GP-5	0910	0%	20%	2%		"	
	GP-4	0915	0%	13%	5%		"	
	GP-3	0920	0%	21%	0%		"	
	GP-2	0925	0%	21%	0%		"	
	Flare	0930	0%	21%	1%	5	"	
BRYANT	GP-1(S)	1015	0%	21%	0%		29.84	
	GP-1(M)	1016	0%	21%	0%		"	
	GP-1(D)	1017	0%	21%	0%		"	
	GP-5	1020	0%	20%	1%		"	
	GP-6	1025	0%	21%	0%		"	
	Flare	1030	9%	3%	2%	5	"	
McCOLLUM PARK	GP-18	1155	0%	6%	5%		29.66	
	GP-19	1200	0%	13%	6%		"	
	GP-14	1205	0%	21%	1%		"	
	GP-15	1210	0%	19%	2%		"	
	GP-16	1215	0%	20%	1%		"	
	Flare	1220	0%	21%	0%	10	"	

Methane/Oxygen Meter Used =	GEM 5000
Technician Name =	ML
Page =	**1 of 2**

Snohomish County Department of Public Works

Solid Waste Division

Gas Probe Monitoring Data

QUARTERLY GAS ROUND
DATE: 05/10/24

Site	Location: Probe	Time (Military)	Methane (% VOL)	Oxygen (% VOL, % LEL, PPM)	Carbon Diox. (% VOL)	Velocity	Barometric Pressure	Comments
LK STEVENS	GP-1	0913	0%	20%	0%		29.69	
	GP-5	0915	0%	18%	3%		"	
	GP-4	0918	0%	10%	9%		"	
	GP-3	0900	0%	21%	0%		"	
	GP-2	0903	0%	21%	0%		"	
	Flare	0907	61%	1%	24%	8	"	
BRYANT	GP-1(S)	1000	0%	21%	0%		29.76	
	GP-1(M)	1002	0%	21%	0%		"	
	GP-1(D)	1003	0%	21%	0%		"	
	GP-5	1006	0%	20%	1%		"	
	GP-6	1012	0%	20%	1%		"	
	Flare	1019	17%	0%	3%	20	"	
McCOLLUM PARK	GP-18	1104	0%	10%	10%		29.58	
	GP-19	1100	0%	10%	11%		"	
	GP-14	1107	0%	20%	1%		"	
	GP-15	1111	0%	20%	5%		"	
	GP-16	1116	0%	19%	1%		"	
	Flare	1120	7%	1%	12%	0	"	

Methane/Oxygen Meter Used =	GEM 5000
Technician Name =	TA/DB
Page =	**1 of 2**

Attachment 3

Groundwater Sampling Field Sheets

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22475 **Conditions:** Overcast
Date: 3/20/2024 **Site:** McCollum Park
Time: 10:07 AM **Location:** BH-07

Well Information:

Well Depth: 15.3 ft **Water Depth:** 6.15 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 1.46 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	5.91	974 µS	11	Clear	Very Fine				
Test 2	Grab	5.85	944 µS	11.2	Clear	Very Fine				
Test 3	Grab	5.84	929 µS	11.2	Clear	Very Fine				

Sampling:

Sample Depth: 5.97 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:35

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22474 **Conditions:** Overcast
Date: 3/20/2024 **Site:** McCollum Park
Time: 10:03 AM **Location:** MMW-18

Well Information:

Well Depth: 100.3 ft **Water Depth:** 6.75 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 14.97 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.07	819 µS	11.6	Clear	Very Fine				
Test 2	Grab	6.42	817 µS	11.5	Clear	Very Fine				
Test 3	Grab	6.51	817 µS	11.3	Clear	Very Fine				

Sampling:

Sample Depth: 6.03 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:25

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22473 **Conditions:** Overcast
Date: 3/20/2024 **Site:** McCollum Park
Time: 9:34 AM **Location:** MMW-19

Well Information:

Well Depth: 94.7 ft **Water Depth:** 1.51 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 14.91 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	5.84	213.4 µS	10.1	Clear	Very Fine				
Test 2	Grab	6.1	213.3 µS	10.2	Clear	Very Fine				
Test 3	Grab	6.17	212.2 µS	10.2	Clear	Very Fine				

Sampling:

Sample Depth: 1.55 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:00

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22472 **Conditions:** Overcast
Date: 3/20/2024 **Site:** McCollum Park
Time: 9:16 AM **Location:** MMW-20

Well Information:

Well Depth: 96.2 ft **Water Depth:** 5.18 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 14.56 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	5.72	228 µS	10.3	Clear	Very Fine				
Test 2	Grab	5.78	236 µS	10.1	Clear	Very Fine				
Test 3	Grab	5.92	236 µS	10.2	Clear	Very Fine				

Sampling:

Sample Depth: 5.23 ft **Sample Type:** Standard Ground - Water
Sample Time: 09:40

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number:	22471	**Conditions:**	Overcast
Date:	3/20/2024	**Site:**	McCollum Park
Time:	8:43 AM	**Location:**	MMW-11

Well Information:

Well Depth: **Water Depth:**

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume:

Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time

Sampling:

Sample Depth: **Sample Type:**

Sample Time:

Sample Type	Sample Method	Volume	Bottle Type	Preservative

Notes: not enough water to sample

Number of Bottles:

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22470 **Conditions:** Overcast
Date: 3/20/2024 **Site:** McCollum Park
Time: 8:41 AM **Location:** MMW-15

Well Information:

Well Depth: 125.5 ft **Water Depth:** 23.12 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 16.38 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.31	310 µS	10.8	Clear	Very Fine				
Test 2	Grab	6.52	313 µS	10.2	Clear	Very Fine				
Test 3	Grab	6.77	312 µS	10	Clear	Very Fine				

Sampling:

Sample Depth: 23.21 ft **Sample Type:** Standard Ground - Water
Sample Time: 09:00

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22469 **Conditions:** Sunny
Date: 3/19/2024 **Site:** McCollum Park
Time: 11:15 AM **Location:** BH-03A

Well Information:

Well Depth: 40.5 ft **Water Depth:** 5.78 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 5.56 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.79	215.3 µS	13.6	Clear	Very Fine				
Test 2	Grab	6.77	214.3 µS	13.7	Clear	Very Fine				
Test 3	Grab	6.73	214.1 µS	13.7	Clear	Very Fine				

Sampling:

Sample Depth: 5.89 ft **Sample Type:** Standard Ground - Water
Sample Time: 11:30

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22468 **Conditions:** Sunny
Date: 3/19/2024 **Site:** McCollum Park
Time: 10:46 AM **Location:** MMW-16

Well Information:

Well Depth: 100.3 ft **Water Depth:** 5 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 15.25 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.6	543 µS	12.1	Clear	Very Fine				
Test 2	Grab	6.78	561 µS	12.3	Clear	Very Fine				
Test 3	Grab	6.87	550 µS	12.4	Clear	Very Fine				

Sampling:

Sample Depth: 5.01 ft **Sample Type:** Standard Ground - Water
Sample Time: 11:15

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22467 **Conditions:** Sunny
Date: 3/19/2024 **Site:** McCollum Park
Time: 10:38 AM **Location:** MMW-17

Well Information:

Well Depth: 47.6 ft **Water Depth:** 9.25 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 6.14 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.8	352 µS	10.7	Clear	Very Fine				
Test 2	Grab	6.81	351 µS	10.7	Clear	Very Fine				
Test 3	Grab	6.82	346 µS	10.7	Clear	Very Fine				

Sampling:

Sample Depth: 9.31 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:55

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
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Field Sampling Data

Sample Number:	22466	**Conditions:**	Sunny
Date:	3/19/2024	**Site:**	McCollum Park
Time:	10:34 AM	**Location:**	MMW-12

Well Information:

Well Depth: **Water Depth:**

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume:

Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time

Sampling:

Sample Depth: 8.78 ft **Sample Type:** Standard Ground - Water

Sample Time: 10:40

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes: Split sample with #22465. See sample #22465 for field data

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22465 **Conditions:** Sunny
Date: 3/19/2024 **Site:** McCollum Park
Time: 10:17 AM **Location:** MMW-12

Well Information:

Well Depth: 101.2 ft **Water Depth:** 8.63 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 14.81 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.73	356 µS	11.5	Clear	Very Fine				
Test 2	Grab	6.87	363 µS	11.4	Clear	Very Fine				
Test 3	Grab	6.95	364 µS	11.4	Clear	Very Fine				

Sampling:

Sample Depth: 8.78 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:40

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes: Split sample with #22466

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

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Snohomish, WA 98296

Field Sampling Data

Sample Number: 22464 **Conditions:**

Date: 3/19/2024 **Site:** McCollum Park

Time: 10:07 AM **Location:** BH-05

Well Information:

Well Depth: 16.85 ft **Water Depth:** 7.58 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 1.48 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.24	165.9 µS	8.7	Clear	Very Fine				
Test 2	Grab	6.14	164.4 µS	8.3	Clear	Very Fine				
Test 3	Grab	6.09	162.4 µS	8.3	Clear	Very Fine				

Sampling:

Sample Depth: 7.67 ft **Sample Type:** Standard Ground - Water

Sample Time: 10:15

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22463 **Conditions:** Sunny
Date: 3/19/2024 **Site:** McCollum Park
Time: 9:54 AM **Location:** BH-06

Well Information:

Well Depth: 14.4 ft **Water Depth:** 4.51 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 1.58 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.38	322 µS	9.2	Clear	Very Fine				
Test 2	Grab	6.32	318 µS	8.7	Clear	Very Fine				
Test 3	Grab	6.3	312 µS	8.5	Clear	Very Fine				

Sampling:

Sample Depth: 4.51 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:00

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22462 **Conditions:** Sunny
Date: 3/19/2024 **Site:** McCollum Park
Time: 9:27 AM **Location:** MMW-14

Well Information:

Well Depth: 108.96 ft **Water Depth:** 13.6 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 15.26 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.17	174.4 µS	12.1	Clear	Very Fine				
Test 2	Grab	6.16	174.1 µS	12.2	Clear	Very Fine				
Test 3	Grab	6.17	173.7 µS	12.2	Clear	Very Fine				

Sampling:

Sample Depth: 13.71 ft **Sample Type:** Standard Ground - Water
Sample Time: 09:45

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22461 **Conditions:** Sunny
Date: 3/19/2024 **Site:** McCollum Park
Time: 9:20 AM **Location:** BH-08

Well Information:

Well Depth: 23 ft **Water Depth:** 12.85 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 1.62 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.12	136.6 µS	10.6	Lt Brown	Medium				
Test 2	Grab	5.99	138.1 µS	10.7	Lt Brown	Medium				
Test 3	Grab	6.01	137.8 µS	10.9	Lt Brown	Medium				

Sampling:

Sample Depth: 15.35 ft **Sample Type:** Standard Ground - Water
Sample Time: 09:30

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Daniel Block **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number:	22562	**Conditions:**	Overcast
Date:	6/26/2024	**Site:**	McCollum Park
Time:	10:06 AM	**Location:**	BH-07

Well Information:

Well Depth: **Water Depth:**

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume:

Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time

Sampling:

Sample Depth: 6.89 ft **Sample Type:** Priority Pollutants - Water

Sample Time: 10:25

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	ISCO	100	Clpl	NaOH
Bottle 2	Grab	ISCO	1000	Ambgl	None
Bottle 3	Grab	ISCO	1000	Ambgl	None
Bottle 4	Grab	ISCO	1000	Ambgl	None
Bottle 5	Grab	ISCO	40	Ambgl	H2SO4

Notes: Added sample suite. See field measurements on 22561.

Number of Bottles: 5

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22561 **Conditions:** Overcast
Date: 6/26/2024 **Site:** McCollum Park
Time: 10:16 AM **Location:** BH-07

Well Information:

Well Depth: 15.3 ft **Water Depth:** 7.05 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 1.32 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.5	968 µS	14.1	Clear	Very Fine				
Test 2	Grab	6.55	942 µS	13.6	Clear	Very Fine				
Test 3	Grab	6.65	958 µS	13.8	Clear	Very Fine				

Sampling:

Sample Depth: 6.89 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:25

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22560 **Conditions:** Overcast
Date: 6/26/2024 **Site:** McCollum Park
Time: 9:56 AM **Location:** MMW-18

Well Information:

Well Depth: 100.3 ft **Water Depth:** 6.68 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 14.98 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	7.15	814 µS	13.6	Clear	Very Fine				
Test 2	Grab	7.21	810 µS	13.7	Clear	Very Fine				
Test 3	Grab	7.14	808 µS	13.7	Clear	Very Fine				

Sampling:

Sample Depth: 8.11 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:15

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22559 **Conditions:** Overcast
Date: 6/26/2024 **Site:** McCollum Park
Time: 9:30 AM **Location:** MMW-19

Well Information:

Well Depth: 94.7 ft **Water Depth:** 2.22 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 14.8 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	7.21	216 µS	12	Clear	Very Fine				
Test 2	Grab	7.33	211 µS	11.3	Clear	Very Fine				
Test 3	Grab	7.37	208 µS	11.5	Clear	Very Fine				

Sampling:

Sample Depth: 3.03 ft **Sample Type:** Standard Ground - Water
Sample Time: 09:45

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22558 **Conditions:** Overcast
Date: 6/26/2024 **Site:** McCollum Park
Time: 9:07 AM **Location:** MMW-20

Well Information:

Well Depth: 96.2 ft **Water Depth:** 6.69 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 14.32 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	7.49	239 µS	12	Clear	Very Fine				
Test 2	Grab	7.27	233 µS	11.6	Clear	Very Fine				
Test 3	Grab	7.23	235 µS	11.3	Clear	Very Fine				

Sampling:

Sample Depth: 5.91 ft **Sample Type:** Standard Ground - Water
Sample Time: 09:25

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number:	22557	**Conditions:**	Overcast
Date:	6/26/2024	**Site:**	McCollum Park
Time:	8:31 AM	**Location:**	MMW-11

Well Information:

Well Depth: **Water Depth:**

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume:

Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time

Sampling:

Sample Depth: **Sample Type:**

Sample Time:

Sample Type	Sample Method	Volume	Bottle Type	Preservative

Notes: Not enough water to sample.

Number of Bottles:

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22556 **Conditions:** Overcast
Date: 6/26/2024 **Site:** McCollum Park
Time: 8:31 AM **Location:** MMW-15

Well Information:

Well Depth: 125.5 ft **Water Depth:** 25.75 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 15.96 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	7.54	328 µS	12.1	Clear	Very Fine				
Test 2	Grab	7.51	307 µS	11.4	Clear	Very Fine				
Test 3	Grab	7.52	306 µS	11.7	Clear	Very Fine				

Sampling:

Sample Depth: 23.81 ft **Sample Type:** Standard Ground - Water
Sample Time: 08:50

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22555 **Conditions:** Sunny
Date: 6/25/2024 **Site:** McCollum Park
Time: 11:01 AM **Location:** MMW-17

Well Information:

Well Depth: 47.6 ft **Water Depth:** 9.7 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 6.06 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.47	345 µS	11.8	Clear	Very Fine				
Test 2	Grab	6.54	354 µS	11.2	Clear	Very Fine				
Test 3	Grab	6.72	347 µS	11.4	Clear	Very Fine				

Sampling:

Sample Depth: 10.33 ft **Sample Type:** Standard Ground - Water
Sample Time: 11:10

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22554 **Conditions:** Sunny
Date: 6/25/2024 **Site:** McCollum Park
Time: 10:40 AM **Location:** MMW-12

Well Information:

Well Depth: 101.2 ft **Water Depth:** 9.54 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 14.67 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.46	370 µS	12.3	Clear	Very Fine				
Test 2	Grab	6.74	382 µS	12.1	Clear	Very Fine				
Test 3	Grab	6.86	384 µS	12.1	Clear	Very Fine				

Sampling:

Sample Depth: 9.41 ft **Sample Type:** Standard Ground - Water
Sample Time: 11:00

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22553 **Conditions:** Sunny
Date: 6/25/2024 **Site:** McCollum Park
Time: 10:33 AM **Location:** BH-05

Well Information:

Well Depth: 16.85 ft **Water Depth:** 8.24 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 1.38 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	5.66	287 µS	10.4	Lt Brown	Medium				
Test 2	Grab	5.77	295 µS	9.4	Clear	Very Fine				
Test 3	Grab	5.86	298 µS	9.1	Clear	Very Fine				

Sampling:

Sample Depth: 8.15 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:40

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22552 **Conditions:** Sunny
Date: 6/25/2024 **Site:** McCollum Park
Time: 10:19 AM **Location:** BH-06

Well Information:

Well Depth: 14.4 ft **Water Depth:** 4.98 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 1.51 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	5.8	309 µS	11.7	Clear	Very Fine				
Test 2	Grab	5.95	300 µS	11.2	Clear	Very Fine				
Test 3	Grab	6.06	301 µS	11	Clear	Very Fine				

Sampling:

Sample Depth: 5.17 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:25

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

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Field Sampling Data

Sample Number: 22551 **Conditions:** Sunny
Date: 6/25/2024 **Site:** McCollum Park
Time: 9:52 AM **Location:** BH-03A

Well Information:

Well Depth: 40.5 ft **Water Depth:** 6.41 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 5.45 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.18	190 µS	14.5	Clear	Very Fine				
Test 2	Grab	6.37	192 µS	14	Clear	Very Fine				
Test 3	Grab	6.45	194 µS	14.2	Clear	Very Fine				

Sampling:

Sample Depth: 6.73 ft **Sample Type:** Standard Ground - Water
Sample Time: 10:00

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number:	22550	**Conditions:**	Sunny
Date:	6/25/2024	**Site:**	McCollum Park
Time:	9:22 AM	**Location:**	MMW-16

Well Information:

Well Depth: **Water Depth:**

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume:

Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time

Sampling:

Sample Depth: 5.82 ft **Sample Type:** Standard Ground - Water

Sample Time: 09:40

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes: Split sample. See field measurements on 22549.

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22549 **Conditions:** Sunny
Date: 6/25/2024 **Site:** McCollum Park
Time: 9:22 AM **Location:** MMW-16

Well Information:

Well Depth: 100.3 ft **Water Depth:** 5.63 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 15.15 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	6.22	536 µS	13.5	Clear	Very Fine				
Test 2	Grab	6.55	547 µS	13.1	Clear	Very Fine				
Test 3	Grab	6.65	554 µS	13.1	Clear	Very Fine				

Sampling:

Sample Depth: 5.82 ft **Sample Type:** Standard Ground - Water
Sample Time: 09:40

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes: Split sample with 22550.

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22548 **Conditions:** Sunny
Date: 6/25/2024 **Site:** McCollum Park
Time: 8:55 AM **Location:** MMW-14

Well Information:

Well Depth: 108.96 ft **Water Depth:** 14.55 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 15.11 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	5.5	166 µS	13.5	Clear	Very Fine				
Test 2	Grab	5.77	168 µS	13.2	Clear	Very Fine				
Test 3	Grab	5.87	170 µS	13.1	Clear	Very Fine				

Sampling:

Sample Depth: 14.59 ft **Sample Type:** Standard Ground - Water
Sample Time: 09:15

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

Snohomish County Solid Waste
Environmental Services Section
8915 Cathcart Way
Snohomish, WA 98296

Field Sampling Data

Sample Number: 22547 **Conditions:** Sunny
Date: 6/25/2024 **Site:** McCollum Park
Time: 8:41 AM **Location:** BH-08

Well Information:

Well Depth: 23 ft **Water Depth:** 14.35 ft

Surface Measurements:

Flow Rate: **Measure Method:**

Field Chemistry Tests:

Purge Volume: 1.38 gallons

	Type	pH	Cond	Temp	Color	Turbidity	Purge Vol	Water Depth	ORP	Time
Test 1	Grab	5.14	120 µS	13.1	Clear	Medium				
Test 2	Grab	5.33	130 µS	12.3	Clear	Fine				
Test 3	Grab	5.36	130 µS	11.5	Clear	Very Fine				

Sampling:

Sample Depth: 16.91 ft **Sample Type:** Standard Ground - Water
Sample Time: 08:50

	Sample Type	Sample Method	Volume	Bottle Type	Preservative
Bottle 1	Grab	Dedicator	1000	Clpl	None
Bottle 2	Grab	Dedicator	250	Clpl	HNO3R
Bottle 3	Grab	Dedicator	250	Clpl	H2SO4
Bottle 4	Grab	Dedicator	250	Clpl	HNO3
Bottle 5	Grab	Dedicator	40	Glass	HCL
Bottle 6	Grab	Dedicator	40	Glass	HCL
Bottle 7	Grab	Dedicator	40	Glass	HCL
Bottle 8	Grab	Dedicator	40	Glass	HCL

Notes:

Number of Bottles: 8

Operator/Witness: Trina Arnold **Sampler: Matt Lawless**

Attachment 4

Groundwater Flow Calculations

Site: **McCollum Park/Former Emander Landfill - Shallow Aquifer, 1st Quarter 2024**

Measurement Date: **3/19/2024**

		[**X**] matrix		[**D**] matrix									
Well ID	**X-axis**	**Y-axis**	**GW Elev.**	D									
BH-03A	222.89	1076.77	**377.77**	1	Pt								
BH-05	899.19	716.67	**377.75**	1		222.89	899.19	658.91	436.3	223.9	0	0	0
BH-06	658.91	680.07	**377.29**	1		1076.77	716.67	680.07	849.7	2097.01	0	0	0
BH-07	436.29	849.69	**377.80**	1		377.77	377.75	377.29	377.8	382.86	0	0	0
BH-08	223.90	2097.01	**382.86**	1									
6	0	0	0	1	{[P]t[P]}								
7	0	0	0	1		1532865.17	2172760.475	923023					
8	0	0	0	1		2172760.475	7254968.763	2057951					
9	0	0	0	1		923023.0477	2057951.236	717067.6					
10	0	0	0	1									
11	0	0	0	1	{[P]t[P]}'								
12	0	0	0	1		5.66416E-06	2.00015E-06	-1.3E-05					
13	0	0	0	1		2.00015E-06	1.44773E-06	-6.7E-06					
14	0	0	0	1		-1.30314E-05	-6.7296E-06	3.75E-05					
15	0	0	0	1									
16	0	0	0	1	{[P]t[P]}'[P]t								
17	0	0	0	1		-0.001506668	0.001604009	0.000176	-8E-04	0.000473357	0	0	0
18	0	0	0	1		-0.000537537	0.000293971	-0.00024	-4E-04	0.000907265	0	0	0
19	0	0	0	1		0.004008943	-0.0023816	0.000979	0.003	-0.002679197	0	0	0
20	0	0	0	1									

{[P]t[P]}'[P]t [D] = [**A**] matrix

A	-6.0098E-06
B	-1.2474E-05
C	0.002684111

Groundwater Gradient:	**0.0052**	
Conductivity (ft/day):	**1.542**	
Effective porosity:	**30%**	
GW velocity:	**0.02652**	**ft/day**
	9.68	**ft/year**
Flow direction:	**-115.72**	**degrees from the positive x-axis**

This spreadsheet is from the paper, "A Spreadsheet Method For Estimating Hydraulic Gradient With Heads From Multiple Wells" submitted to Ground Water, March, 2002. To use the program, enter the coordinates for the well locations in the columns labeled x and y (part of the [**X**] matrix), and the water levels in the z column. The matrices are automatically updated and the gradient magnitude and direction are calculated in cell H36 and H41.

Site: **McCollum Park/Former Emander Landfill - Deep Aquifer, 1st Quarter 2024**

Measurement Date: **3/19/2024**

	[**X**] matrix			[**D**] matrix
Well ID	**X-axis**	**Y-axis**	**GW Elev.**	D
MW-12	881.62	719.01	**377.68**	1
MW-14	213.79	2027.73	**380.05**	1
MW-15	1401.93	991.00	**378.74**	1
MW-16	193.95	1231.98	**378.68**	1
MW-17	867.27	723.98	**377.66**	1
MW-18	430.16	834.63	**377.13**	1
MW-19	11.87	855.95	**377.86**	1
MW-20	0.30	1017.50	**378.32**	1
9	0	0	0	1
10	0	0	0	1
11	0	0	0	1
12	0	0	0	1
13	0	0	0	1
14	0	0	0	1
15	0	0	0	1
16	0	0	0	1
17	0	0	0	1
18	0	0	0	1
19	0	0	0	1
20	0	0	0	1

Pt

881.62	213.79	1401.93	194	867.27	430.2	11.87
719.01	2027.73	991	1232	723.98	834.6	856
377.68	380.05	378.74	378.7	377.66	377.1	377.9

{[P]t[P]}

3763320.181	3693033.096	1512991
3693033.096	10117230.98	3180604
1512991.208	3180604.175	1144681

{[P]t[P]}'

6.41237E-07	2.56047E-07	-1.56E-06
2.56047E-07	8.83721E-07	-2.79E-06
-1.55901E-06	-2.7939E-06	1.07E-05

{[P]t[P]}'[P]t

0.00016062	6.37823E-05	0.000562	-2E-04	0.000152722	-1E-04	-4E-04
-0.000194073	0.000784853	0.000177	8E-05	-0.000193299	-2E-04	-3E-04
0.000656891	-0.00193308	-0.000903	3E-04	0.000665163	0.001	0.002

{[P]t[P]}'[P]t [D] = [**A**] matrix

A	-9.8453E-07
B	-5.5351E-06
C	0.002660317

Groundwater Gradient:	**0.0021**	
Conductivity (ft/day):	**15.584**	
Effective porosity:	**30%**	
GW velocity:	**0.10978**	**ft/day**
	40.07	**ft/year**
Flow direction:	**-100.09**	**degrees from the positive x-axis**

This spreadsheet is from the paper, "A Spreadsheet Method For Estimating Hydraulic Gradient With Heads From Multiple Wells" submitted to Ground Water, March, 2002. To use the program, enter the coordinates for the well locations in the columns labeled x and y (part of the [**X**] matrix), and the water levels in the z column. The matrices are automatically updated and the gradient magnitude and direction are calculated in cell H36 and H41.

Site: **McCollum Park/Former Emander Landfill - Shallow Aquifer, 2nd Quarter 2024**

Measurement Date: **6/25/2024**

		[**X**] matrix		[**D**] matrix									
Well ID	**X-axis**	**Y-axis**	**GW Elev.**	D									
BH-03A	222.89	1076.77	**377.14**	1	Pt								
BH-05	899.19	716.67	**377.09**	1		222.89	899.19	658.91	436.3	223.9	0	0	0
BH-06	658.91	680.07	**376.82**	1		1076.77	716.67	680.07	849.7	2097.01	0	0	0
BH-07	436.29	849.69	**376.90**	1		377.14	377.09	376.82	376.9	381.36	0	0	0
BH-08	223.90	2097.01	**381.36**	1									
6	0	0	0	1	{[P]t[P]}								
7	0	0	0	1		1532865.17	2172760.475	921251					
8	0	0	0	1		2172760.475	7254968.763	2052570					
9	0	0	0	1		921250.9629	2052570	713913.8					
10	0	0	0	1									
11	0	0	0	1	{[P]t[P]}'								
12	0	0	0	1		5.65829E-06	1.98939E-06	-1.3E-05					
13	0	0	0	1		1.98939E-06	1.4382E-06	-6.7E-06					
14	0	0	0	1		-1.30213E-05	-6.7021E-06	3.75E-05					
15	0	0	0	1									
16	0	0	0	1	{[P]t[P]}'[P]t								
17	0	0	0	1		-0.00150755	0.001603419	0.000175	-7E-04	0.000472872	0	0	0
18	0	0	0	1		-0.000535611	0.000292254	-0.00024	-4E-04	0.000905425	0	0	0
19	0	0	0	1		0.004013581	-0.00238115	0.000983	0.003	-0.002679205	0	0	0
20	0	0	0	1									

{[P]t[P]}'[P]t [D] = [**A**] matrix

A	-5.407E-06
B	-1.0571E-05
C	0.002683781

Groundwater Gradient:	**0.0044**	
Conductivity (ft/day):	**1.542**	
Effective porosity:	**30%**	
GW velocity:	**0.02274**	**ft/day**
	8.30	**ft/year**
Flow direction:	**-117.09**	**degrees from the positive x-axis**

This spreadsheet is from the paper, "A Spreadsheet Method For Estimating Hydraulic Gradient With Heads From Multiple Wells" submitted to Ground Water, March, 2002. To use the program, enter the coordinates for the well locations in the columns labeled x and y (part of the [**X**] matrix), and the water levels in the z column. The matrices are automatically updated and the gradient magnitude and direction are calculated in cell H36 and H41.

Site: **McCollum Park/Former Emander Landfill - Deep Aquifer, 2nd Quarter 2024**

Measurement Date: **6/25/2024**

	[**X**] matrix			[**D**] matrix
Well ID	**X-axis**	**Y-axis**	**GW Elev.**	D
MW-12	881.62	719.01	**376.77**	1
MW-14	213.79	2027.73	**379.10**	1
MW-15	1401.93	991.00	**376.11**	1
MW-16	193.95	1231.98	**378.05**	1
MW-17	867.27	723.98	**377.21**	1
MW-18	430.16	834.63	**377.20**	1
MW-19	11.87	855.95	**377.15**	1
MW-20	0.3	1017.5	**376.81**	1
9	0	0	0	1
10	0	0	0	1
11	0	0	0	1
12	0	0	0	1
13	0	0	0	1
14	0	0	0	1
15	0	0	0	1
16	0	0	0	1
17	0	0	0	1
18	0	0	0	1
19	0	0	0	1
20	0	0	0	1

Pt

881.62	213.79	1401.93	194	867.27	430.2	11.87
719.01	2027.73	991	1232	723.98	834.6	856
376.77	379.1	376.11	378.1	377.21	377.2	377.2

{[P]t[P]}

3763320.181	3693033.096	1507808
3693033.096	10117230.98	3172230
1507807.528	3172229.539	1138848

{[P]t[P]}'

6.38395E-07	2.52613E-07	-1.55E-06
2.52613E-07	8.80554E-07	-2.79E-06
-1.54887E-06	-2.7872E-06	1.07E-05

{[P]t[P]}'[P]t

0.000160886	6.15389E-05	0.000563	-2E-04	0.000152299	-1E-04	-4E-04
-0.000194302	0.0007829	0.000178	8E-05	-0.000194777	-2E-04	-3E-04
0.000659047	-0.00192934	-0.000912	3E-04	0.000672126	0.001	0.002

{[P]t[P]}'[P]t [D] = [**A**] matrix

A	1.4496E-06
B	-4.0232E-06
C	0.002659685

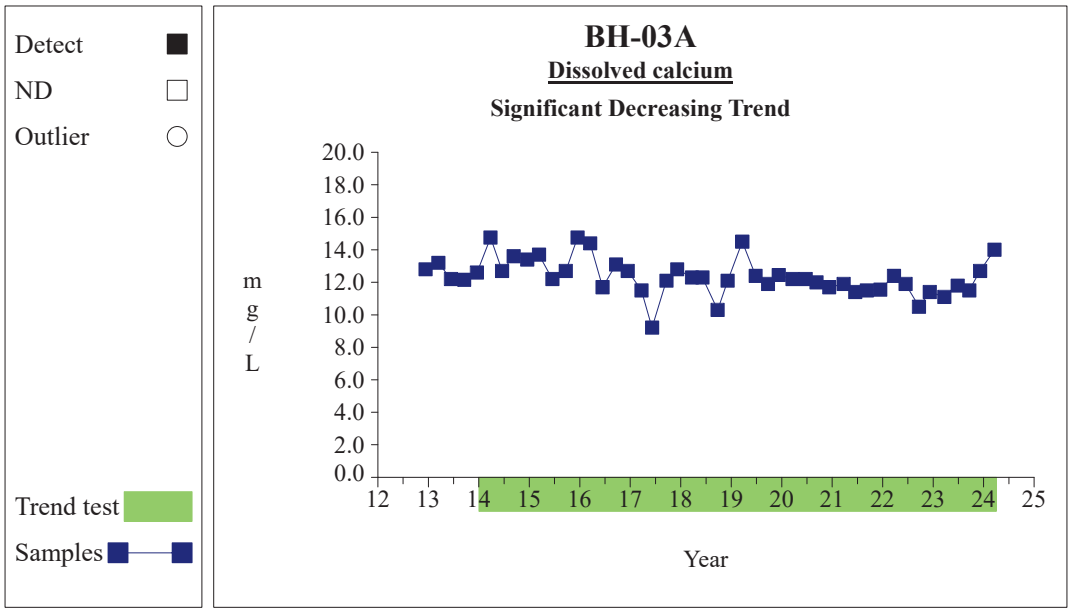
Groundwater Gradient:	**0.0016**	
Conductivity (ft/day):	**15.584**	
Effective porosity:	**30%**	
GW velocity:	**0.08352**	**ft/day**
	30.49	**ft/year**
Flow direction:	**-70.19**	**degrees from the positive x-axis**

This spreadsheet is from the paper, "A Spreadsheet Method For Estimating Hydraulic Gradient With Heads From Multiple Wells" submitted to Ground Water, March, 2002. To use the program, enter the coordinates for the well locations in the columns labeled x and y (part of the [**X**] matrix), and the water levels in the z column. The matrices are automatically updated and the gradient magnitude and direction are calculated in cell H36 and H41.

