Data Collection Report

for the

Joe Pool Lake Watershed Characterization Project

December 2020

JOE POOL LAKE
WATERSHED PROTECTION

tra
Trinity River Authority of Texas

On the cover:
Preparing for flow data collection
on the west bank of Hollings Branch near
Marker Lane in Cedar Hill, Texas.

Data Collection Report

for

The Joe Pool Lake Watershed Characterization Project

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Investigating Entities

The Trinity River Authority of Texas

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List of Acronyms

BMP	best management practice
Chl-a	chlorophyll-a
CRP	Clean Rivers Program
DO	dissolved oxygen
E. coli	*Escherichia coli*
EPA	Environmental Protection Agency
JPL	Joe Pool Lake Watershed
LDC	load duration curve
MPN	most probable number
NO_2	nitrite
NO_3	nitrate
OB	Optical brightener
OP	orthophosphate
OSSF	on-site sewage facility
QAPP	Quality Assurance Project Plan
SELECT	Spatially Explicit Load Enrichment Calculation Tool
Sp. Cond	specific conductance
St. Dev	standard deviation
SWAT	Soil and Water Assessment Tool
SWQM	Surface Water Quality Monitoring
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TKN	total Kjeldahl nitrogen
TP	total phosphorous
TRA	Trinity River Authority of Texas
TSS	total suspended solids
TSWQS	Texas Surface Water Quality Standards
USGS	United States Geological Survey
VSS	Volatile Suspended Solids
WPP	watershed protection plan

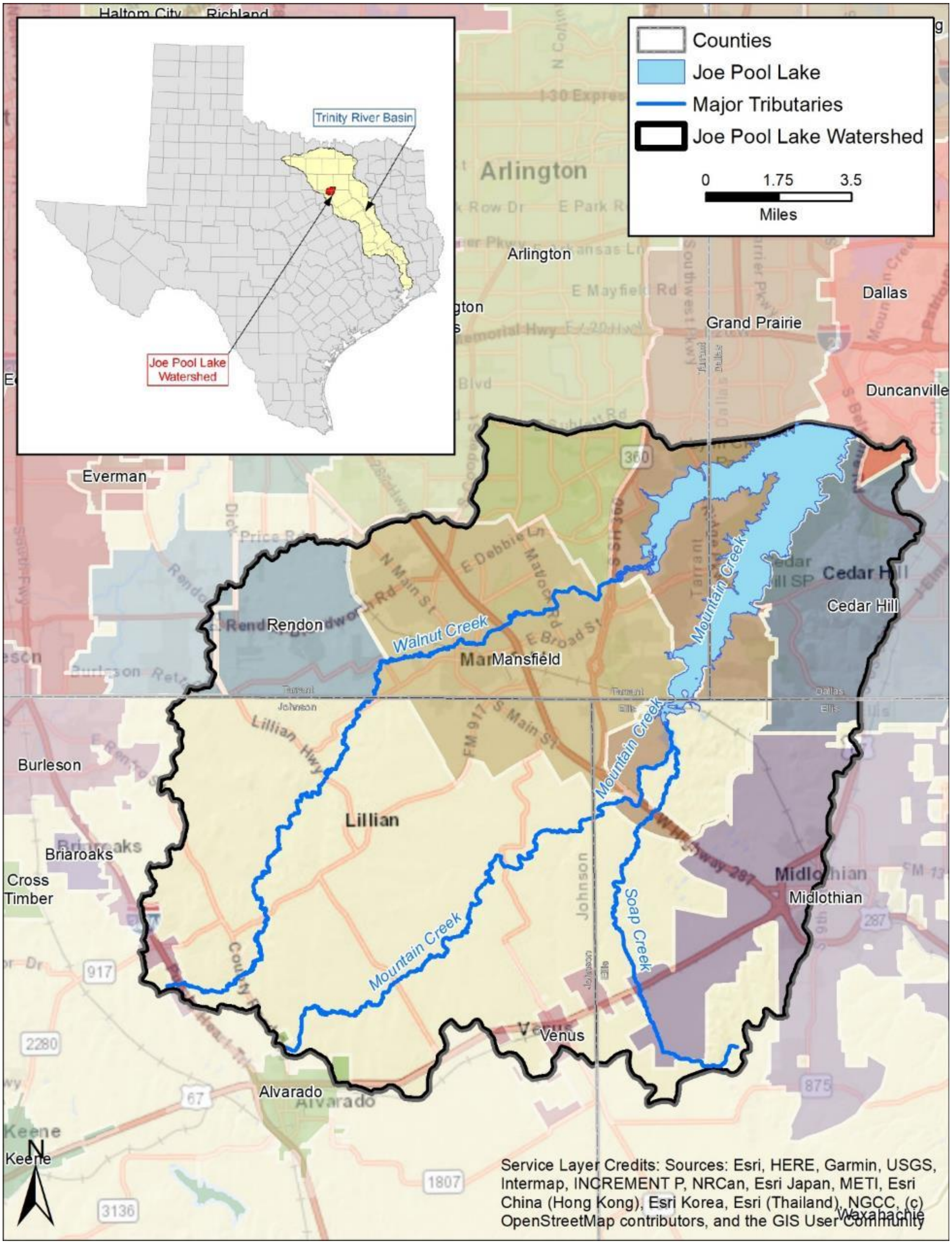
1.0 Introduction

This data collection report was prepared as part of an effort to improve water quality within Walnut Creek, which is a tributary of Joe Pool Lake (JPL). The effort has further goals of protecting water quality in JPL, along with its other tributaries, Soap Creek and Mountain Creek. These waterbodies and their shared watershed are located in Dallas, Ellis, Johnson, and Tarrant counties, in the southern extent of the Dallas/Fort Worth Metroplex in North-central Texas (Figure 1-1). Walnut Creek, one of Joe Pool's two main tributaries, was listed on the 2014 TCEQ Texas Water Quality Inventory and 303(d) List due to elevated levels of *E. coli*, with its first listing occurring in 2006. The majority of the impaired segment flows through the city limits of Mansfield, who approached TRA in late 2015 as they were considering restoration options available for Walnut Creek. Additionally, the Mountain Creek arm of Joe Pool Lake was listed on the 2014 Water Quality Inventory—Water Bodies with Concerns for Use Attainment and Screening Levels for general use concerns due to elevated levels of nitrate. The Cities of Cedar Hill, Grand Prairie, and Mansfield all border this segment of concern. As of the 2018 TCEQ Texas Integrated Report, the Walnut Creek segment has been delisted and the Mountain Creek concern has been removed (TCEQ 2019a).

The data collected as part of this project and the ensuing analysis thereof will serve to expand and enhance the knowledge of the stakeholder group as they make important management decisions to improve and protect water quality in the Joe Pool Lake watershed. This project will result in the development of a watershed protection plan (WPP) that integrates the results of these water quality data, Spatially Explicit Load Enrichment Calculation Tool (SELECT) calculations, Soil and Water Assessment Tool (SWAT) watershed modeling program, and load duration curve (LDC) results with goals and strategies for water quality improvements. Aspects of the SELECT, SWAT, and LDC analyses will be covered in detail later in a technical report on source identification and load reduction evaluation as part of this project.

The goal of this project was to conduct both routine and targeted water quality sampling and analysis for several parameters, including *Escherichia coli* (*E. coli*), nitrites (NO_2), nitrates (NO_3), total Kjehdahl nitrogen (TKN), total phosphorus (TP), and orthophosphate (OP), in order to obtain the technical information necessary to build the WPP. The data collected will be used to inform other reports developed as part of this project, which will evaluate annual and seasonal trends, spatial patterns, hydrologic characteristics (*i.e.,* flow characterization), and other relational patterns that will help identify how and when *E. coli* and other pollutants are entering the system. Five distinct sampling regimes were conducted as part of this project:

- Regime #1 - routine sampling at 9 stream sites (herein after called routine monitoring). The routine monitoring consisted of bi-monthly *E. coli*, NO_2, NO_3, TKN, TP, and OP samples, as well as field and flow parameters. These routine samples were consistently taken near the beginning of the two-month cycle, regardless of flow conditions.
- Regime #2 - bi-monthly flow-biased monitoring at the same 9 stream sites (herein after called flow-targeted monitoring) and for the same parameters described for the routine monitoring. The flows represented by these sample events were selected to capture a wide range of flows needed for building functional LDCs. The goal of the flow-targeted monitoring was to ensure that, to the furthest extent possible, the full range of flows were represented in the resultant data set. Therefore, sampling for targeted flows was based on data gaps that developed in the routine monitoring. For example, if routine monitoring did not include high flow events, then higher flows were targeted for monitoring. Conversely, if routine monitoring tended to occur during normal and higher flow events, then low flow events were targeted. The needed flows and timing of flow-targeted monitoring were evaluated on a continuous basis during the course of sampling to ensure that any flow-targeted samples were spread out as evenly as possible.



Basemap: ESRI World Streetmap.

Figure 1-1. Location of the Joe Pool Lake Watershed.