Attachment 5

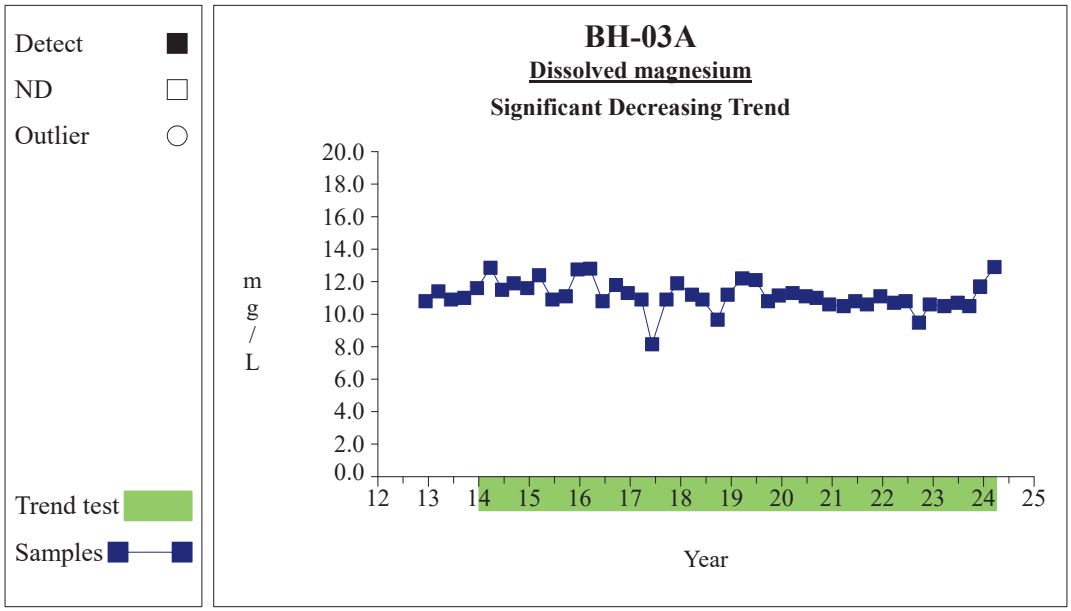
Statistical Time Series Plots

Time Series



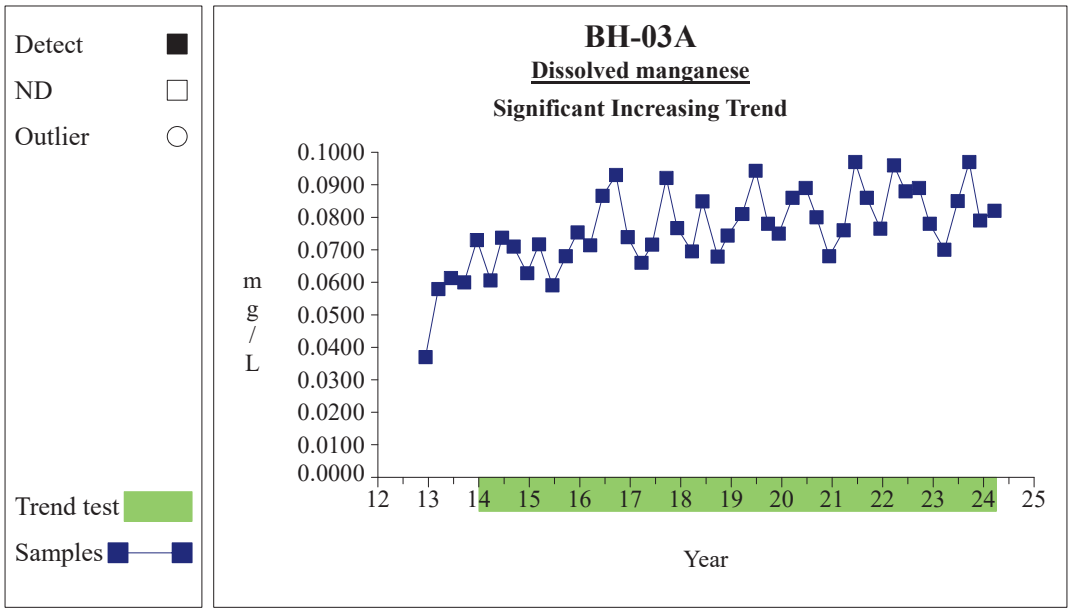
Graph 22

Time Series



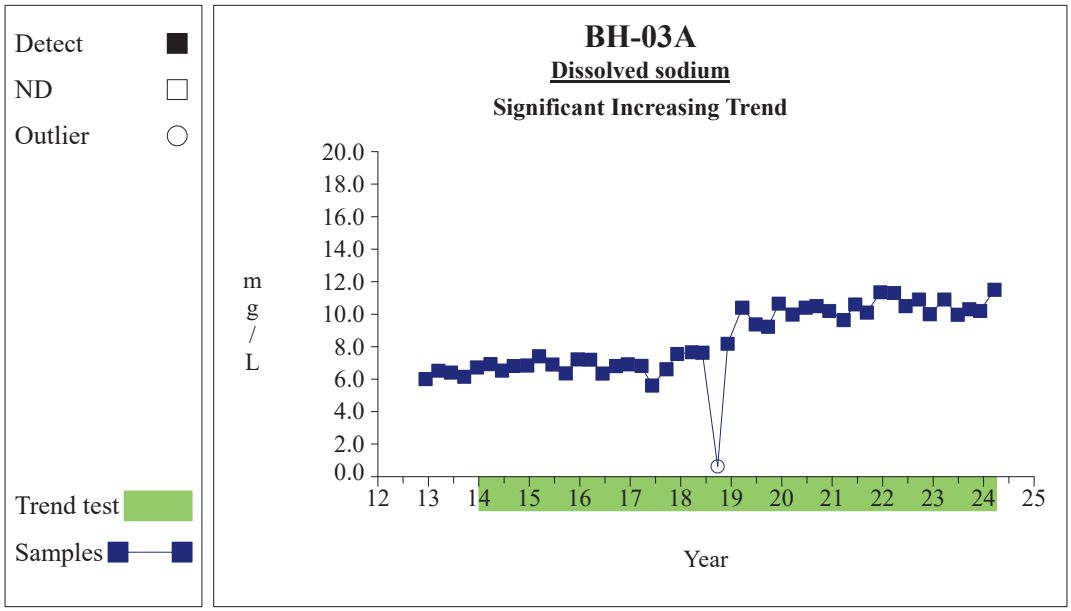
Graph 28

Time Series



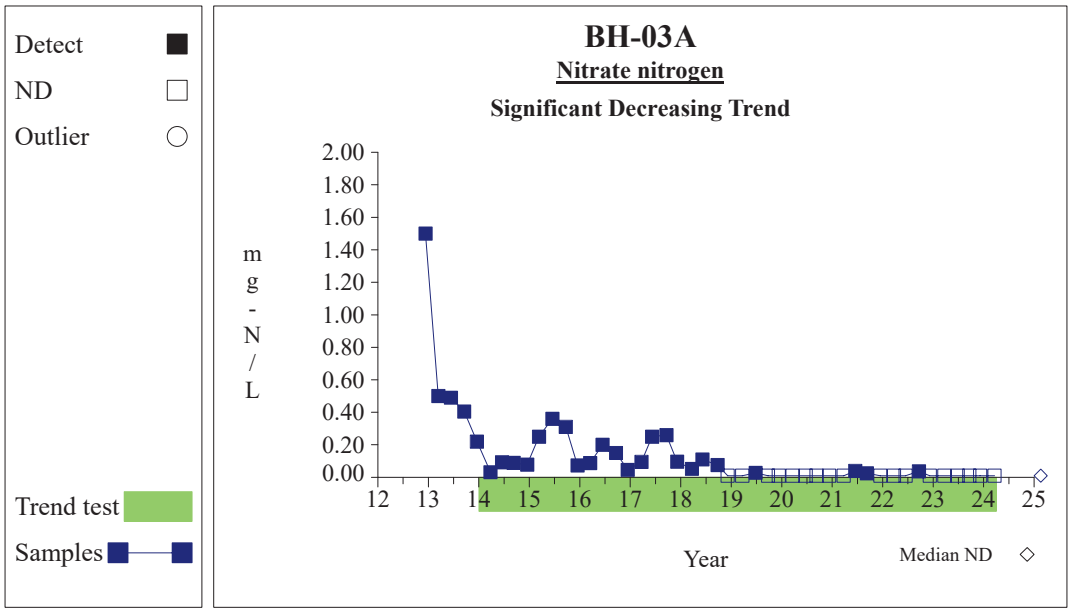
Graph 29

Time Series



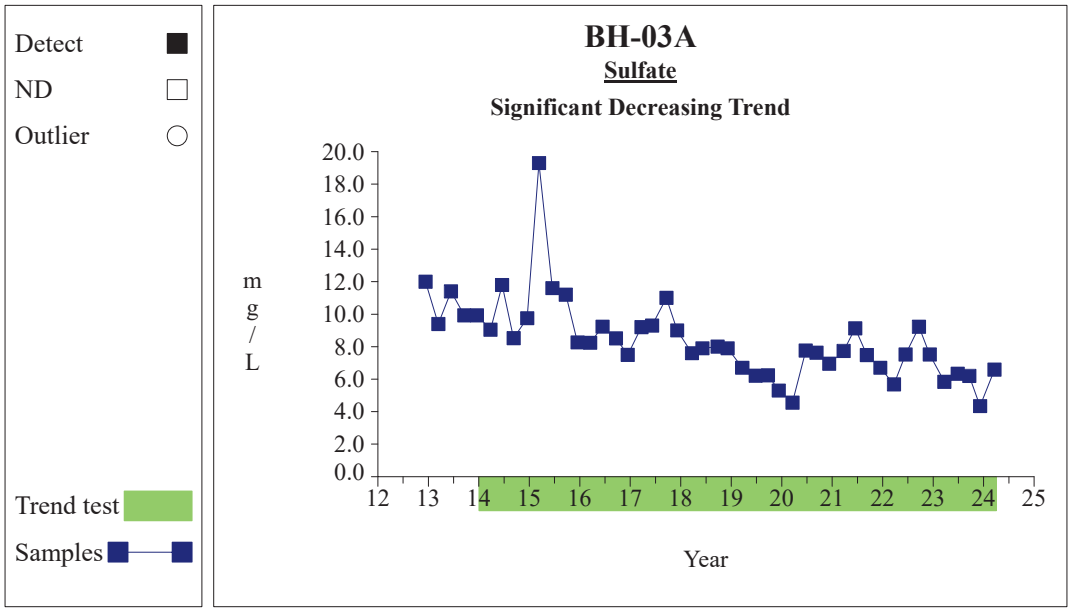
Graph 34

Time Series



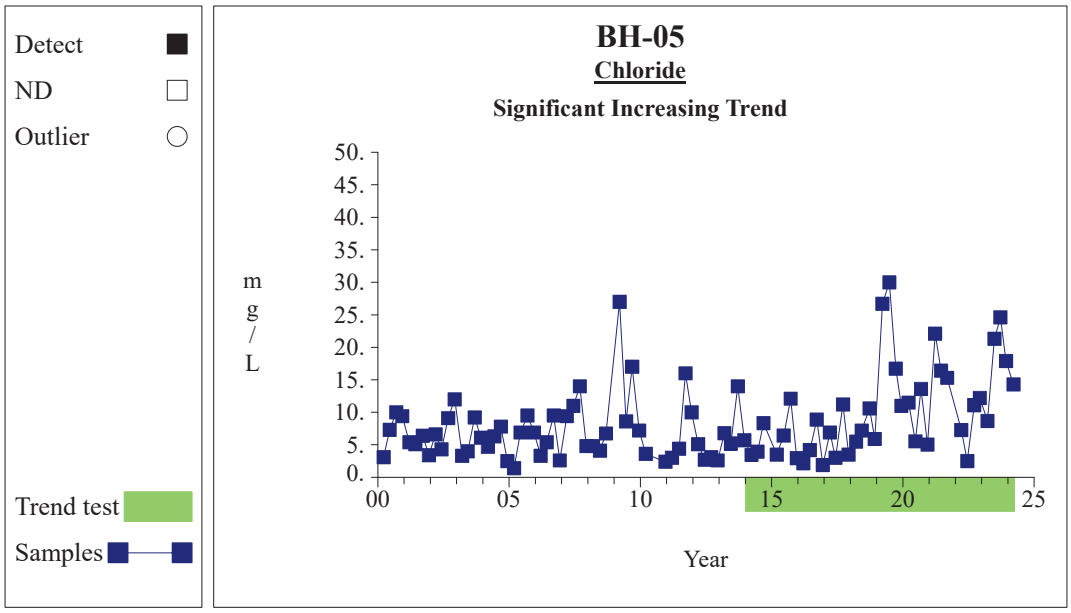
Graph 40

Time Series



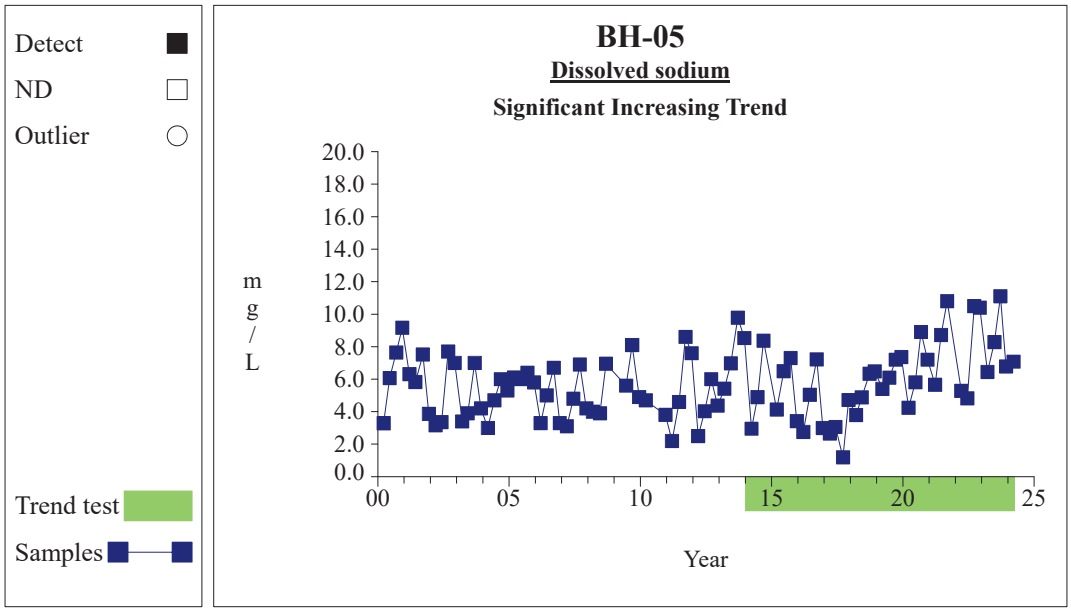
Graph 45

Time Series



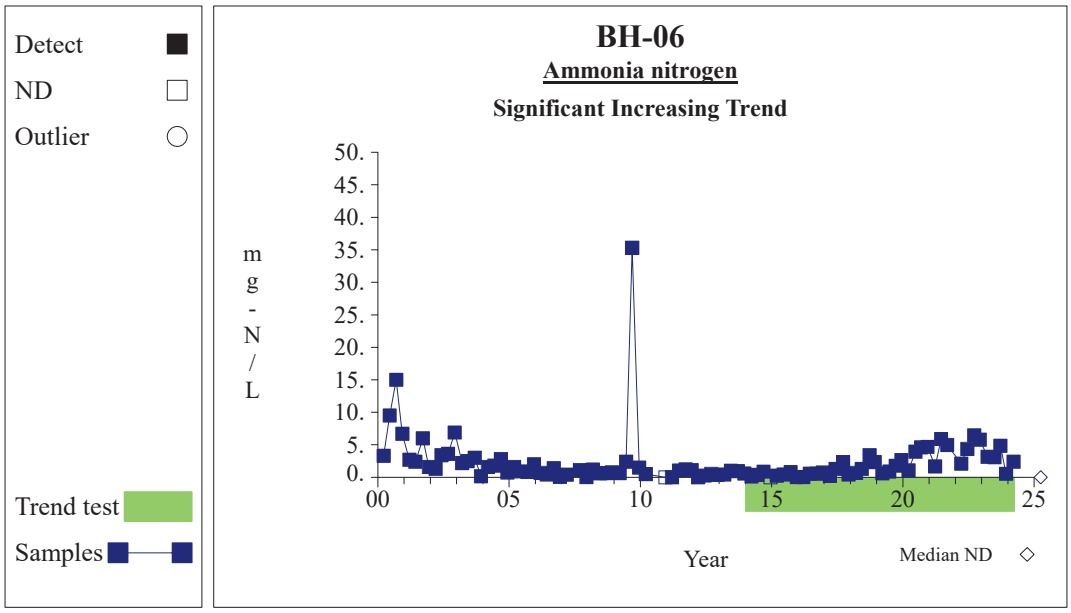
Graph 62

Time Series



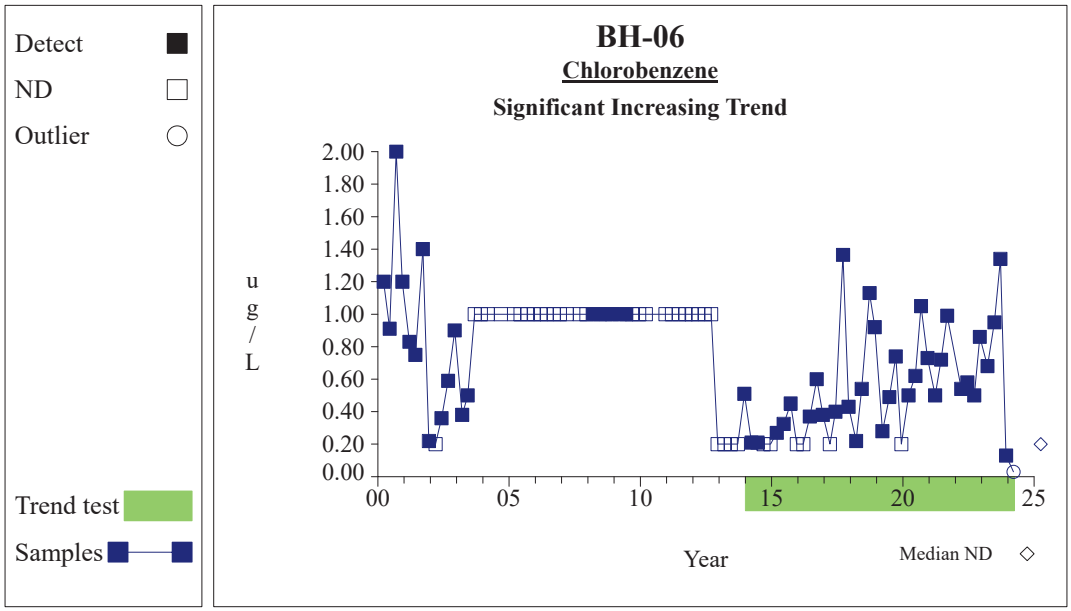
Graph 85

Time Series



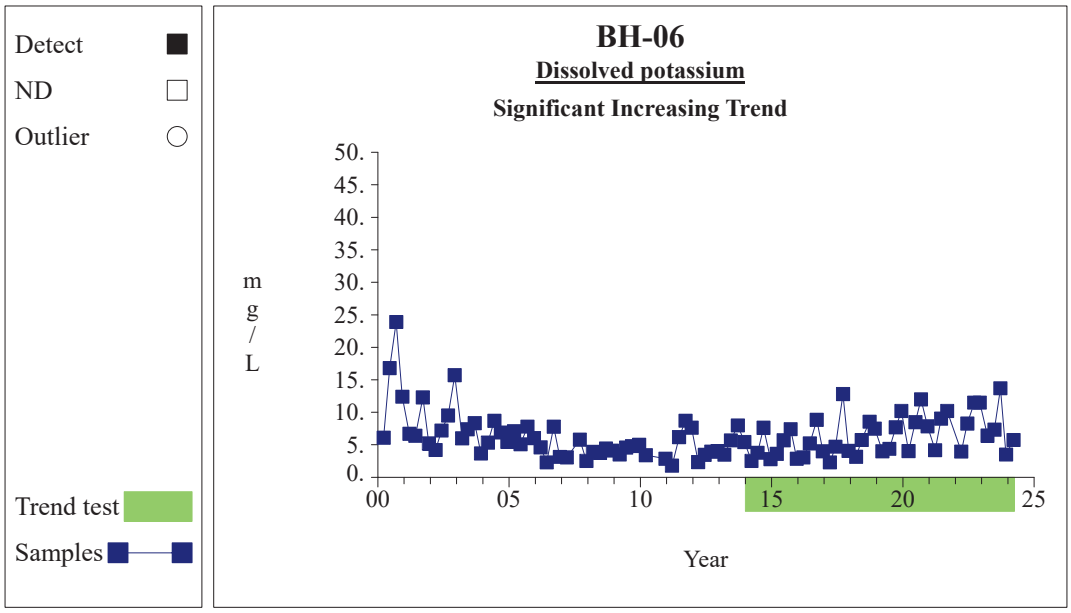
Graph 108

Time Series



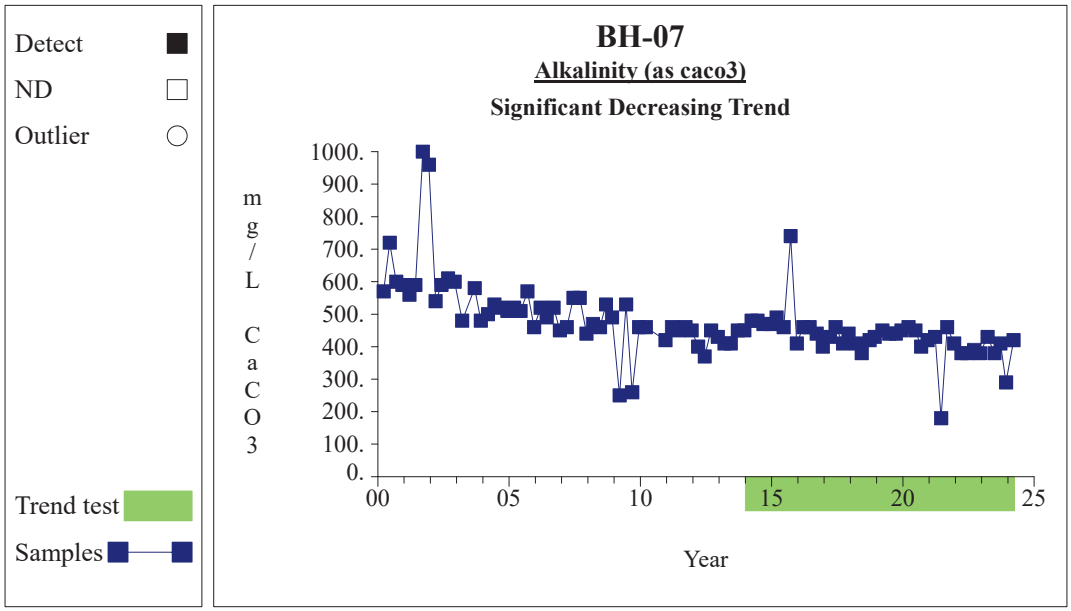
Graph 114

Time Series



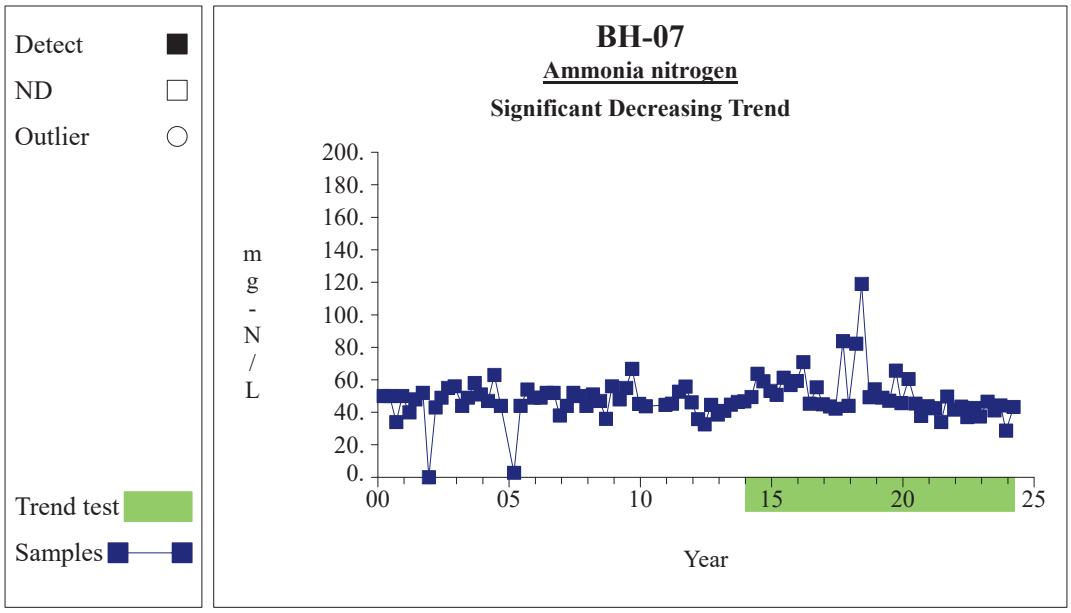
Graph 133

Time Series



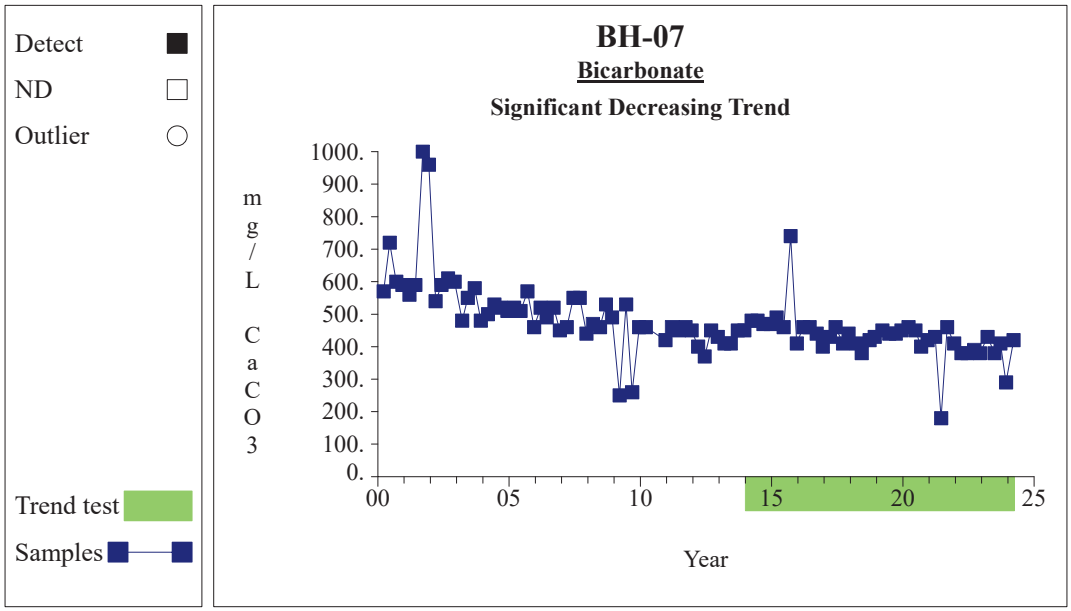
Graph 158

Time Series



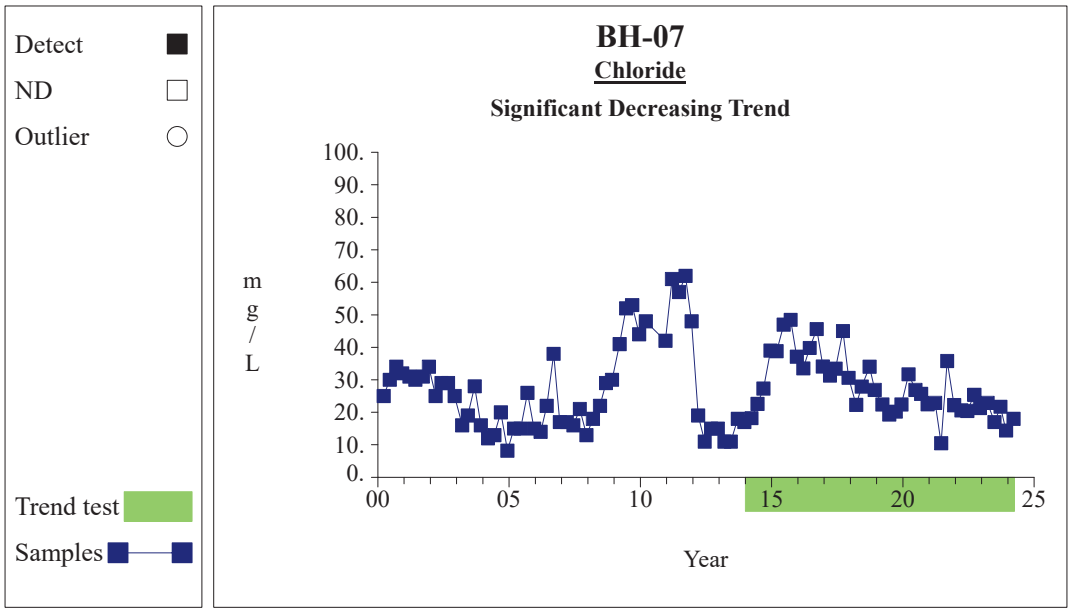
Graph 159

Time Series



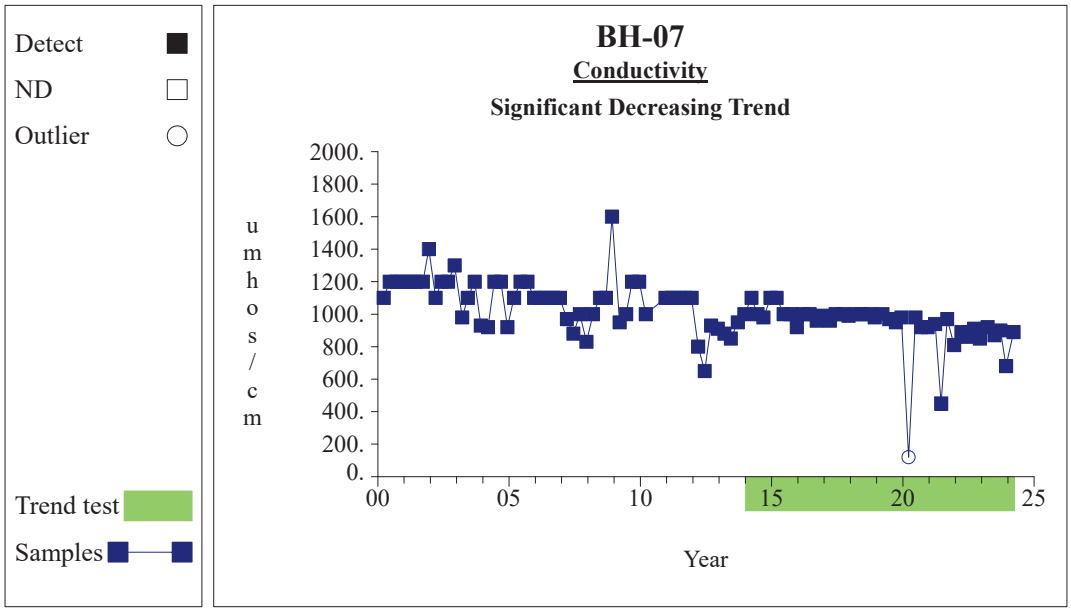
Graph 161

Time Series



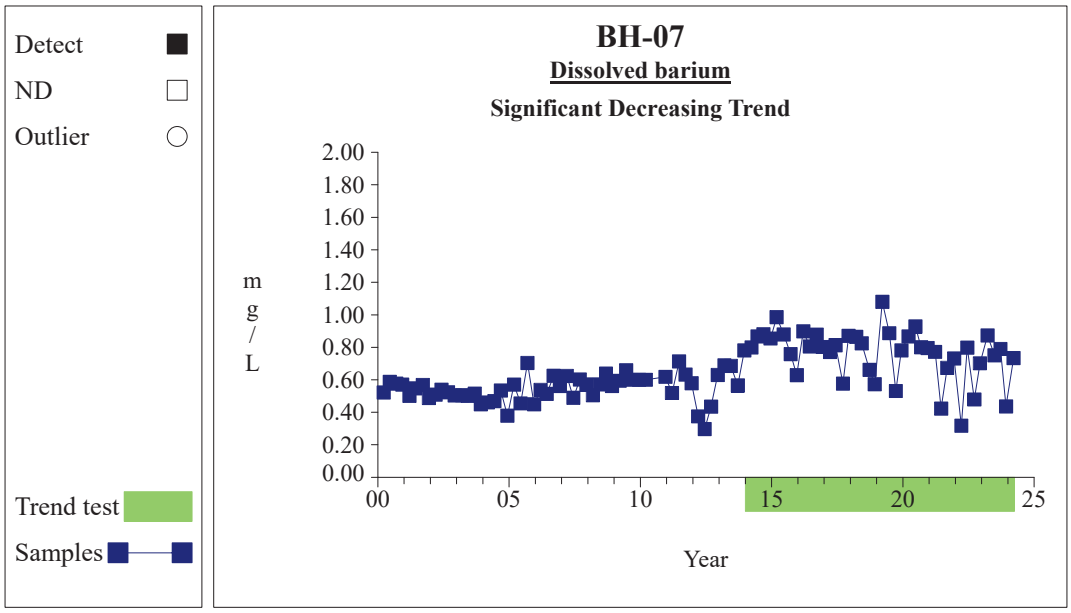
Graph 164

Time Series



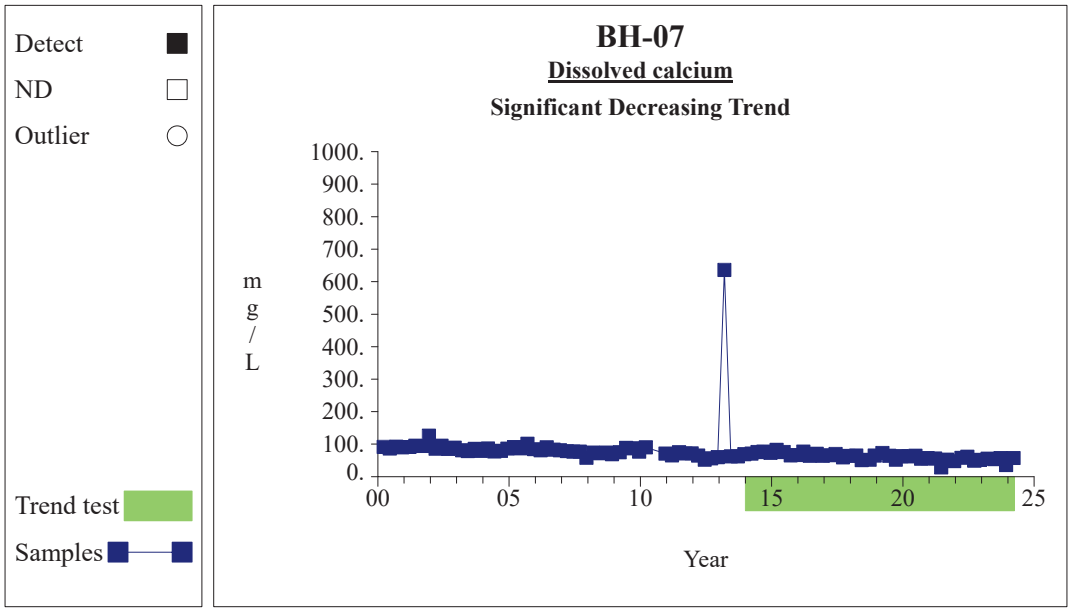
Graph 169

Time Series



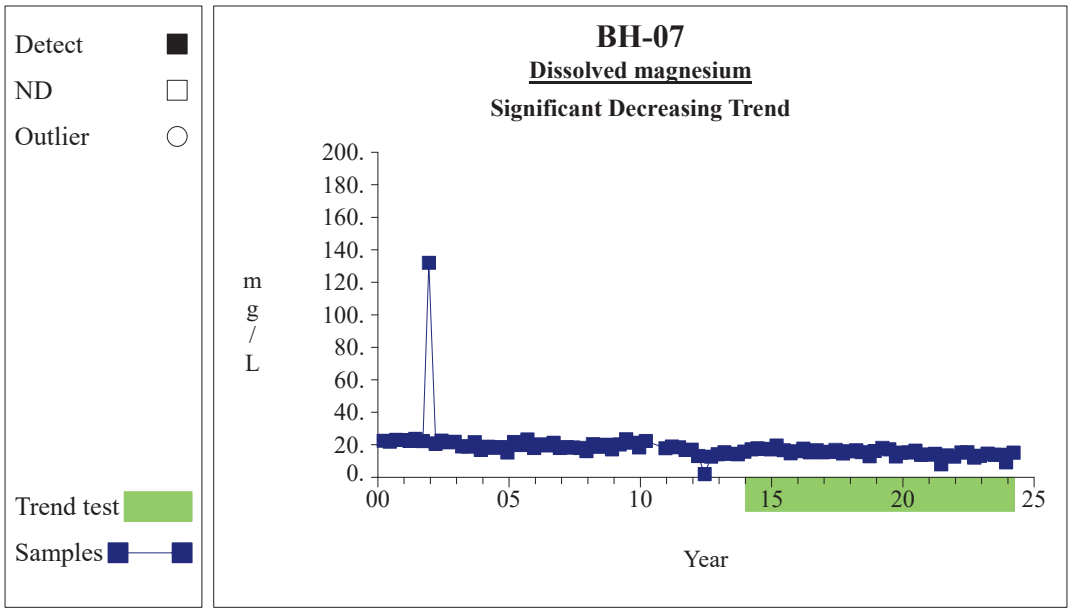
Graph 172

Time Series



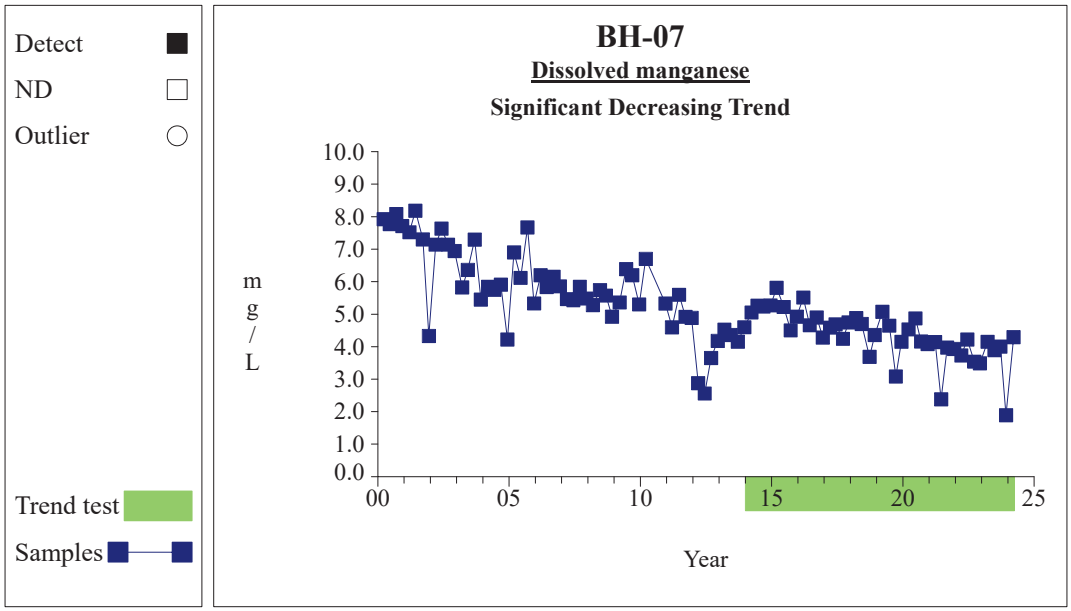
Graph 175

Time Series



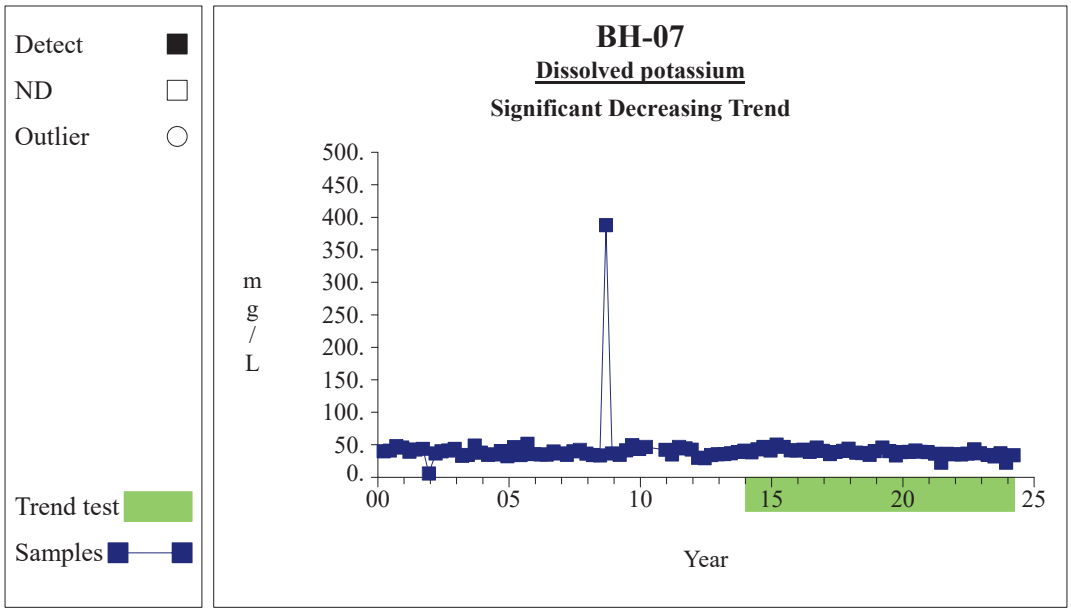
Graph 181

Time Series



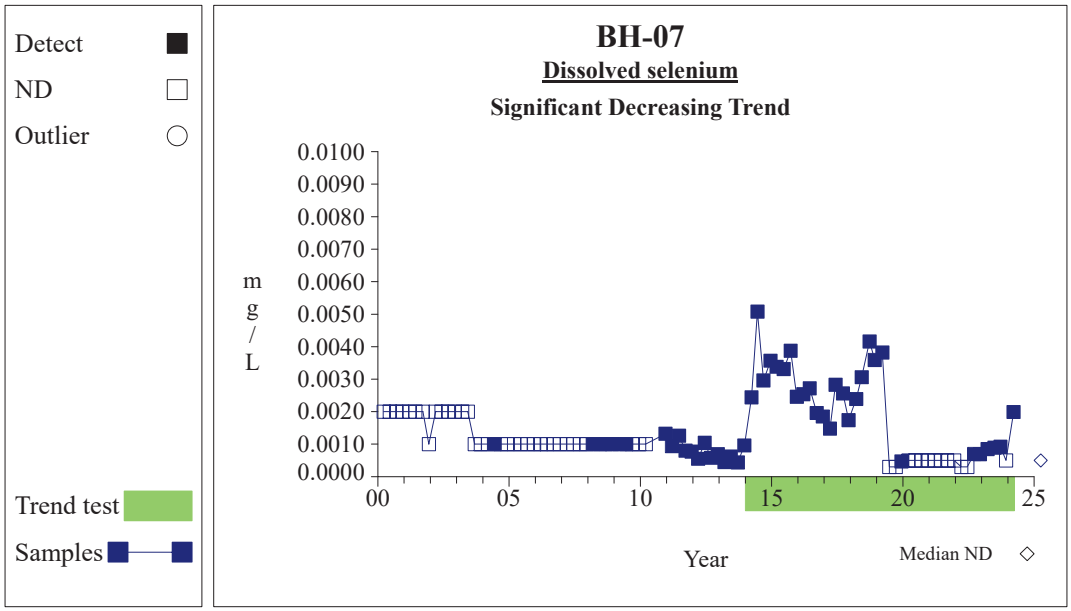
Graph 182

Time Series



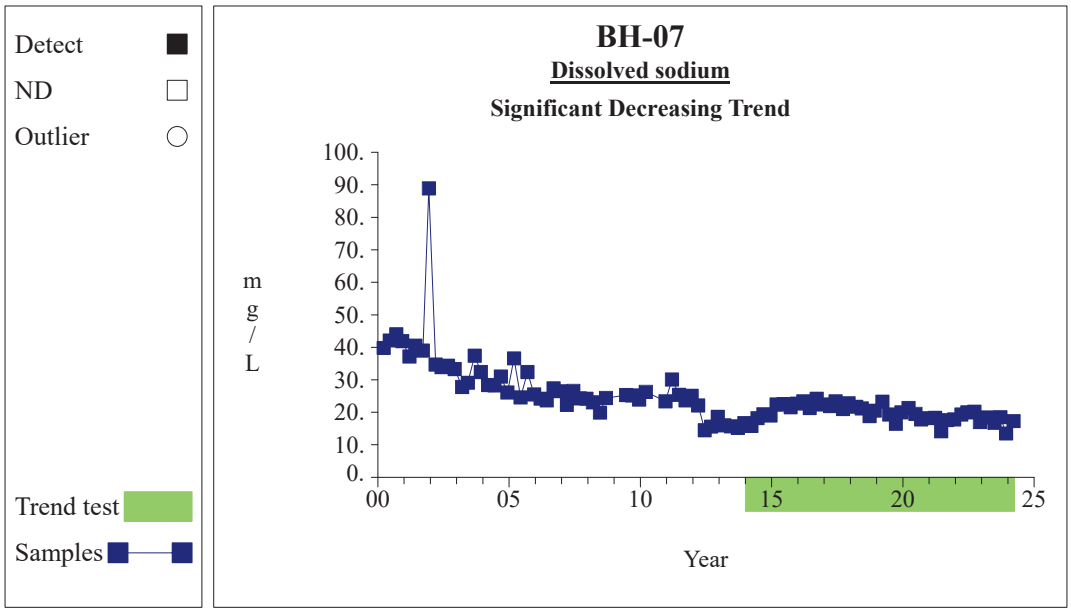
Graph 184

Time Series



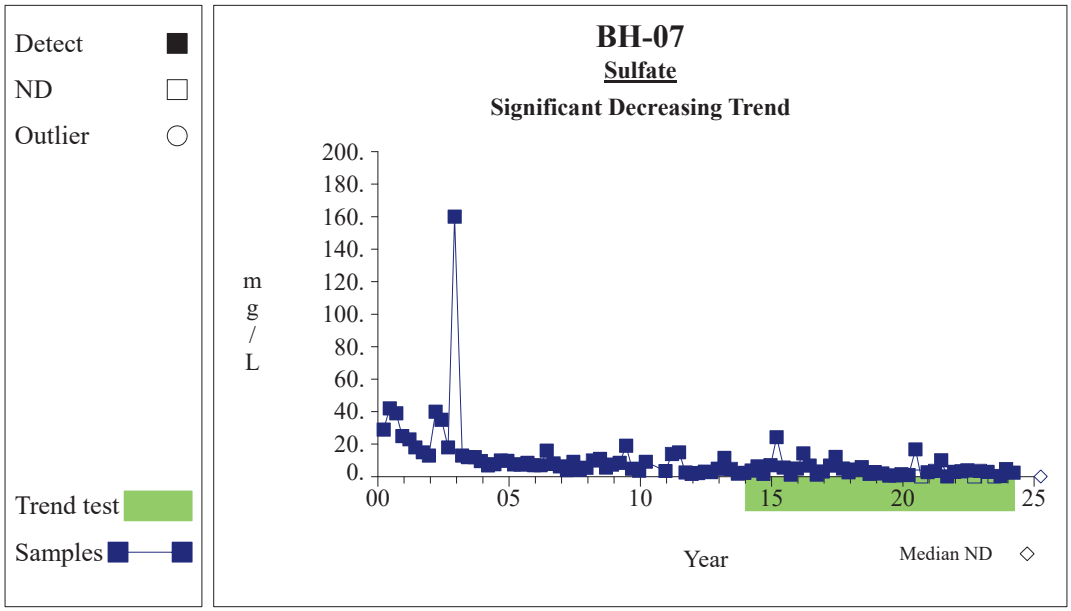
Graph 185

Time Series



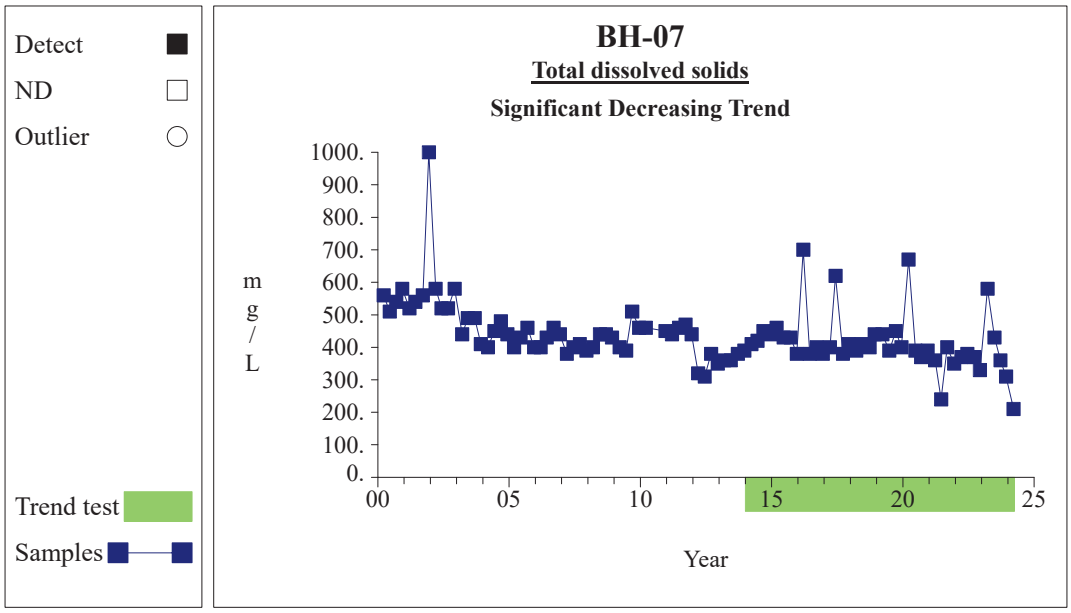
Graph 187

Time Series



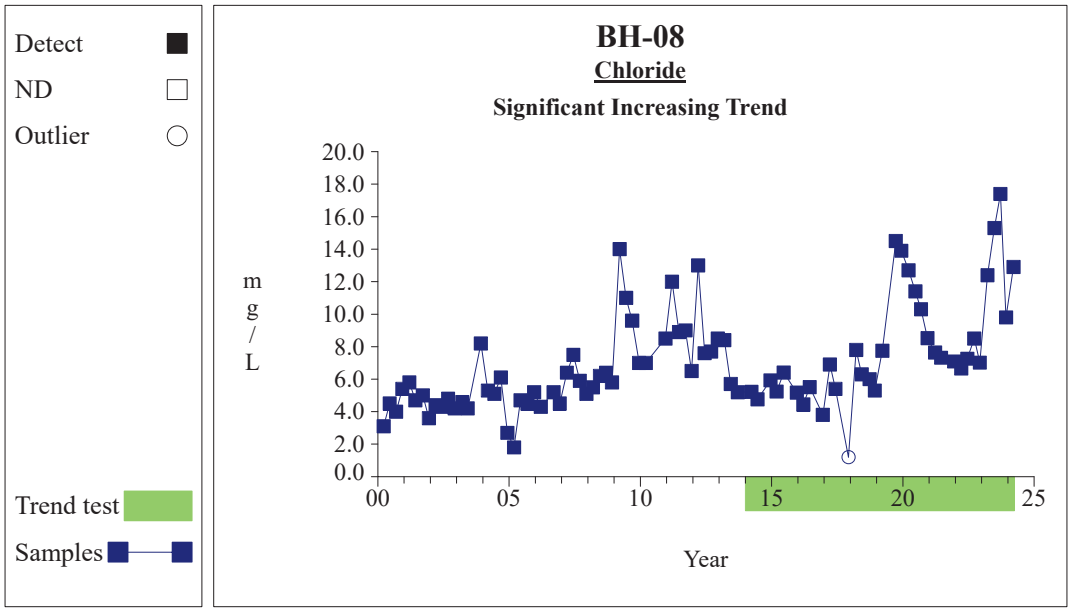