- Regime #3 - a supplement of the first and second regime, focused on the high-flow events that may have occurred during routine sampling or among those events selected for the flow-targeted monitoring. Three sampling events were completed with an additional six sites sampled. These sites are located within ephemeral portions of main tributaries near their headwaters, or within smaller, typically ephemeral tributaries surrounding the lake. The intent of using this regime was to characterize the periodic loading to the lake from channels or portions of channels that are typically dry, but where accumulated pollutants may contribute significantly to pollutant loads during periods of significant overland runoff. As there were only three samples per site collected in this regime, they will not be directly used to calculate load or flow duration curves. Rather, they will act to inform downstream measurements, providing additional information about potential pollutant sources and periodic contribution to the overall load delivered to the lake.
- Regime #4 - monitoring at five lake sites in Joe Pool Lake, with samples collected during both the routine and flow-targeted regimes described above. All parameters described in those regimes were collected at lake sites, except for flow parameters. Despite this lack of flow data, the flow-targeted samples will still provide important information about any changes in the condition of the lake during flow-targeted events, specifically during low-flow or drought periods, as well as high-flow or flood conditions. Given the pooled conditions at these sites, assessment of conditions will not be based on the calculation of flow/load duration curves, but rather on the pollutant concentrations at each site. Profile samples were collected for relevant field parameters (water temperature, pH, dissolved oxygen, specific conductance) at lake sites following the SWQM Procedures manual (Chapter 3, pg. 4):
    - ***Reservoirs, inland streams, bays, and barge channels with depths 1.5 to < 3.0 meters.*** *In reservoirs, inland streams, bays, and barge channels (for example, the Intracoastal Waterway) which are 1.5 to < 3.0 m deep, record measurements at 0.30 m below the surface, at mid-depth, and at 0.3 m above the bottom.*
    - ***Reservoirs, inland streams, and bays with depths ≥ 3.0 meters.*** *In reservoirs, inland streams, and bays which are 3.0 meters or greater in depth, record measurements at 0.30 m below the surface and then at 1.0 m and each subsequent 1.0 m interval. For the final measurement, take a reading 0.30 m above the bottom, if possible. If the remaining distance is less than 0.3 m, a final measurement is not required. The intervals may be extended to 3.0 m in reservoirs, if the total depth exceeds 18 m. All of the intervals, however, must be equal—1, 2, or 3 meters—and consistent with intervals used in earlier and subsequent field events. This helps determine compliance with water quality standards.*
- Regime #5 - optical brightener (OB) testing at various sites in the watershed including, but not necessarily limited to, the 9 sites at which routine and flow-targeted monitoring were conducted. This testing consisted of deployment of natural untreated cotton sampling medium for a short period of time while field staff were on site collecting samples. The sampling medium was placed in a rigid flow through sample container and fixed in the stream. After deployment, the sample medium was collected and checked for fluorescence due to the detectable presence of OBs. These compounds are found in many laundry detergents and can indicate the presence of sewage leaks or failing septic systems in the upstream watershed. This testing did not generate numeric data but may help identify the potential sources of E. coli in the watersheds and provide information for the development of the WPP. In addition, this testing may help in the selection of best management practices (BMPs) for some areas of the Joe Pool Lake watershed. The OB testing was completed, but the results were largely inconclusive.

Additional information such as land use, soil types, locations of septic systems (also known as on-site sewage facilities or OSSFs), etc. were obtained and published in the Analysis of Historical Data for the Joe Pool Lake Watershed Characterization document (TRA, 2019). This information will be supplemented from other sources (e.g. stakeholders) as needed to fill data gaps for SELECT, SWAT and LDC calculations.

The purpose of this report is to summarize the data collected during the watershed characterization phase and provide a basic statistical review of the results. A more rigorous analysis of the data will be provided in the forthcoming Technical Report.

2.0 Overview of Sample Collection Efforts

Sampling conducted as part of this project began on 6/24/2019 and concluded on 4/30/2020. A list of all analytical parameters collected in the field are provided in Table 2-1. Please refer to Section A7, Quality Objectives and Criteria of the Quality Assurance Project Plan (QAPP) for Monitoring and Data Acquisition requirements for more information about sample collection, processing, and representativeness. For additional information about the collection, preservation, and laboratory analysis of samples collected for these parameters, please consult the Texas Commission on Environmental Quality (TCEQ) *SWQM Procedures Manual, Volume 1: Physical and Chemical Monitoring Methods* (TCEQ 2012). A brief description of selected parameters is provided in Section 2.1 through 2.4 below.

Table 2-1. List of collected parameters for water quality monitoring.

Field Parameters										
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**AWRL**	**Limit of Quantitation (LOQ)**	**Recovery at LOQ (%)**	**Precision (RPD of LCS/LCSD)**	**Bias %Rec. of LCS**	**Lab**
TEMPERATURE, WATER (DEGREES CENTIGRADE)	DEG C	water	SM 2550 B and TCEQ SOP V1	00010	NA[1]	NA	NA	NA	NA	Field
TEMPERATURE, AIR (DEGREES CENTIGRADE)	DEG C	air	SM 2550 B and TCEQ SOP V1	00020	NA[1]	NA	NA	NA	NA	Field
TRANSPARENCY, SECCHI DISC (METERS)	meters	water	TCEQ SOP V1	00078	NA[1]	NA	NA	NA	NA	Field
SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C)	uS/cm	water	EPA 120.1 and TCEQ SOP, V1	00094	NA[1]	NA	NA	NA	NA	Field
OXYGEN, DISSOLVED (MG/L)	mg/L	water	SM 4500-O G & TCEQ SOP V1	00300	NA[1]	NA	NA	NA	NA	Field
PH (STANDARD UNITS)	s.u	water	EPA 150.1 and TCEQ SOP V1	00400	NA[1]	NA	NA	NA	NA	Field
DAYS SINCE PRECIPITATION EVENT (DAYS)	days	other	TCEQ SOP V1	72053	NA[1]	NA	NA	NA	NA	Field
DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE	meters	water	TCEQ SOP V2	82903	NA[1]	NA	NA	NA	NA	Field
MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS)[2]	meters	other	TCEQ SOP V2	89864	NA[1]	NA	NA	NA	NA	Field
MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS)[2]	meters	other	TCEQ SOP V2	89865	NA[1]	NA	NA	NA	NA	Field
POOL LENGTH, METERS[2]	meters	other	TCEQ SOP V2	89869	NA[1]	NA	NA	NA	NA	Field
% POOL COVERAGE IN 500 METER REACH[2]	%	other	TCEQ SOP V2	89870	NA[1]	NA	NA	NA	NA	Field
Flow Parameters										
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**AWRL**	**Limit of Quantitation (LOQ)**	**Recovery at LOQ (%)**	**Precision (RPD of LCS/LCSD)**	**Bias %Rec. of LCS**	**Lab**
FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC)	cfs	water	TCEQ SOP V1	00061	NA[1]	NA	NA	NA	NA	Field

FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry	NU	water	TCEQ SOP V1	01351	NA[1]	NA	NA	NA	NA	Field
FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER	NU	other	TCEQ SOP V1	89835	NA[1]	NA	NA	NA	NA	Field
Bacteriological Parameters in Water										
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**AWRL**	**Limit of Quantitation (LOQ)**	**Recovery at LOQ (%)**	**Precision (RPD of LCS/LCSD)**	**Bias %Rec. of LCS**	**Lab**
E. COLI, COLILERT, IDEXX METHOD, MPN/100ML	MPN/ 100 mL	water	Colilert/ Colilert-18	31699	1	1	NA	0.50[3]	NA	TRA
E. COLI, COLILERT, IDEXX, HOLDING TIME	hours	water	NA	31704	NA	NA	NA	NA	NA	TRA

Conventional Parameters in Water										
Parameter	**Units**	**Matrix**	**Method**	**Parameter Code**	**AWRL**	**Limit of Quantitation (LOQ)**	**Recovery at LOQ (%)**	**Precision (RPD of LCS/LCSD)**	**Bias %Rec. of LCS**	**Lab**
RESIDUE, TOTAL NONFILTRABLE (MG/L)	mg/L	water	SM 2540 D	00530	5	2	NA	NA	NA	TRA
RESIDUE, VOLATILE NONFILTRABLE (MG/L)	mg/L	water	EPA 160.4	00535	5	2	NA	NA	NA	TRA
NITRITE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00615	0.05	0.05	70-130	20	80-120	TRA
NITRATE NITROGEN, TOTAL (MG/L AS N)	mg/L	water	EPA 300.0 Rev. 2.1 (1993)	00620	0.05	0.05	70-130	20	80-120	TRA
NITROGEN, KJELDAHL, TOTAL (MG/L AS N)	mg/L	water	EPA 351.2	00625	0.2	0.2	70-130	20	80-120	TRA
PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P)	mg/L	water	SM 4500 P E	00665	0.06	0.02	70-130	20	80-120	TRA
CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH	µg/L	water	SM 10200 H No field of accreditation (FOA) offered	32211	3	3	NA	20	80-120	TRA
RESIDUE, TOTAL FILTRABLE (DRIED AT 180C) (MG/L)	mg/L	water	SM 2540 C	70300	10	10	NA	20	80-120	TRA
ORTHOPHOSPHATE PHOSPHORUS, DISS, MG/L, FILTER >15MIN	mg/L	water	SM 4500 P F	70507	0.04	0.02	70-130	20	80-120	TRA

1 - Reporting to be consistent with SWQM guidance and based on measurement capability.
2 - To be routinely reported when collecting data from perennial pools.
3 -This value is not expressed as a relative percent difference. It represents the maximum allowable difference between the logarithm of the result of a sample and the logarithm of the duplicate result. See Section B5.

References:
United States Environmental Protection Agency (USEPA) Methods for Chemical Analysis of Water and Wastes, Manual #EPA-600/4-79-020
American Public Health Association (APHA), American Water Works Association (AWWA), and Water Environment Federation (WEF), Standard
TCEQ SOP, V1 - TCEQ Surface Water Quality Monitoring Procedures, Volume 1: Physical and Chemical Monitoring Methods, 2012 (RG-415).
TCEQ SOP, V2 - TCEQ Surface Water Quality Monitoring Procedures, Volume 2: Methods for Collecting and Analyzing Biological Assemblage and Habitat Data, 2014 (RG-416)

2.1 Field Parameters

Water Temperature

This basic water quality parameter is perhaps one of the most important indicators of health in an aquatic ecosystem, as it is directly linked to many of the physiological processes carried out by aquatic organisms. As temperature increases, dissolved oxygen (DO) in the water decreases. This results in increased oxygen demand across the whole community, which can be stressful for higher-level, cold-blooded organisms like fish and aquatic insects, who depend on species-specific temperatures to survive. Variations in water temperature become more detrimental to aquatic species when they occur rapidly, especially for organisms that may lack the biological advantages to adapt quickly to the change.

Water Transparency

Two methods were used to measure water transparency for this project, secchi depth and nephalometric turbidity. High turbidity can limit the amount of available light in the water column by inhibiting photosynthetic growth in autotrophic organisms like phytoplankton, algae, and aquatic plants. This growth limitation may be either helpful or detrimental to the overall aquatic community, depending on several other biological factors, including the trophic state of the waterbody, and whether or not algal communities are also limited by nutrients. The reduced visibility from high turbidity may also be detrimental to predatory species of fish and birds that depend on visibility to locate their prey.

Dissolved Oxygen

Although the specific needs will vary based on the community assemblage and species adaptations, DO is vital to the survival of fish and aquatic insects. DO is affected by both temperature and nutrient concentrations, albeit indirectly. Primary productivity and decomposition processes also affect the amount of DO in the water column. Minimum DO concentrations may vary based on the type of water body (lentic or lotic systems), flow status of lotic systems (perennial, intermittent, with or without pools), species assemblage, and in-stream habitat. The Texas Commission on Environmental Quality (TCEQ) accounts for these differences by applying waterbody-specific DO criteria. Some waterbodies have had full-scale biological surveys undertaken to set the criteria. For those waterbodies which have not had biological surveys performed, criteria are based on known or presumed flow status until these surveys can be undertaken.

Specific Conductance (@ 25°C)

The efficiency with which a liquid can conduct electricity at a certain temperature is known as specific conductance. In most water quality studies, a standard temperature of 25°C is used for sonde-based deployments. A waterbody will become more conductive with increased levels of ionic dissolved solids, which include both nutrients and salts. As levels of these solids increase, particularly nutrients, DO decreases, which typically results in reduced water quality and overall aquatic health.

Potential Hydrogen (pH)

A waterbody is considered 'neutral' if it has a pH of 7.0, with values less than 7.0 being acidic and values greater than 7.0 considered alkaline. Healthy aquatic habitats typically fall within a pH range of 6.5-9.0, which is reflected within the TCEQ water quality standard for the parameter. However, TCEQ does have the ability to adjust the pH range where appropriate using local monitoring data for specific sites.

Days Since Last Precipitation Event

It is important for both field staff and data analysts to be mindful of recent precipitation events that coincide with monitoring events. Rainfall that produces runoff can carry nonpoint source pollutants (*E. coli*, nutrients, and other solids) into a waterbody. The volume of these pollutant loads typically increase with the duration and severity of the runoff event. Monitoring precipitation events is important for data analysts to determine if high pollutant loads are the result of inputs from a recent rainfall/runoff event, or perhaps from other factors.

2.2 Flow Parameters

Instantaneous Stream Flow

Flow measurement is an integral part of this project, as it is one of the two components required to compute the bacterial and nutrient loads. Flooding, stream geomorphology, and aquatic life support are all directly influenced by streamflow, and runoff and streamflow drive the generation, transport, and delivery of many nonpoint source pollutants. Calculation of pollutant loads requires knowledge of water flow (Meals and Dressing 2008). These results will indicate areas of interest in the watershed with respect to making informed water quality management recommendations.

Flow Severity

A qualitative observation of flow is sometimes useful, in addition to measured flow, to categorize the flow regime at the time of sample collection within the greater context of the watershed. Though two tributaries may have the exact same measured flow during a given event, that flow rate may be normal in one tributary, but uncharacteristically high in the other. This difference may indicate the effects of localized rainfall, external water inputs, or other natural or anthropogenic factors.

Flow Method

In addition to the use of existing U.S. Geological Survey (USGS) gage station data, TRA uses instruments to directly measure flow. It is important for data analysts to be mindful of the flow measurement method used to collect the data, as it may explain and eventually correct any errors that may arise in flow data. See the QAPP for Monitoring and Data Acquisition for this project for more information on the approved methods used during this project.

2.3 Bacteria Parameters

E. coli

E. coli is a bacterium commonly found in the intestines of warm-blooded animals and humans. These bacteria live in the waste products and can be washed into surface and ground water during rain events, or directly deposited in surface waters. High measurements of these bacteria can indicate improperly treated wastewater, illicit discharges, livestock and wildlife presence, and a host of other sources. Some strains of this bacteria produce powerful toxins and can cause severe illness if ingested. To protect public safety, Clean Rivers Program (CRP) partners sample for bacteria throughout the basin. These samples are compared to a surface water quality standard determined by the TCEQ and approved by the U.S. Environmental Protection Agency. *E. coli* is used in assessing water bodies against the Contact Recreation use standard. Because *E. coli* results can vary by orders of magnitude, the standard is based on the geometric mean (geomean) of the sample set. It is important to note that analysis of *E. coli* as an “indicator bacteria” is based on current knowledge and technology and has its limitations – primarily that it is shed by all warm-blooded animals. This test is intended as a surrogate for the potential for human illness – higher levels of *E. coli* indicate that there is higher potential for illness causing strains of *E. coli*, other bacteria, or viruses to be found in the water which may be ingested during recreational activities such as swimming, wading, and boating.

Optical Brighteners

Optical brighteners are dye compounds that are added to laundry detergent to make clothing seem whiter or brighter in color after washing. Although not a direct measurement of bacterial contamination, the presence or absence of OBs in the water found at the monitoring site may be an indicator of human sewage contamination, which is a potential source of *E. coli* in the watershed. However, other household, personal care, and industrial products can contain similar dyes, which can present 'false positives' in the test. These include, but are not limited to, antifreeze, car wash detergents, lawn grass dyes, and some viral-vector pesticides. The OB testing was completed, but the results were largely inconclusive.

2.4 Conventional Parameters

Solids

Total dissolved solids (TDS) is a rudimentary measurement of all the dissolved ions within a waterbody. While it does provide a very rough indicator of general water quality, it cannot reveal the specific source or composition of the ions in the sample.

The suspended or colloidal particles, commonly referred to as total suspended solids (TSS), are the particles that are suspended in the water column that are not passed through a filter of a specific pore size. This can include organic matter such as algal and bacterial cells and planktonic organisms as well as inorganic matter such as erodible soil material.