Graph 198

Time Series



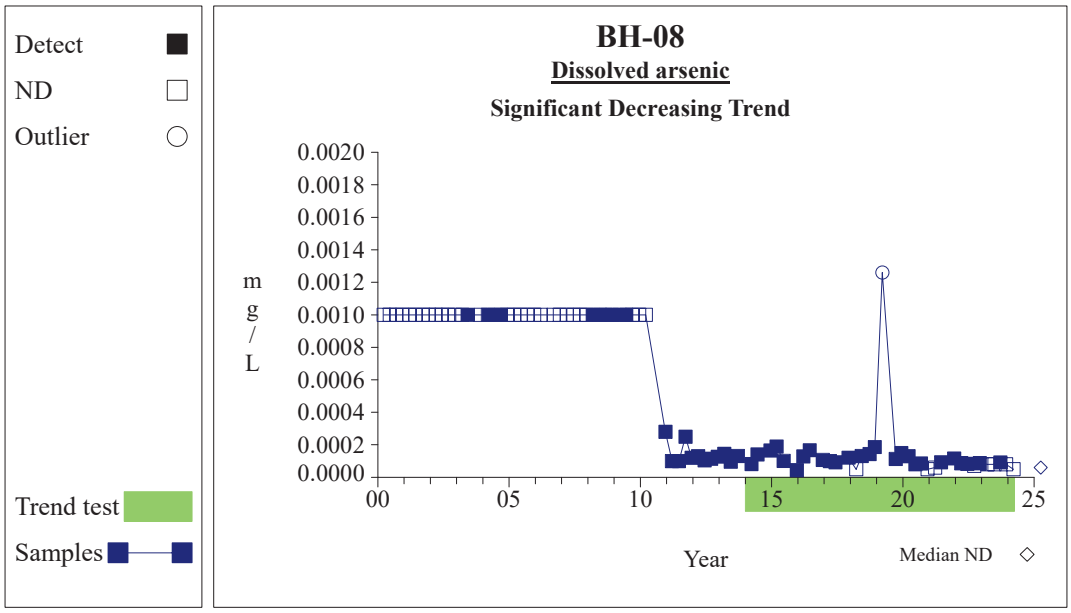
Graph 200

Time Series



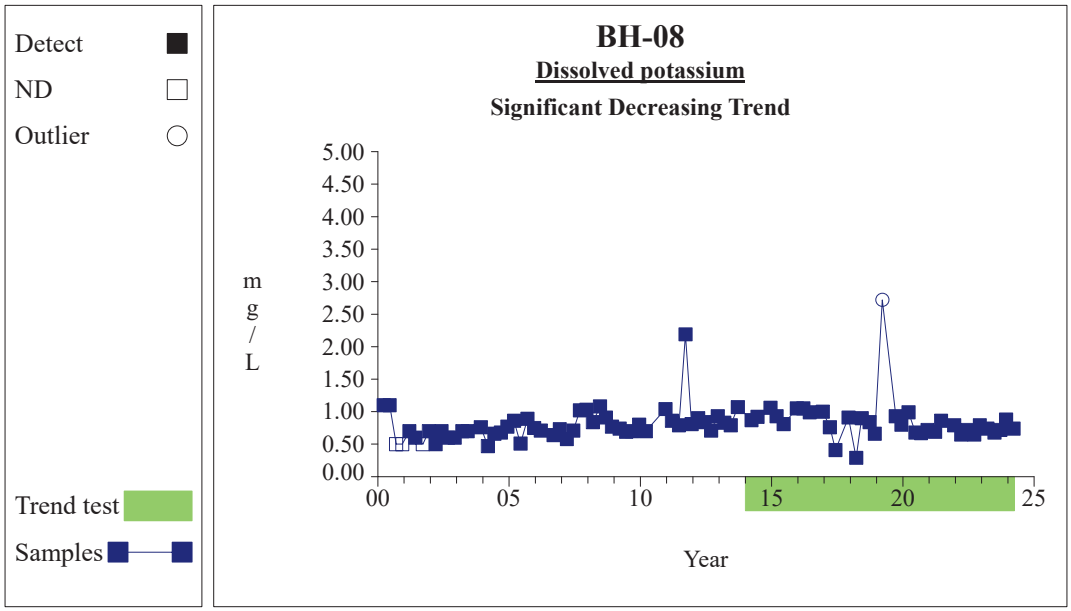
Graph 215

Time Series



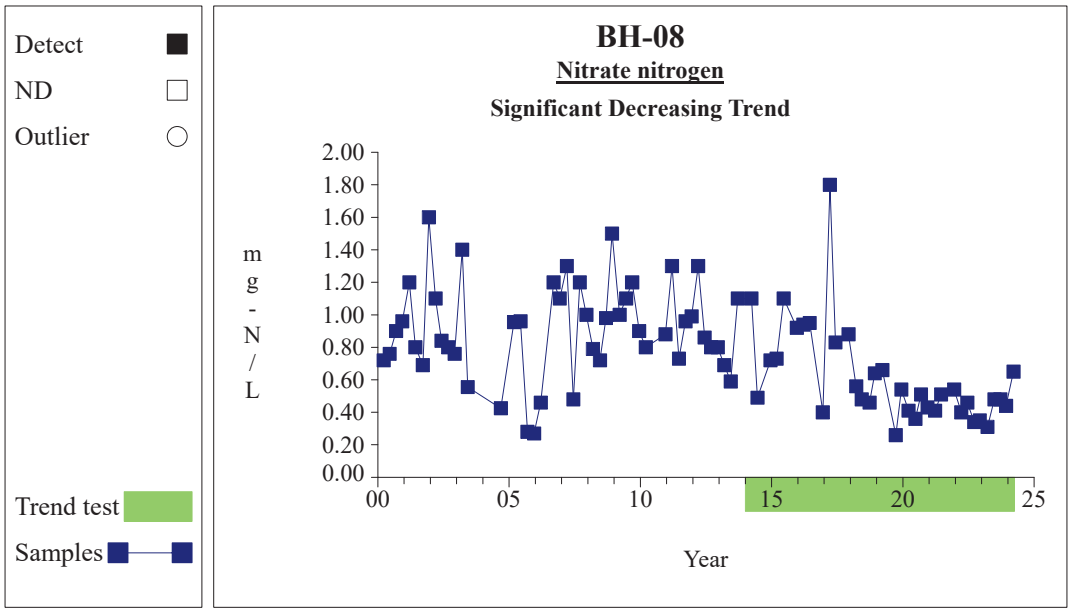
Graph 222

Time Series



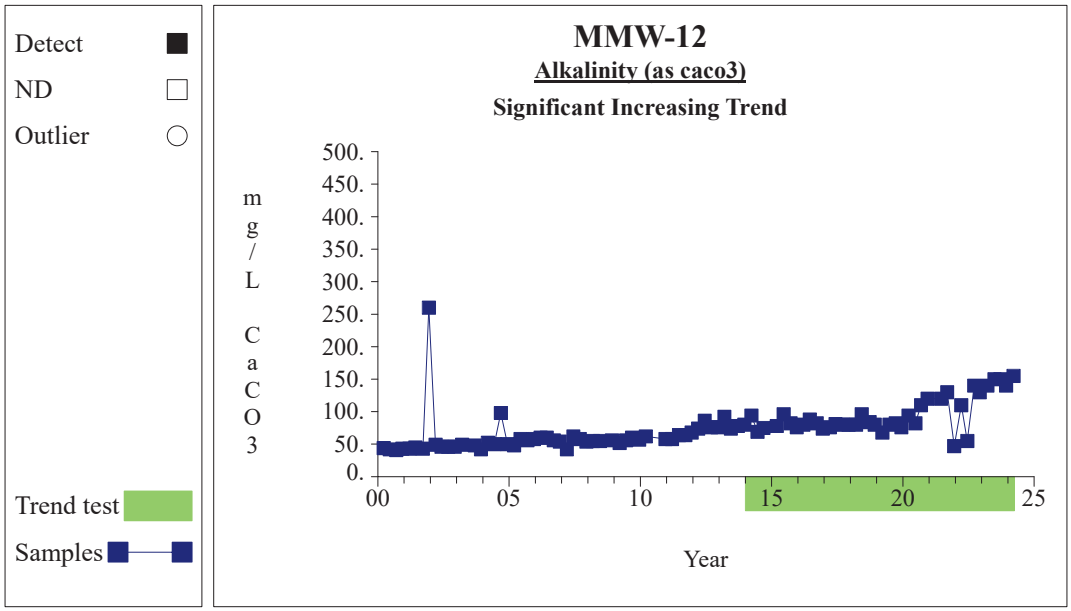
Graph 235

Time Series



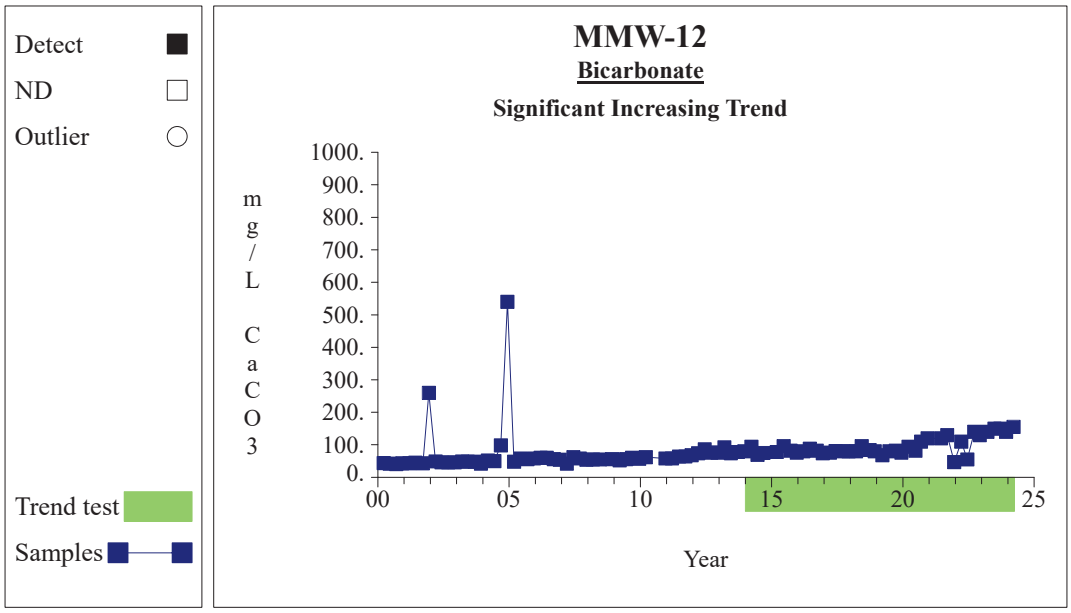
Graph 244

Time Series



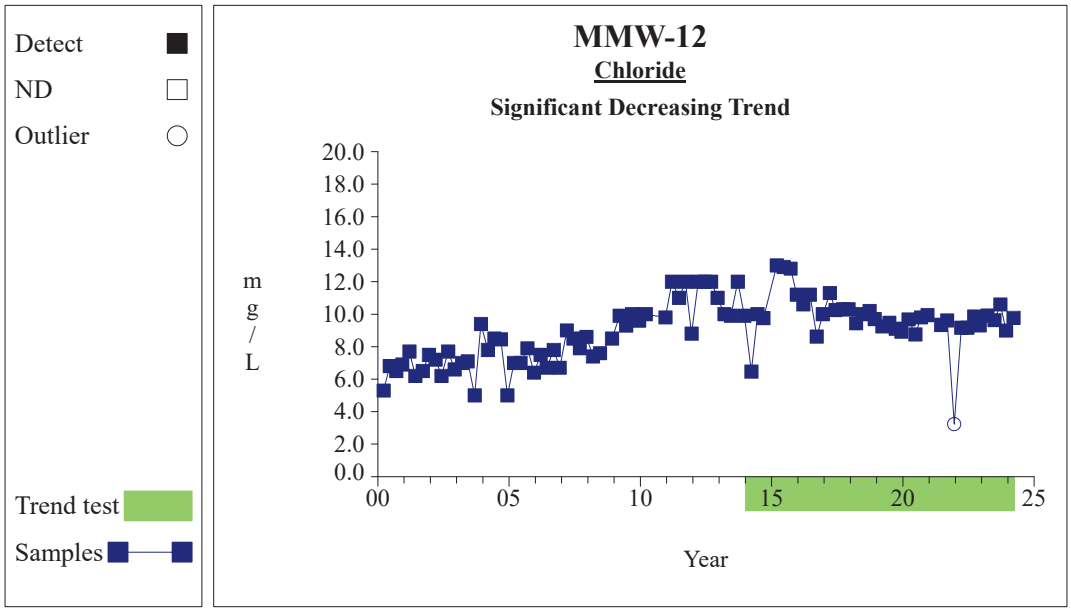
Graph 5

Time Series



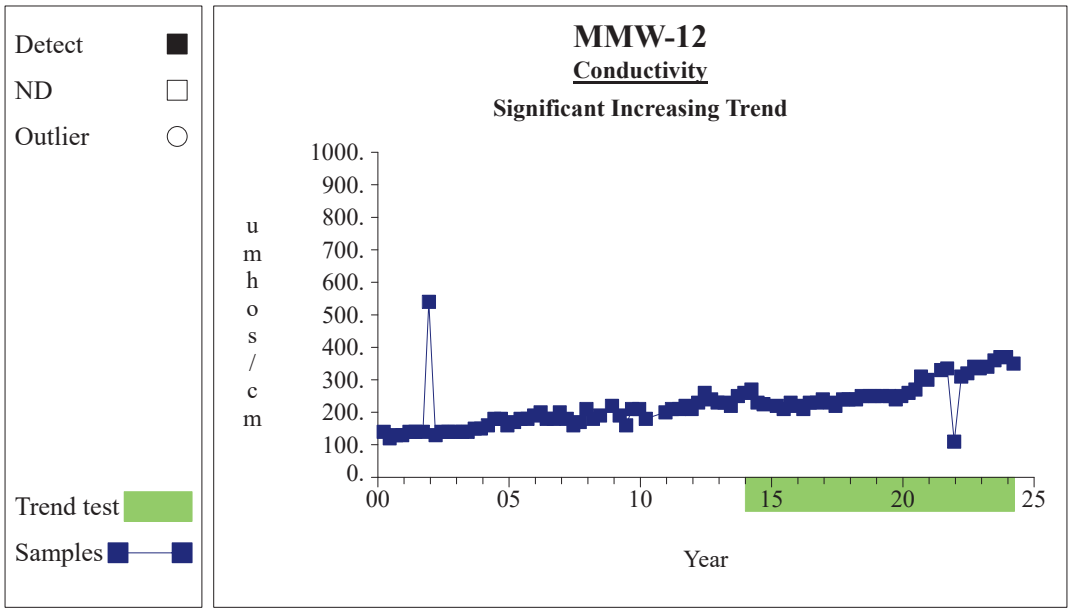
Graph 8

Time Series



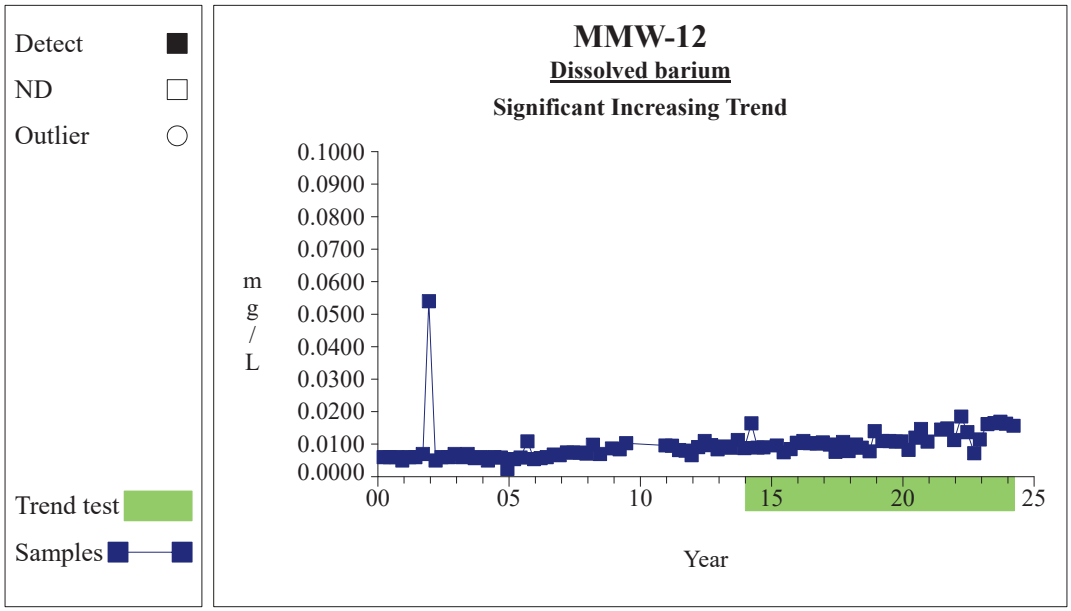
Graph 11

Time Series



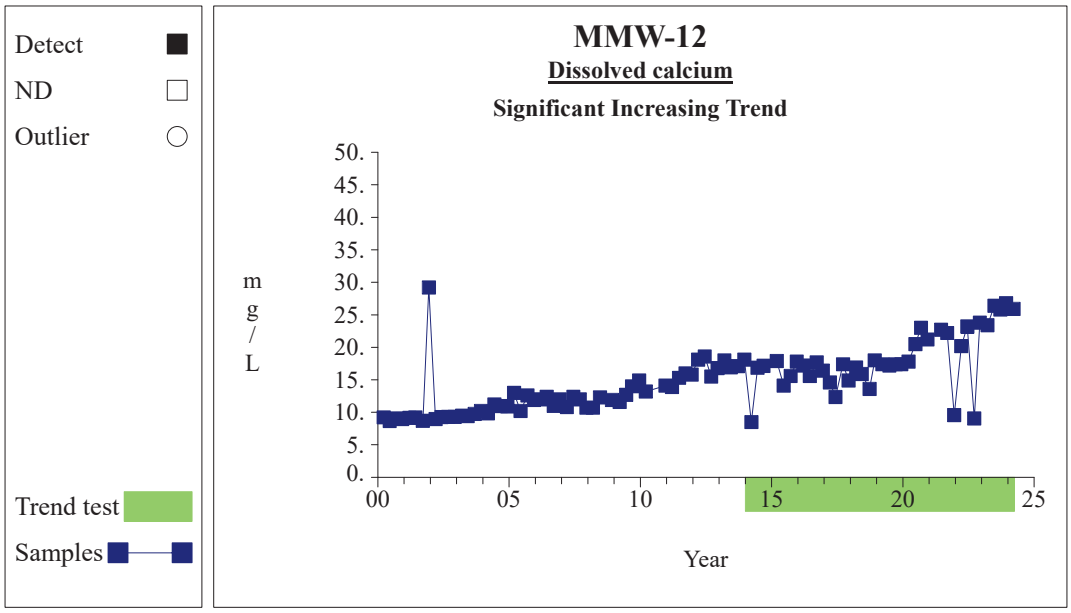
Graph 14

Time Series



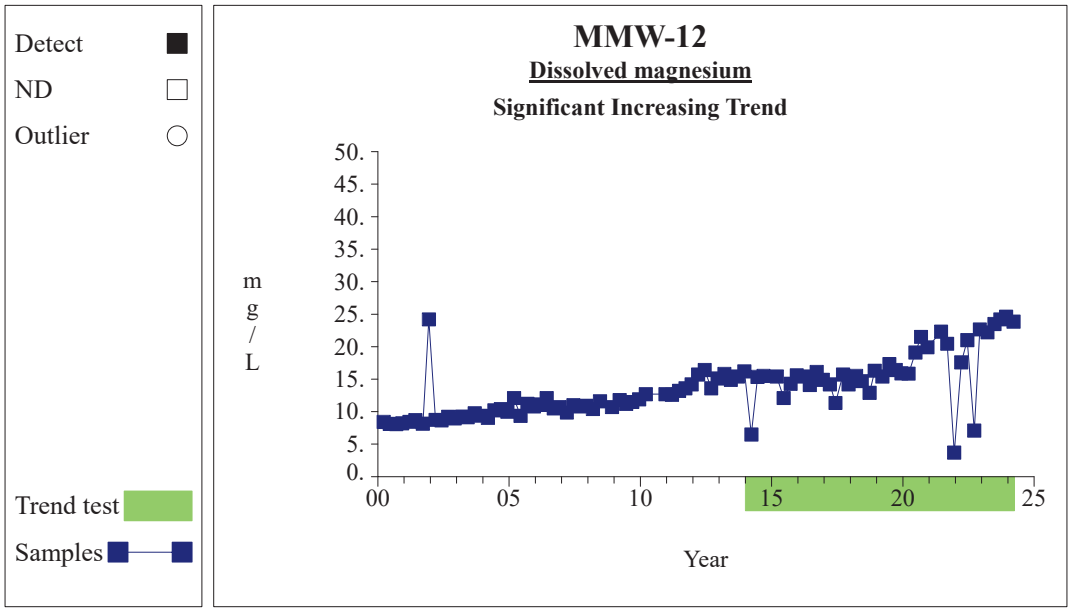
Graph 17

Time Series



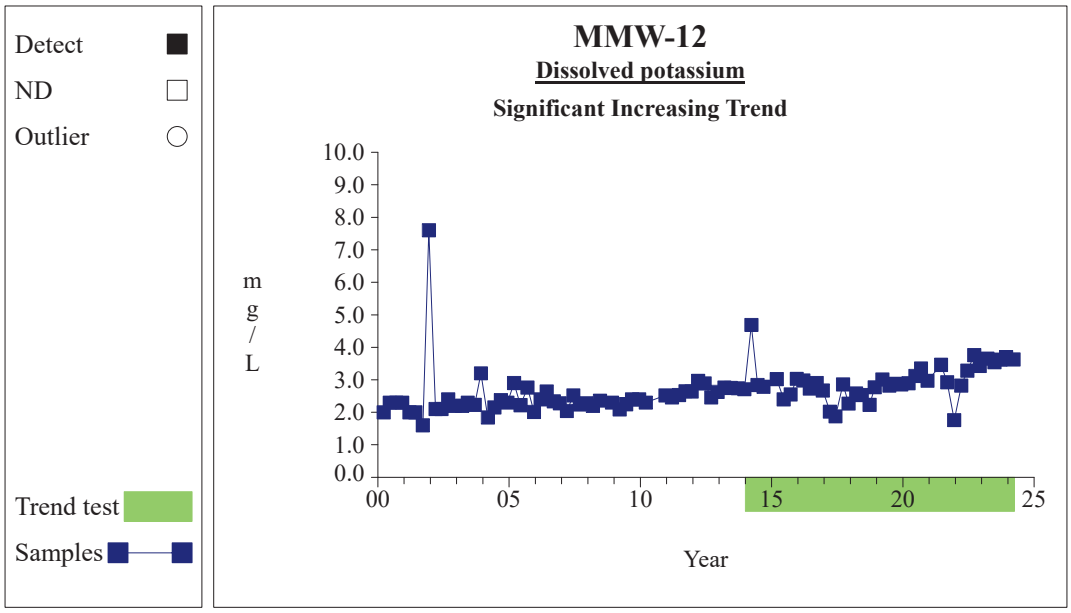
Graph 20

Time Series



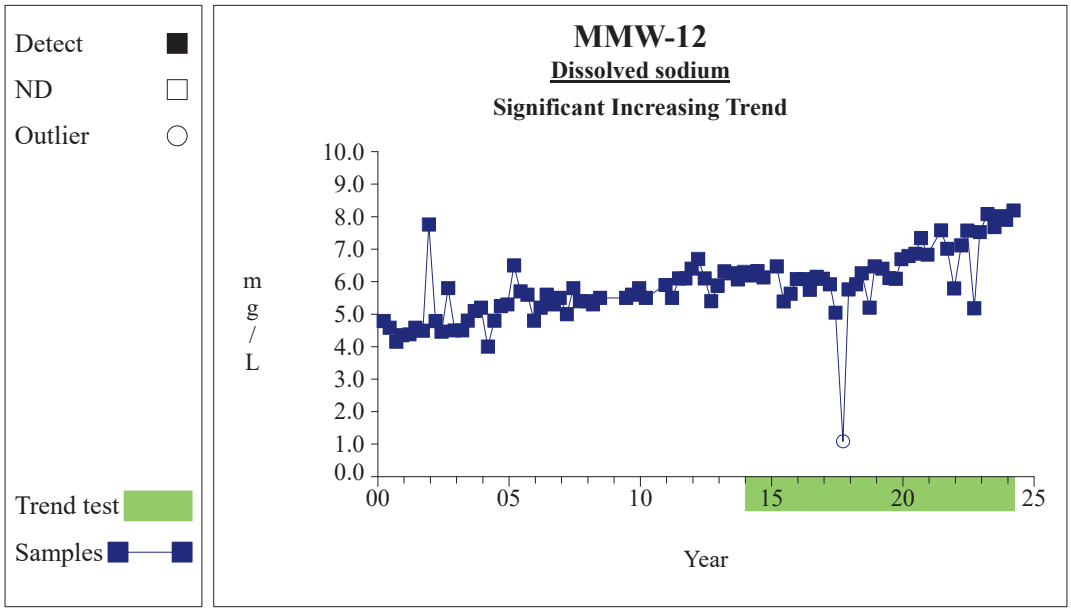
Graph 26

Time Series



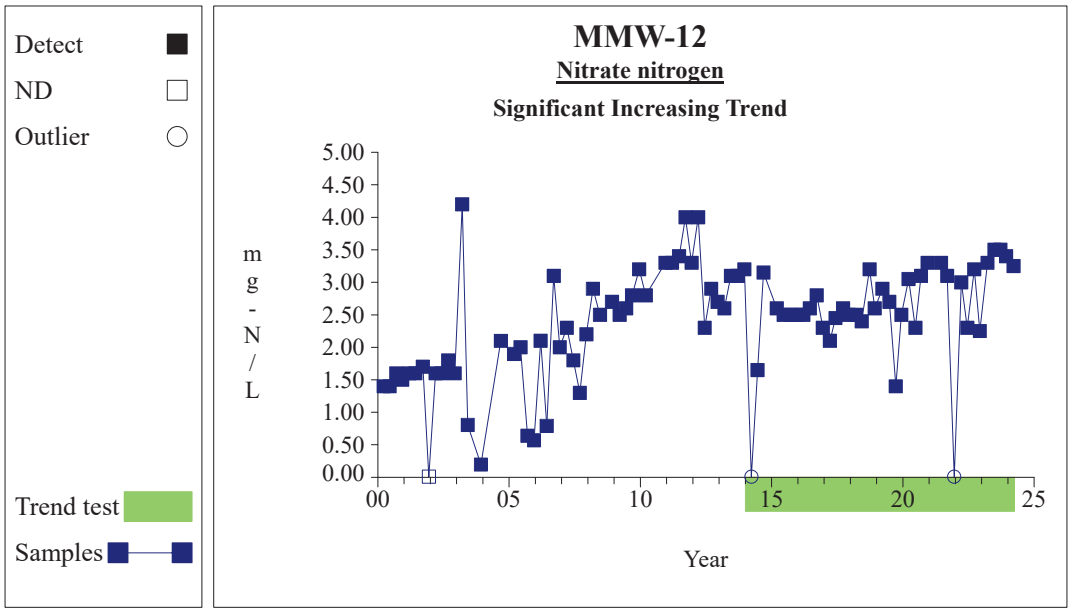
Graph 29

Time Series



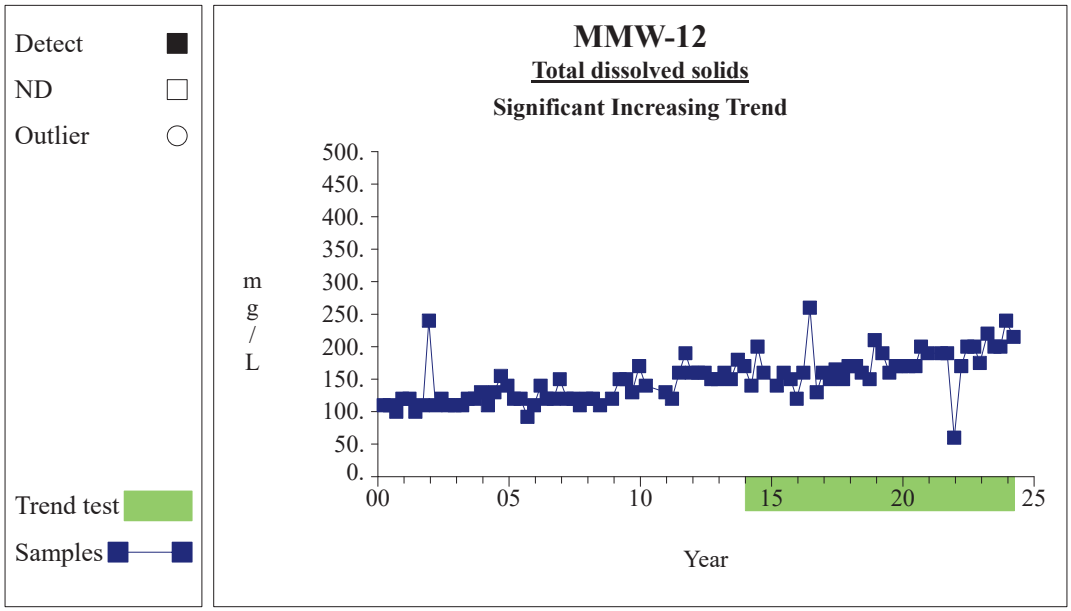
Graph 32

Time Series



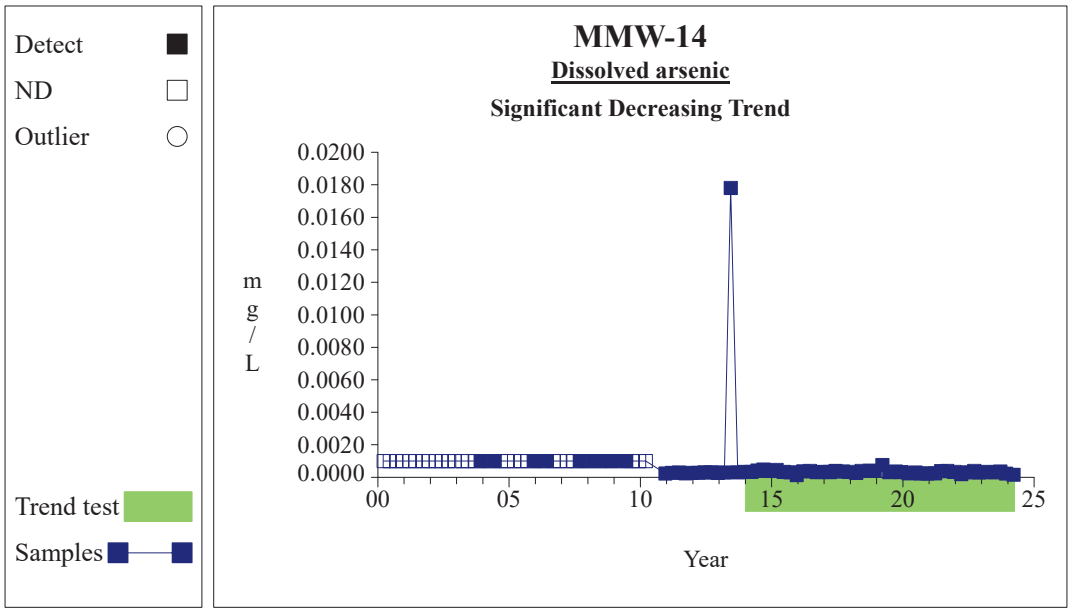
Graph 38

Time Series



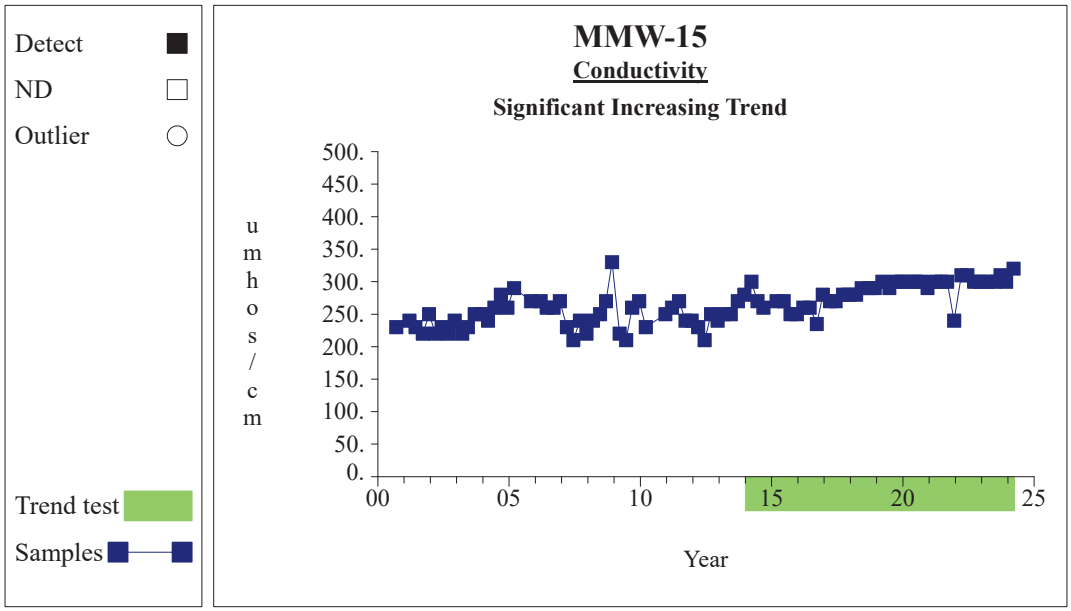
Graph 45

Time Series



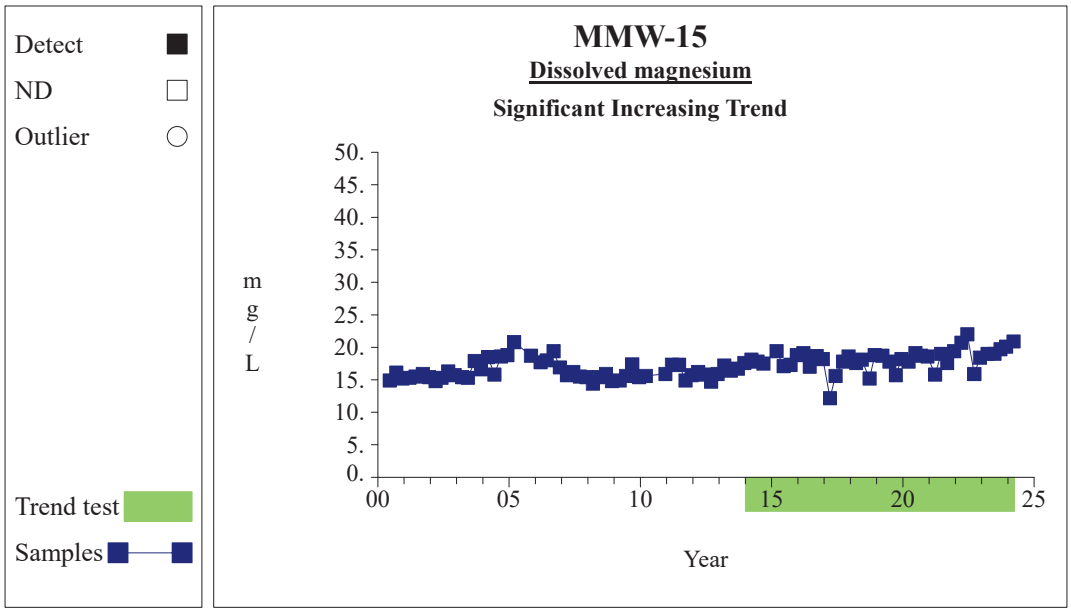
Graph 112

Time Series



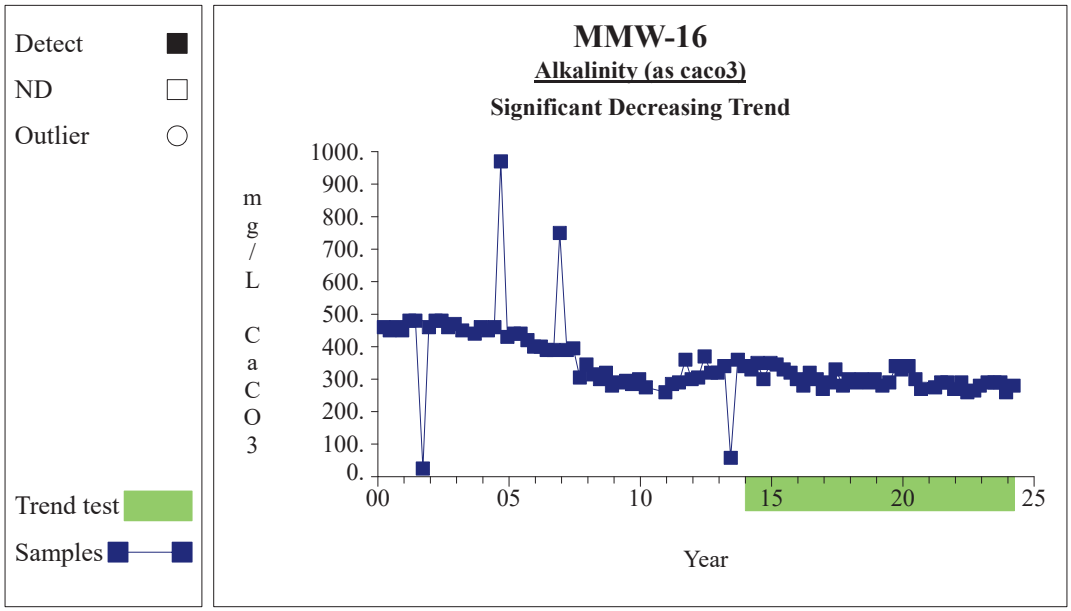
Graph 158

Time Series



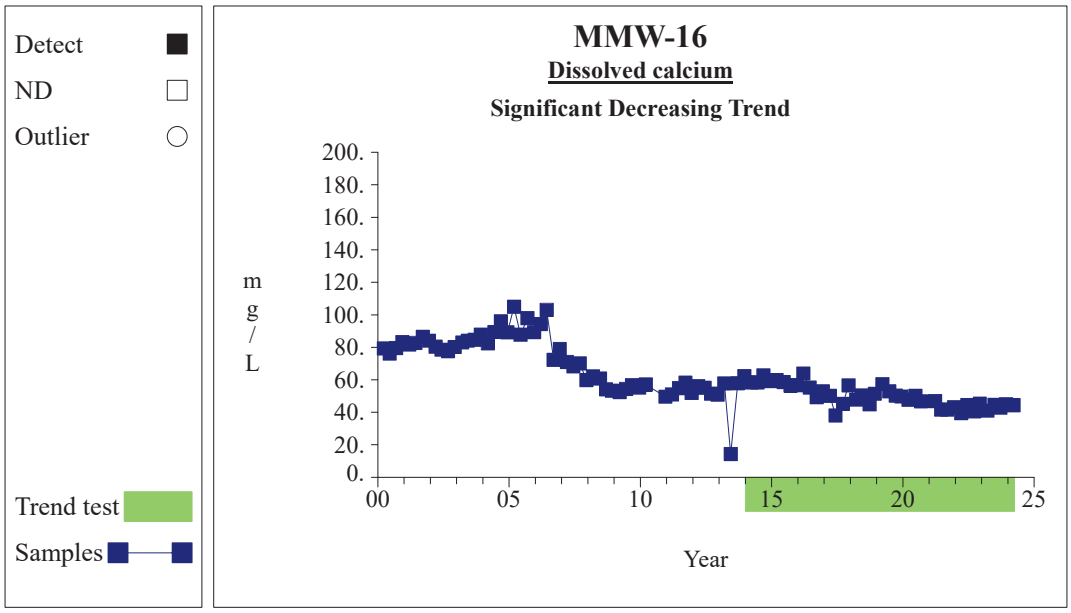
Graph 170

Time Series



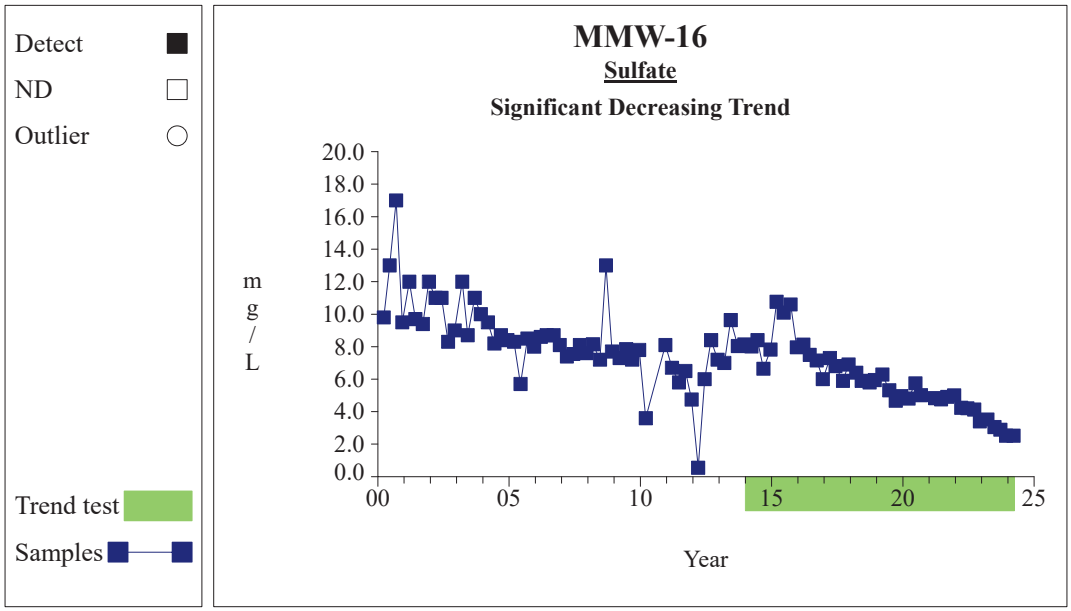
Graph 197

Time Series



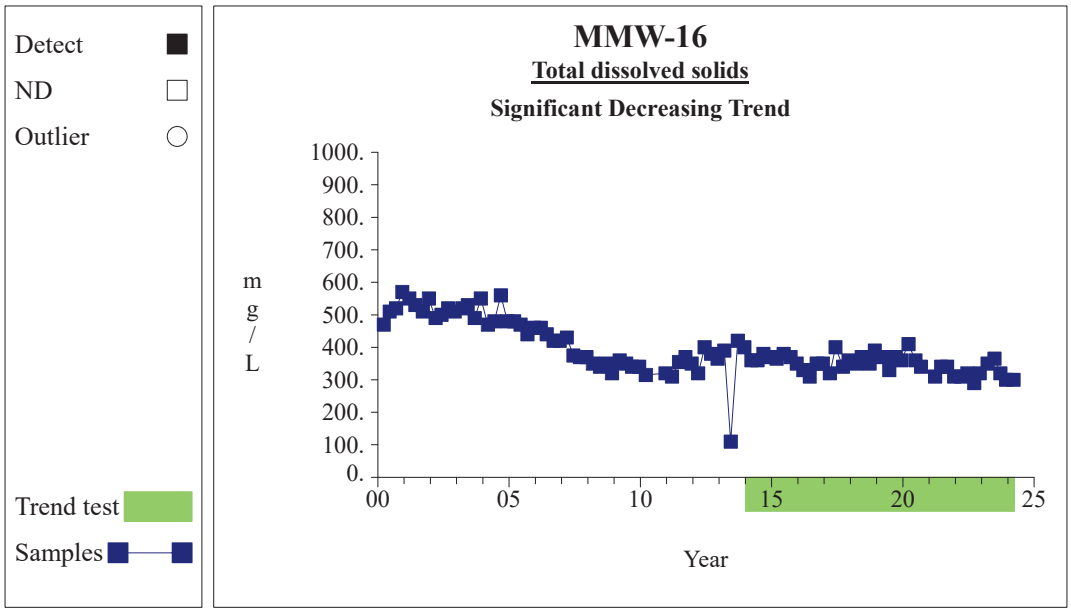
Graph 212

Time Series



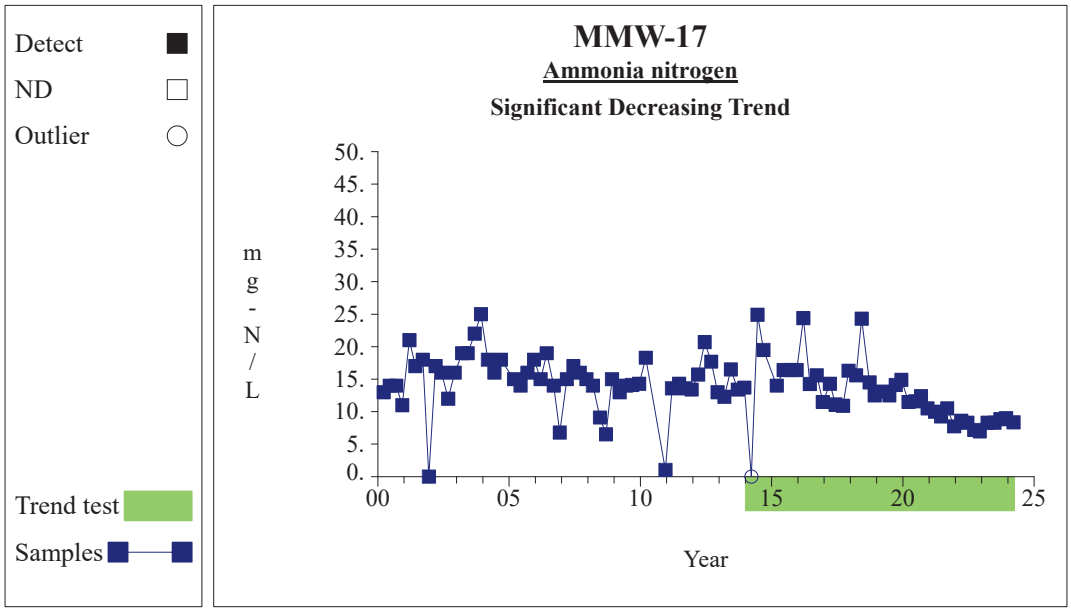
Graph 235

Time Series



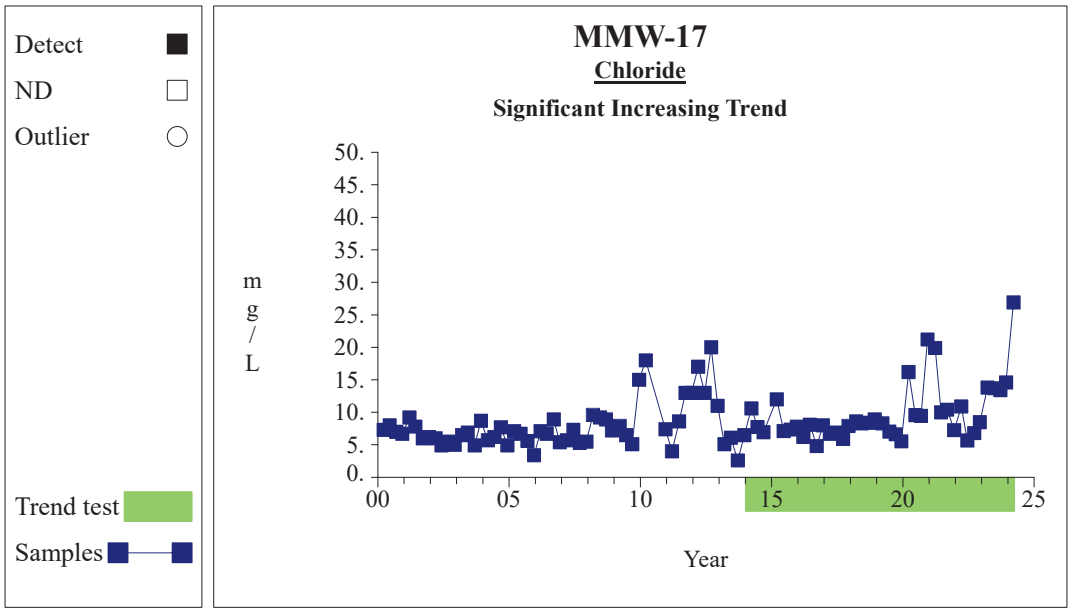
Graph 237

Time Series



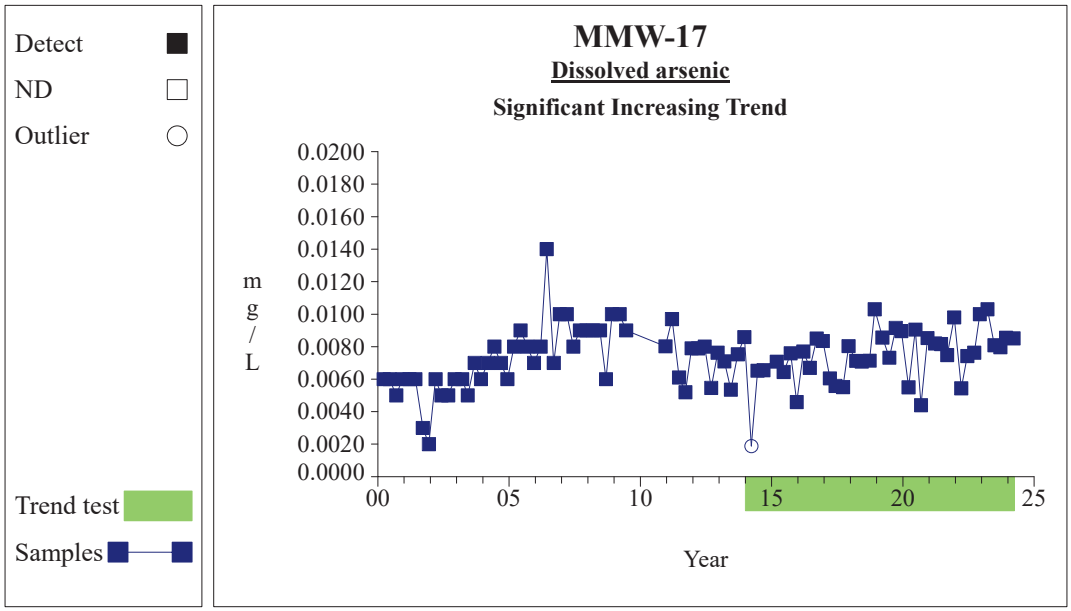
Graph 246

Time Series



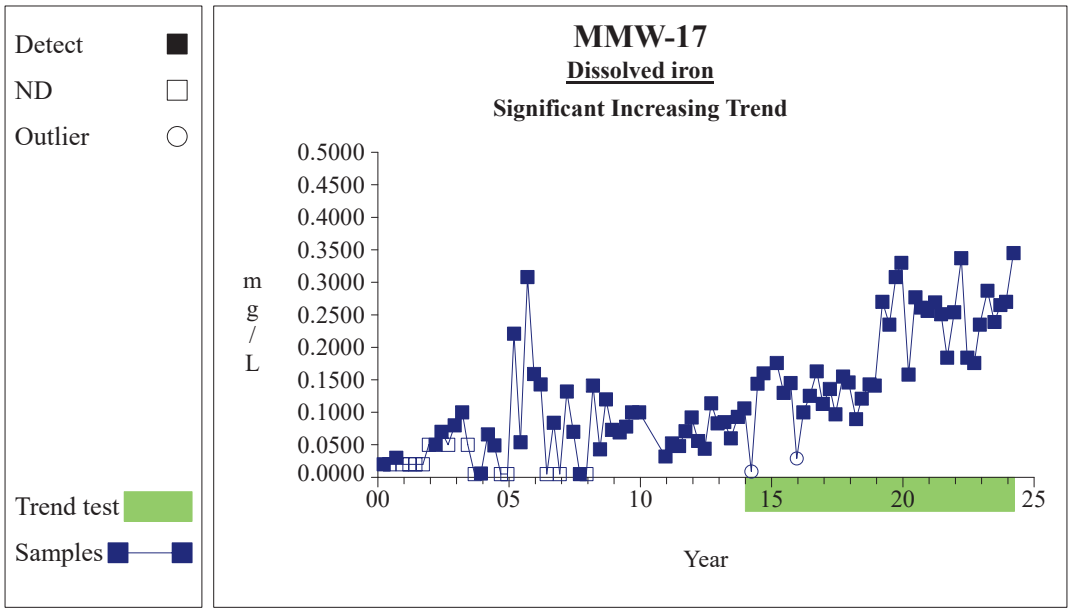