Volatile suspended solids (VSS) is the portion of the suspended solids that are lost on the ignition of the dried solids. Along with TSS, it can also provide further indication of microbial, algal, and planktonic growth within a water quality sample.

Turbidity is closely related to TSS, but is technically an optical feature of the water. It is a measurement of the light scattered by a water sample rather than the mass of the material suspended in the water. The measurement can also include response to dyes in the water such as tannin staining from decaying leaves.

Nutrients

Nutrients are essential for the productivity of aquatic ecosystems. Without the building blocks, or "food", that drives the system, there will be no plant and animal life. Conversely, an overabundance of nutrients within riverine and reservoir ecosystems can have detrimental effects. Clear reservoirs are more susceptible to algal blooms due to nutrient enrichment than sediment-laden rivers and lakes. Algae require nutrients and light to grow, but waterbodies in this watershed are generally turbid. As a result, light can be more of a limiting factor than nutrients.

The most common limiting nutrients in aquatic environments are phosphorus and nitrogen. Nutrients can enter waterbodies via runoff containing residential and agricultural fertilizers, as well as animal waste, atmospheric deposition, effluent from wastewater treatment plants, and sanitary sewer overflows.

NO_3 is one of the components of total nitrogen, along with NO_2 and TKN. NO_3 and NO_2 are inorganic, oxidized forms of nitrogen, with nitrate being the most abundant and nitrite often occurring at such low levels that for the majority of the samples, the limit of quantitation was not met over the course of this monitoring effort. TKN is the final component of total nitrogen, which contains ammonia (another inorganic form of nitrogen) and organic nitrogen.

TP is a measure of all the forms of phosphorus that are present in a water sample. This includes both dissolved and particulate forms, as well as both organic and inorganic forms. Of the inorganic forms, OP (sometimes referred to as "reactive phosphorus") is important because it is the form used most readily by plants. A prominent by-product of natural processes, OP is also found in sewage.

Chlorophyll-a

Chlorophyll-a (chl-a) is commonly used throughout the state as a surrogate for algal biomass. It is the pigment responsible for the green color of many algal species and is vital for photosynthesis. High levels of chl-a may indicate algal blooms have occurred or are occurring in a waterbody. Typically nutrients, such as nitrogen and phosphorous, are the limiting factors for algal growth. However, in some systems, trace metals may also be limiting.

In more turbid waterbodies, nutrients are not always the limiting factor for algal growth. In the naturally turbid waters of the river, light availability is commonly the limiting factor. High suspended sediment loads decrease light penetration into the water column. Therefore, algal productivity is limited to a narrow band at the surface of the water which can range from just a few inches to several feet depending on the turbidity of the water. In reservoirs, light can be the limiting factor in the turbid upper reaches and coves where sediments are still in suspension. As sediments settle out nearer to the main body of the reservoirs, nutrients can become the limiting factors.

Algal growth can affect levels of DO and pH. As algae cycle through photosynthesis and respiration during a 24-hour period, DO and pH levels rise and fall in response. Because chl-a is used as a surrogate for algal biomass, data analysis can show a strong correlation between chl-a, DO, and pH. The strength and direction of the correlation depends on the extent of the algal bloom and the time of day, as well as the time required for DO and pH levels to recover.

At night or during cloudy weather, algal respiration is the dominant process. Cellular respiration uses carbohydrates and oxygen to produce carbon dioxide and water. Carbon dioxide in the presence of water forms carbonic acid which reduces the pH of the water. Therefore, oxygen and pH levels can decrease.

During sunny daylight hours, algal photosynthesis becomes dominant. The process of photosynthesis uses light, carbon dioxide, and water to produce carbohydrates and oxygen. Therefore, oxygen and pH levels can increase.

During an algal bloom, it is not uncommon for the water to become supersaturated with DO during the day. At night or during cloudy weather, DO and pH can drop to very low levels. This rise and fall in DO and pH during a 24-hour period is called a diurnal swing. The severity of the diurnal swing and the resultant minimum and maximum DO and pH levels are dependent of the extent of the algal bloom. While uncommon in areas like the Trinity River where mineral inputs from calcareous soils provide a strong buffering capacity, water bodies with weaker buffering capacity may be more sensitive to intense DO and pH declines, occasionally causing fish kills.

3.0 Data Review and Assessment Methods

3.1 TCEQ Water Quality Standards

TCEQ is responsible for establishing numeric and narrative criteria for water quality in the state of Texas. These criteria are described in TCEQ's Texas Surface Water Quality Standards (TSWQS) and are approved by the U.S. Environmental Protection Agency (EPA). These standards are codified in the Texas Administrative Code (TAC), Title 30, Chapter 307, hereto referred to as TAC 307 (TCEQ 2014) and are used by TCEQ regulatory programs to establish reasonable methods of assessing water bodies of the state with the intent of implementing targeted strategies aimed at specific water quality uses. Site-specific water quality criteria for Joe Pool Lake (Segment 0838) and Hollings Branch Creek, Mountain Creek, Soap Creek, Sugar Creek, Walnut Creek (Segment 0838A-F), as defined in TAC 307, are presented in Table 3-1.

Table 3-1. Site-specific water quality criteria for the Joe Pool Lake watershed.