Graph 251

Time Series



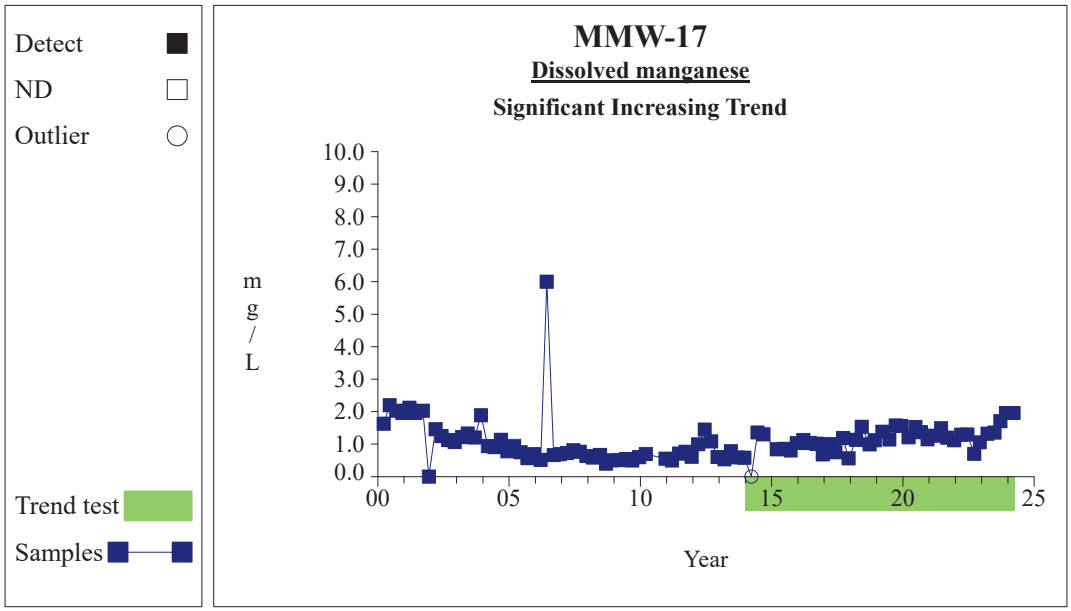
Graph 256

Time Series



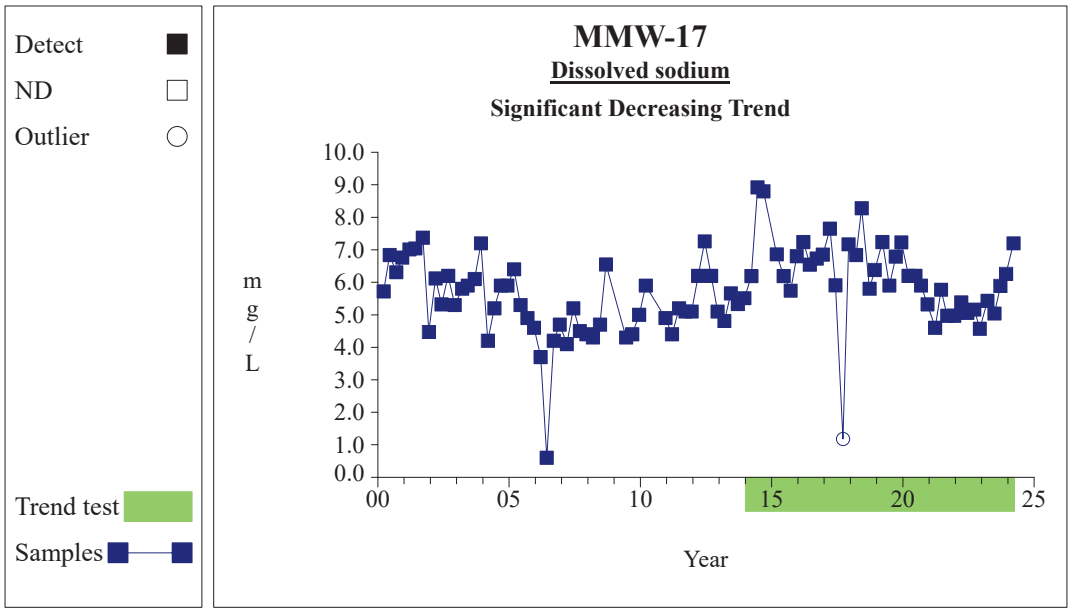
Graph 264

Time Series



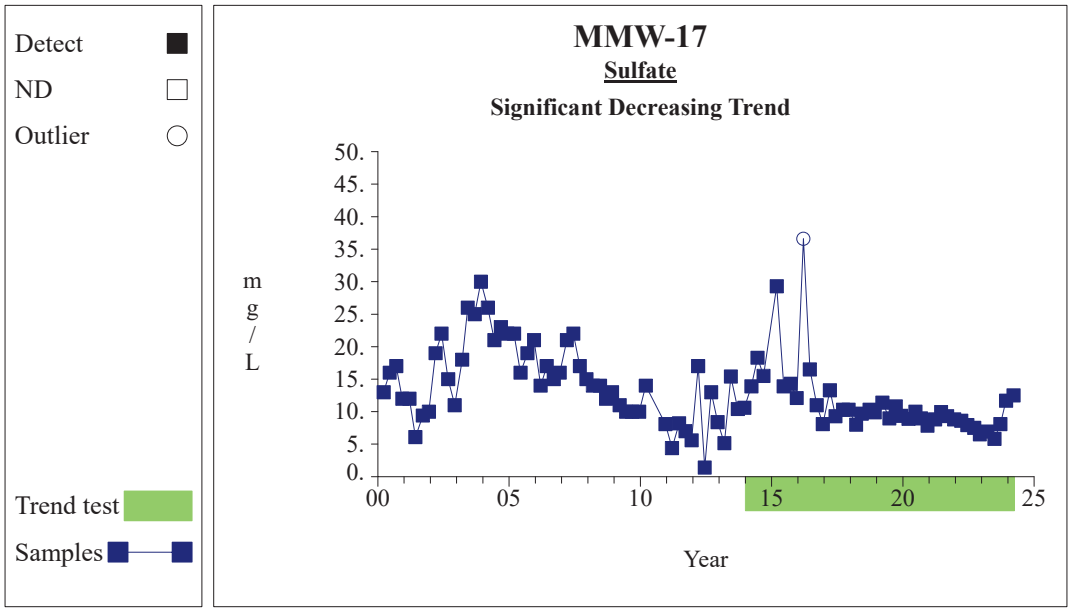
Graph 267

Time Series



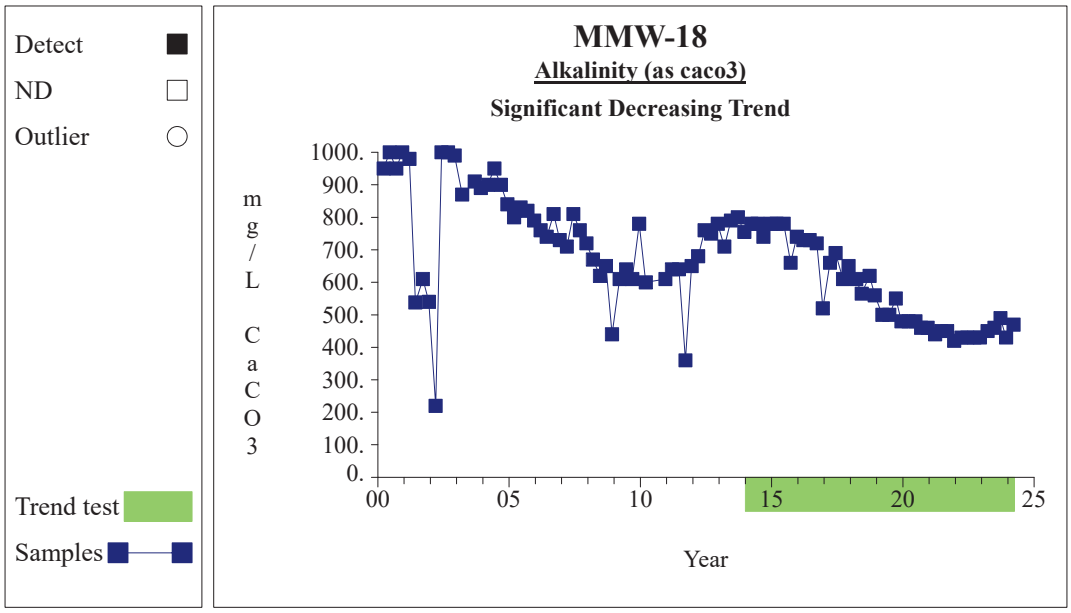
Graph 272

Time Series



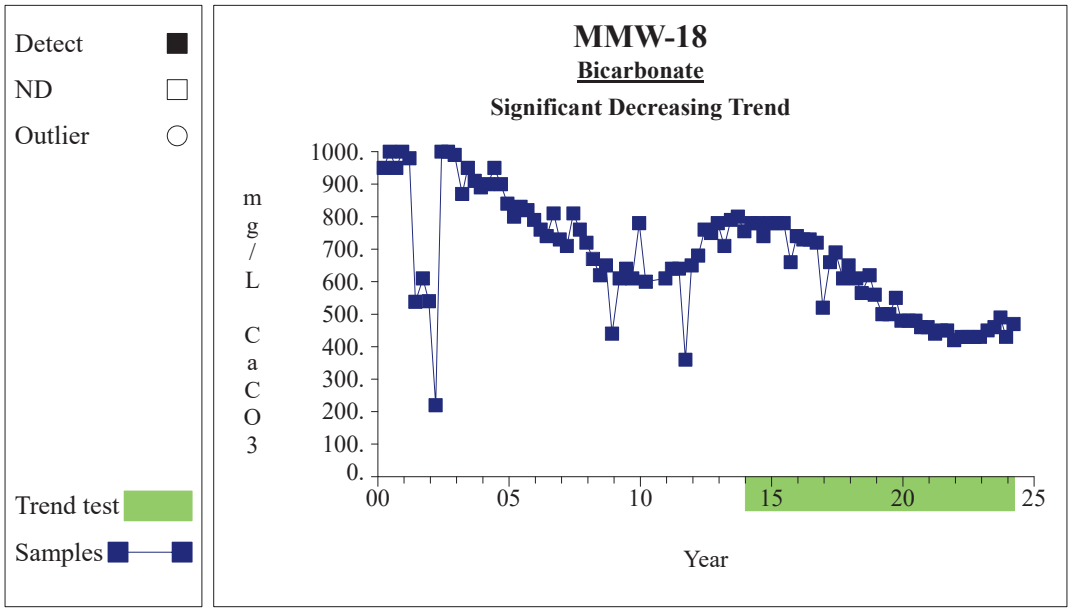
Graph 283

Time Series



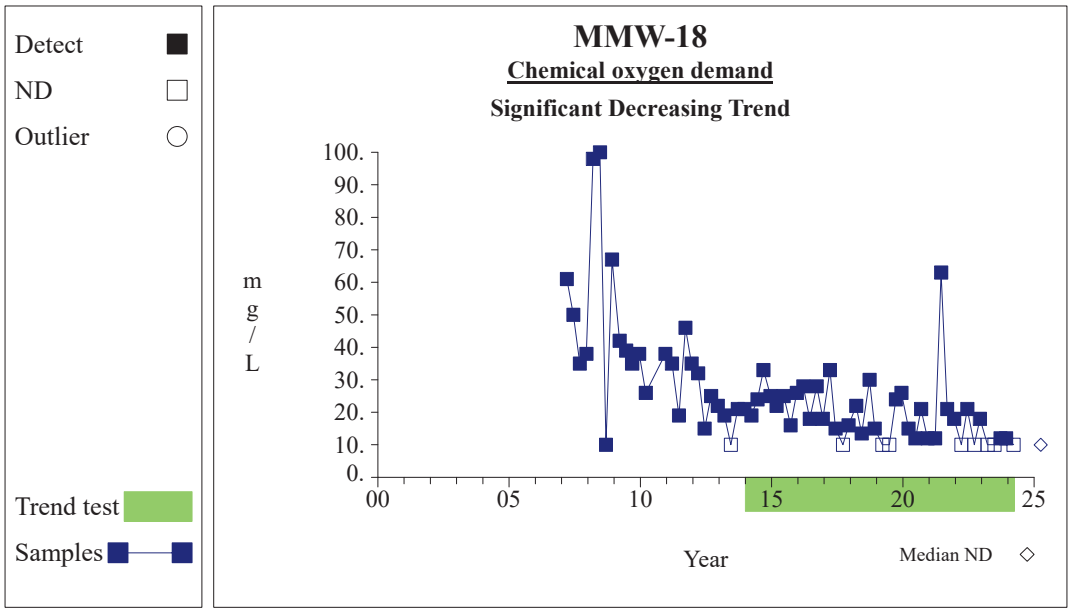
Graph 293

Time Series



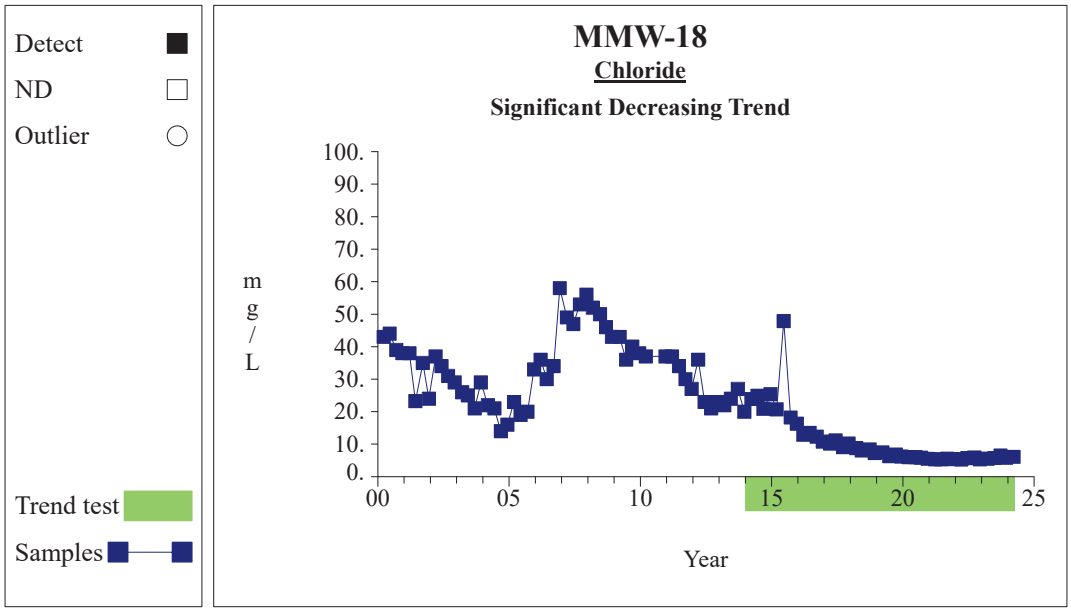
Graph 296

Time Series



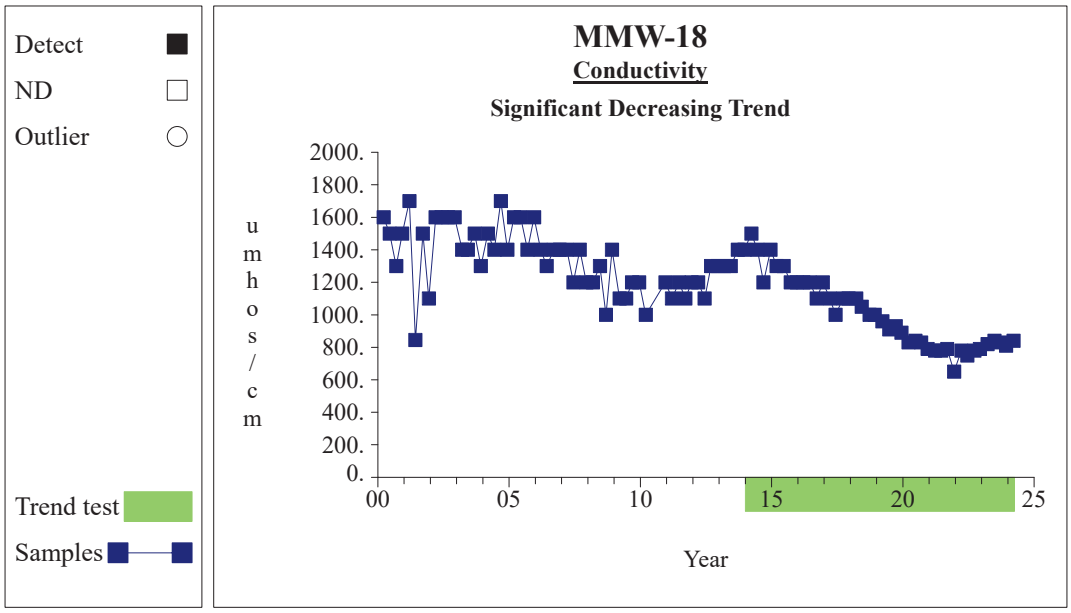
Graph 298

Time Series



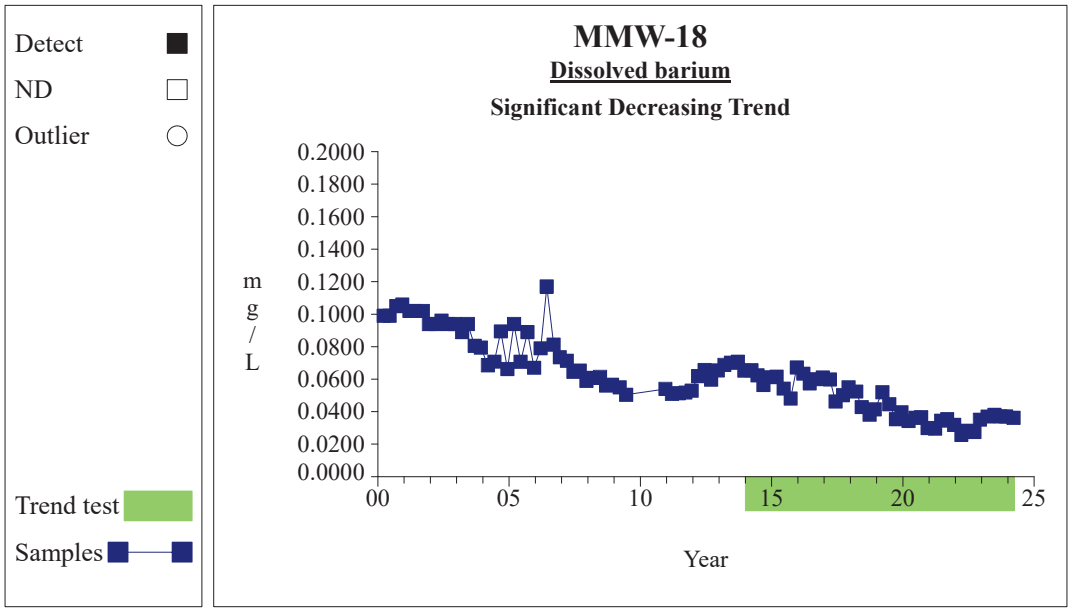
Graph 299

Time Series



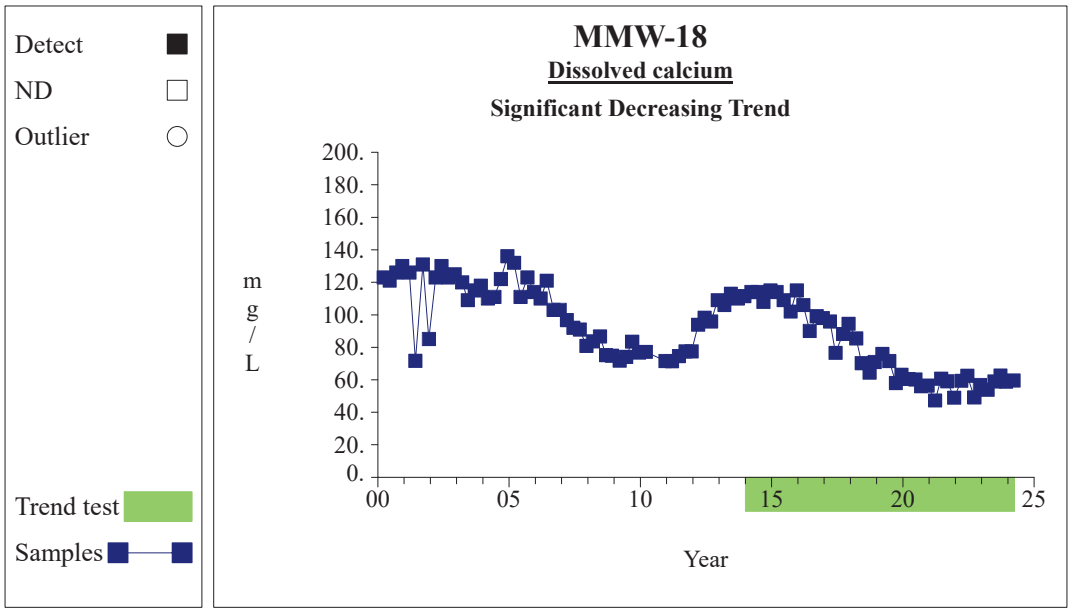
Graph 302

Time Series



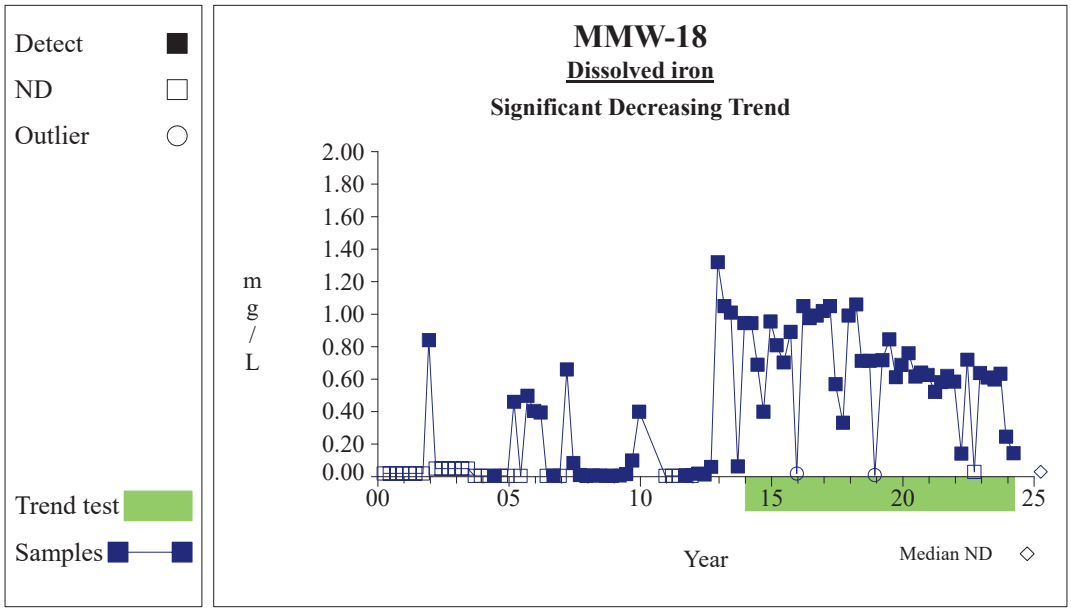
Graph 305

Time Series



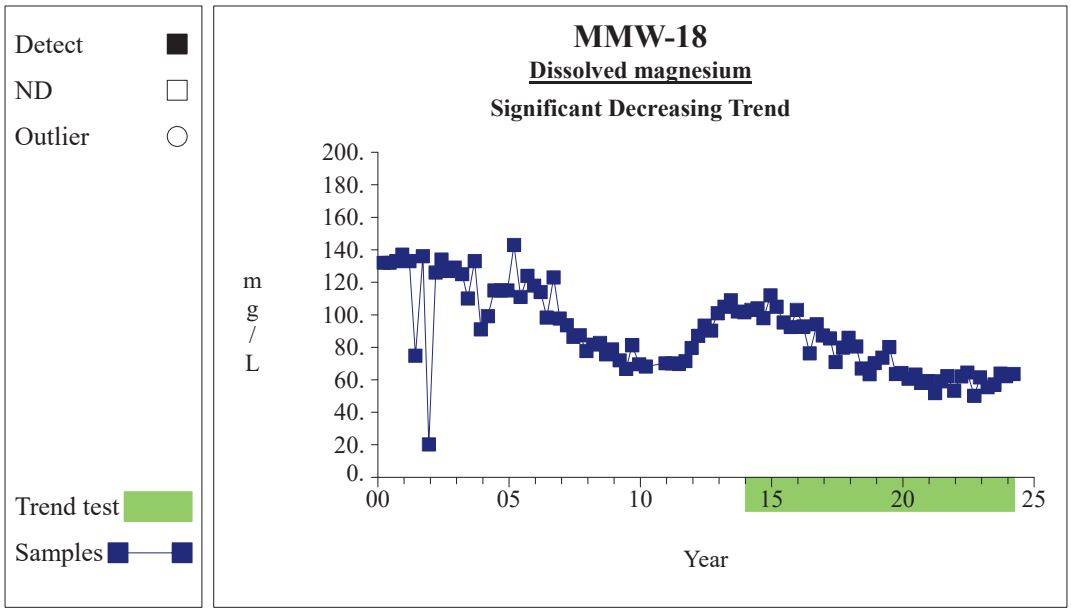
Graph 308

Time Series



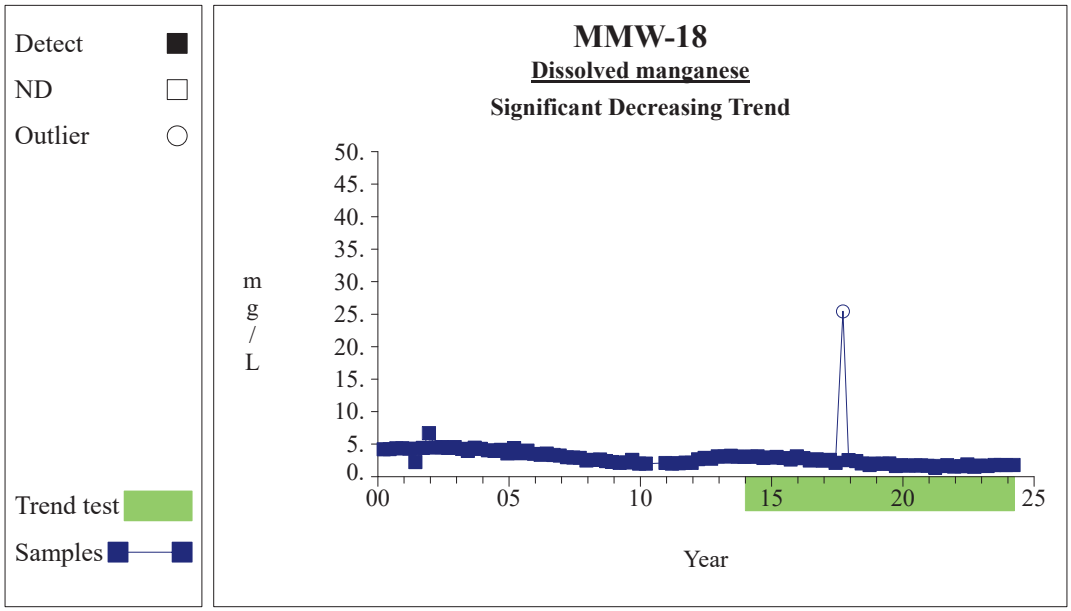
Graph 312

Time Series



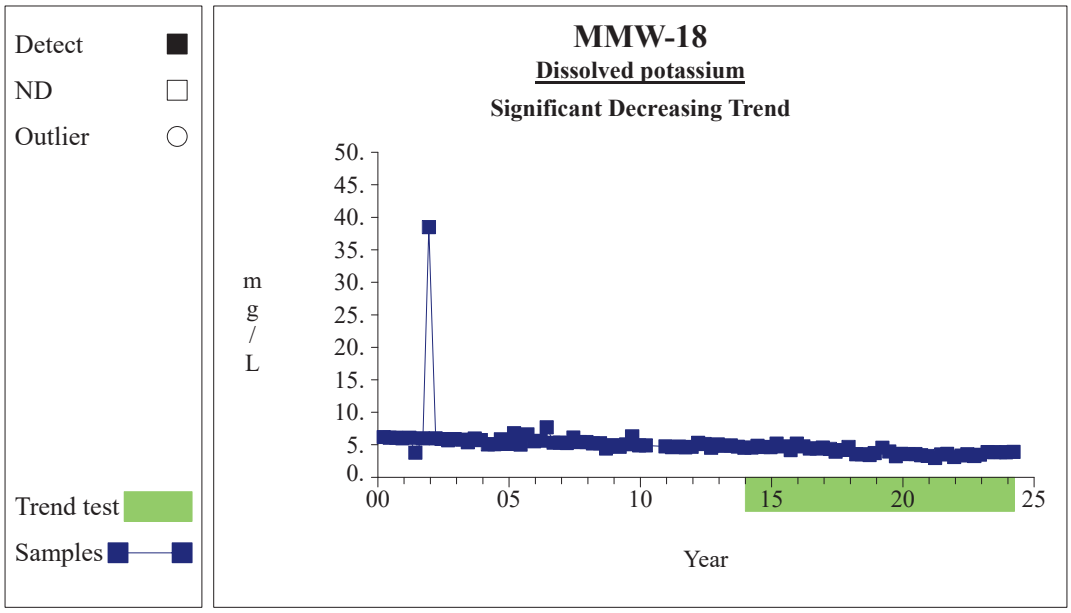
Graph 314

Time Series



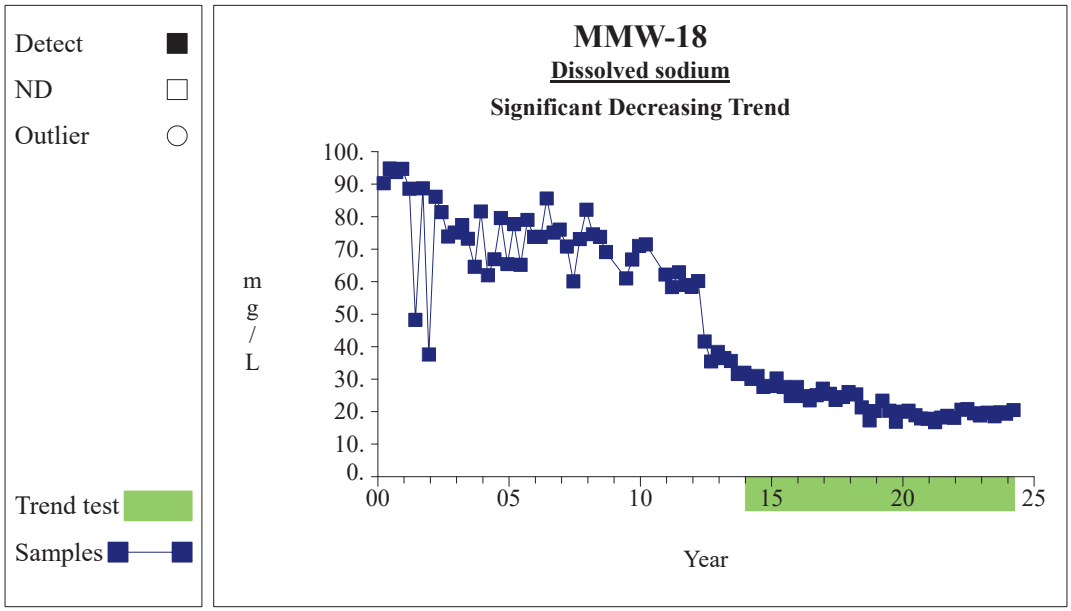
Graph 315

Time Series



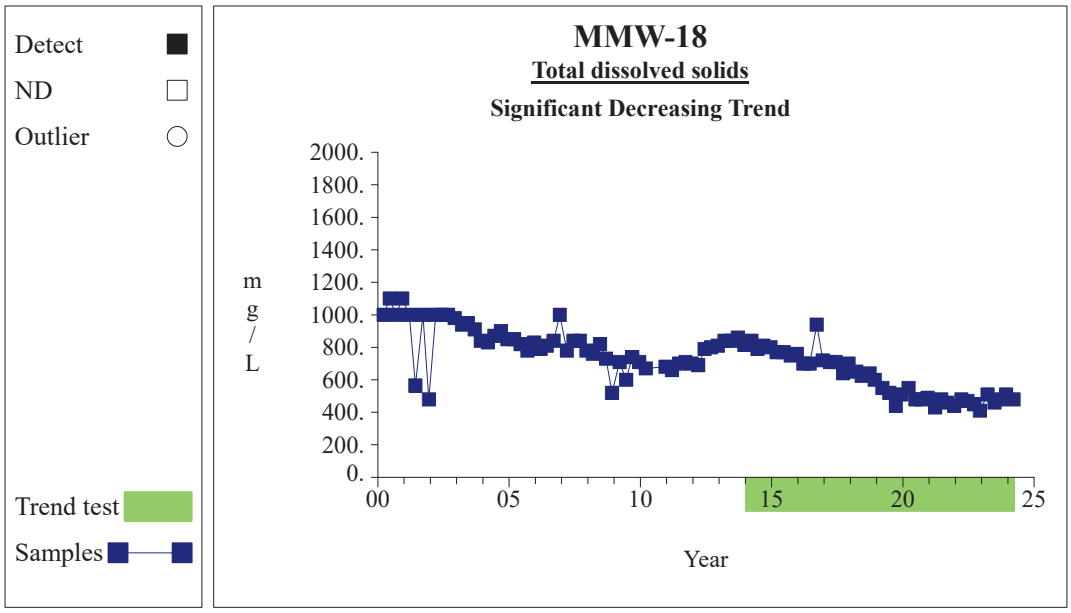
Graph 317

Time Series



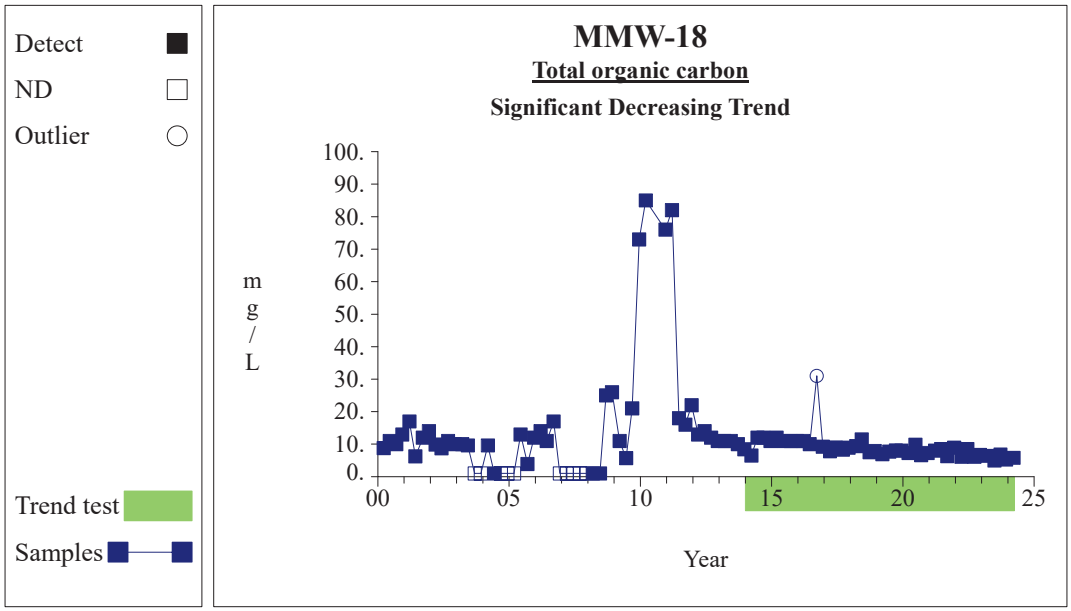
Graph 320

Time Series



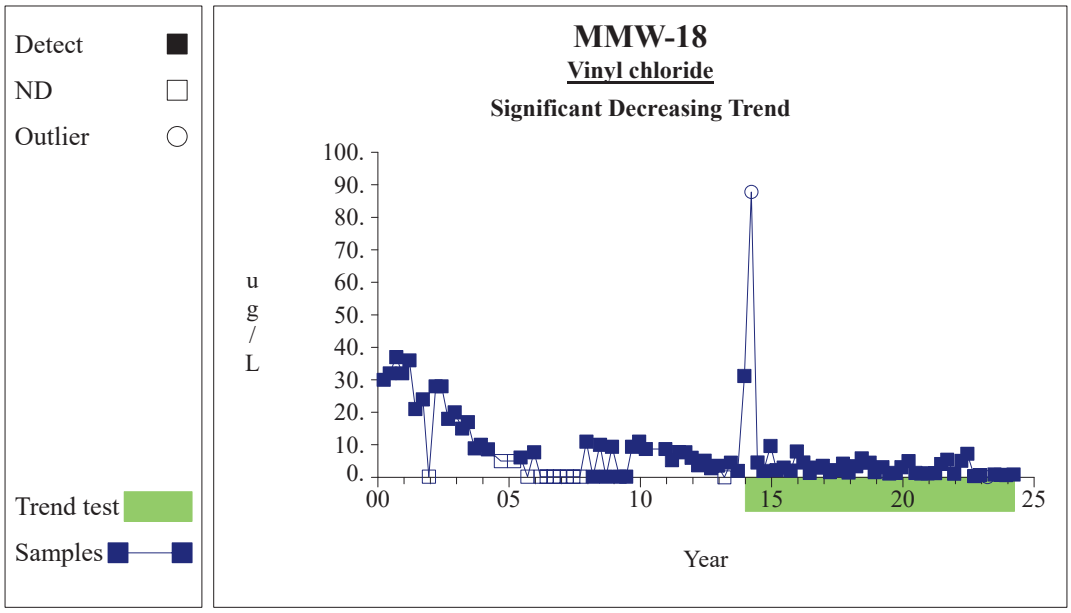
Graph 333

Time Series



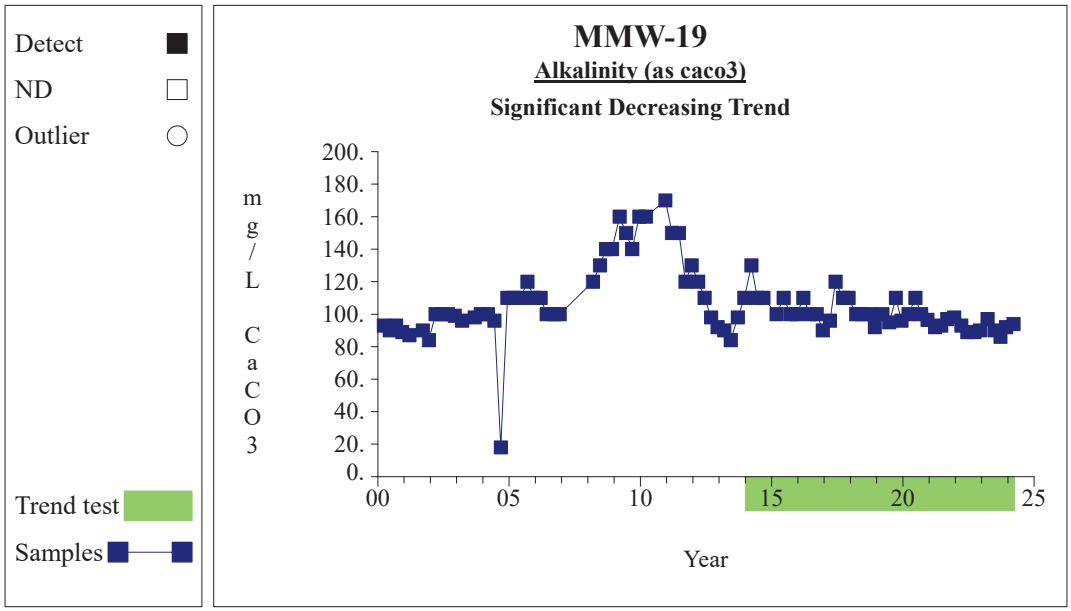
Graph 334

Time Series



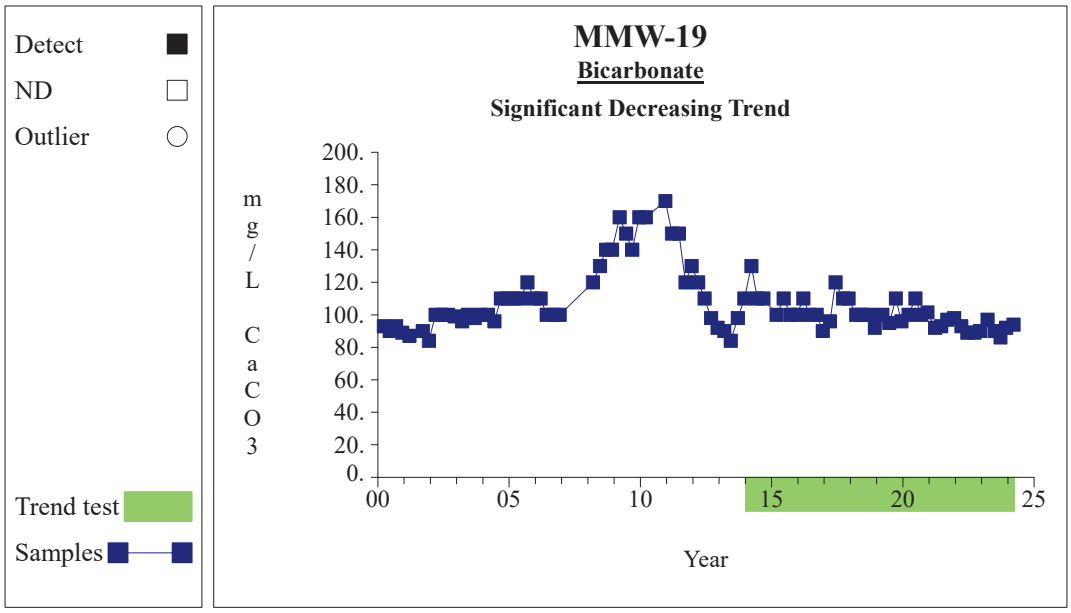
Graph 336

Time Series



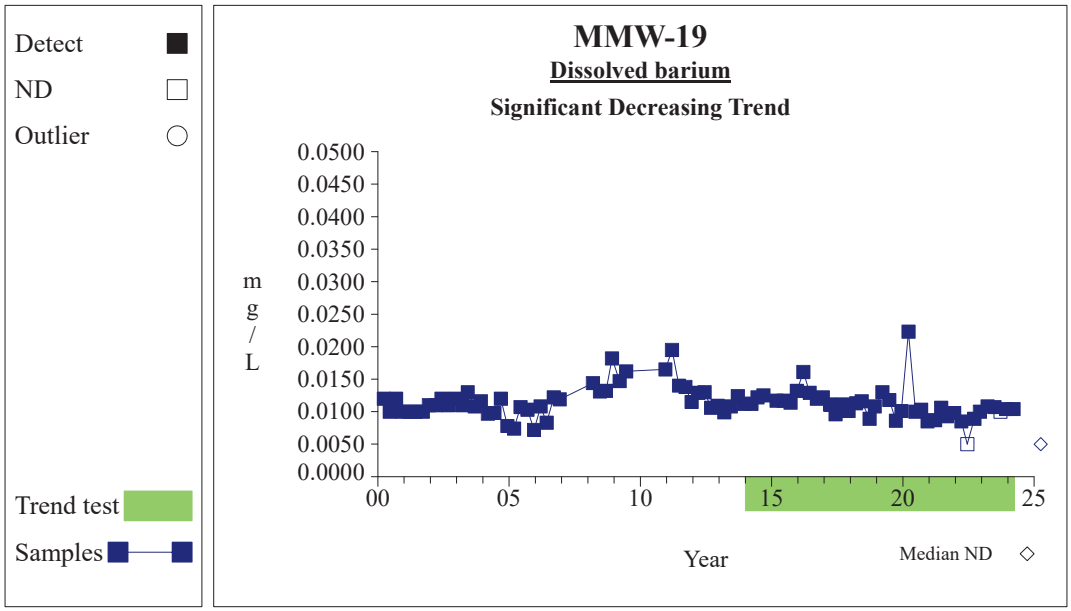
Graph 341

Time Series



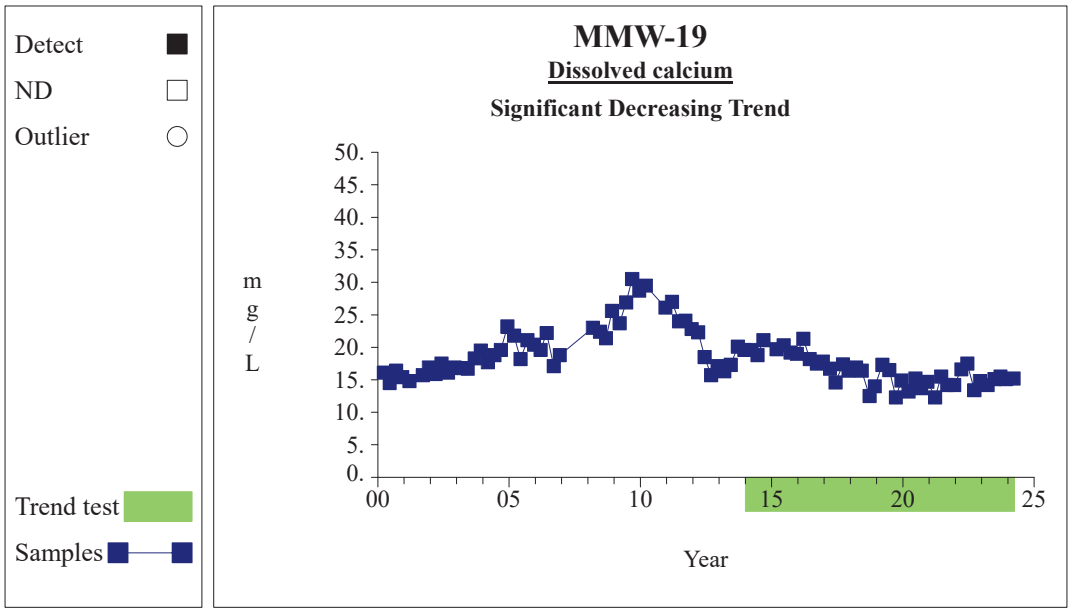
Graph 344

Time Series



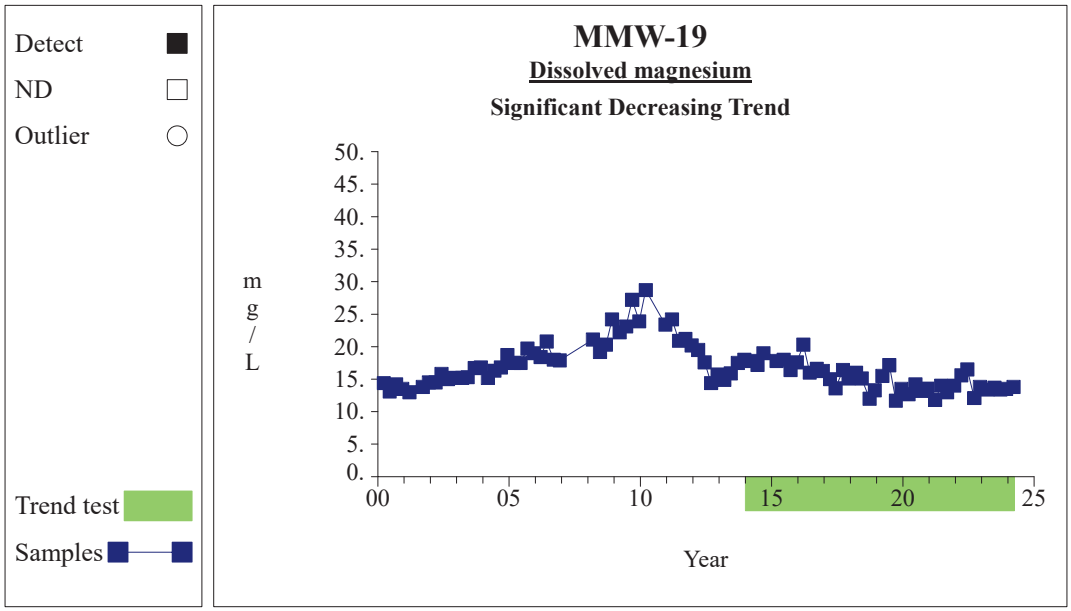
Graph 353

Time Series



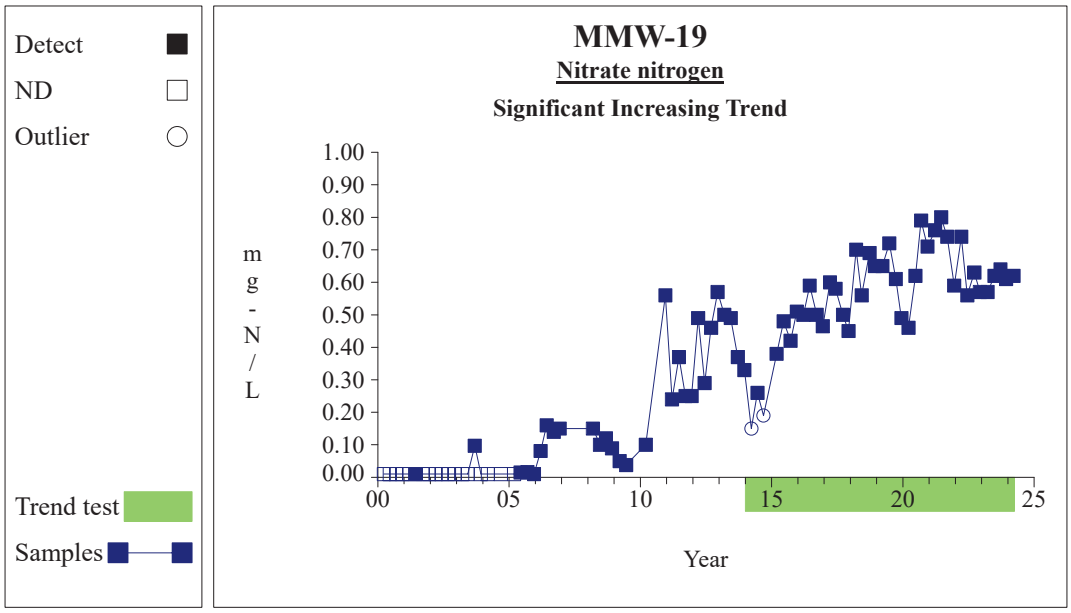
Graph 356

Time Series



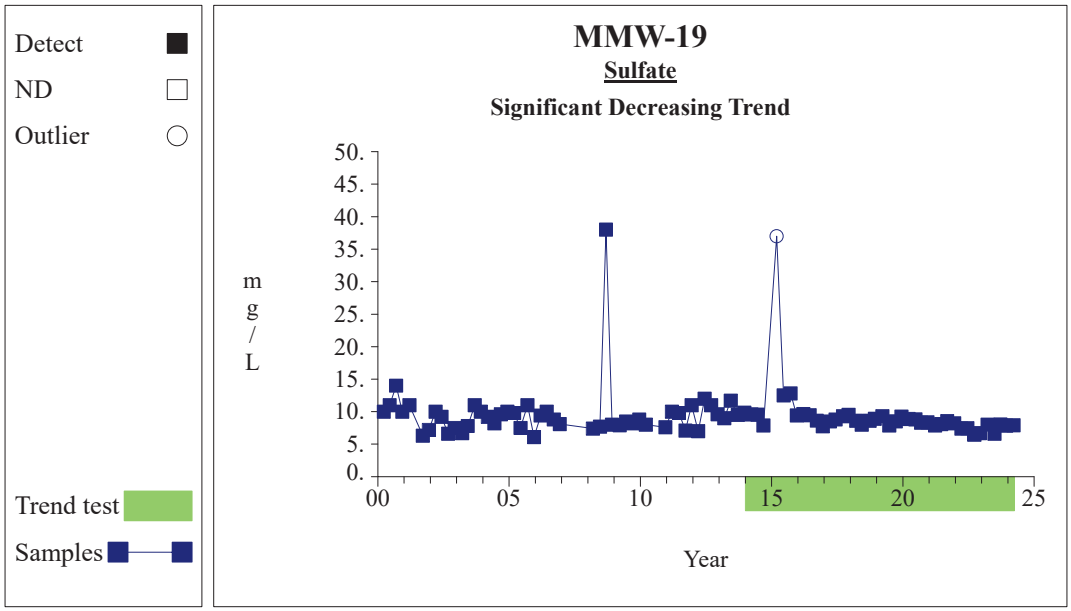
Graph 362

Time Series



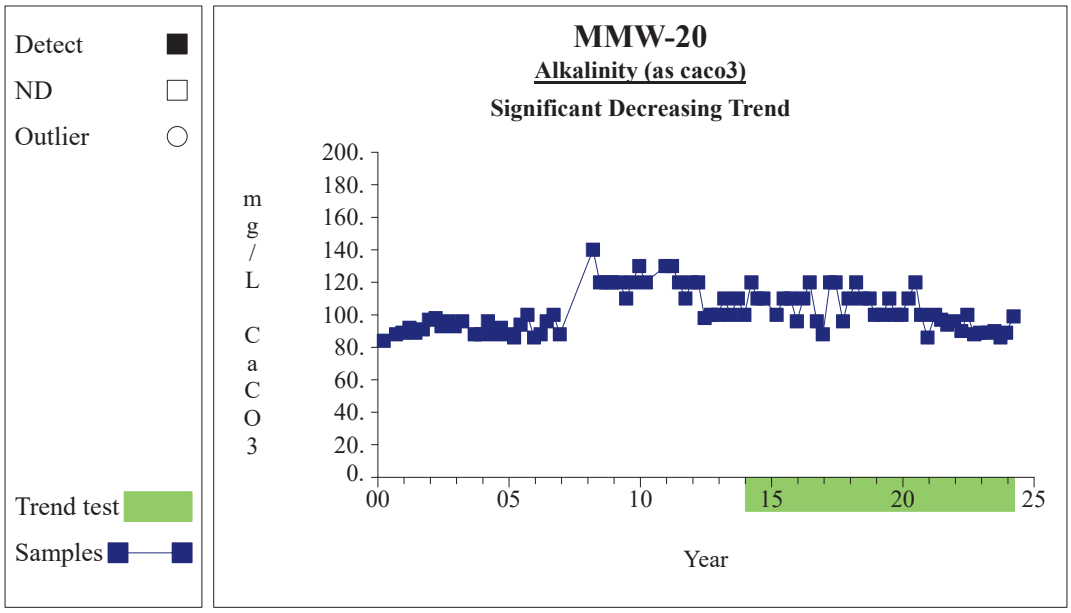
Graph 374

Time Series



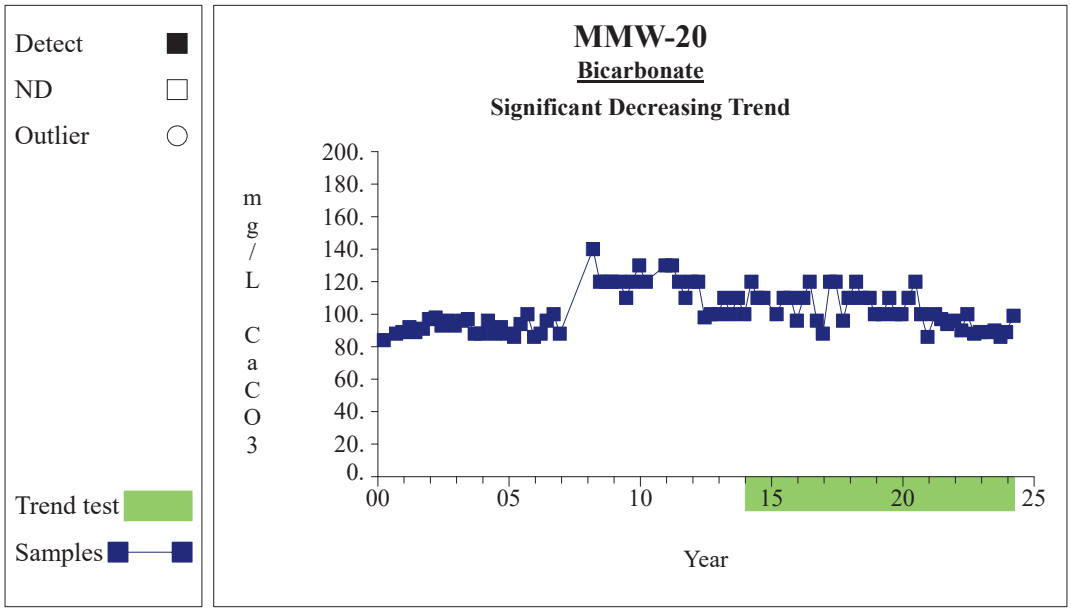
Graph 379

Time Series



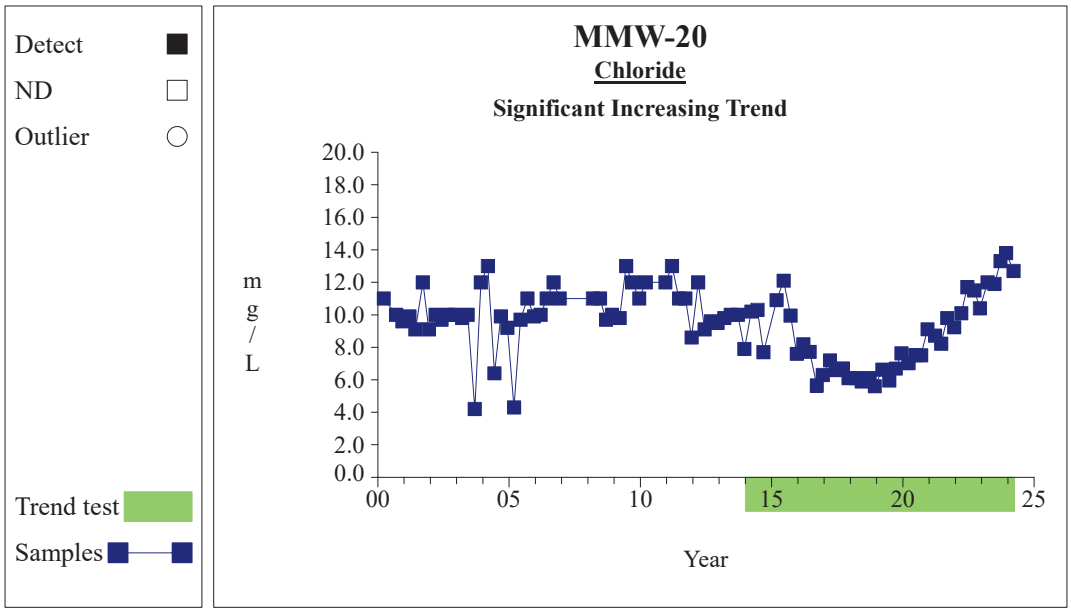
Graph 389

Time Series



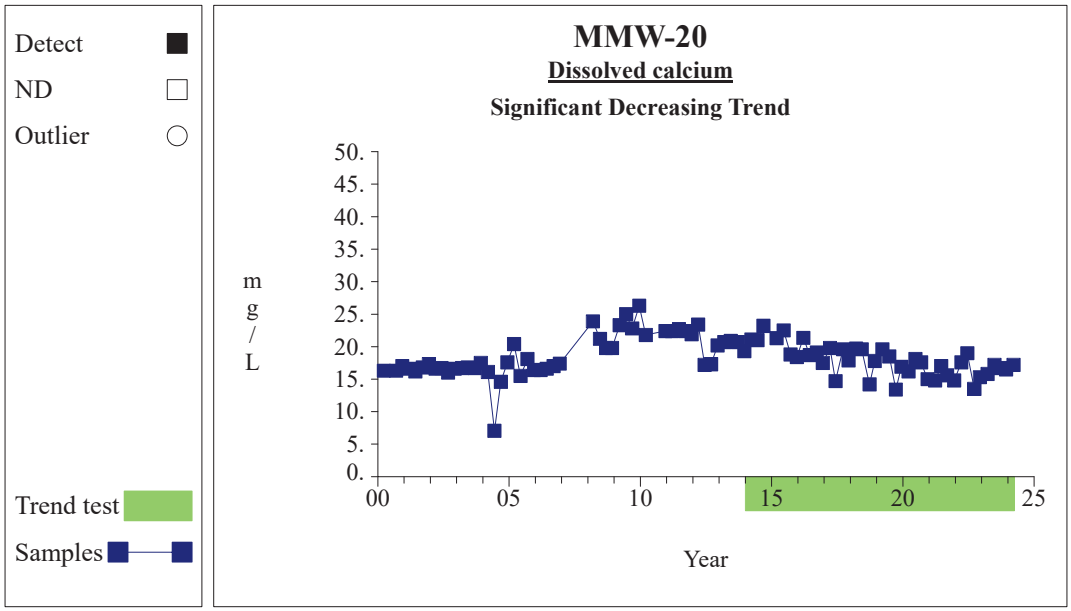
Graph 392

Time Series



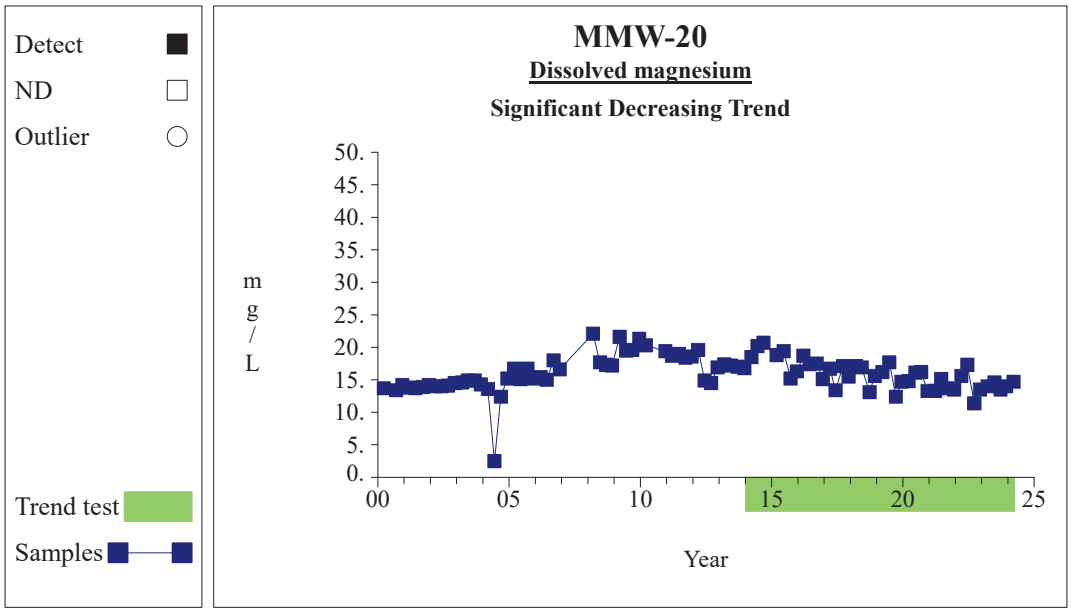
Graph 395

Time Series



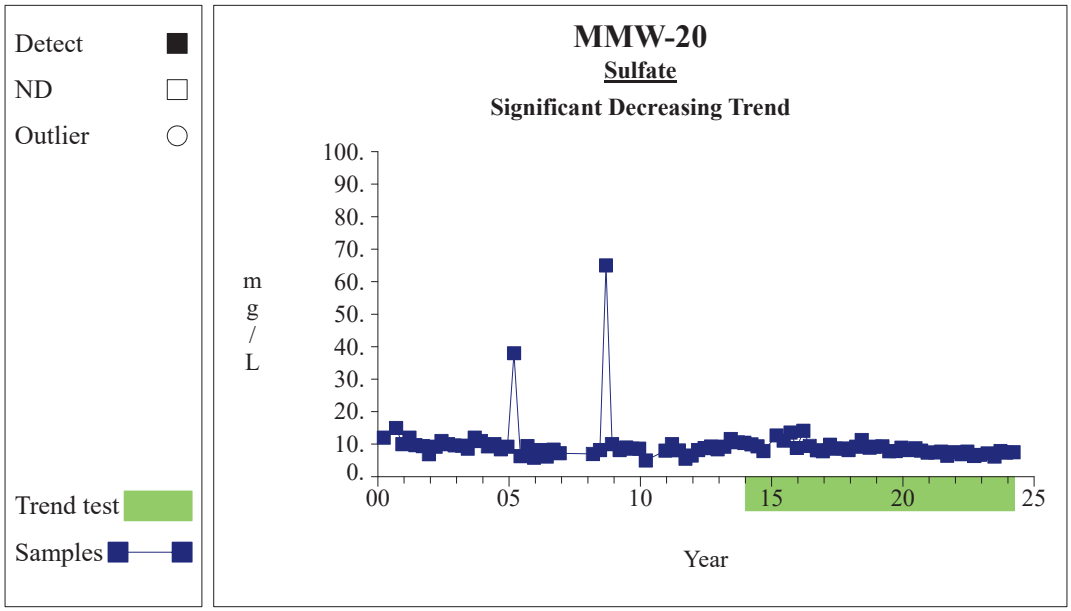
Graph 404

Time Series



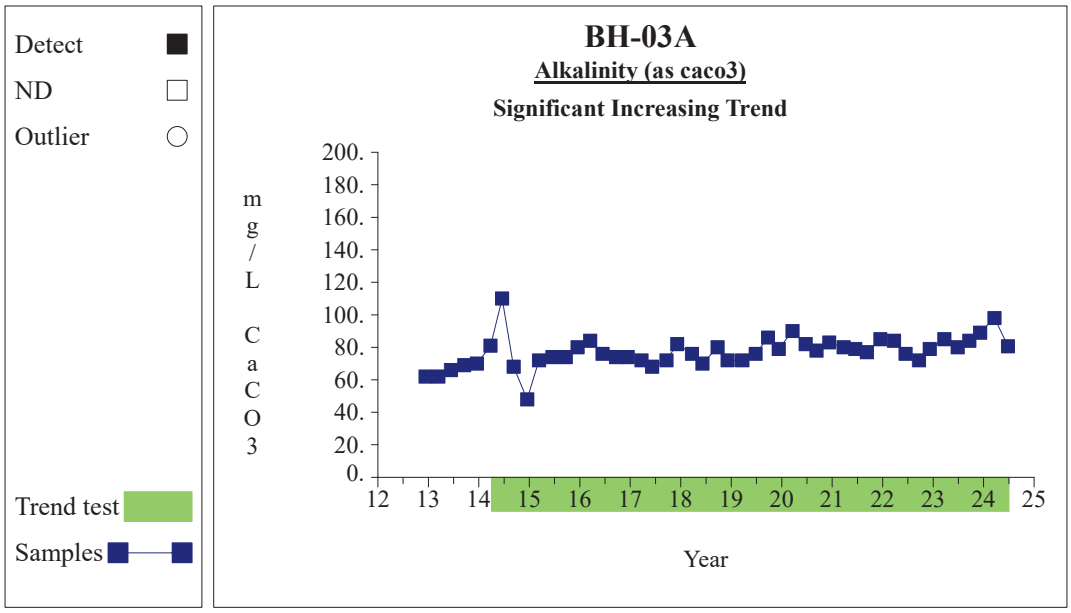
Graph 410

Time Series



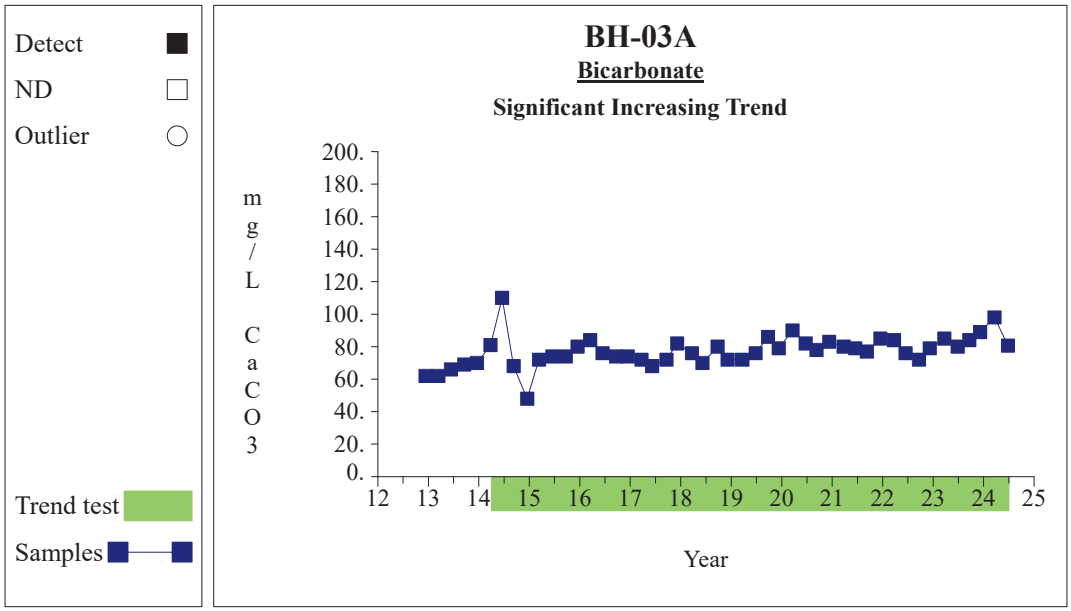
Graph 427

Time Series



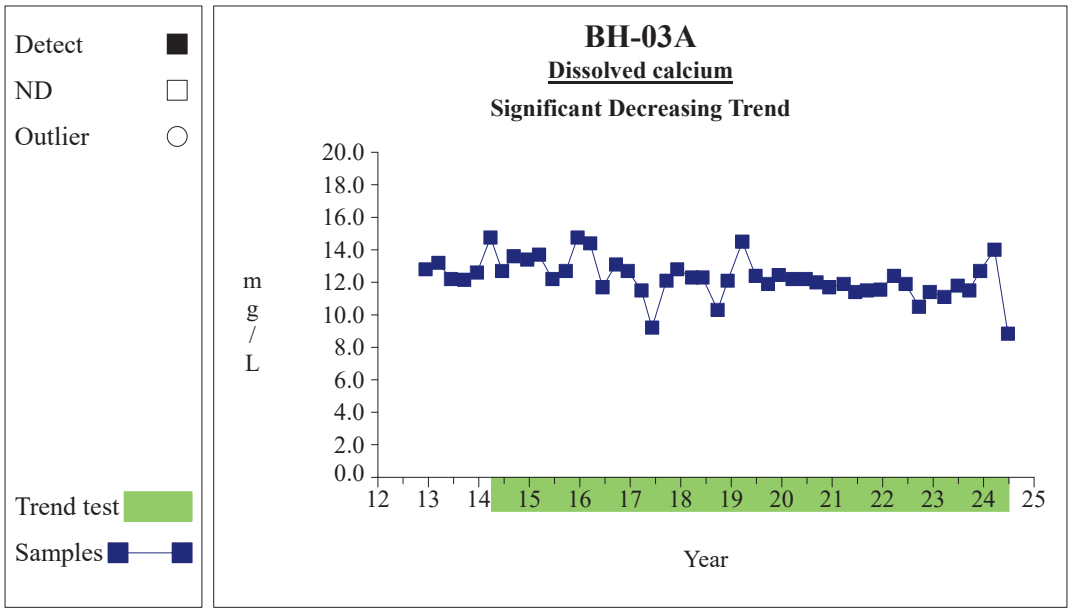
Graph 5

Time Series



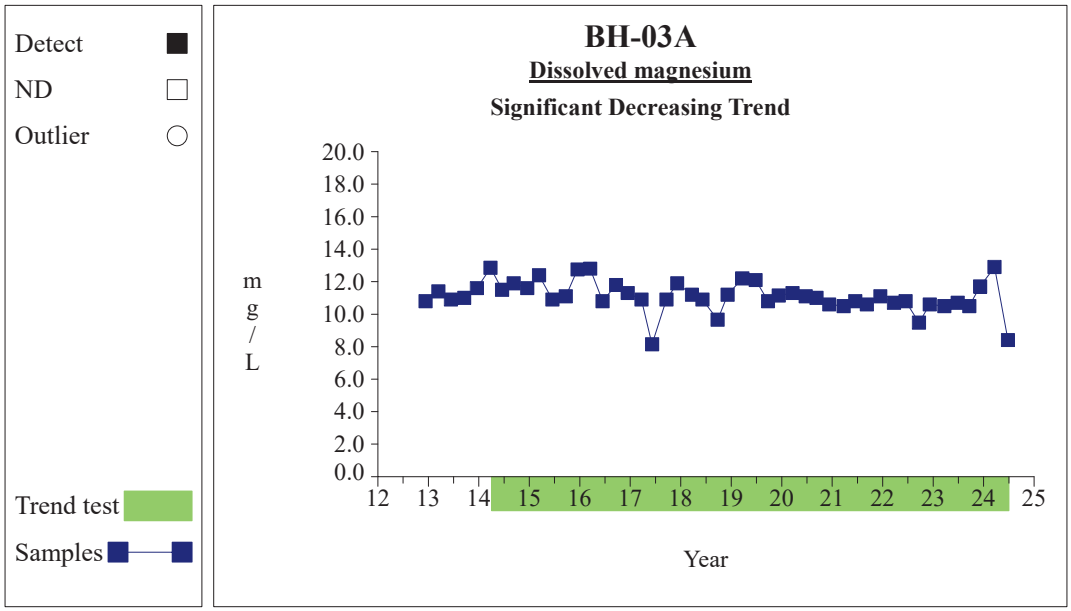
Graph 8

Time Series



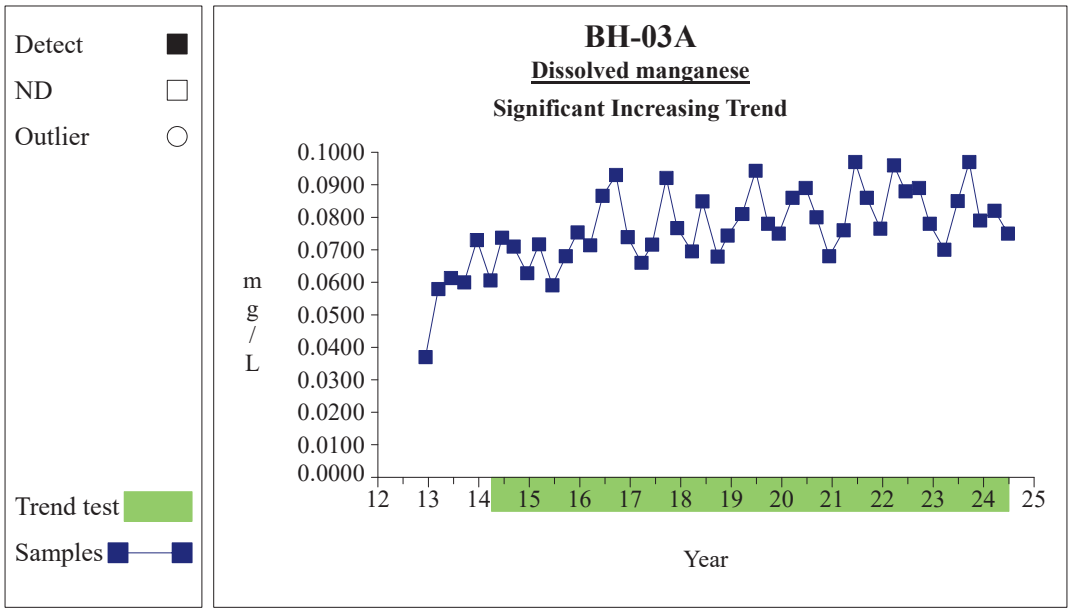
Graph 22

Time Series



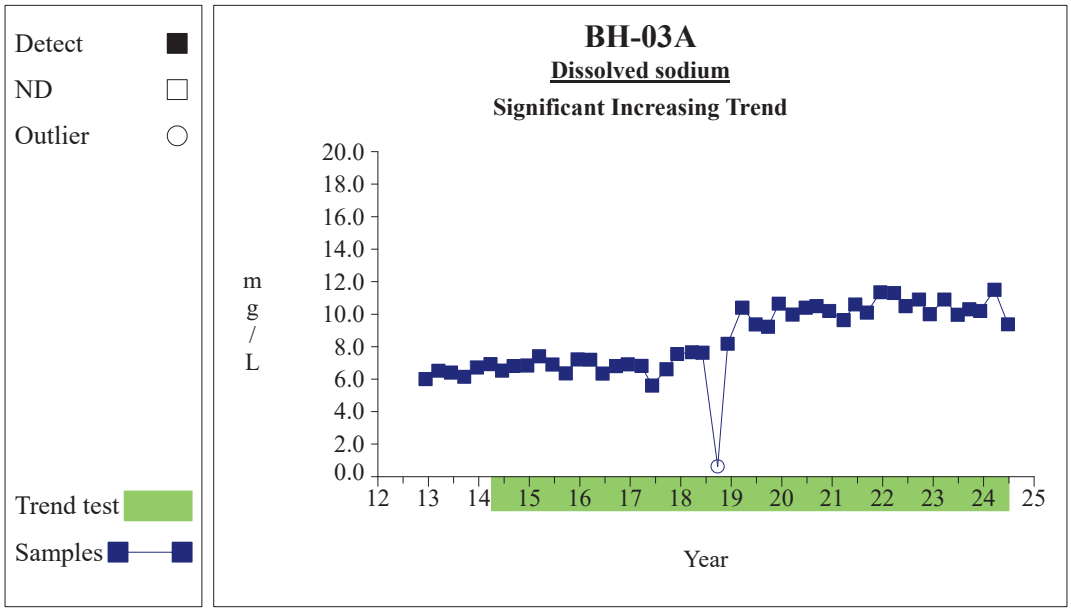
Graph 28

Time Series



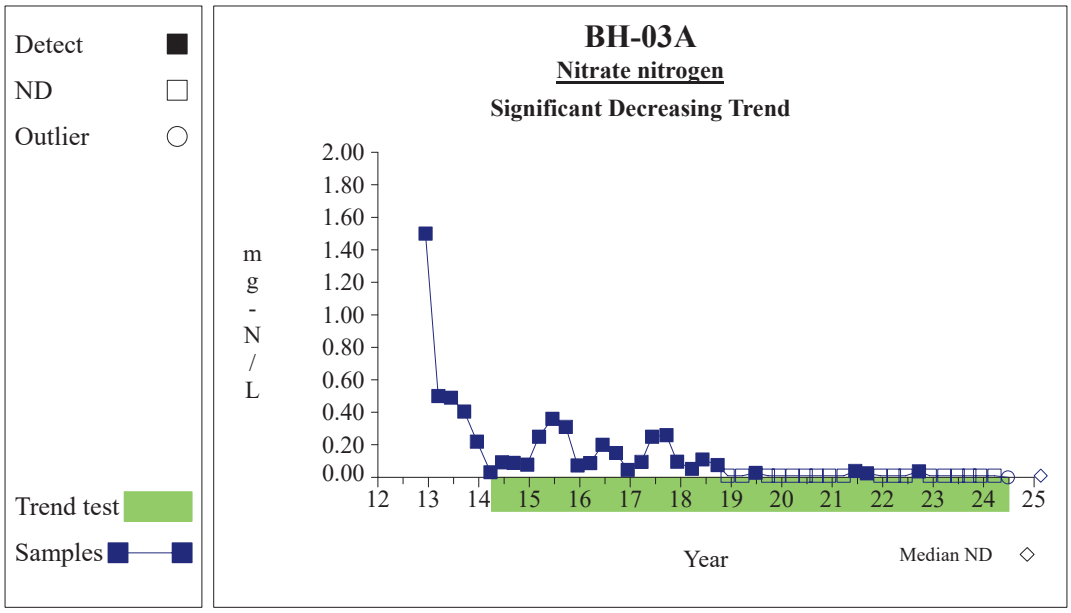
Graph 29

Time Series



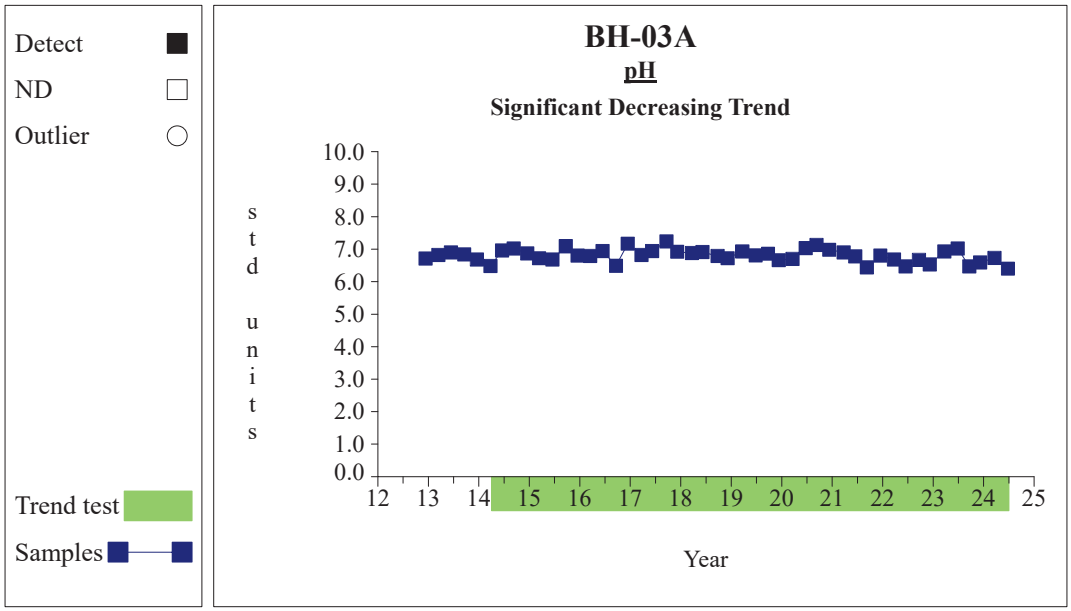
Graph 34

Time Series



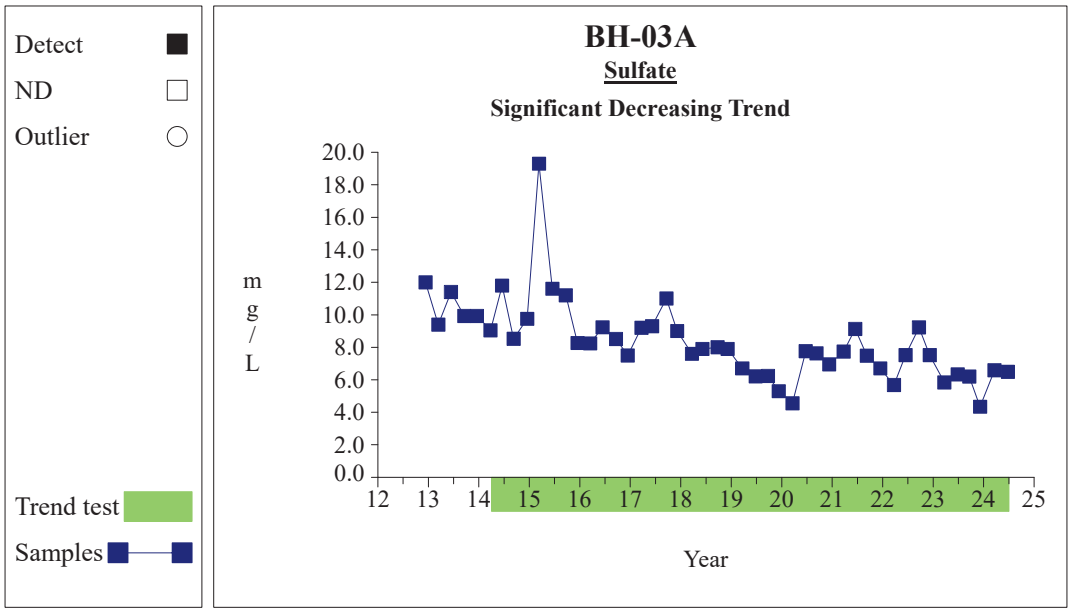
Graph 40

Time Series



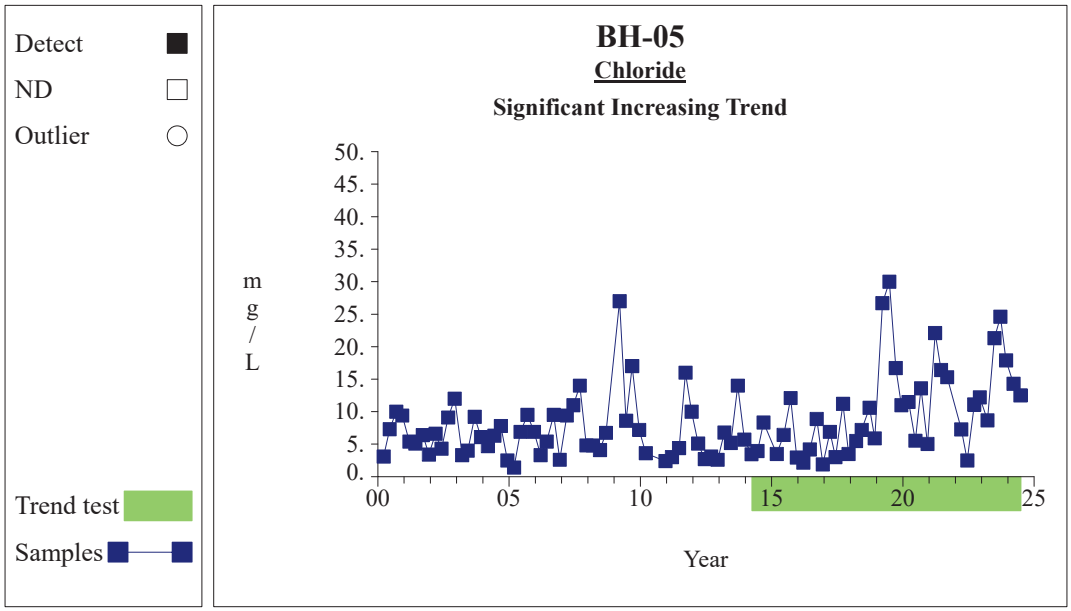
Graph 43

Time Series



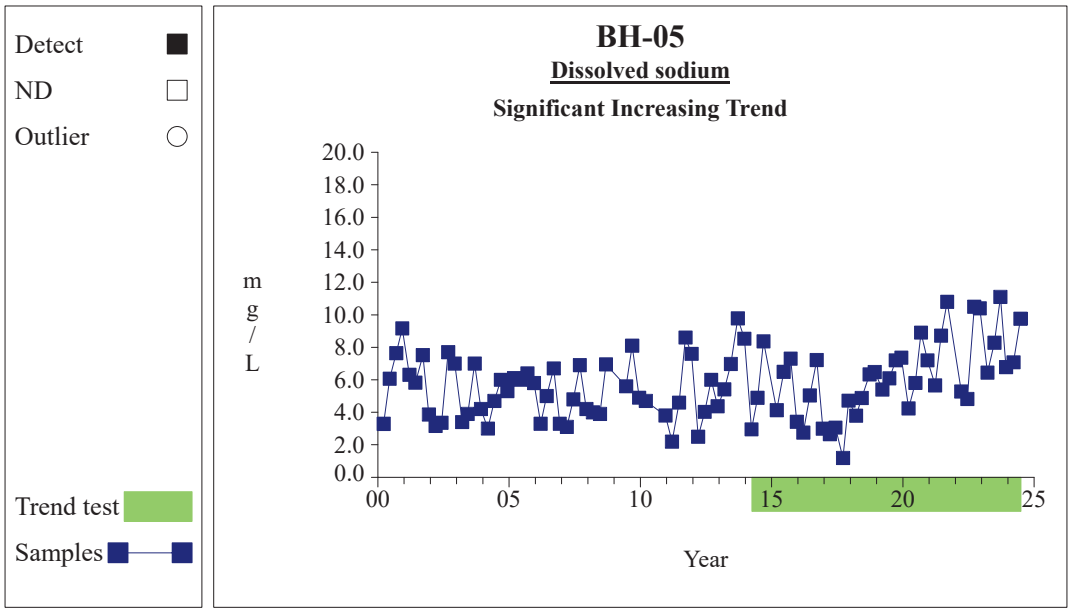
Graph 45

Time Series



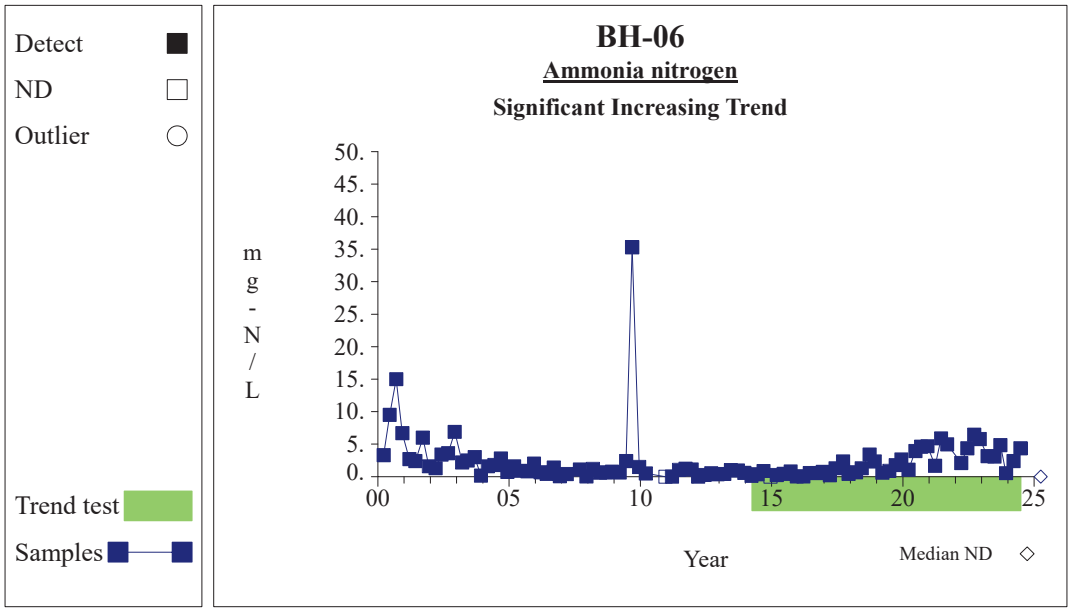
Graph 62

Time Series



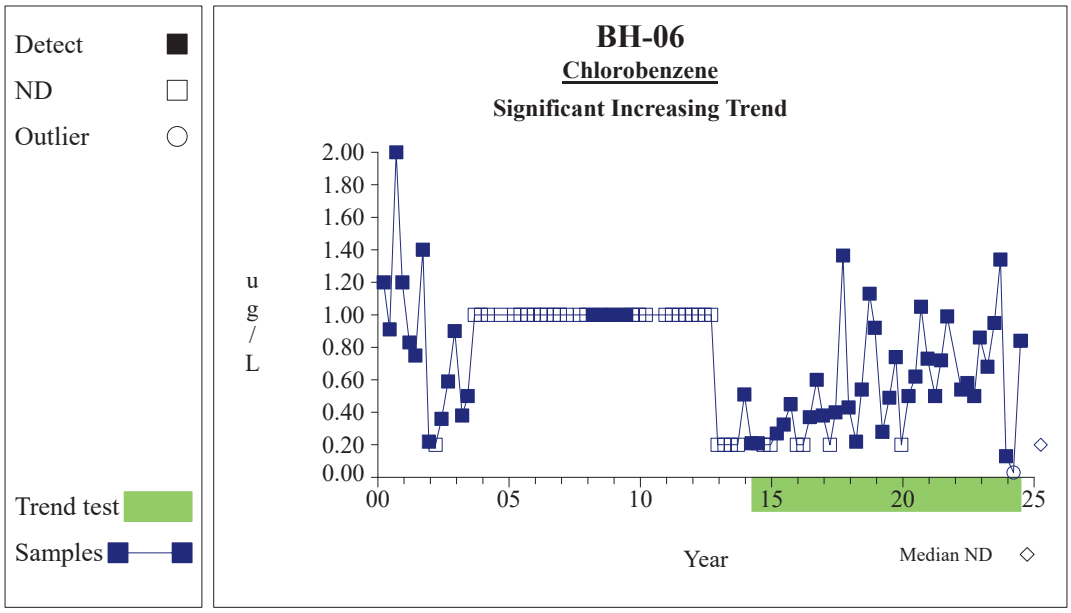
Graph 85

Time Series



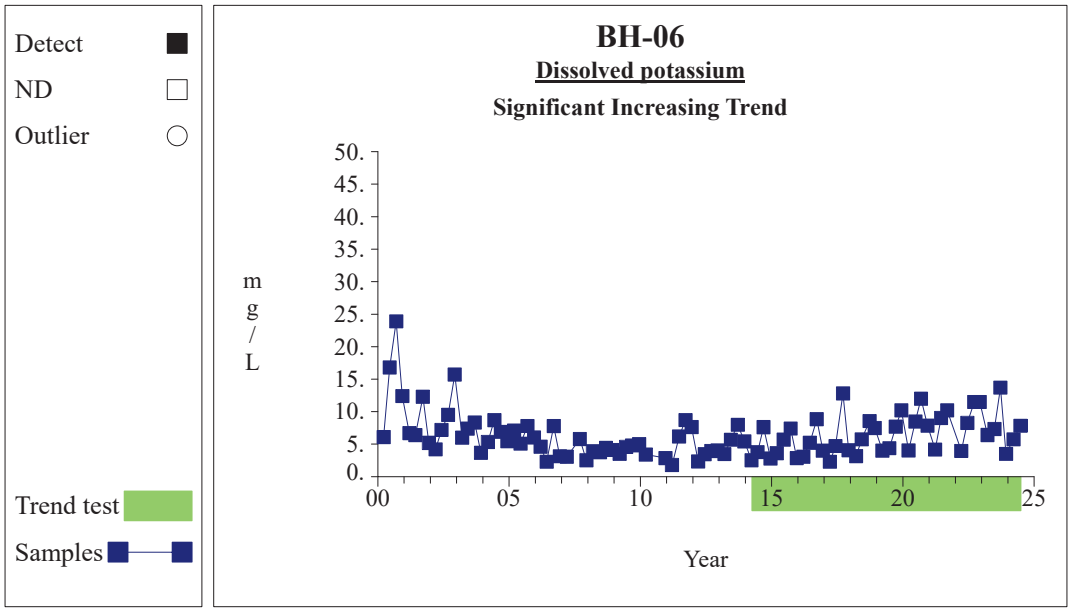
Graph 108

Time Series



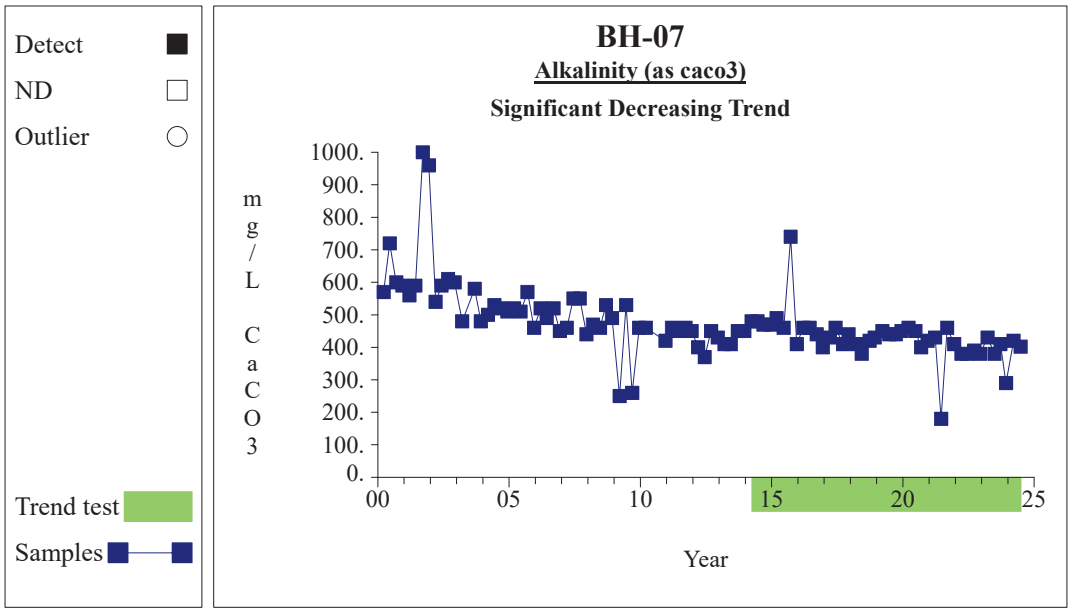
Graph 114

Time Series



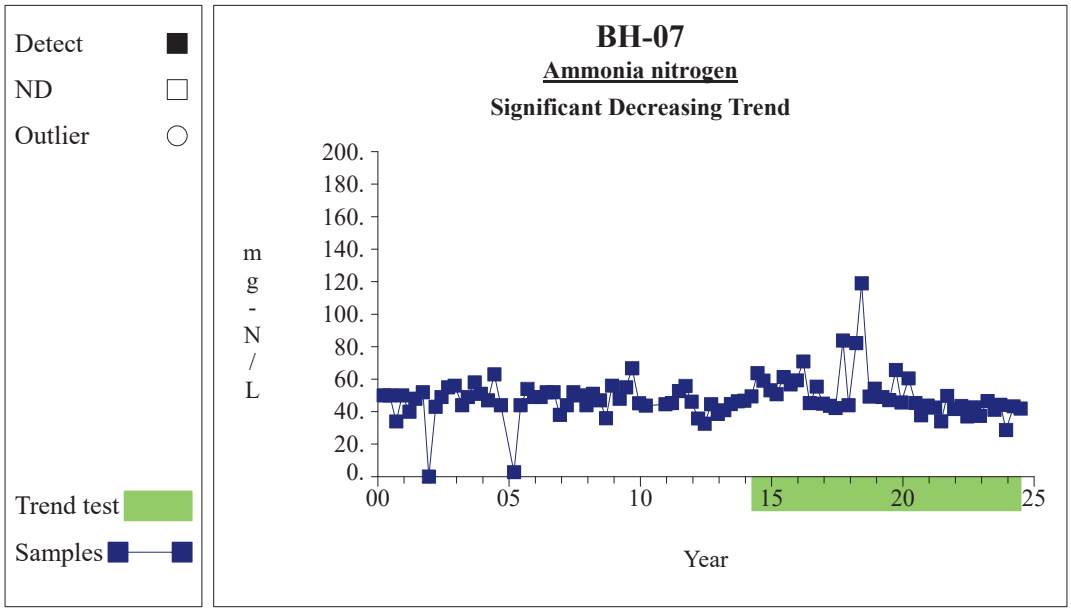
Graph 133

Time Series



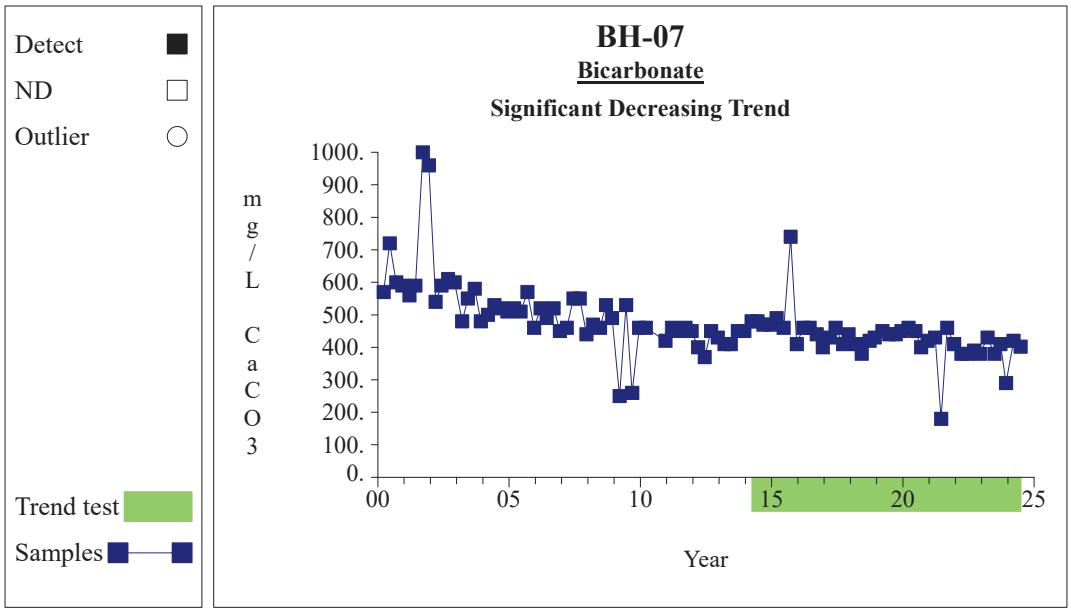
Graph 158

Time Series



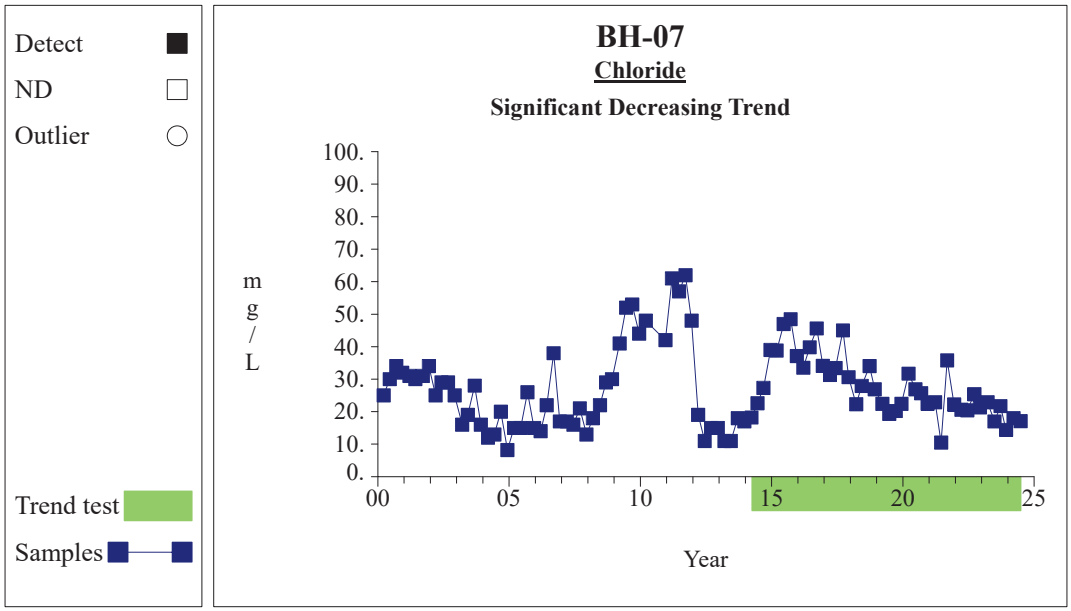
Graph 159

Time Series



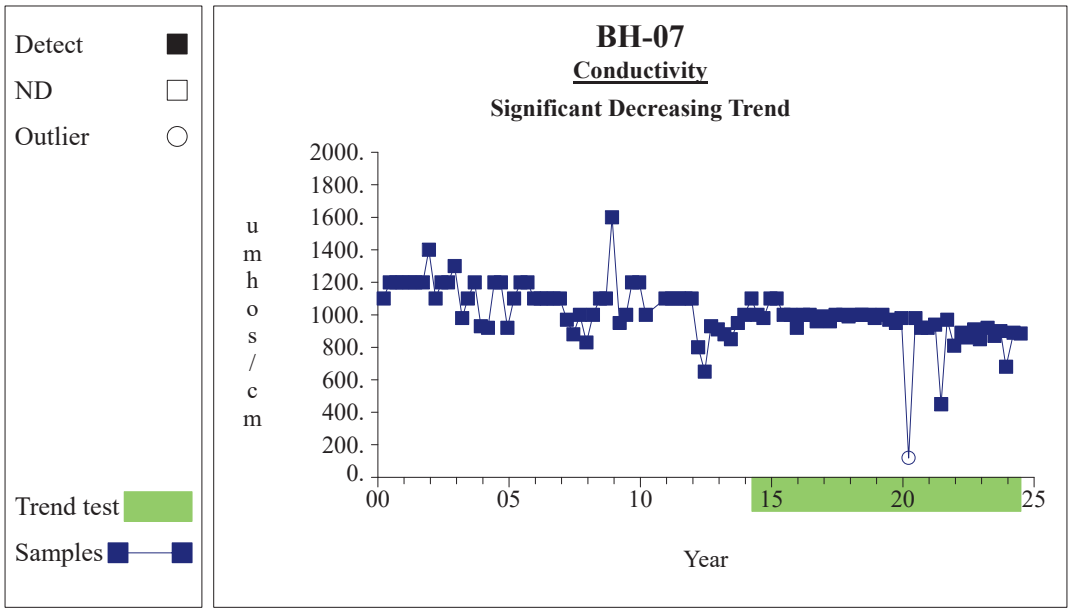