Parameter	Segment ID	
	0838	0838A-F
Cl^- (mg/L)	100	100
SO_4^{2-} (mg/L)	250	-
TDS (mg/L)	500	300
DO (mg/L) 24-hr minimum	3.0	1.5[a]
DO (mg/L) 24-hr average	5.0	2.0[a]
pH range	6.5-9.0	6.5-9.0
E. coli (#/100ml) geomean	126	126
Temperature (°F; °C)	95; 35	95; 35

(a) Tributaries 0838B and 0838C use a DO 24-hr minimum and average of 2.0 mg/L and 3.0 mg/L, respectively.

3.2 Nutrient Screening Levels and Reference Criteria

Currently, no numeric standards exist for nutrients in streams in the state of Texas. Numeric standards for chl-a have been approved by EPA for 75 reservoirs in the state; however, Joe Pool Lake is not one of these reservoirs. In such situations where no water quality standards exist, or are in the process of being developed, controls such as narrative criteria and antidegradation considerations are often used. Despite this lack of numeric criteria, TCEQ continues to screen for parameters such as nitrogen, phosphorus, and chl-a as preliminary indicators for concern. To support this effort, nutrient screening levels and reference conditions are often used to compare a waterbody to reference values at a local, regional, or national level. Table provides screening level values from various sources. The Texas Nutrient Screening Levels are based on statistical analyses of Surface Water Quality Monitoring (SWQM) data (TCEQ 2015) and the EPA Reference Criteria are regional values based on data from reservoirs and streams within specific ecoregion units and subunits (USEPA 2000a, USEPA 2000b). It is worth noting that these Reference Criteria differ from the Texas Nutrient Screening Levels in that EPA developed the Reference Criteria using conditions that are indicative of minimally impacted (or in some cases, pristine) waterbodies, attainment of which would result in protection of all designated uses within those specific units and subunits. As such, Reference Criteria thresholds are much lower than those for state screening levels, and surpassing them may not necessarily indicate a concern, as is the case with the state thresholds. Where state screening levels or national reference criteria were non-existent, other sources were used, for nitrite (NO_2) in particular (Mesner and Geiger 2010).

Table 3-2. Texas Nutrient Screening Levels and EPA Nutrient Reference Criteria.

Parameter		TCEQ Screening Levels		EPA Reference Criteria				Other Sources
		Lake/Reservoir	Stream	Lake/Reservoir		Stream		
TKN	(mg/L)	-	-	0.38[a]	0.41[b]	0.3[a]	0.4[b]	
NO_2^-	(mg/L)	-	-	-	-	-	-	0.02[c]
NO_3^-	(mg/L)	0.37	1.95	-	-	-	-	
$NO_2^-+NO_3^-$	(mg/L)	-	-	0.017[a]	0.01[b]	0.125[a]	0.078[b]	
TP	(mg/L)	0.20	0.69	0.02[a]	0.019[b]	0.037[a]	0.038[b]	
OP[d]	(mg/L)	0.05	0.37	-	-	-	-	
Chlorophyll a[e]	(µg/L)	26.7	14.1	5.18[a]	2.875[b]	0.93[a]	1.238[b]	

(a) Reference conditions for aggregate Ecoregion IX waterbodies, upper 25th percentile of data from all seasons, 1990-1999.

(b) Reference conditions for level III Ecoregion 29 waterbodies, upper 25th percentile of data from all seasons.

(c) For nitrite, concentrations above 0.02 mg/L (ppm) usually indicate polluted waters (Mesner, N., J. Geiger. 2010. Understanding Your Watershed: Nitrogen. Utah State University, Water Quality Extension.

(d) OP is no longer used for TCEQ screening purposes, as of the 2014 Texas Integrated Report.

(e) Chlorophyll a, as measured by Spectrophotometric method with acid correction.

3.3 303(d) Water Quality Inventory Table

The TCEQ 2020 Texas Integrated Report for the Trinity River covers a seven-year assessment period from December 1, 2011 to November 30, 2018 (TCEQ 2020). In cases where additional data was needed to meet minimum data requirements and make an informed assessment, data from an additional three-year period beginning December 1, 2008 were used. The methods used for this assessment are described in the 2020 Guidance for Assessing and Reporting Surface Water Quality in Texas (TCEQ 2019c).

Findings of the Integrated Report assessments are classified as Fully Supporting, No Concern, Use Concern, Screening Level Concern, and Not Supporting. To simplify data presentation in this report, the Use Concern and Screening Level Concern classifications were combined into a single “Concern” category. Use Concern findings are given for assessments against designated use standards for water quality parameters such as DO and *E. coli*. Use Concerns can apply to datasets with limited data where the threshold number of exceedances are met or to datasets with adequate data where there are less than the threshold number of exceedances required for a Not Supporting finding. Screening Level Concerns apply to General Use parameters, such as nutrients and chl-a, as well as a few other parameters for other designated uses. These parameters have screening levels rather than standards.

The TCEQ 2020 Texas Integrated Report did not identify any concerns or impairments. However, the impetus to conduct water quality monitoring in Joe Pool Lake watershed was based on the TCEQ 2014 Texas Integrated Report that did identify concerns and impairments (TCEQ 2015). The results of the 2014, 2016, 2018 and 2020 assessments are shown in Table , Table , Table , Table , which call out any impairments or concerns identified in each segment (TCEQ 2015, 2019a, 2019b, 2020). The results are accompanied by an evaluation of which designated uses have data that was available for a use assessment.