Graph 161

Time Series



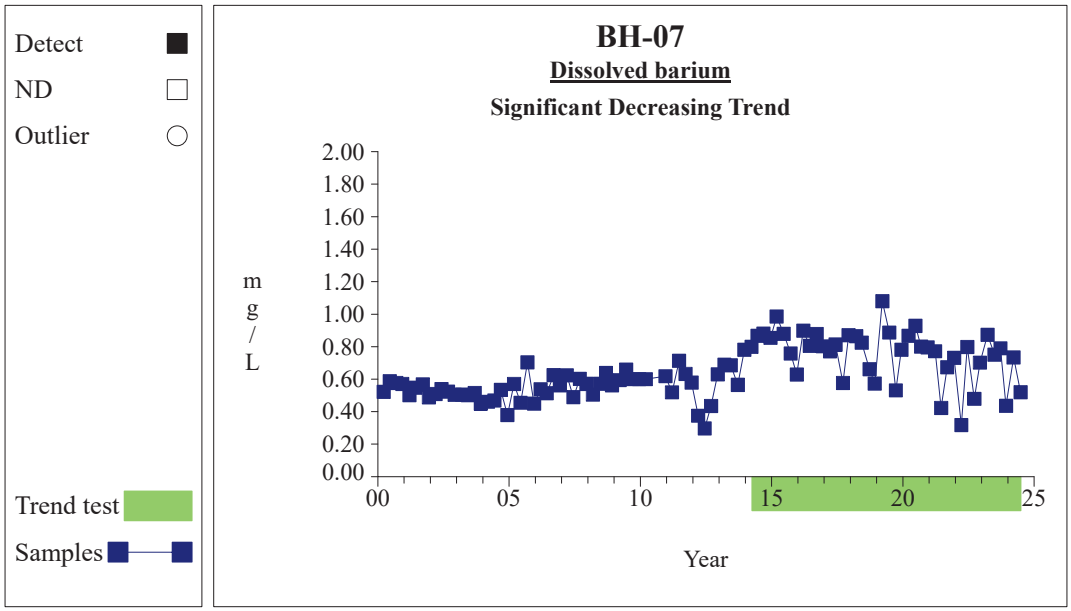
Graph 164

Time Series



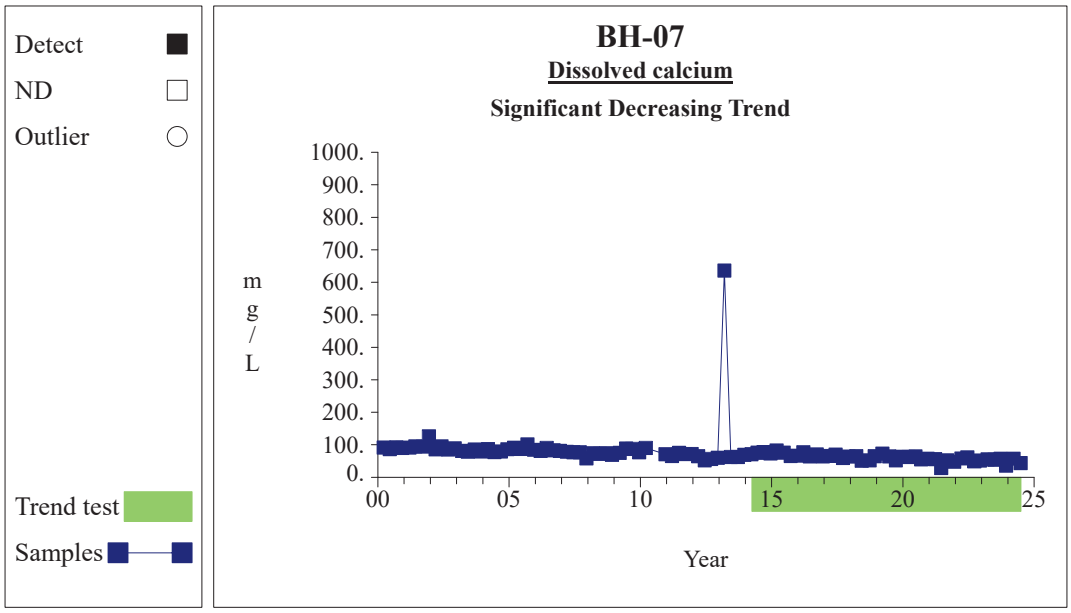
Graph 169

Time Series



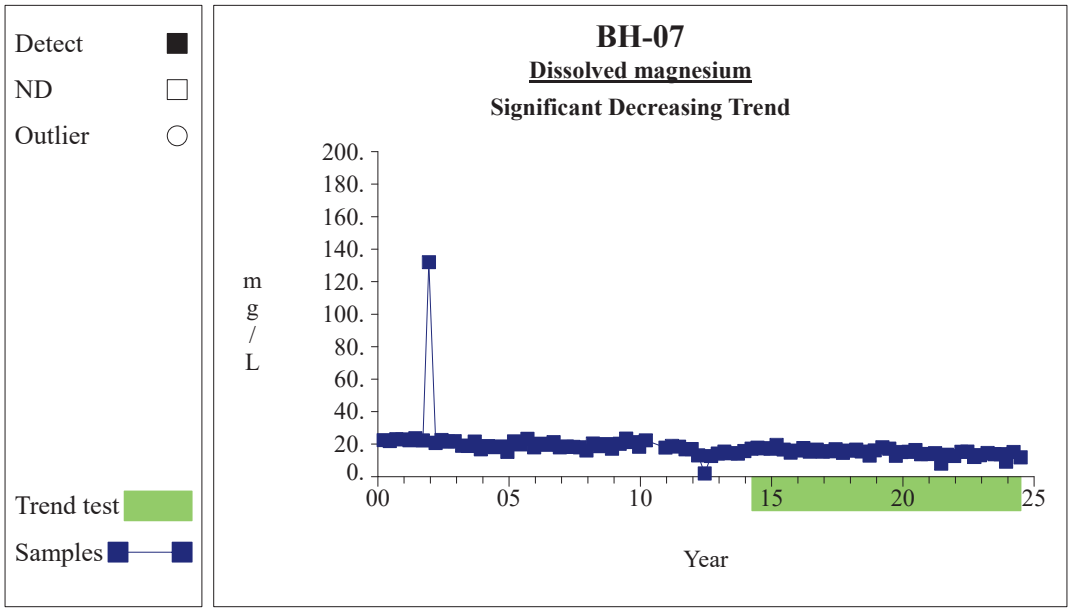
Graph 172

Time Series



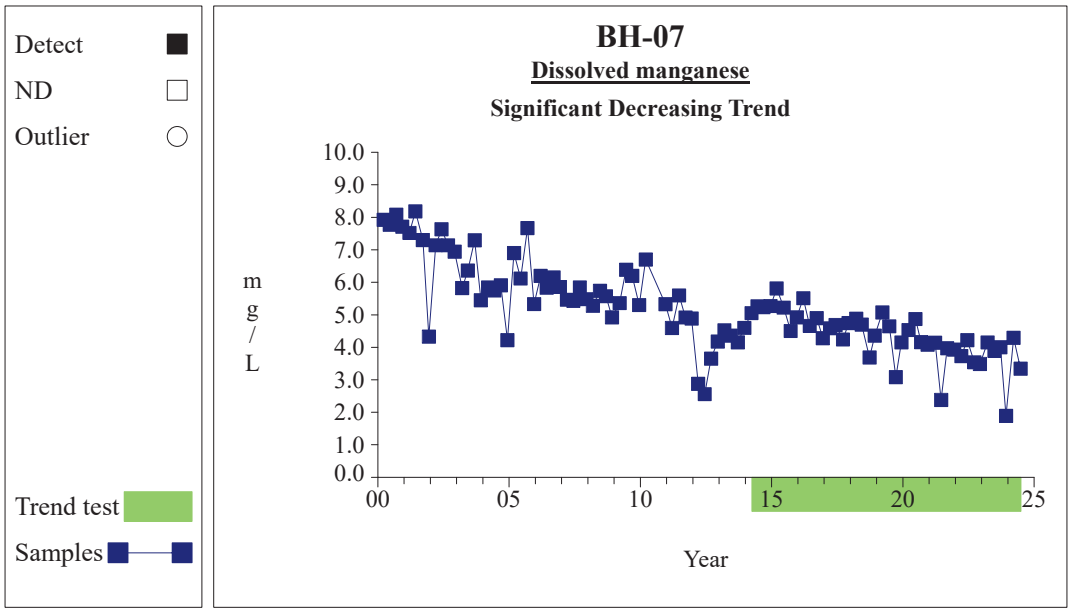
Graph 175

Time Series



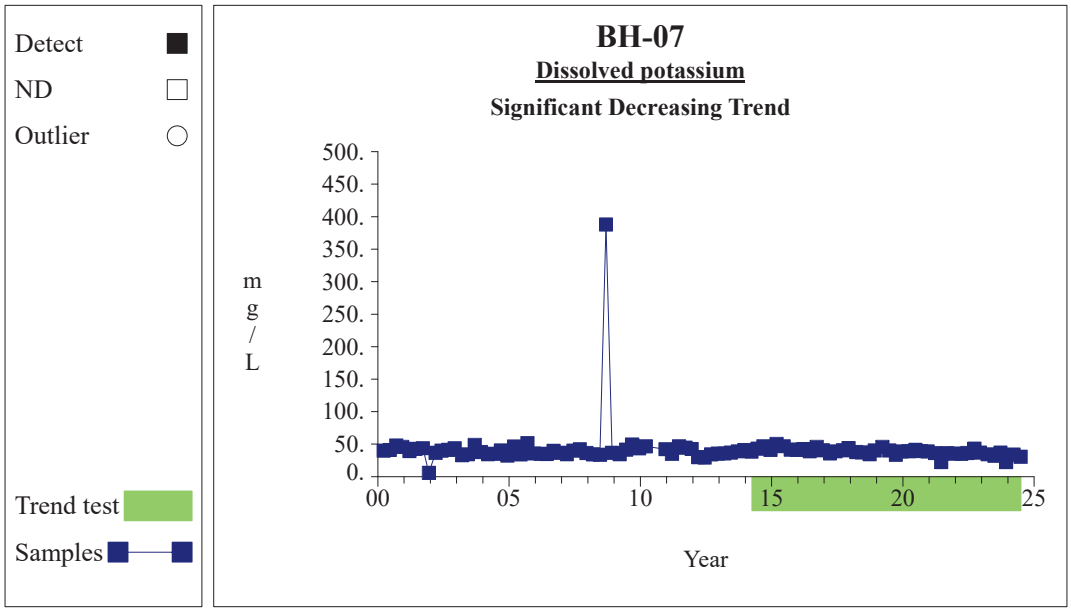
Graph 181

Time Series



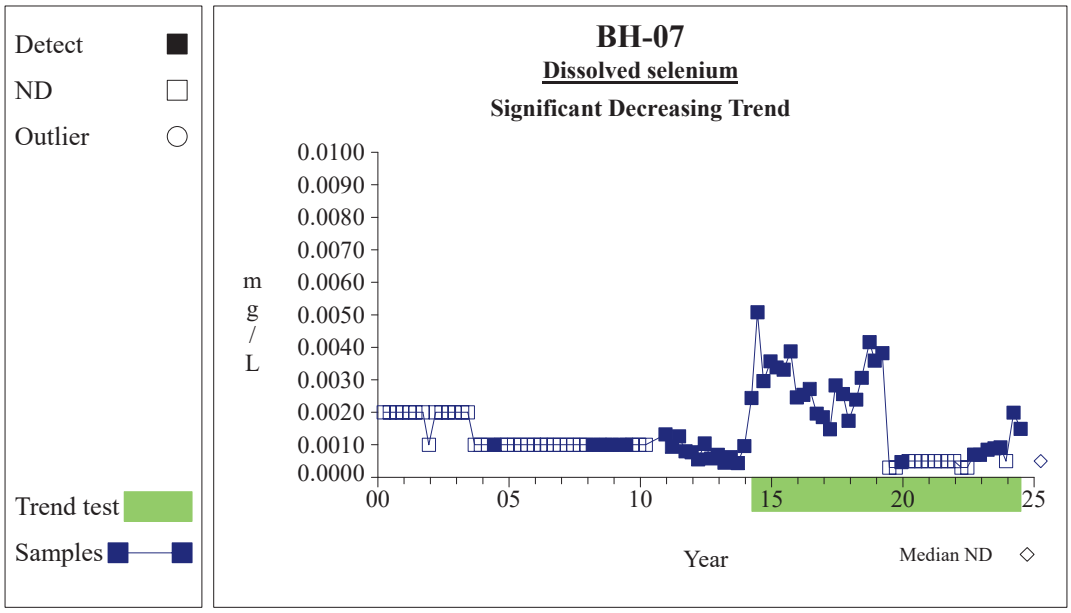
Graph 182

Time Series



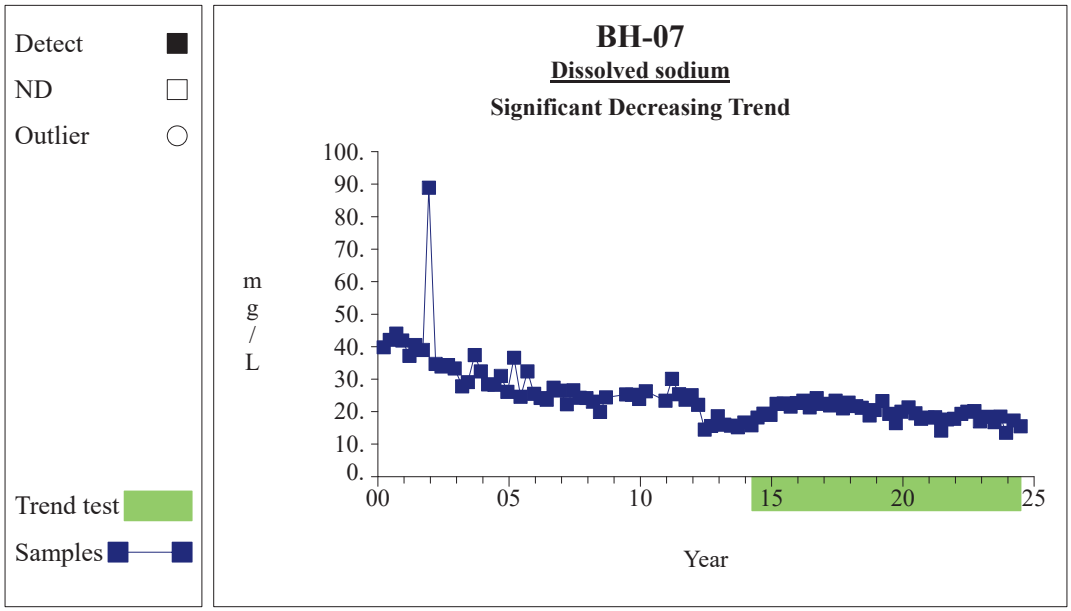
Graph 184

Time Series



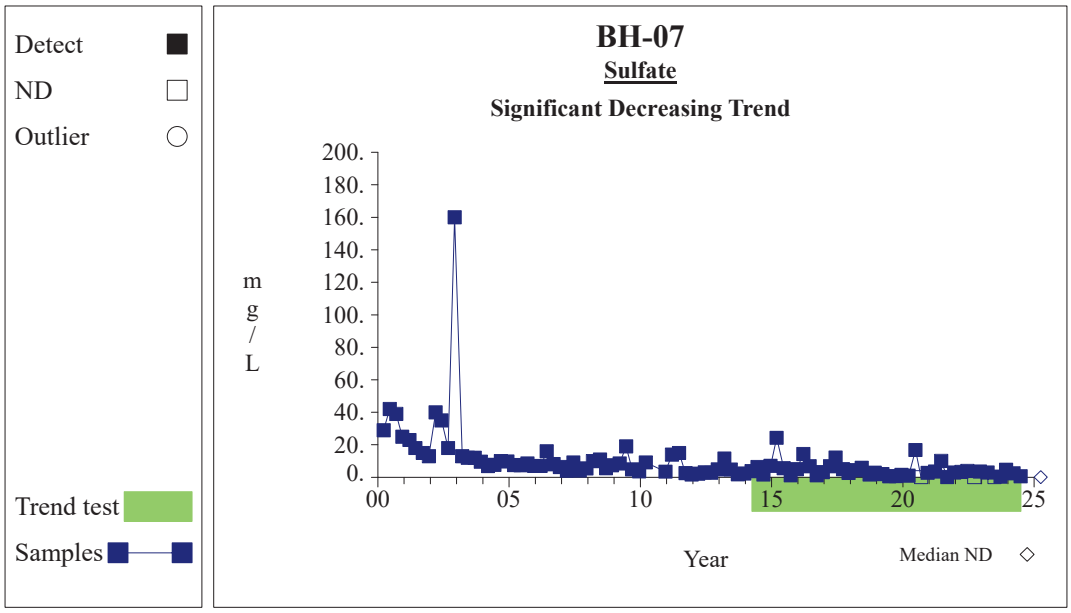
Graph 185

Time Series



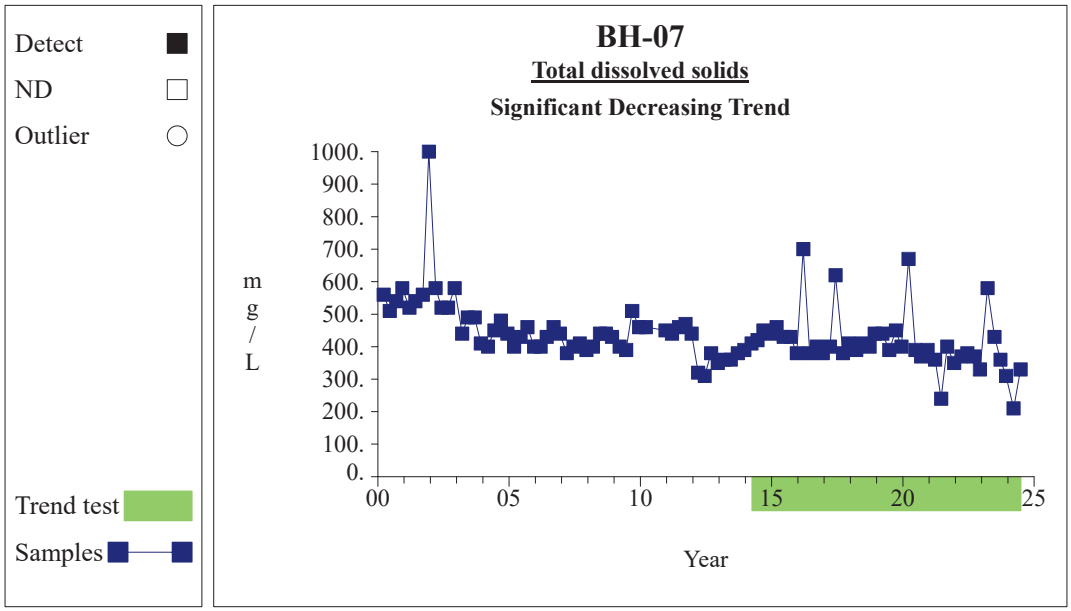
Graph 187

Time Series



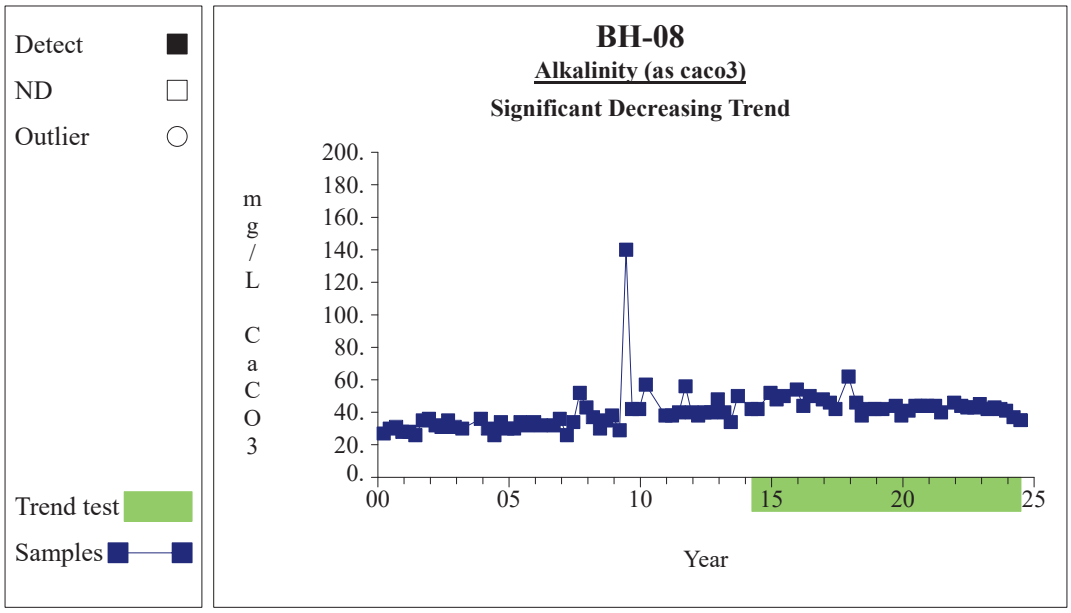
Graph 198

Time Series



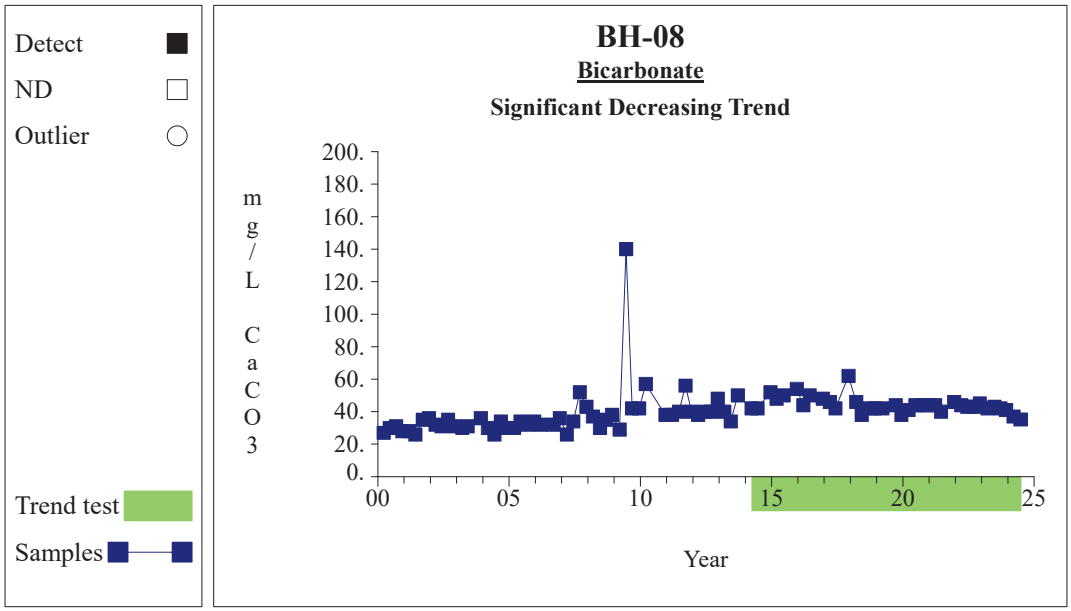
Graph 200

Time Series



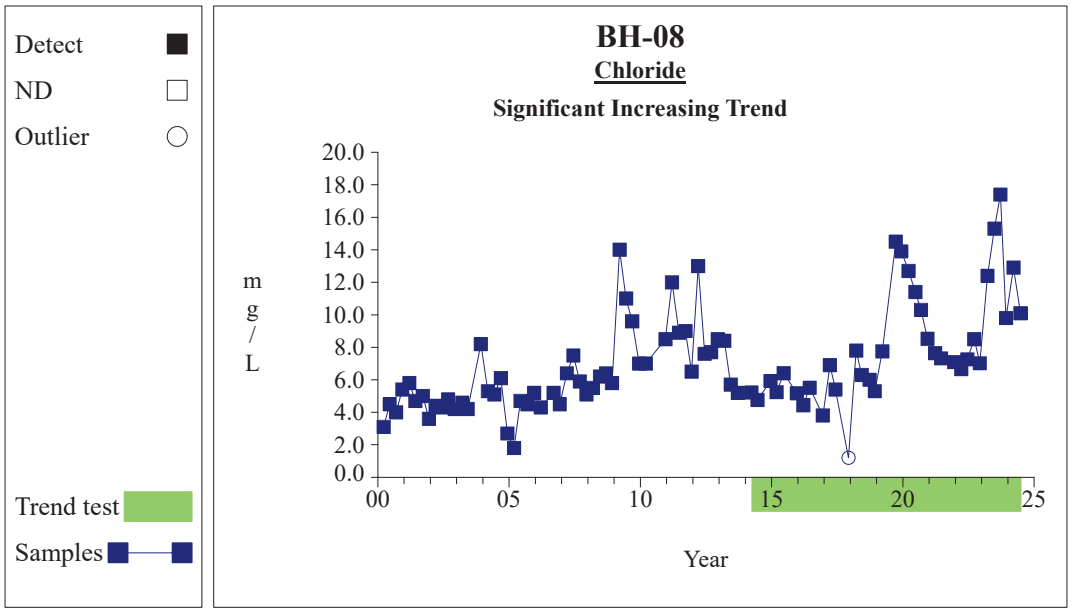
Graph 209

Time Series



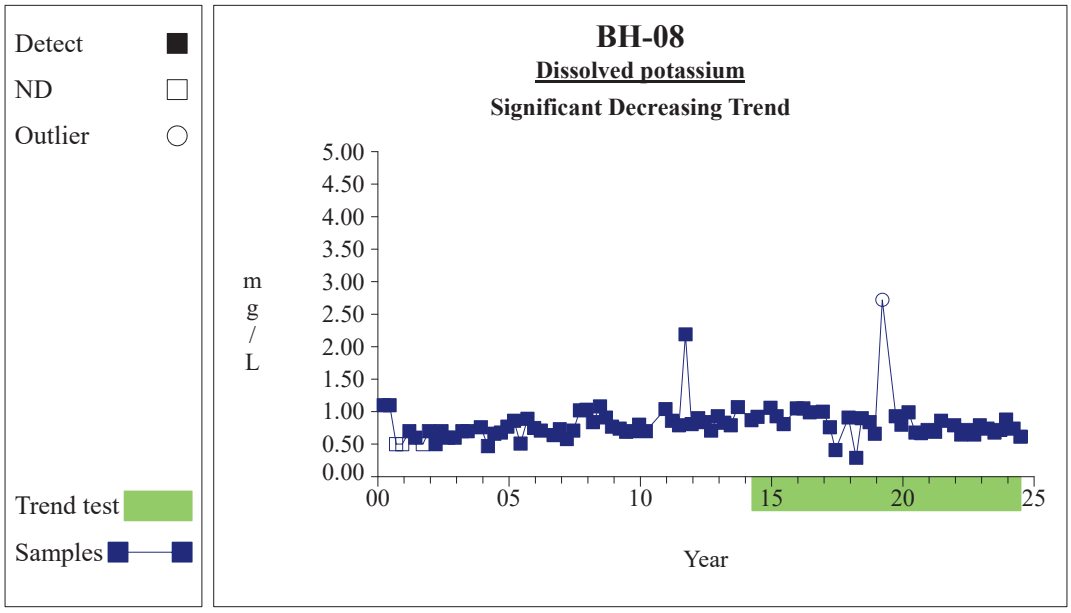
Graph 212

Time Series



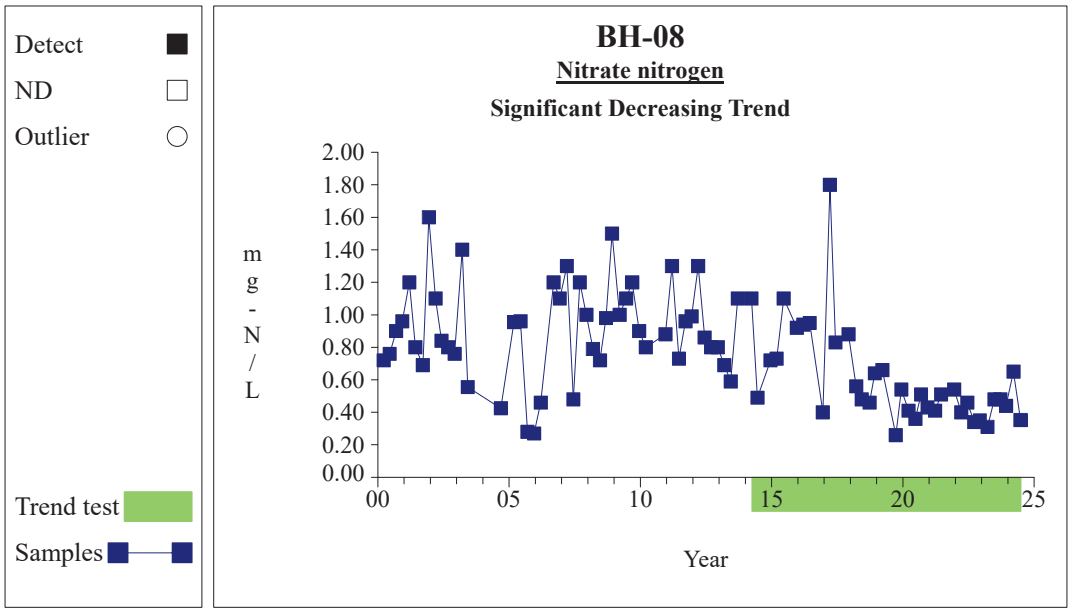
Graph 215

Time Series



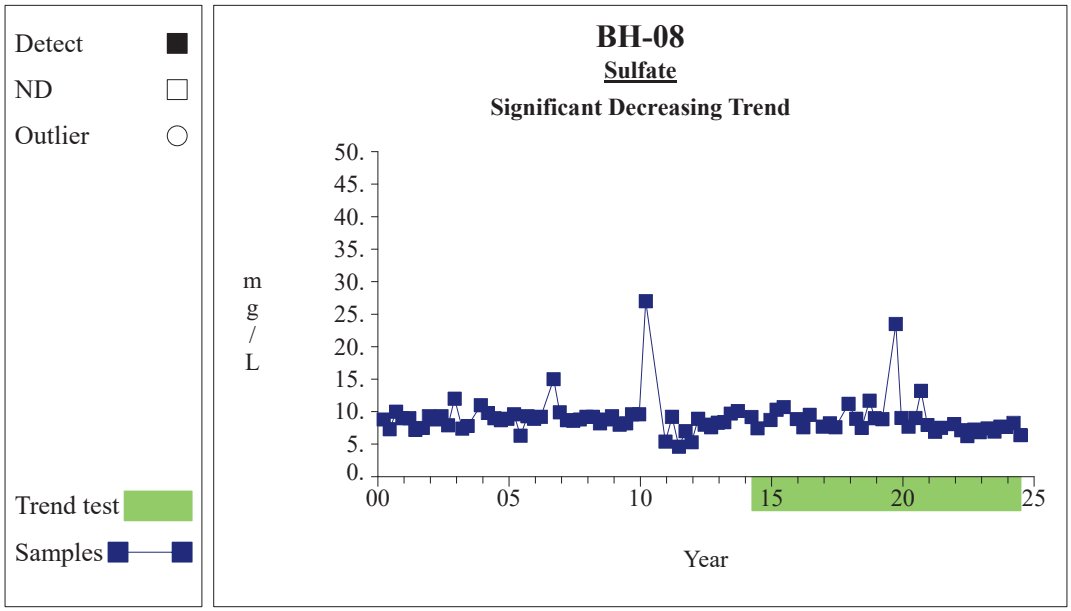
Graph 235

Time Series



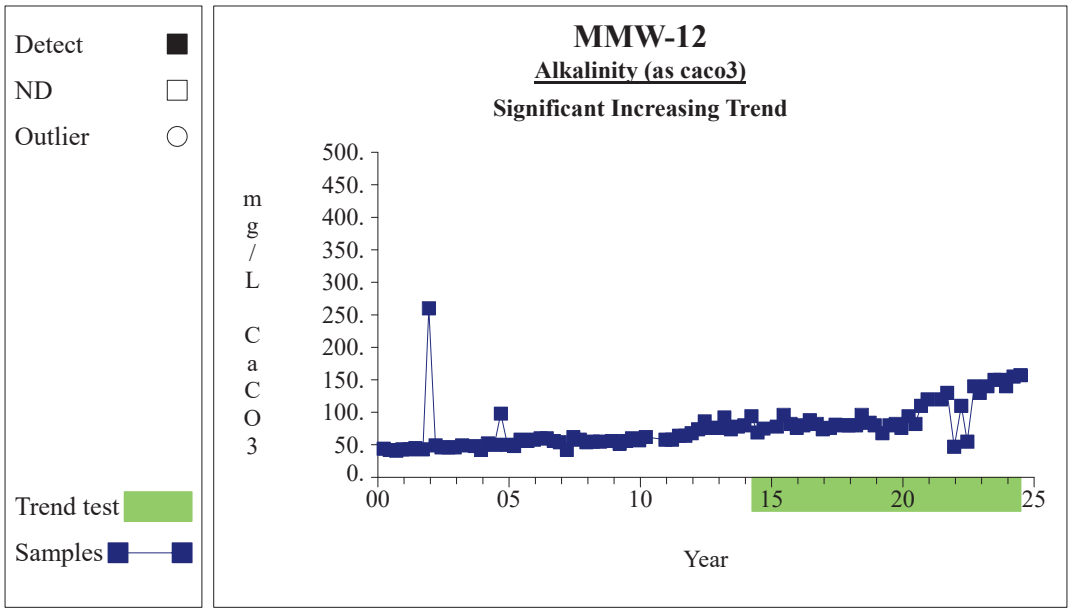
Graph 244

Time Series



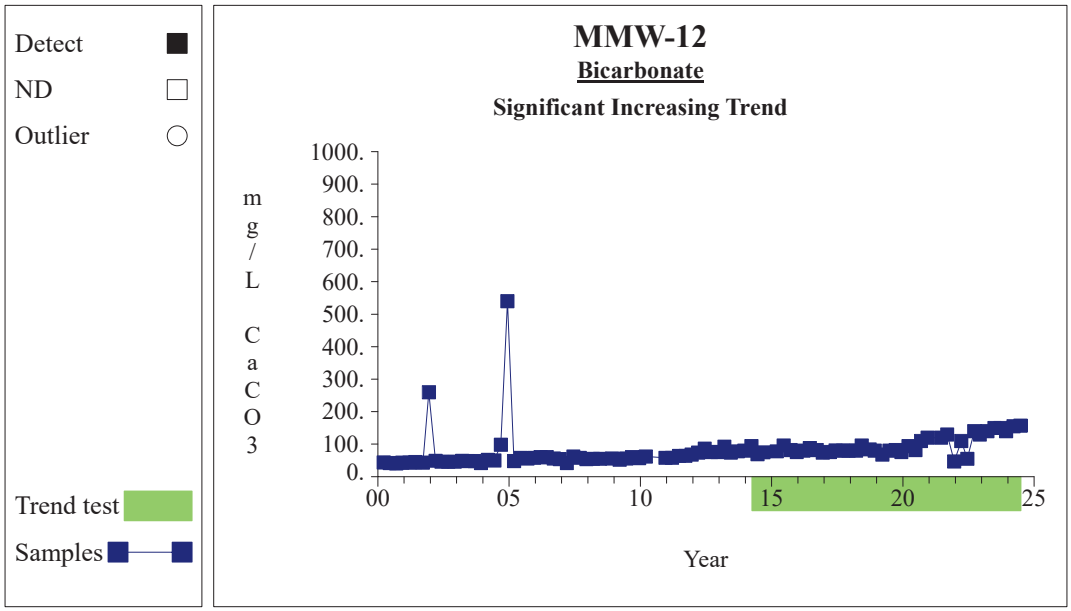
Graph 249

Time Series



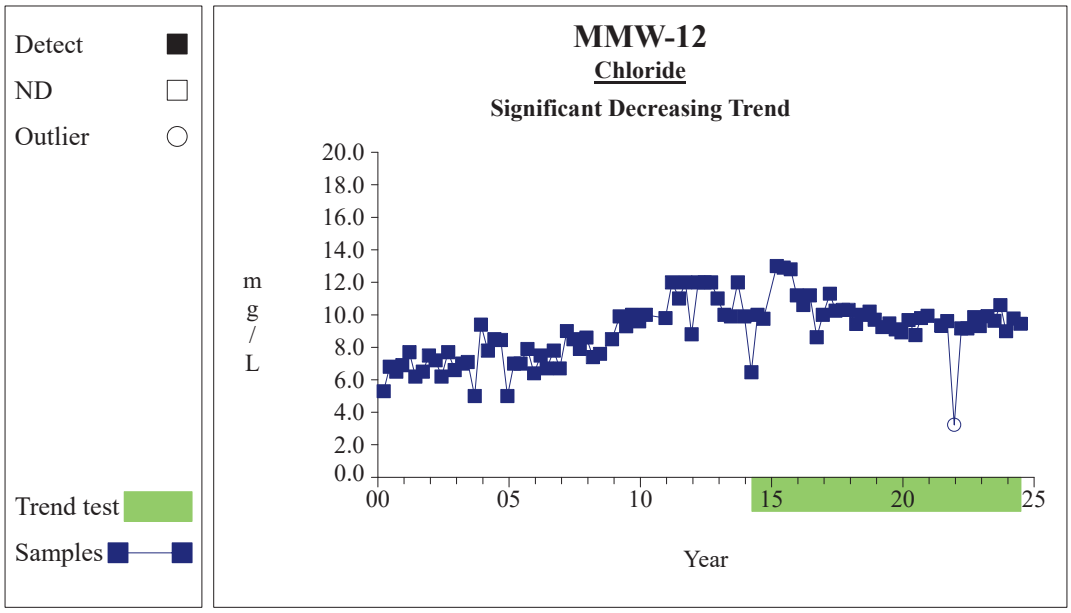
Graph 5

Time Series



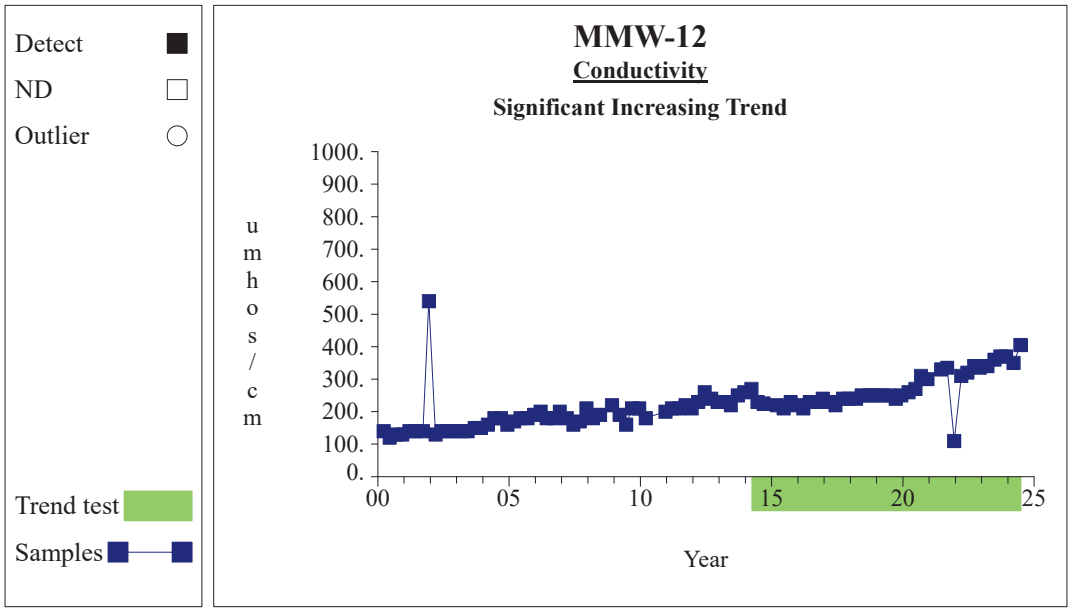
Graph 8

Time Series



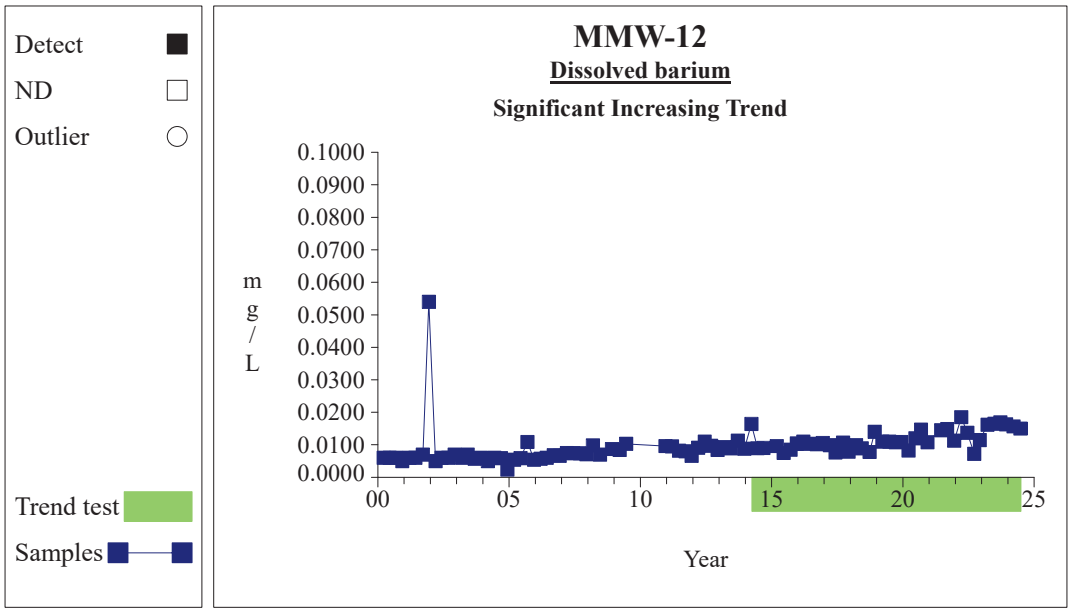
Graph 11

Time Series



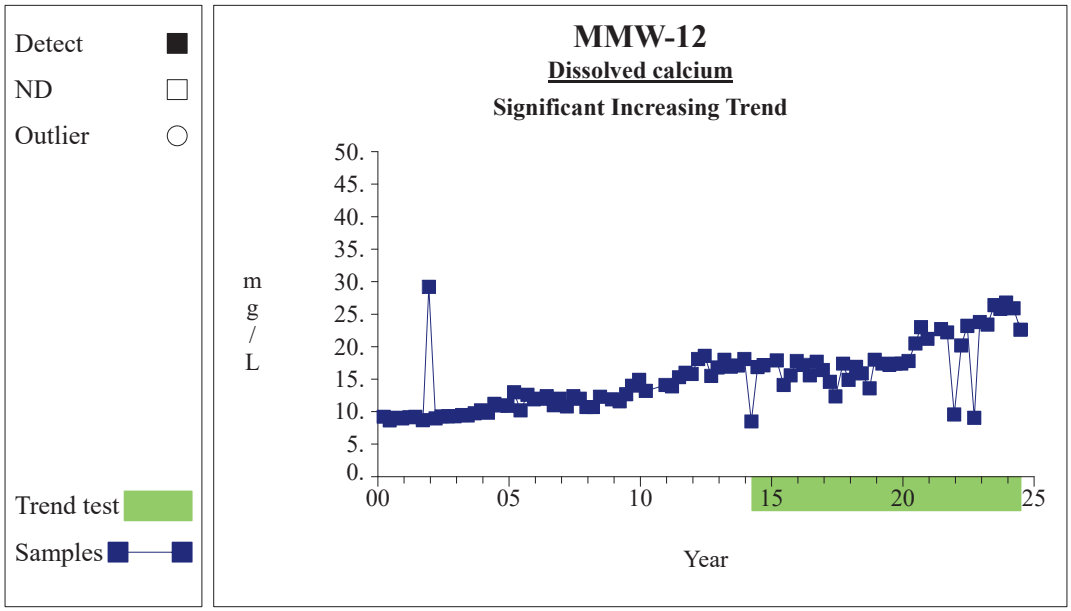
Graph 14

Time Series



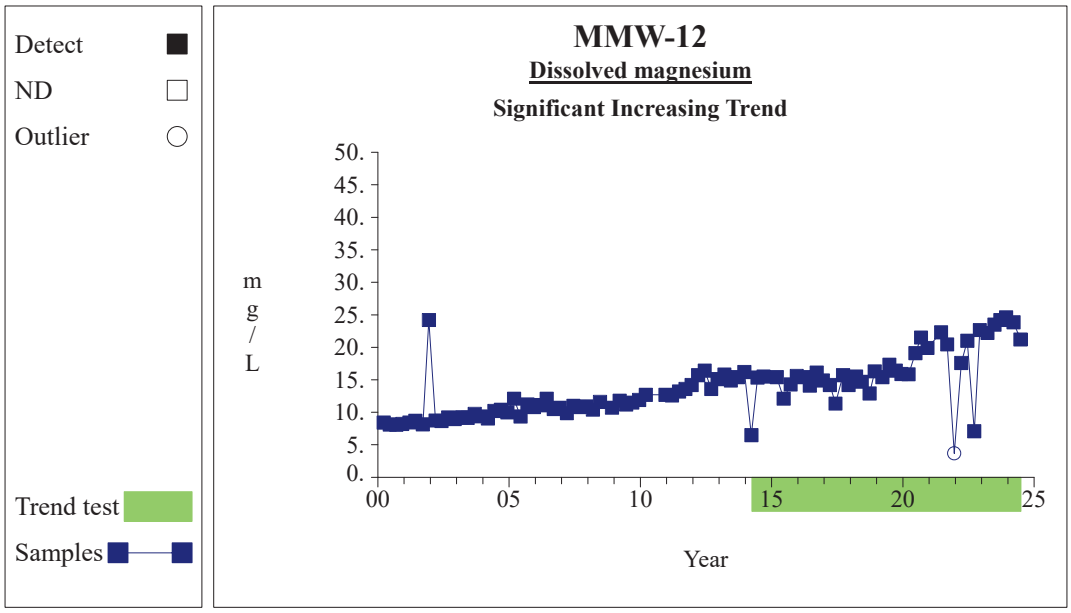
Graph 17

Time Series



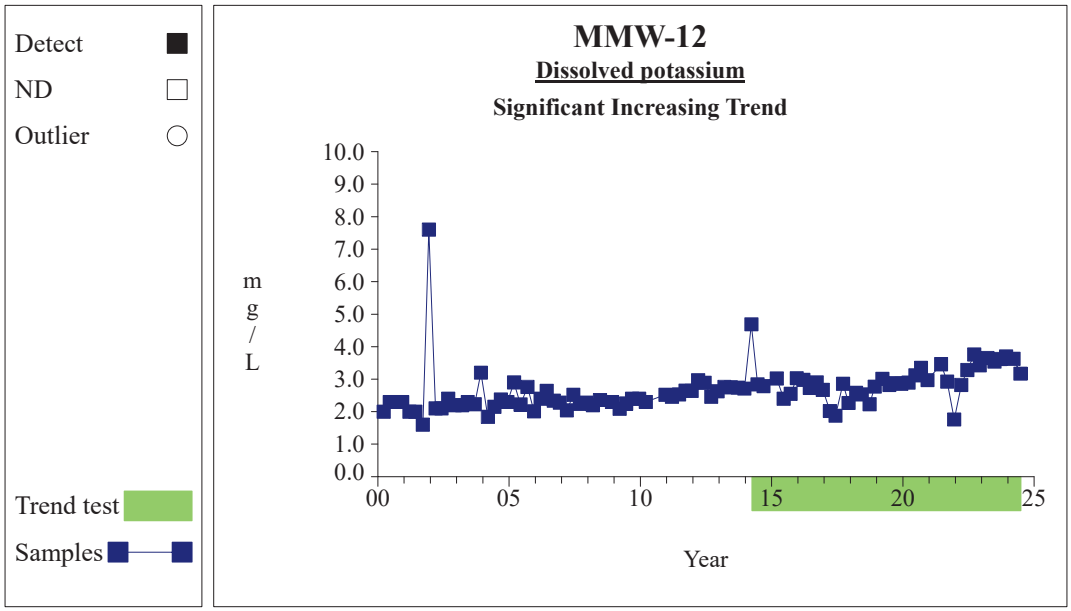
Graph 20

Time Series



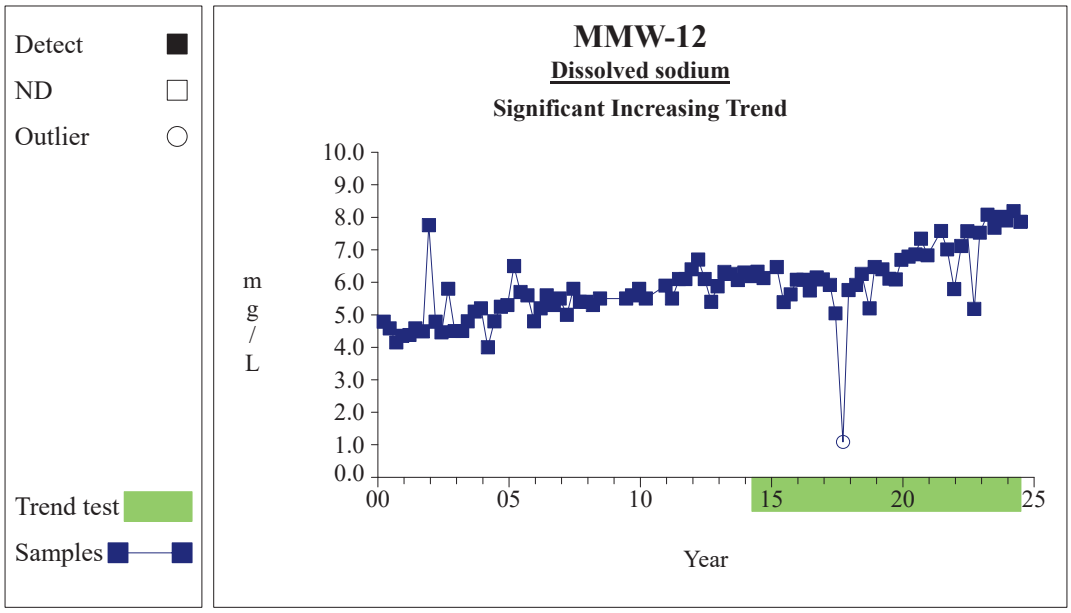
Graph 26

Time Series



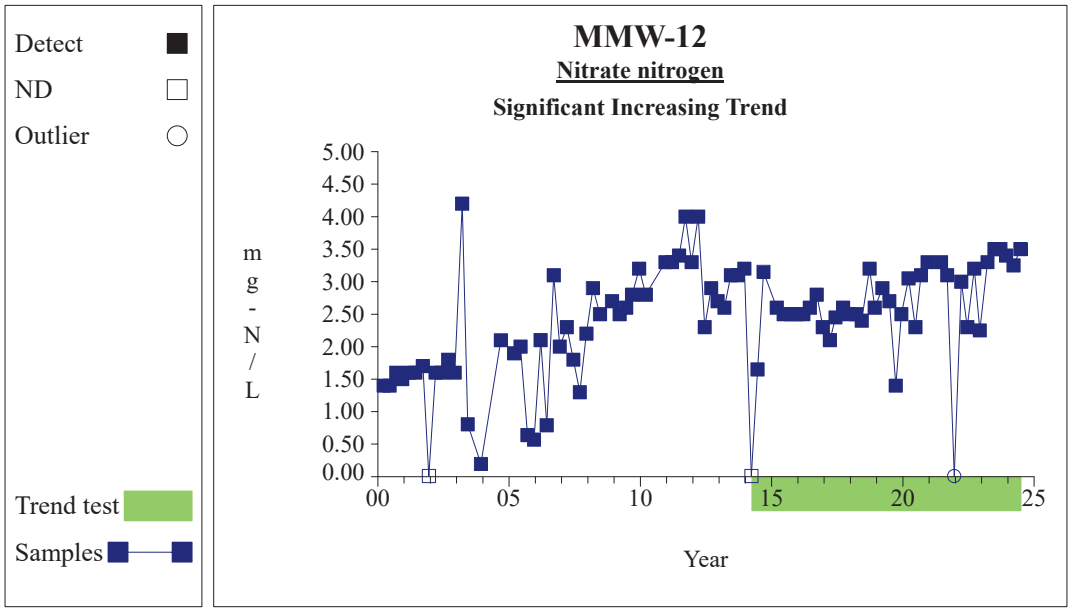
Graph 29

Time Series



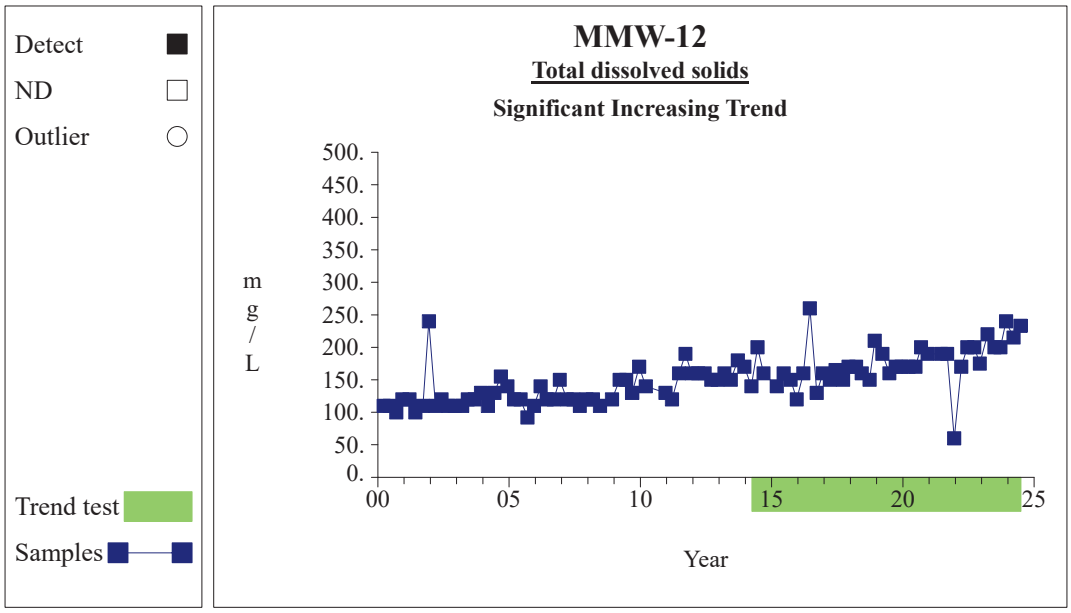
Graph 32

Time Series



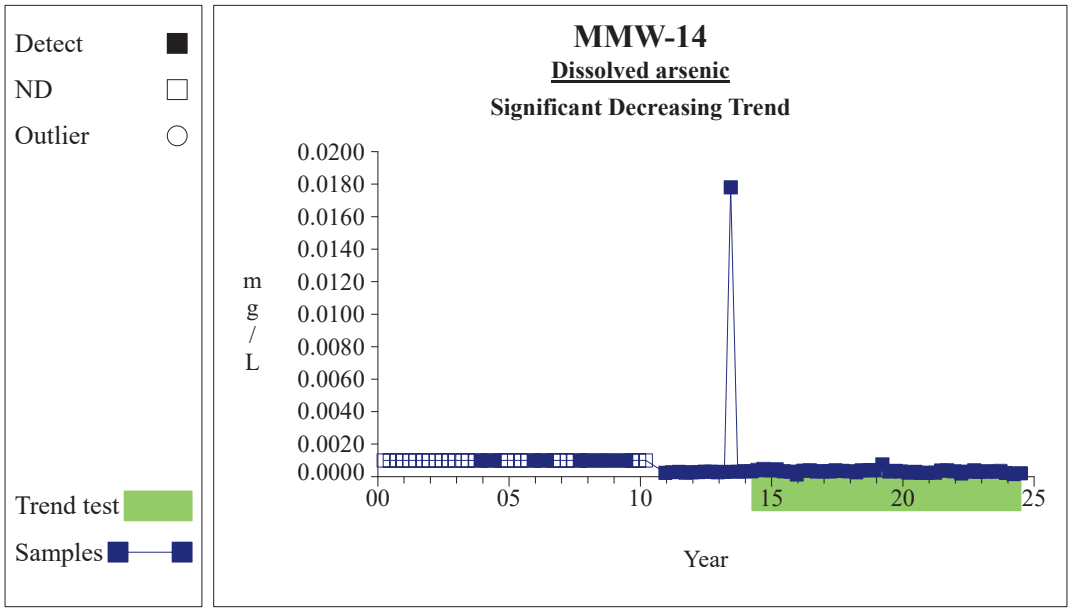
Graph 38

Time Series



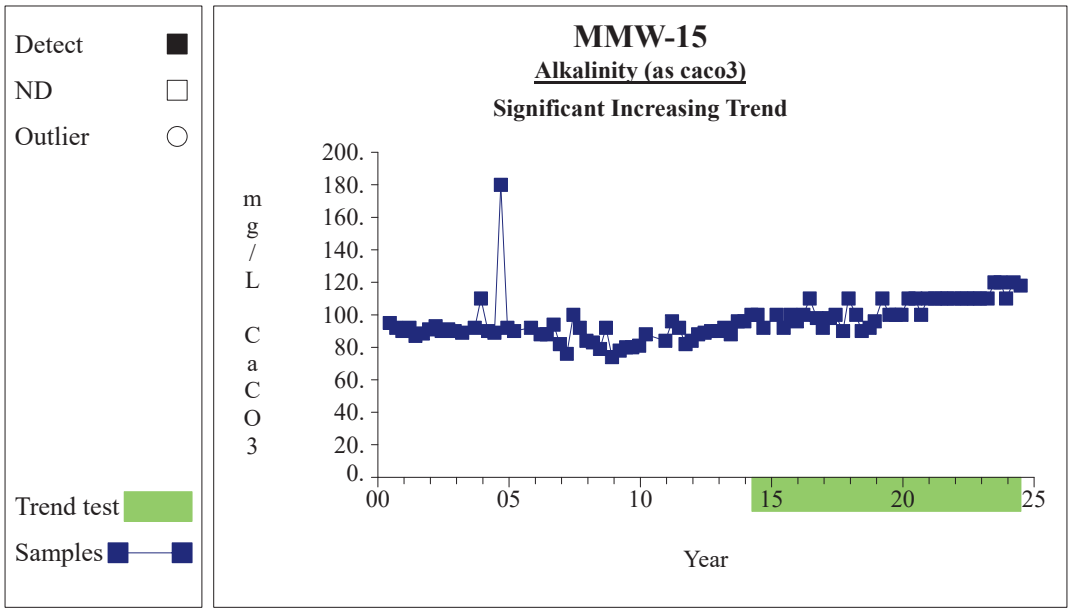
Graph 45

Time Series



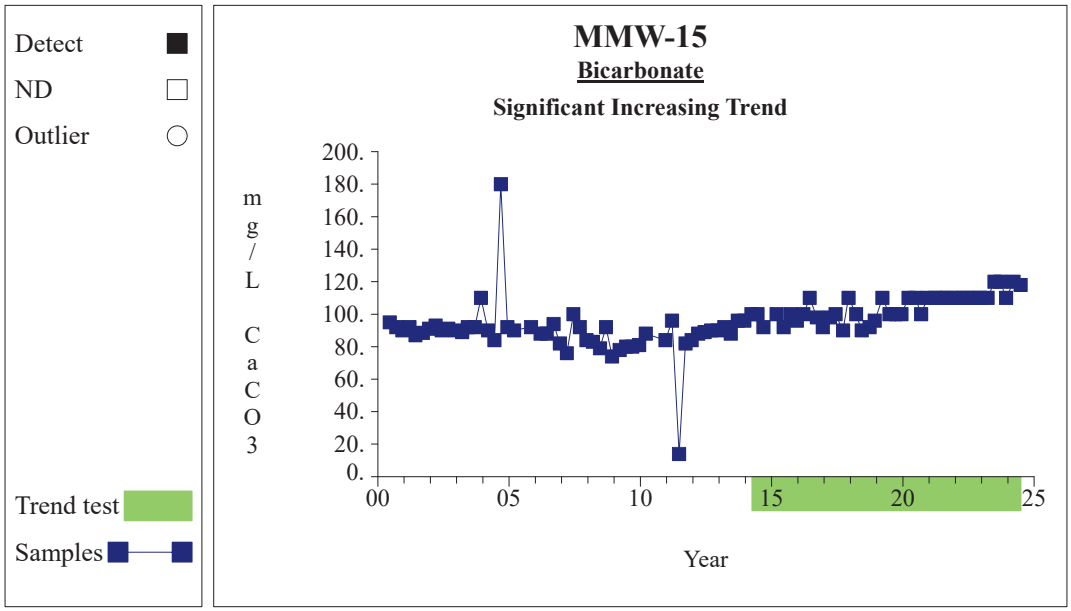
Graph 112

Time Series



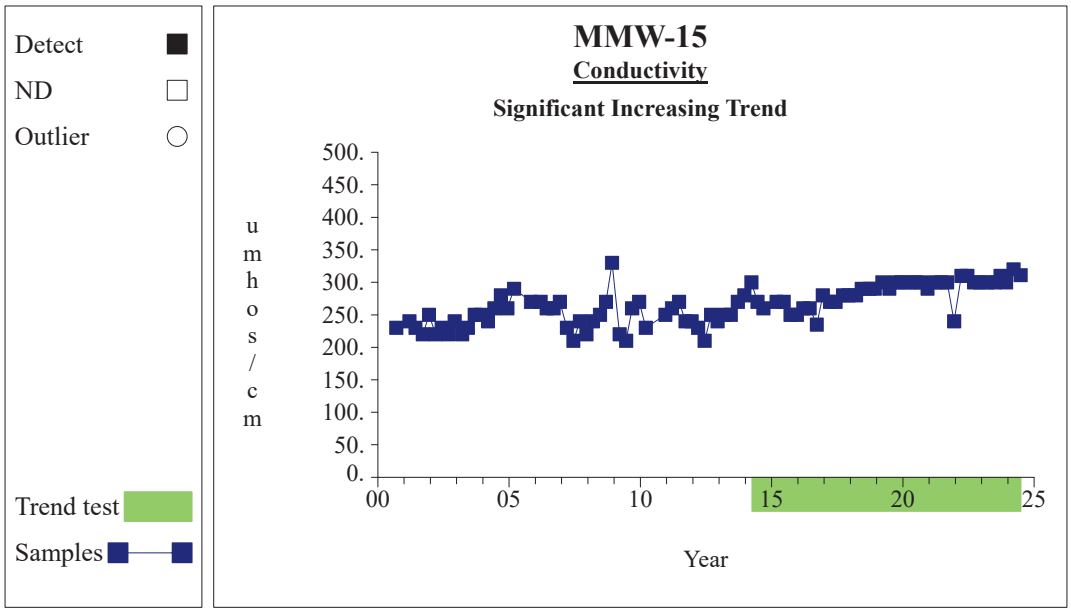
Graph 149

Time Series



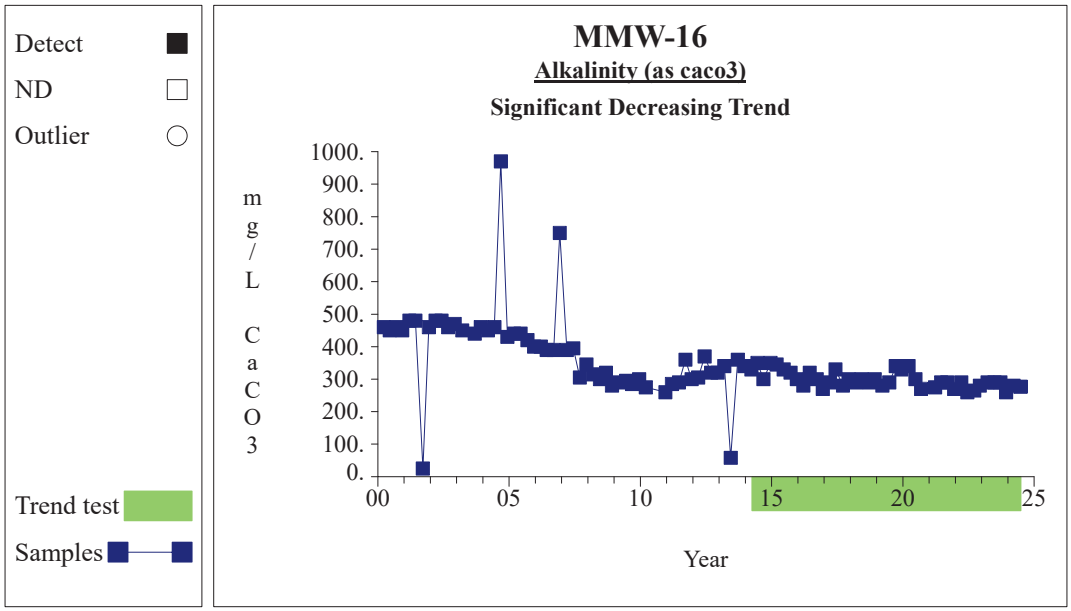
Graph 152

Time Series



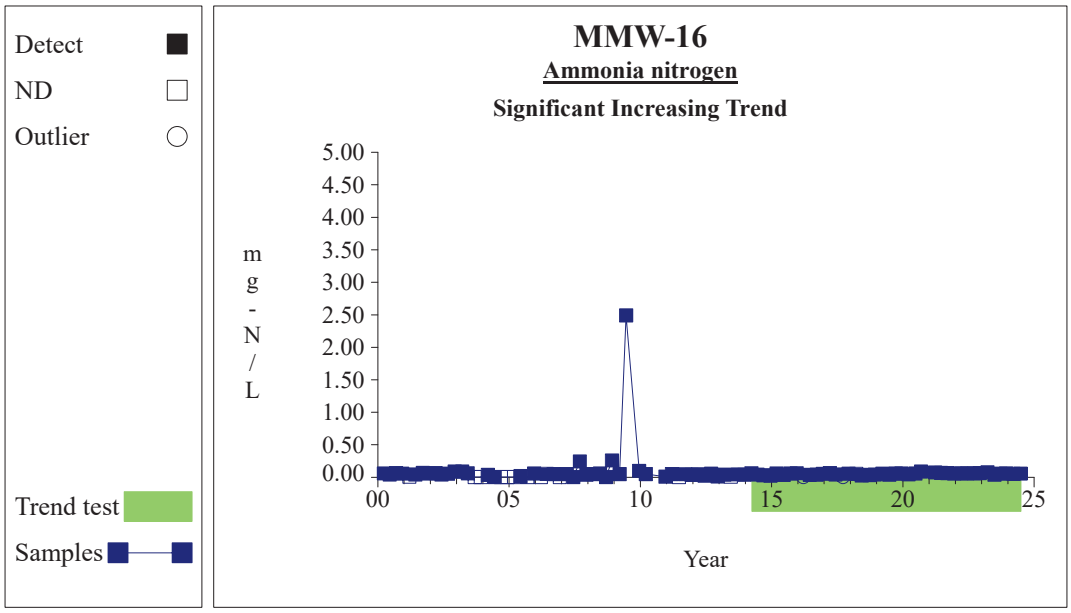
Graph 158

Time Series



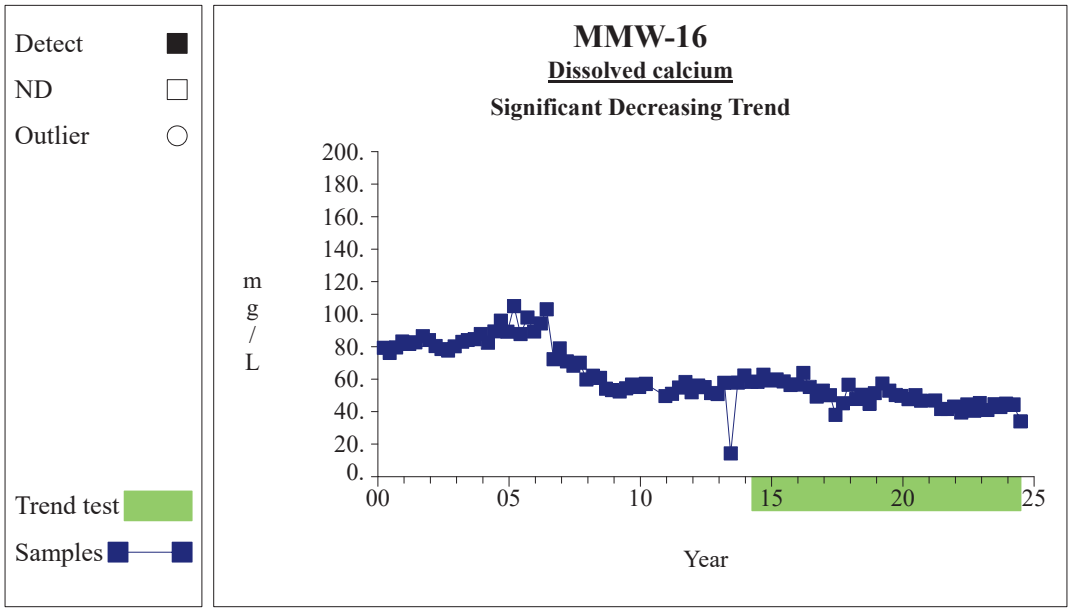
Graph 197

Time Series



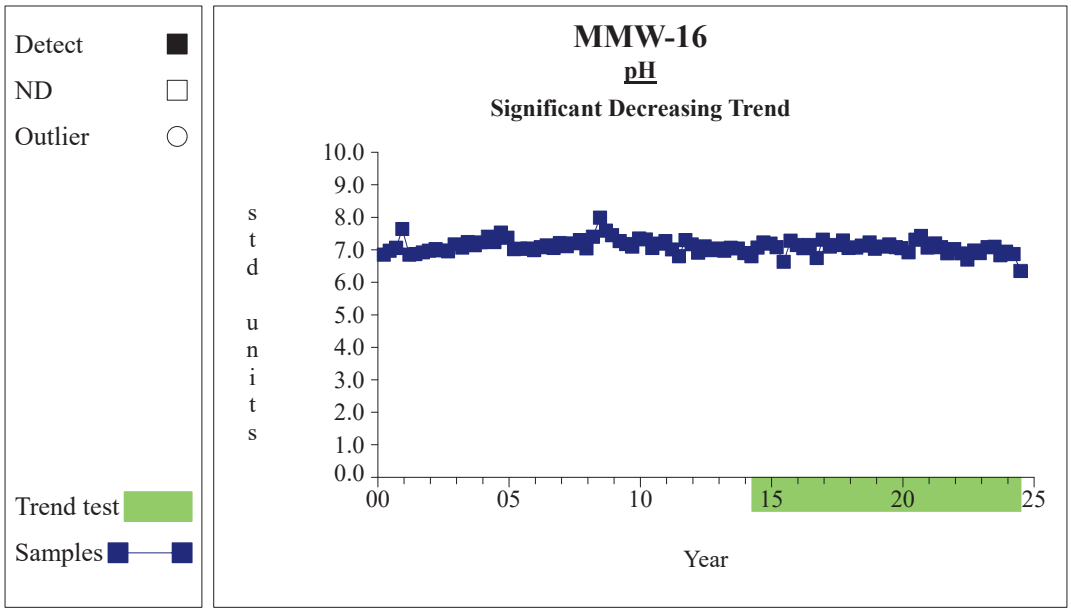
Graph 198

Time Series



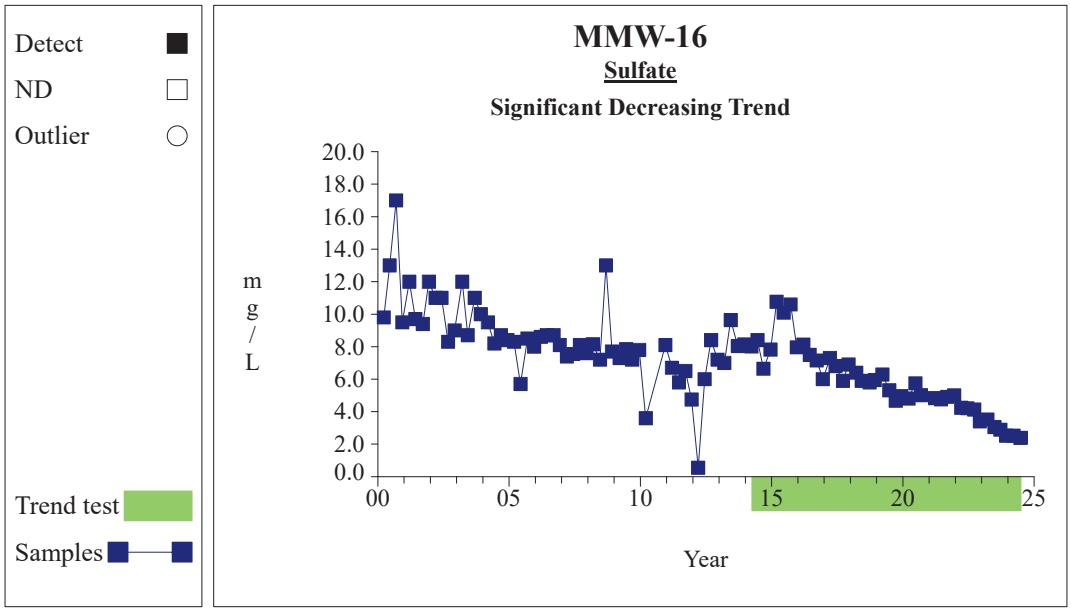
Graph 212

Time Series



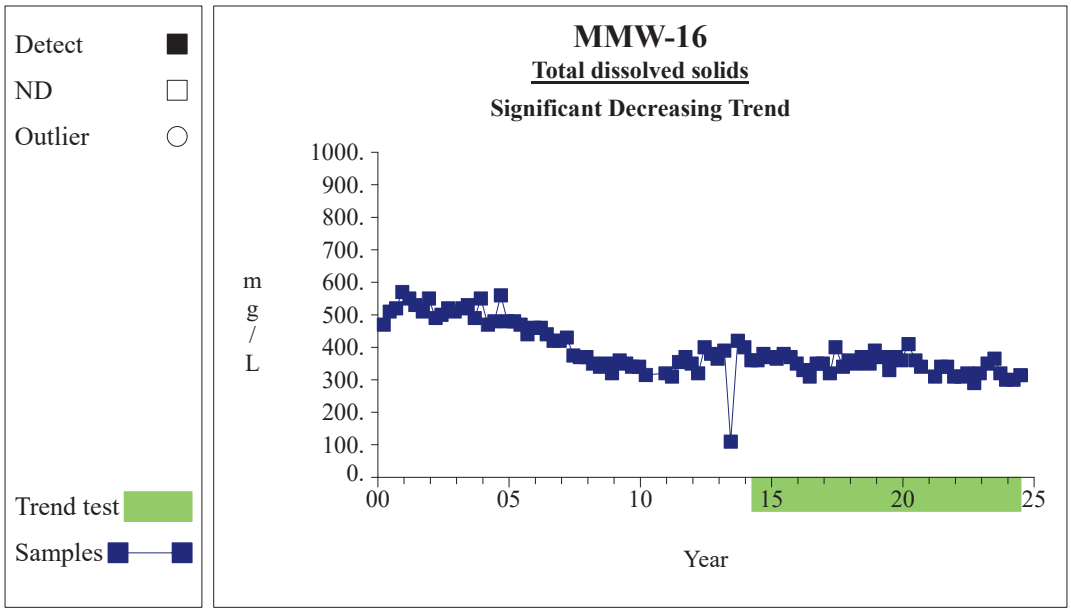
Graph 233

Time Series



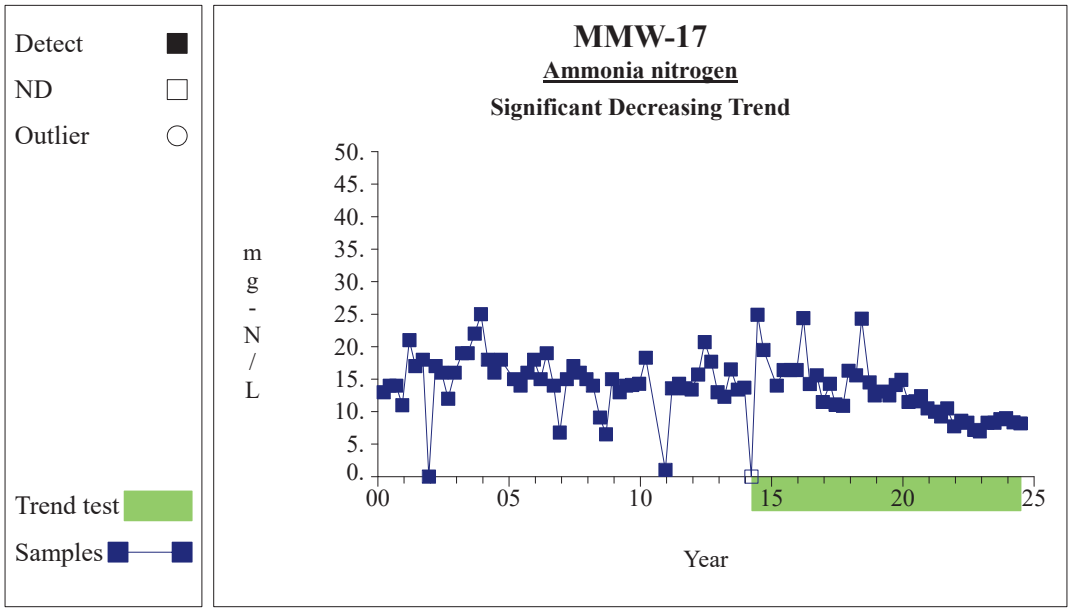
Graph 235

Time Series



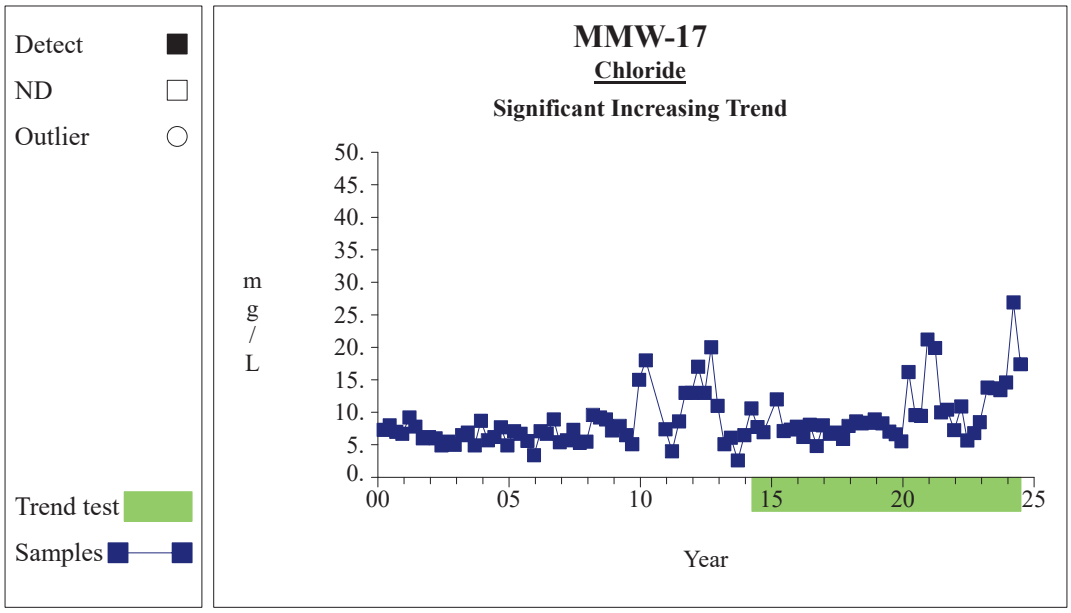
Graph 237

Time Series



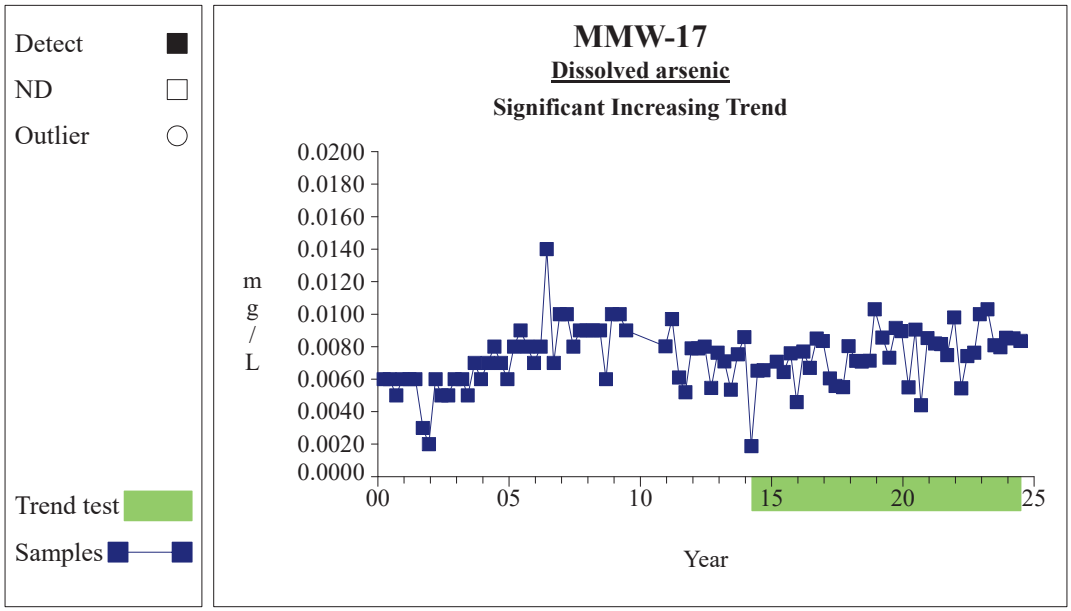
Graph 246

Time Series



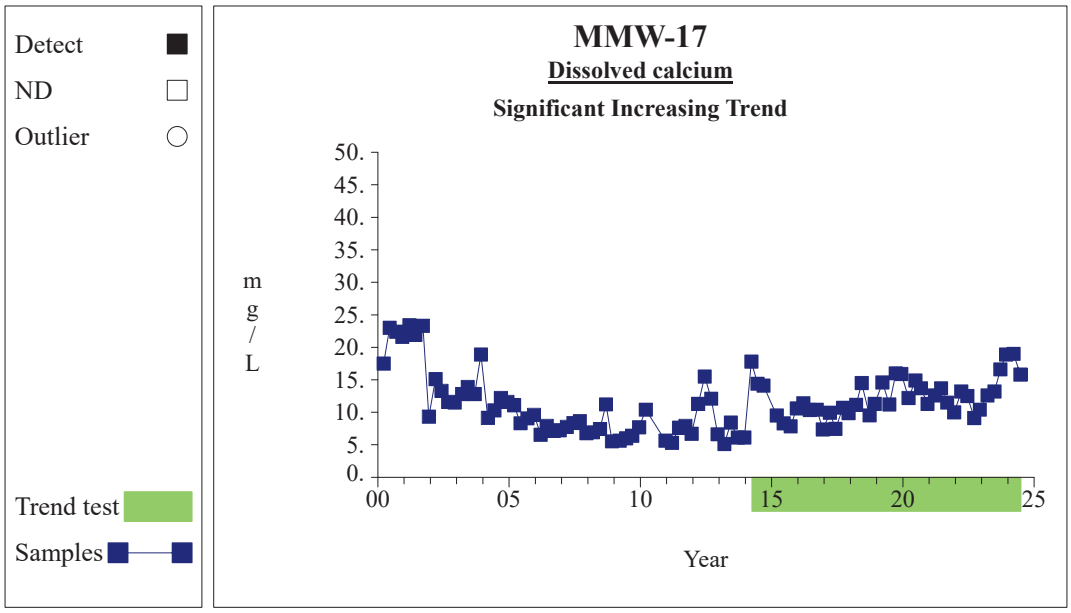
Graph 251

Time Series



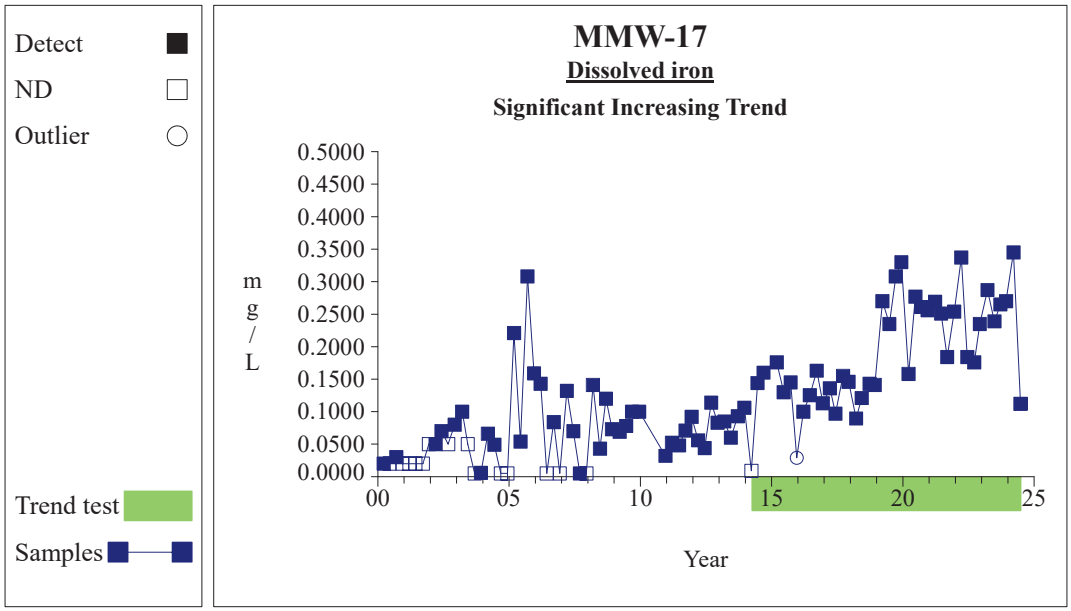
Graph 256

Time Series



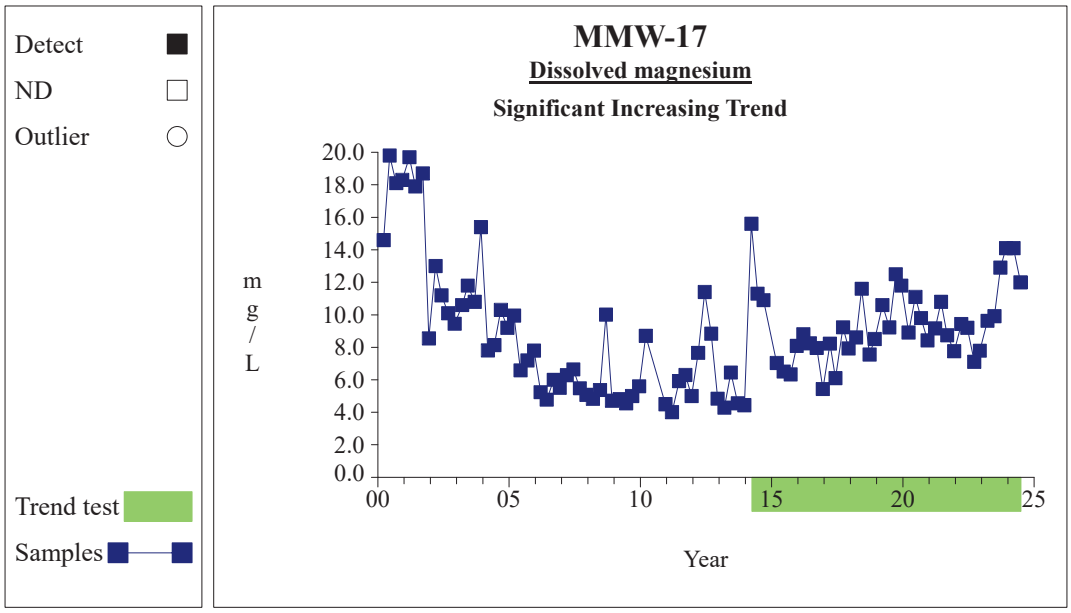
Graph 260

Time Series



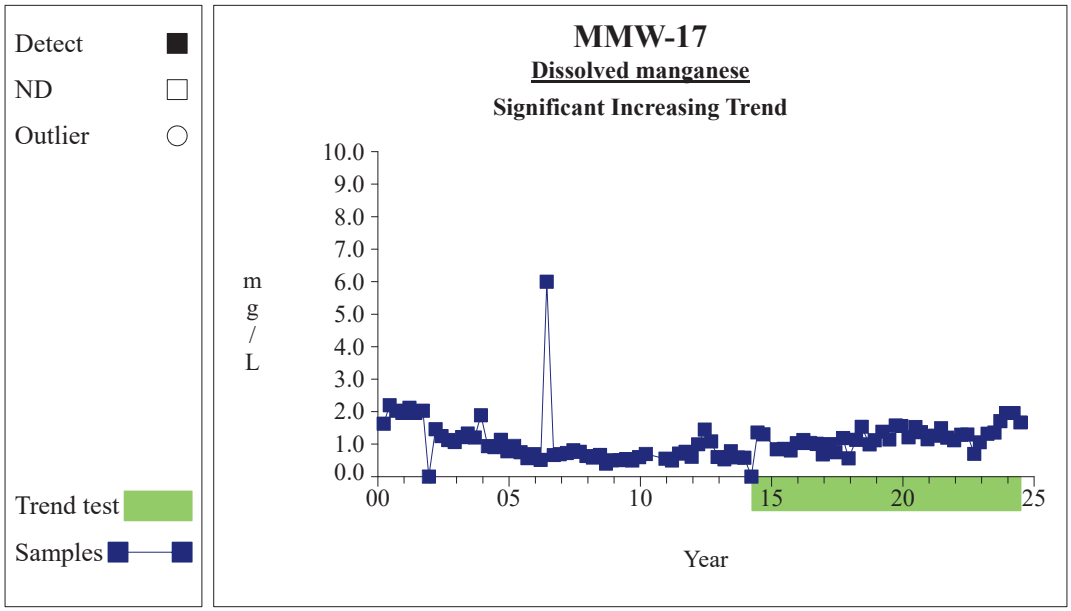
Graph 264

Time Series



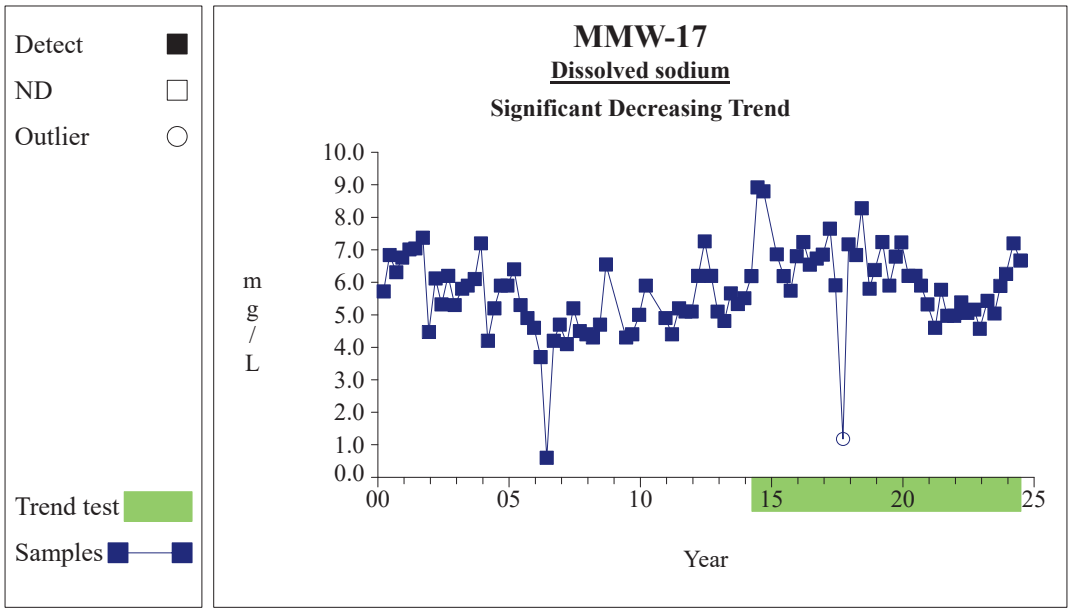
Graph 266

Time Series



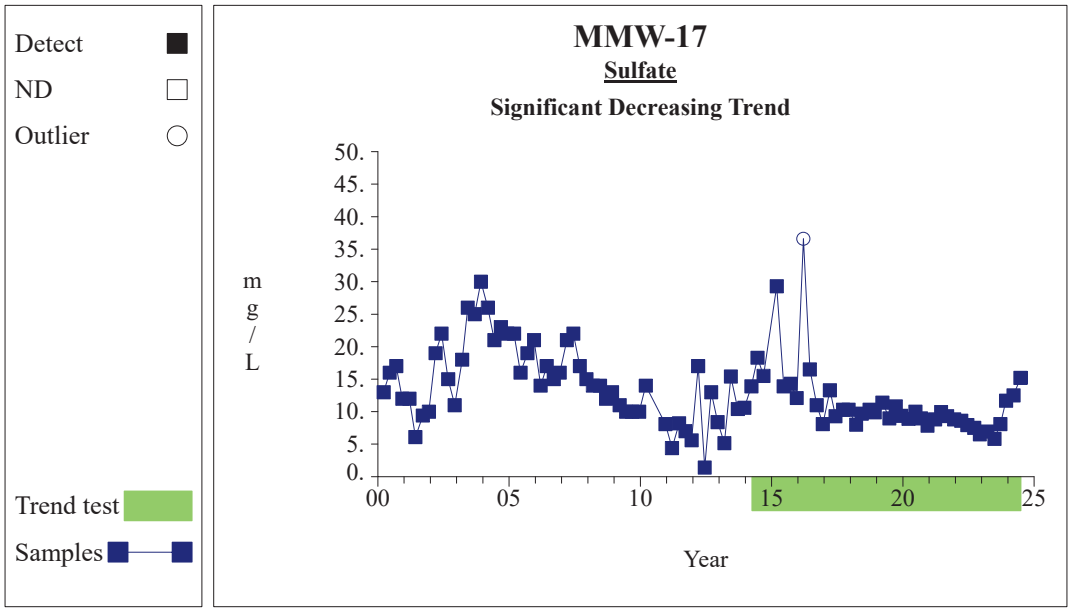
Graph 267

Time Series



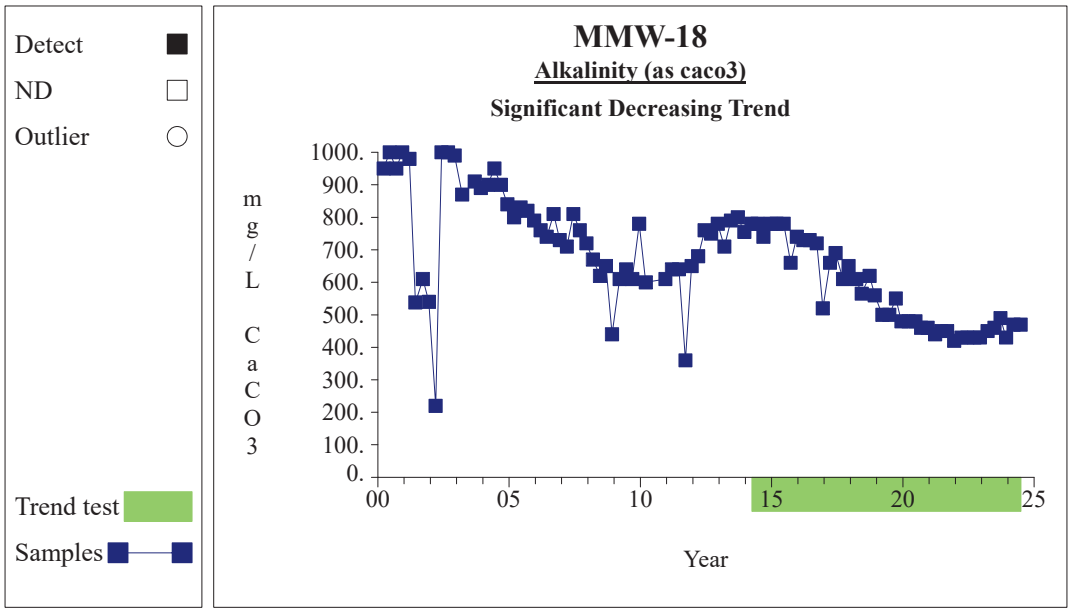
Graph 272

Time Series



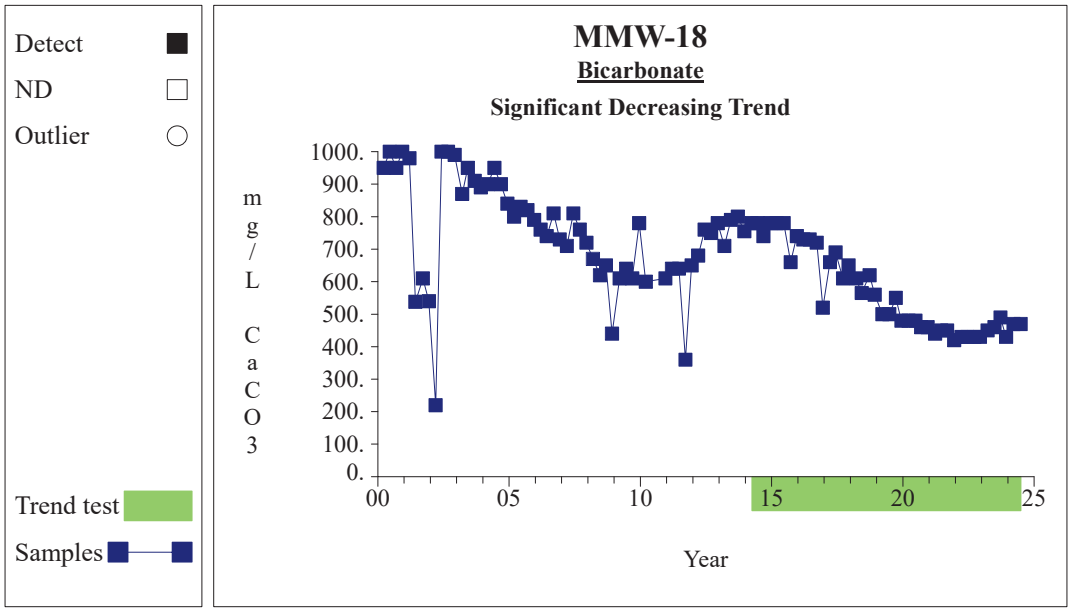
Graph 283

Time Series



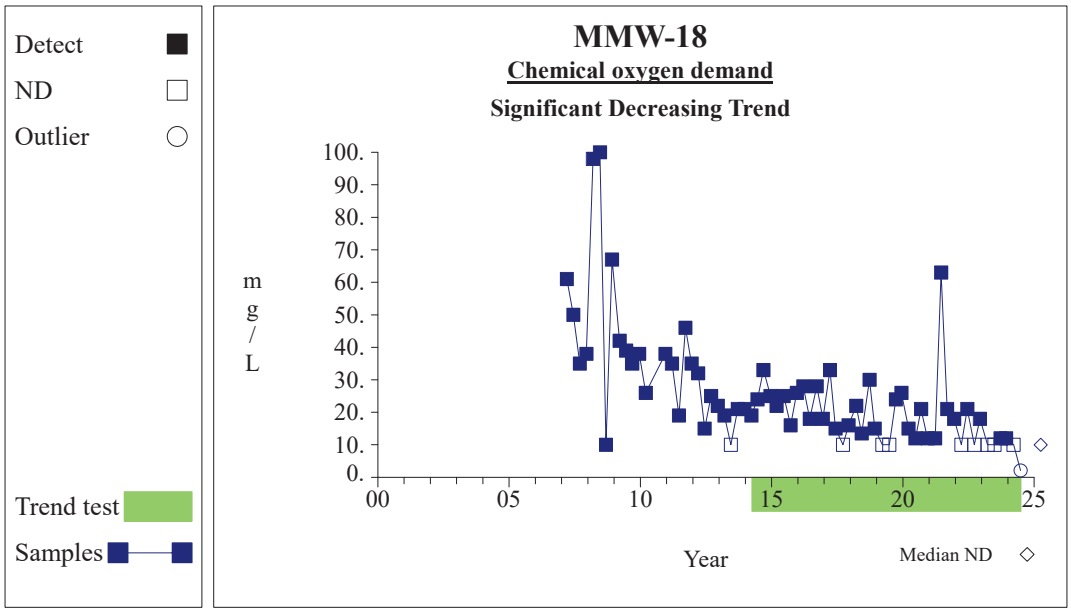
Graph 293

Time Series



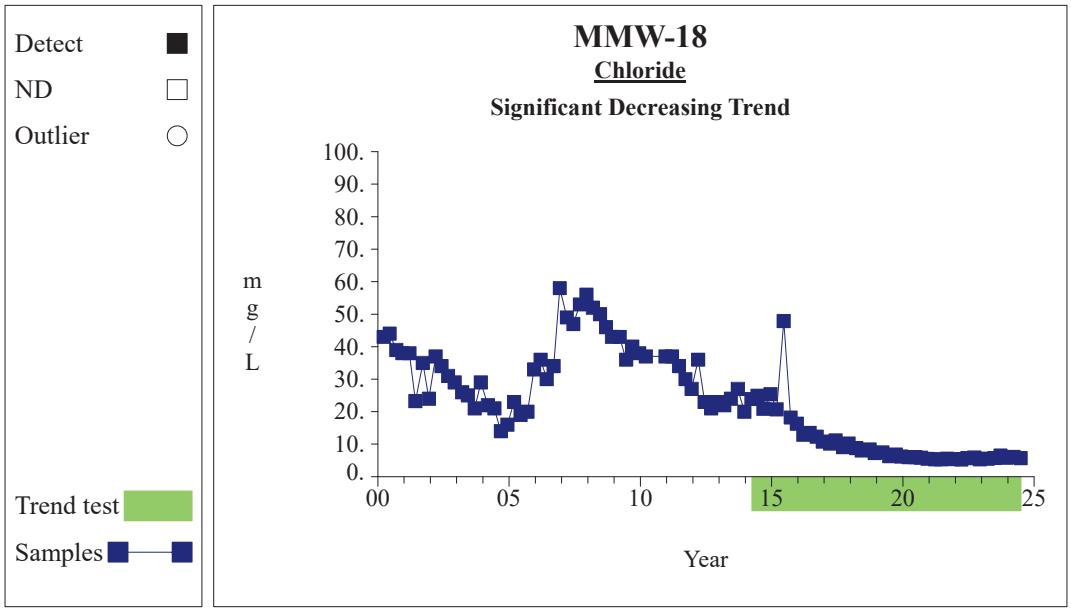
Graph 296

Time Series



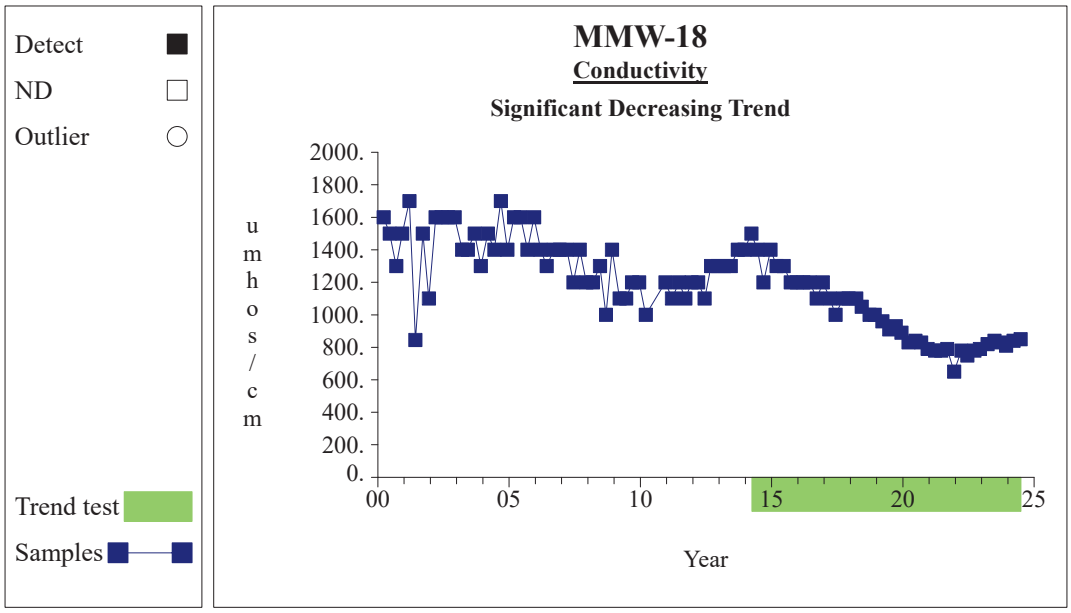
Graph 298

Time Series



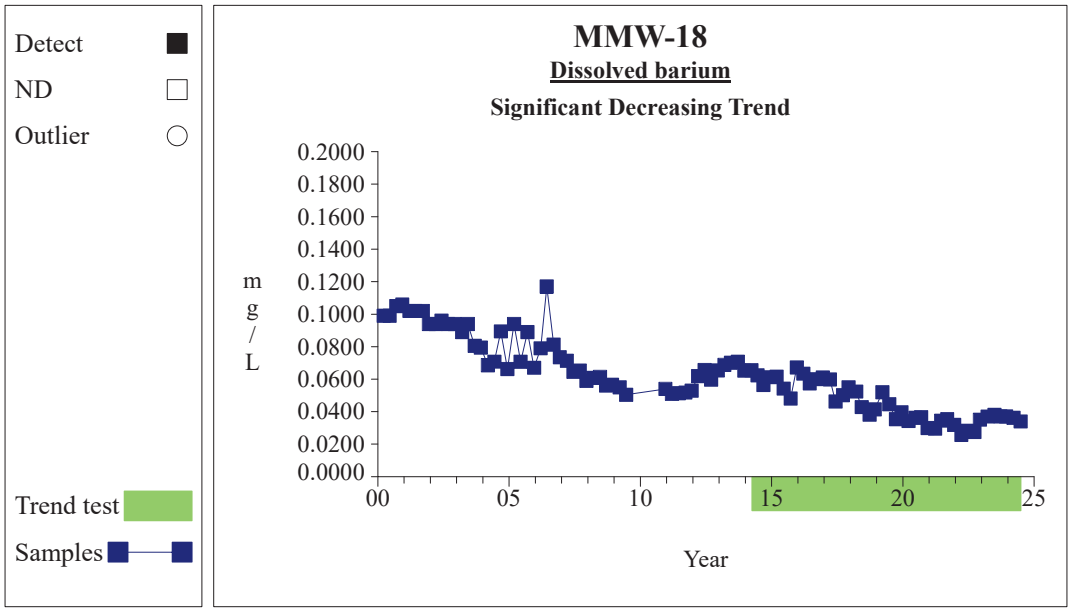
Graph 299

Time Series



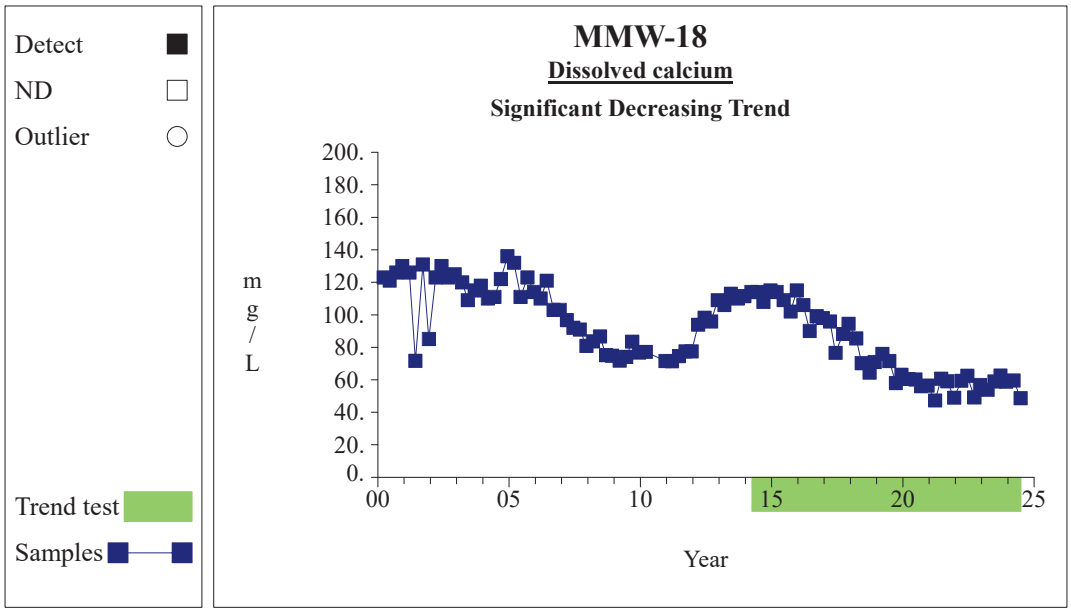
Graph 302

Time Series



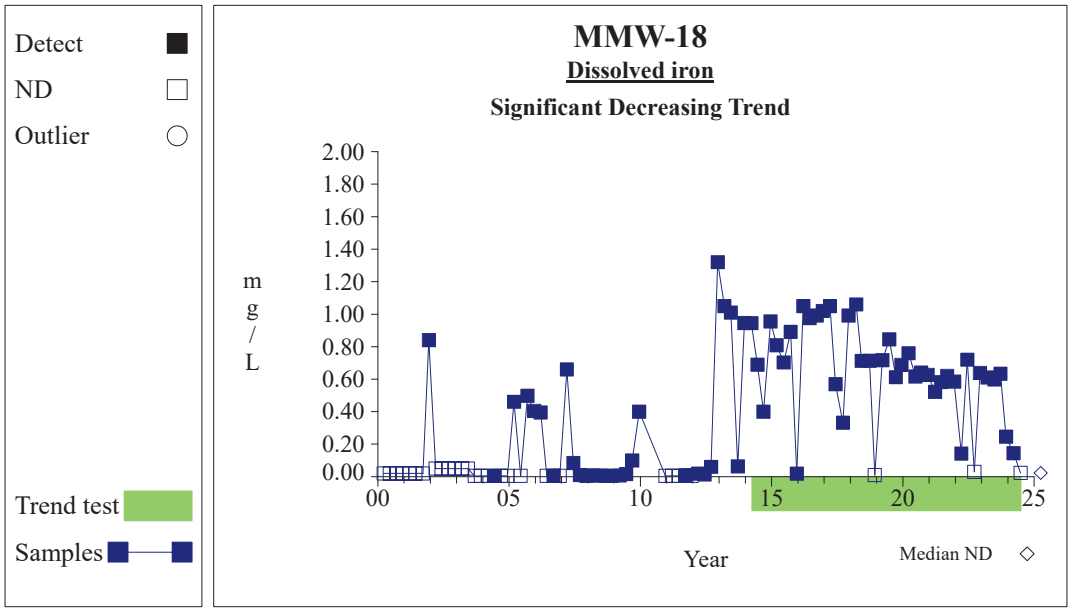
Graph 305

Time Series



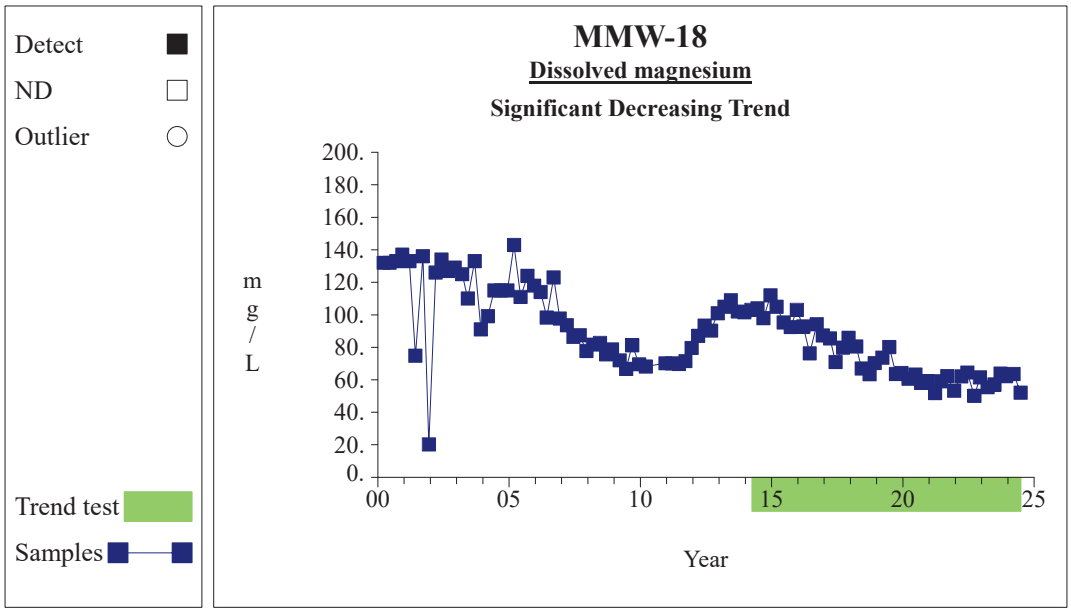
Graph 308

Time Series



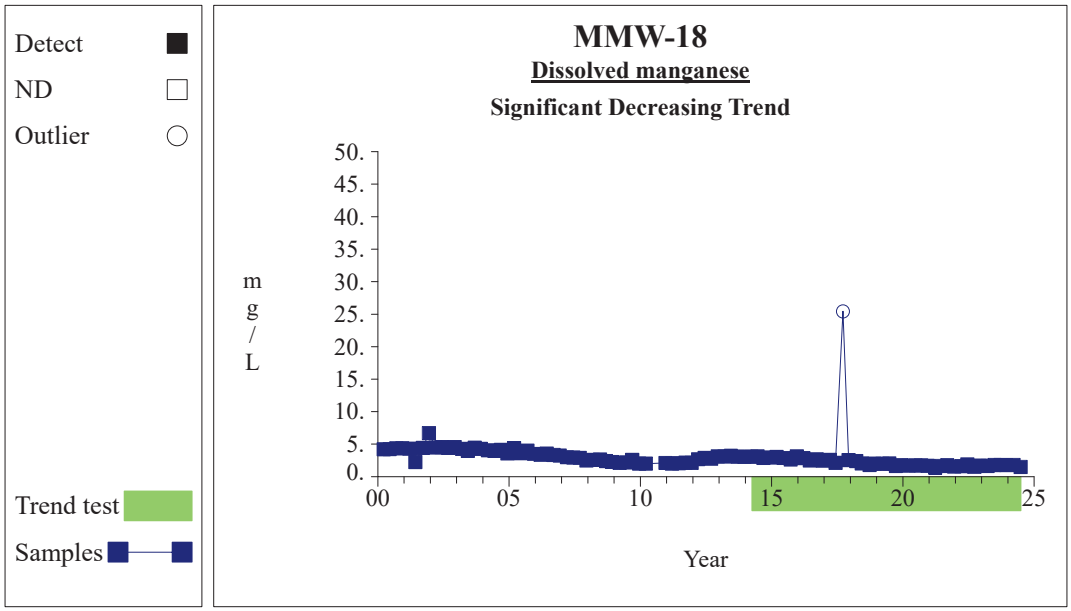
Graph 312

Time Series



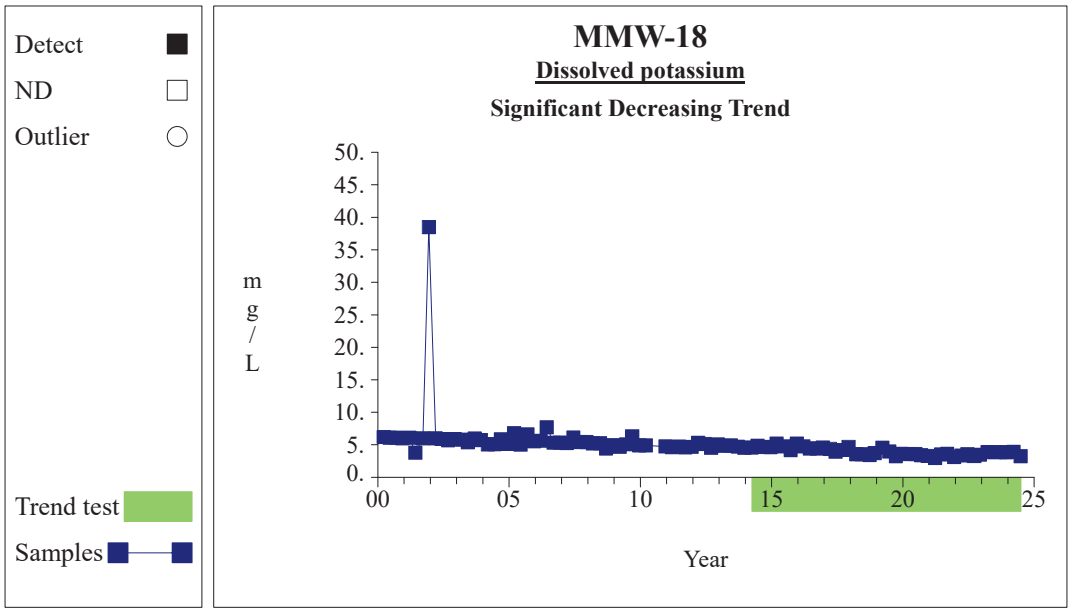
Graph 314

Time Series



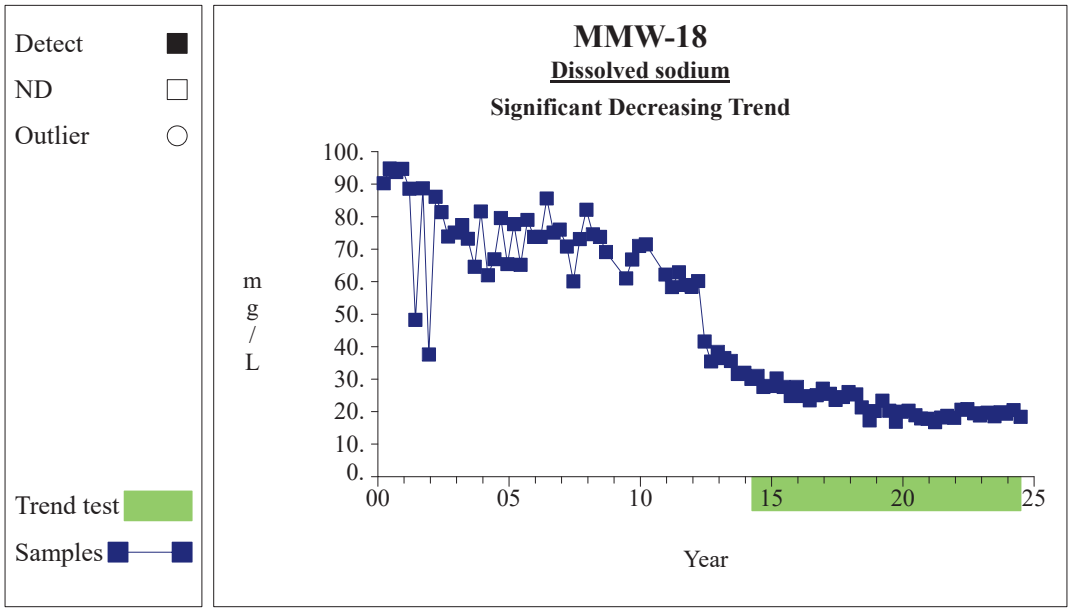
Graph 315

Time Series



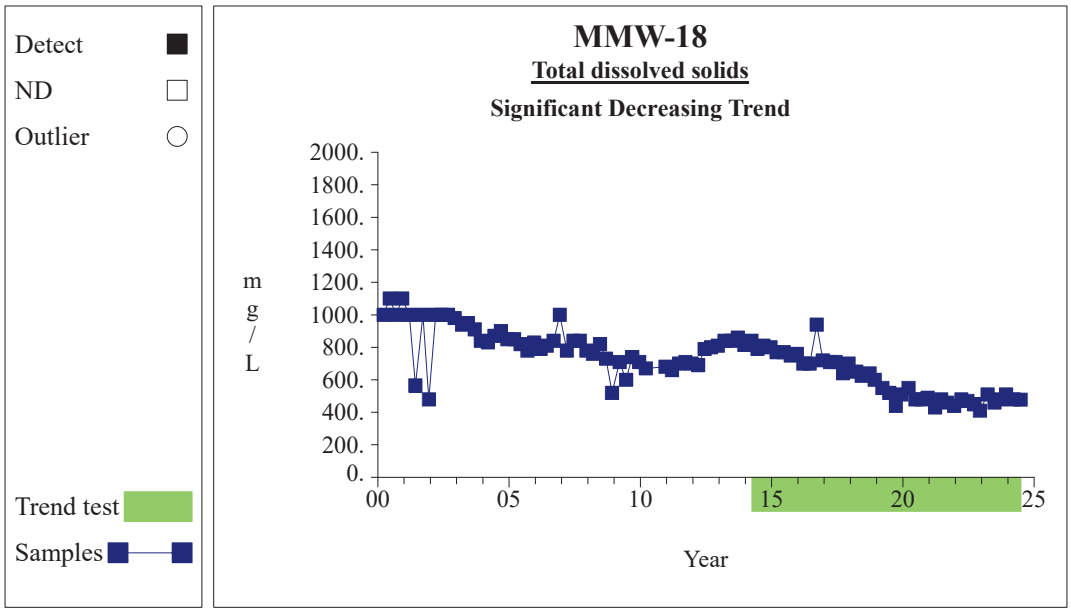
Graph 317

Time Series



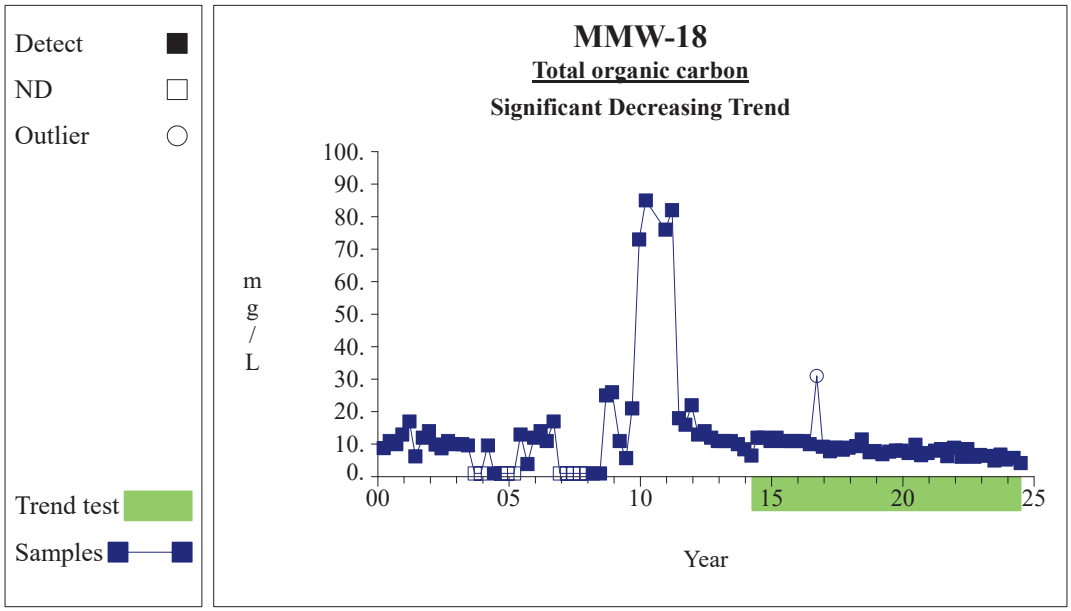
Graph 320

Time Series



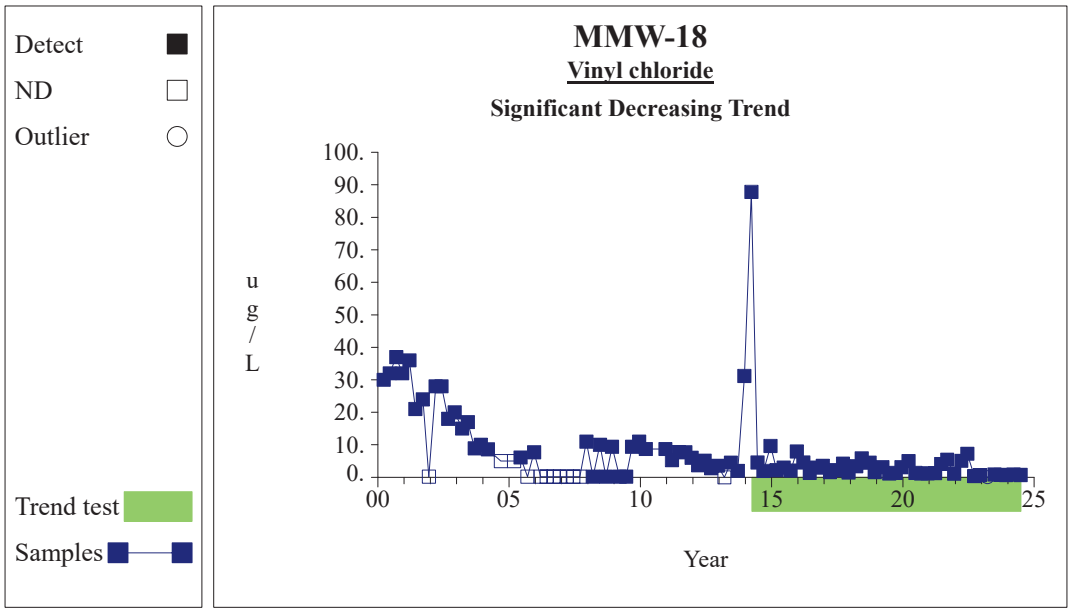
Graph 333

Time Series



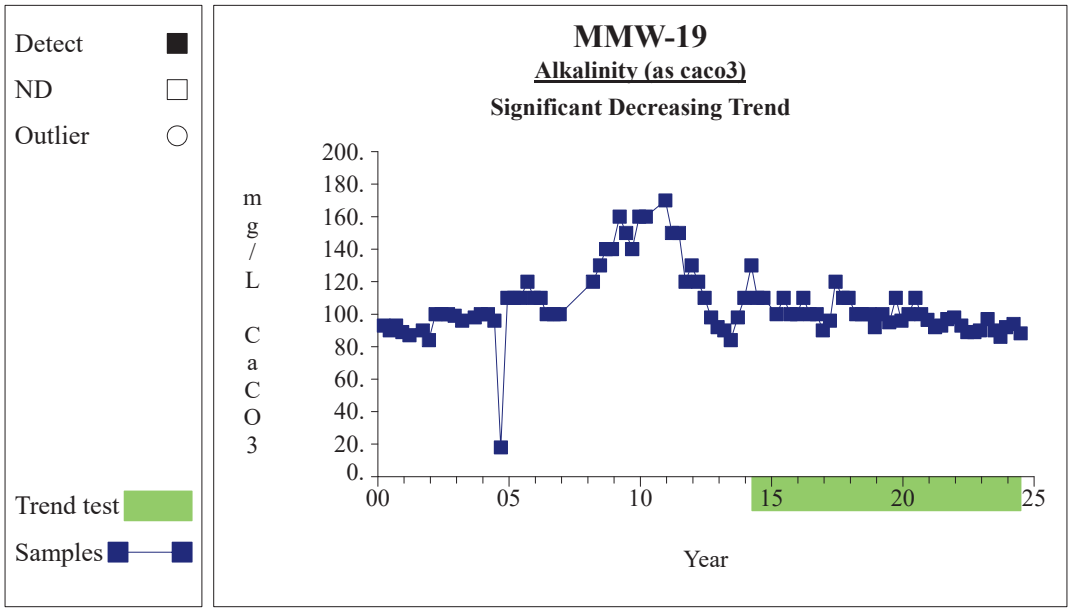
Graph 334

Time Series



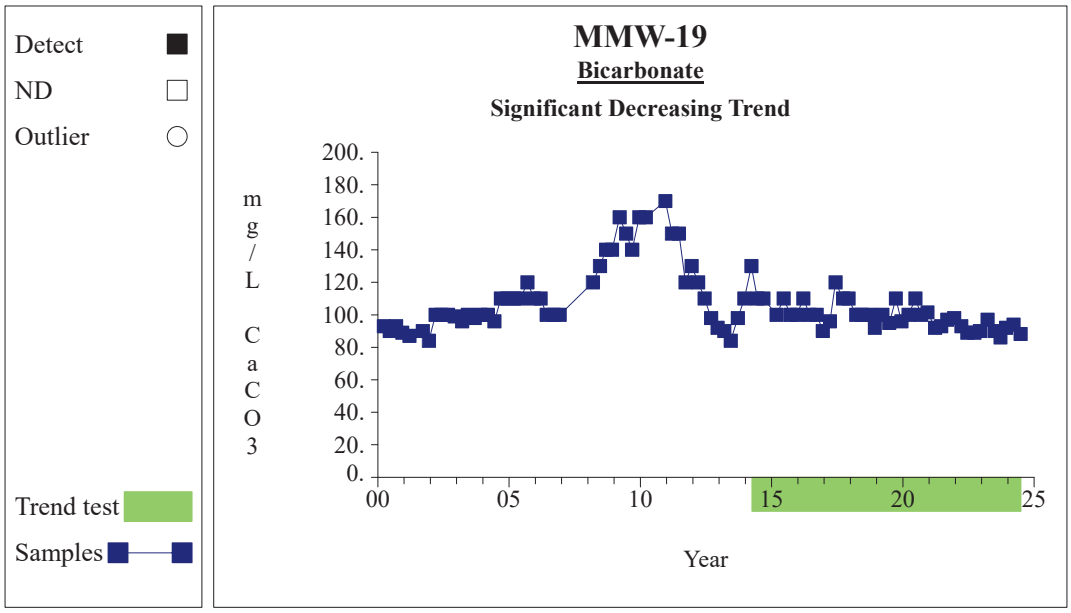
Graph 336

Time Series



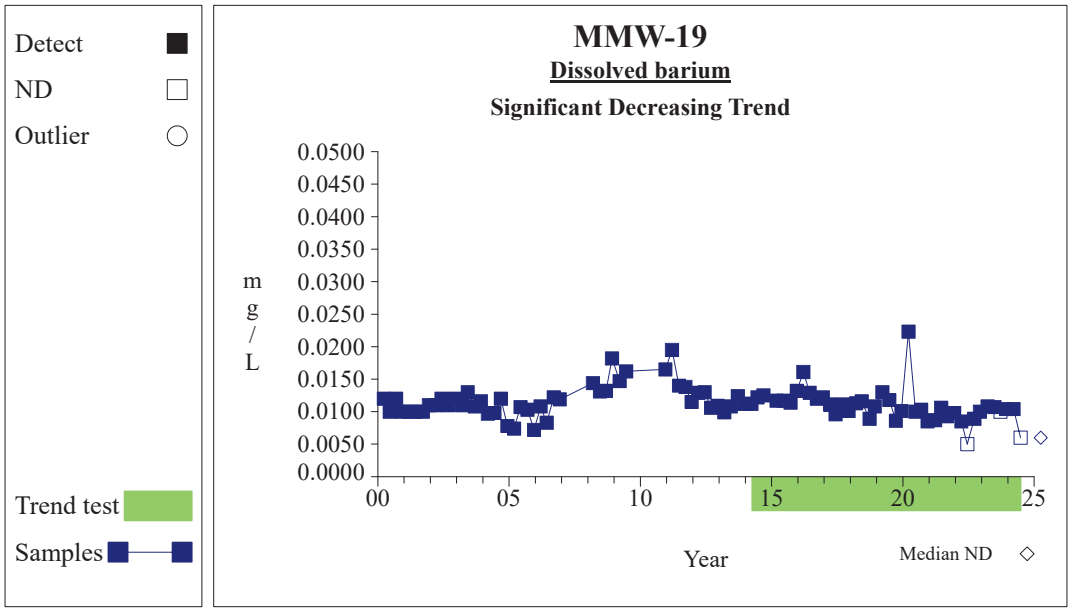
Graph 341

Time Series



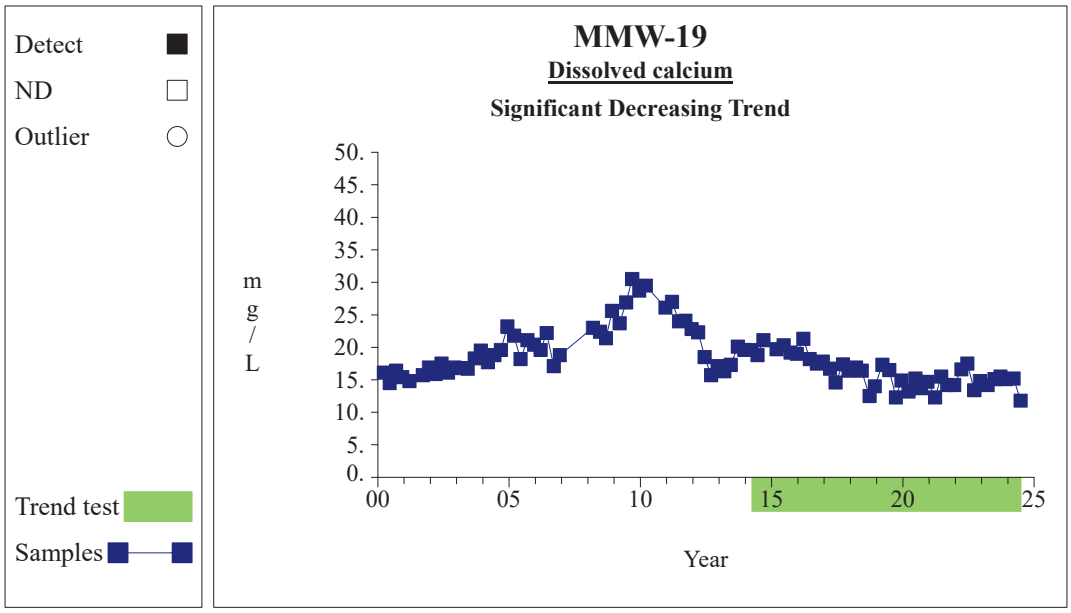
Graph 344

Time Series



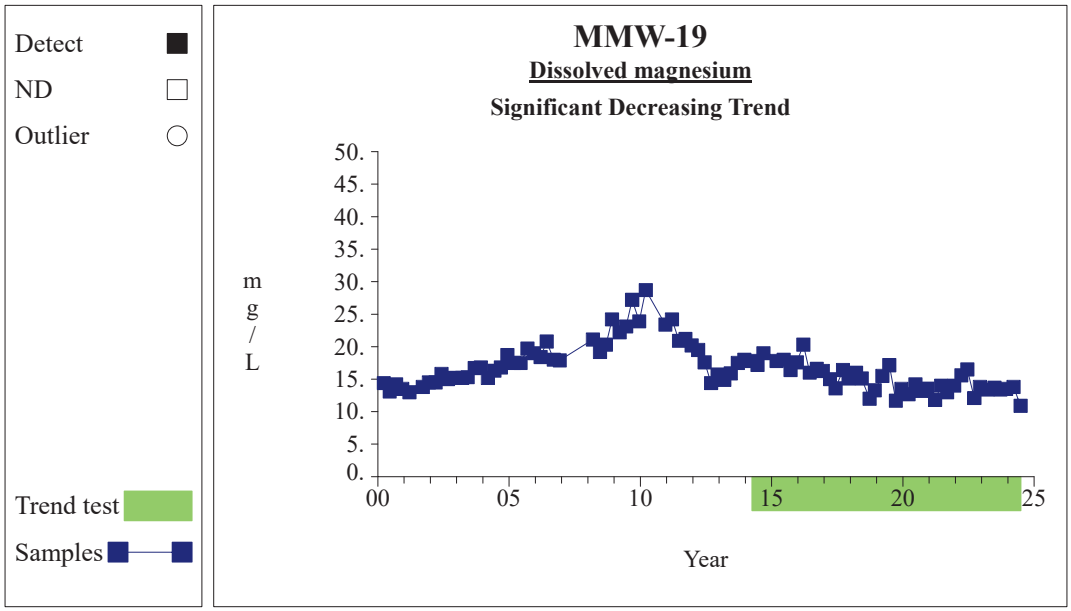
Graph 353

Time Series



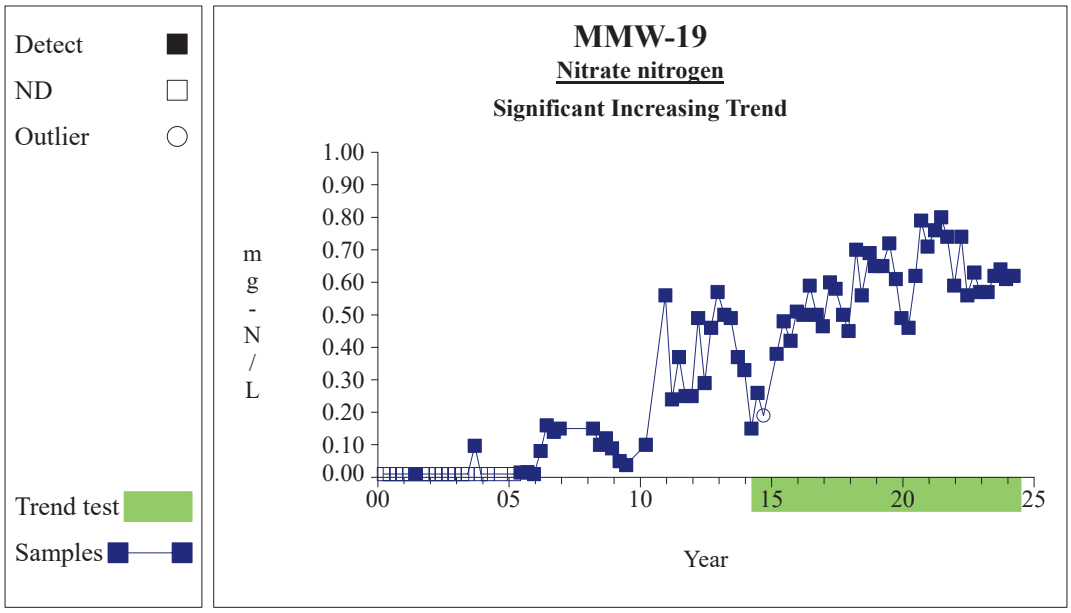
Graph 356

Time Series



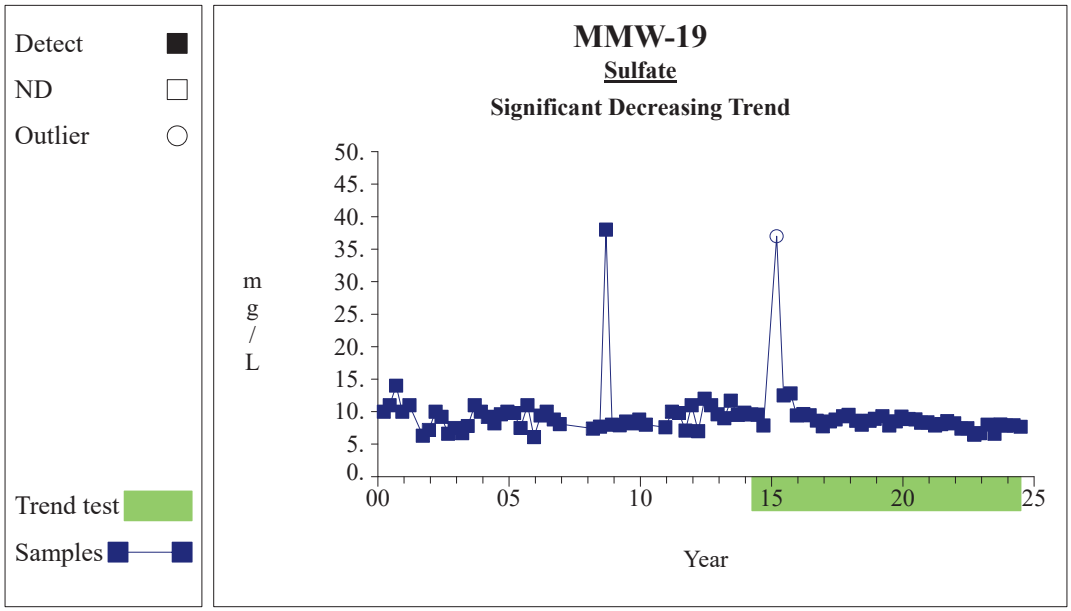
Graph 362

Time Series



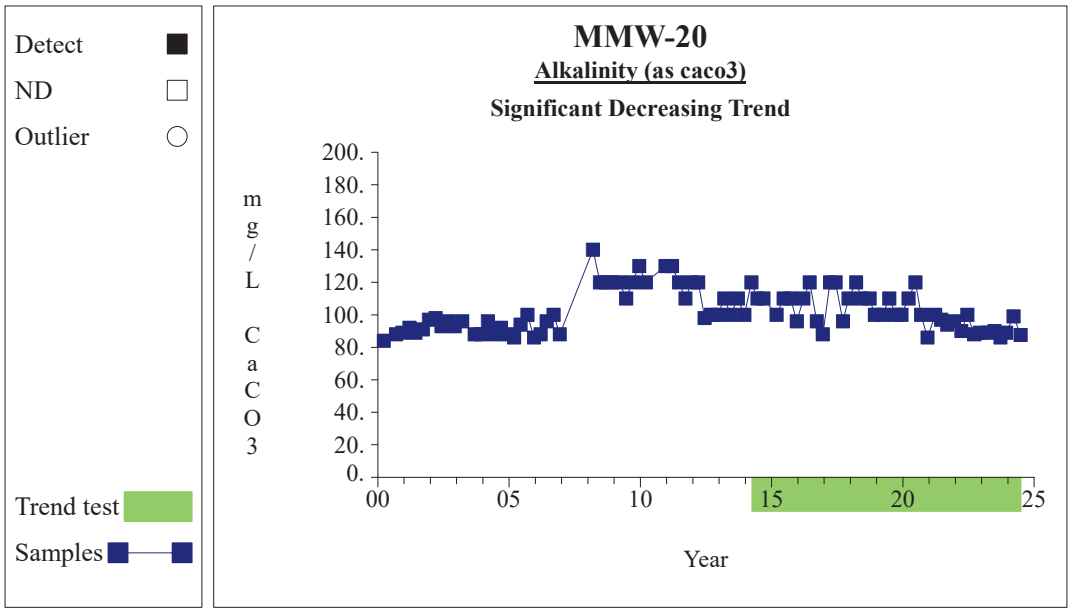
Graph 374

Time Series



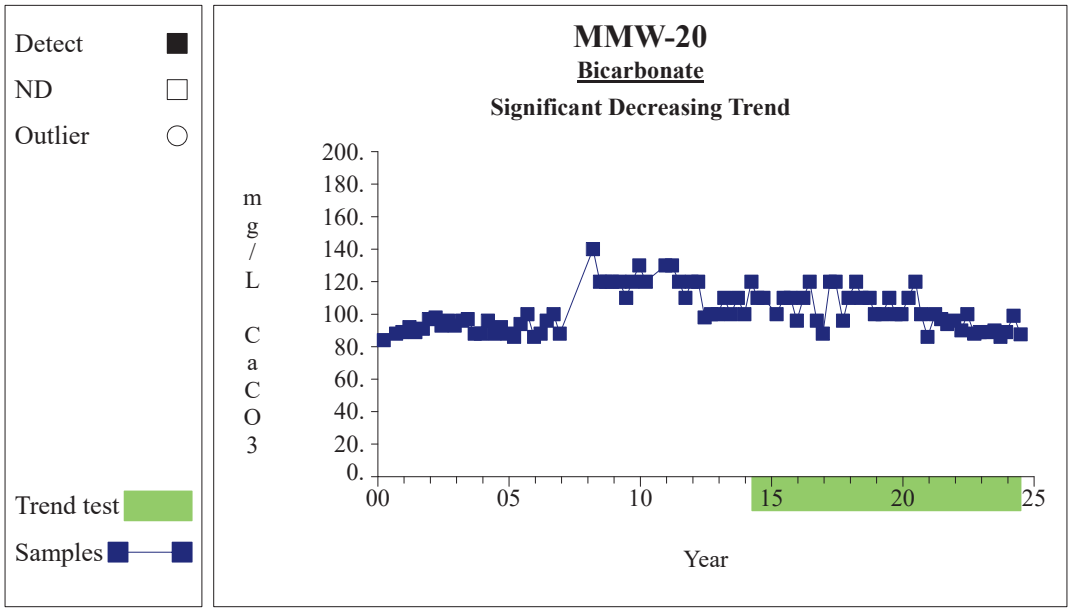
Graph 379

Time Series



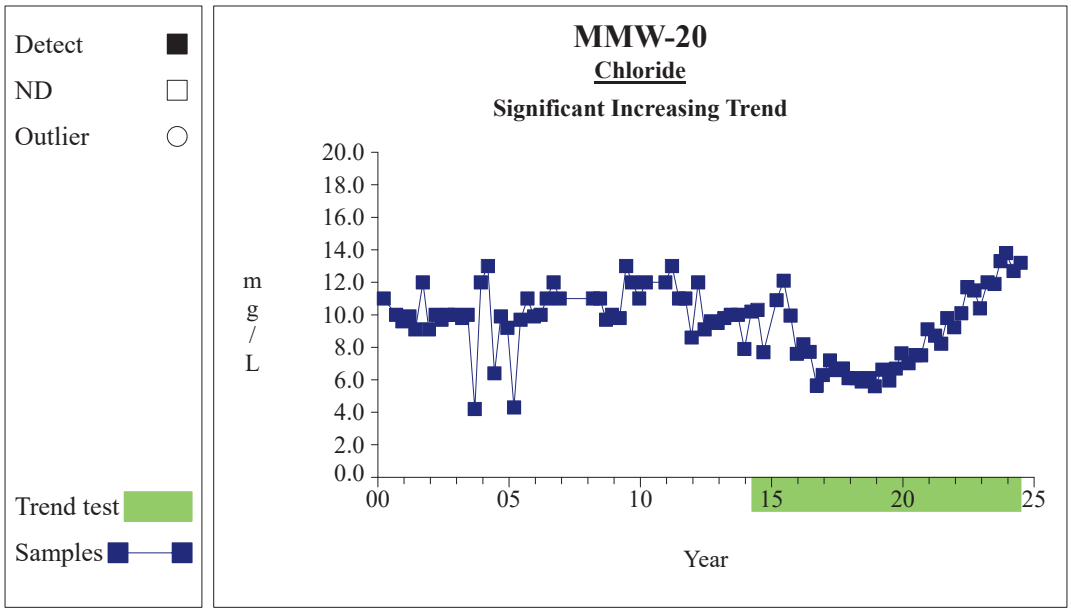
Graph 389

Time Series



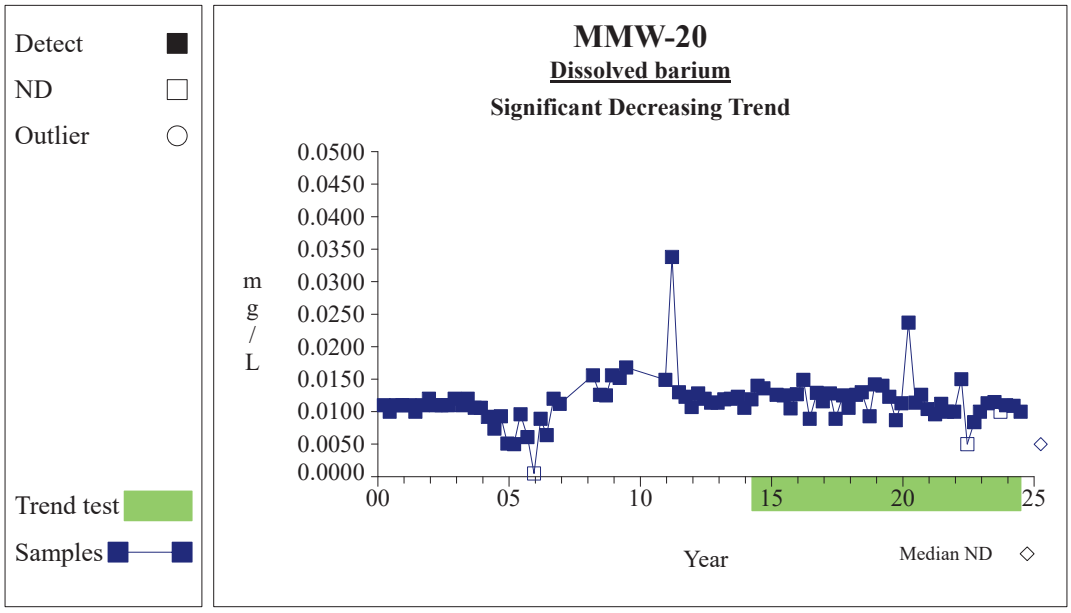
Graph 392

Time Series



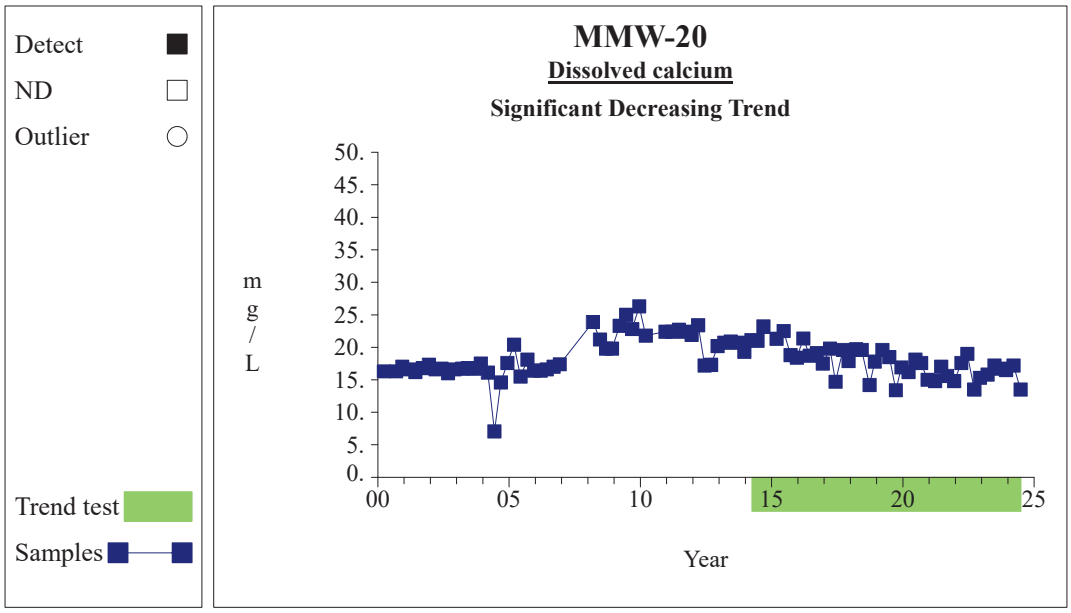
Graph 395

Time Series



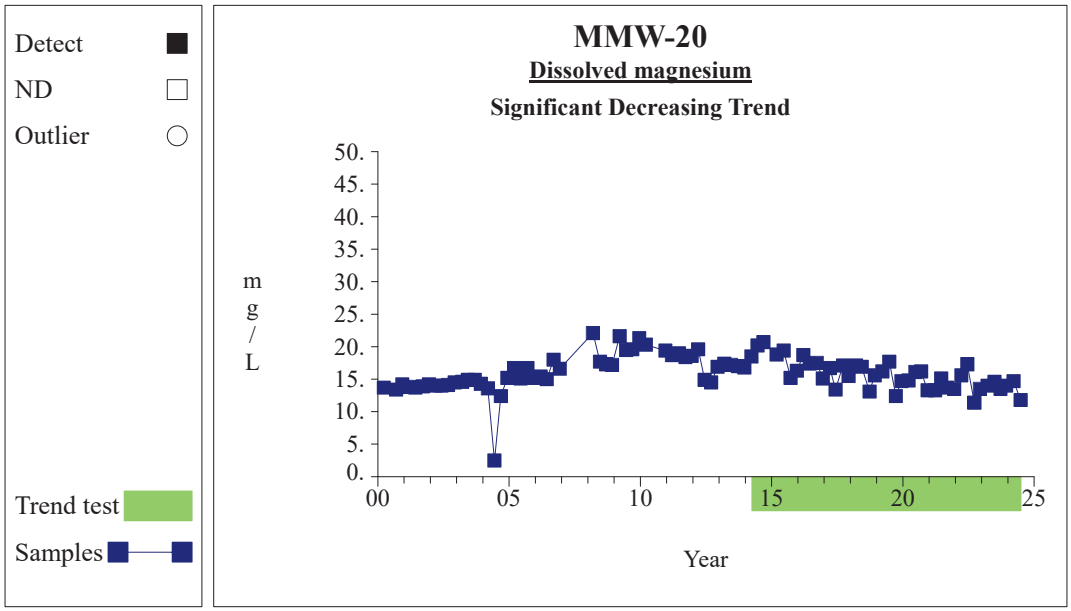
Graph 401

Time Series



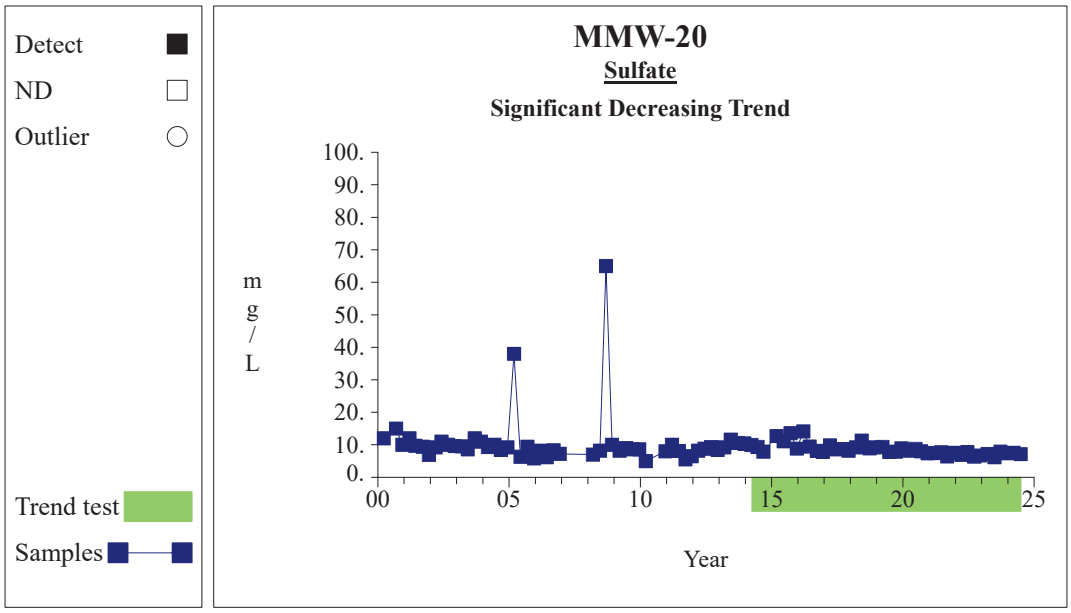
Graph 404

Time Series



Graph 410

Time Series



Graph 427