Table 3-3. 2020 Texas Integrated Report & 2020 TRA In-house Assessment information for Joe Pool Lake Watershed.

Waterbody	Segment ID	Designated Uses*					2020 TCEQ Report	
		Aquatic Life	Contact Recreation	General Use	Fish Consumption	Public Water Supply	Impairments	Concerns
Joe Pool Lake: Lowermost portion of reservoir adjacent to the dam	0838_01							
Joe Pool Lake: Mountain Creek arm	0838_02							
Joe Pool Lake: Walnut Creek arm	0838_03							
Mountain Creek: Entire segment	0838A_01							
Sugar Creek: Entire segment	0838B_01	•	•	•	•			
Walnut Creek: From the confluence with Joe Pool Lake up to the headwaters at Spring Street in	0838C_01	•	•					
Hollings Branch from the confluence of Mountain Creek arm of Joe Pool Lake upstream to the headwater 500 m downstream of US 67 in Midlothian	0838D_01	•	•	•	•			
Soap Creek from the confluence of the Maountain Creek arm of Joe Pool Lake upstream to the headwater 6.6 km (3.98 miles) upstream of US 67 in Midlothian	0838E_01	•	•	•	•			
Unnamed tributary of Mountain Creek: Intermittent stream from the confluence with Mountain Creek south of Mansfield upstream to the headwaters approximately 2.0 k, upstream of FM 157 in Mansfield	0838F_01	•	•	•				

**note: blanks in the "Designated Uses" column indicate that no data was available for a specific designated use in the corresponding segment, or that a specific designated use does not apply for that segment.*

Table 3-4. 2018 Texas Integrated Report information for Joe Pool Lake Watershed.

Waterbody	Segment ID	Designated Uses*					2018 TCEQ Report	
		Aquatic Life	Contact Recreation	General Use	Fish Consumption	Public Water Supply	Impairments	Concerns
Joe Pool Lake: Lowermost portion of reservoir adjacent to the dam	0838_01							
Joe Pool Lake: Mountain Creek arm	0838_02							
Joe Pool Lake: Walnut Creek arm	0838_03							
Mountain Creek: Entire segment	0838A_01							
Sugar Creek: Entire segment	0838B_01	•	•	•	•			
Walnut Creek: From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson	0838C_01	•	•					
Hollings Branch from the confluence of Mountain Creek arm of Joe Pool Lake upstream to the headwater 500 m downstream of US 67 in Midlothian	0838D_01	•	•	•	•			
Soap Creek from the confluence of the Maountain Creek arm of Joe Pool Lake upstream to the headwater 6.6 km (3.98 miles) upstream of US 67 in Midlothian	0838E_01	•	•	•	•			
Unnamed tributary of Mountain Creek: Intermittent stream from the confluence with Mountain Creek south of Mansfield upstream to the headwaters approximately 2.0 k, upstream of FM 157 in Mansfield	0838F_01	•	•					

**note: blanks in the "Designated Uses" column indicate that no data was available for a specific designated use in the corresponding segment, or that a specific designated use does not apply for that segment.*

Table 3-5. 2016 Texas Integrated Report information for Joe Pool Lake Watershed.

Waterbody	Segment ID	Designated Uses*					2016 TCEQ Report	
		Aquatic Life	Contact Recreation	General Use	Fish Consumption	Public Water Supply	Impairments	Concerns
Joe Pool Lake: Lowermost portion of reservoir adjacent to the dam	0838_01			•	•			
Joe Pool Lake: Mountain Creek arm	0838_02	•	•	•	•			
Joe Pool Lake: Walnut Creek arm	0838_03			•	•			
Mountain Creek: Entire segment	0838A_01							
Sugar Creek: Entire segment	0838B_01	•	•	•	•			
Walnut Creek: From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson	0838C_01	•	•	•			bacteria	
Hollings Branch from the confluence of Mountain Creek arm of Joe Pool Lake upstream to the headwater 500 m downstream of US 67 in Midlothian	0838D_01	•	•	•	•			
Soap Creek from the confluence of the Maountain Creek arm of Joe Pool Lake upstream to the headwater 6.6 km (3.98 miles) upstream of US 67 in Midlothian	0838E_01	•	•	•				
Unnamed tributary of Mountain Creek: Intermittent stream from the confluence with Mountain Creek south of Mansfield upstream to the headwaters approximately 2.0 k, upstream of FM 157 in Mansfield	0838F_01	•	•	•				

**note: blanks in the "Designated Uses" column indicate that no data was available for a specific designated use in the corresponding segment, or that a specific designated use does not apply for that segment.*

Table 3-6. 2014 Texas Integrated Report & 2015 TRA In-house Assessment information for Joe Pool Lake Watershed.

Waterbody	Segment ID	Designated Uses*					2014 TCEQ Report	
		Aquatic Life	Contact Recreation	General Use	Fish Consumption	Public Water Supply	Impairments	Concerns
Joe Pool Lake: Lowermost portion of reservoir adjacent to the dam	0838_01	•		•	•	•		
Joe Pool Lake: Mountain Creek arm	0838_02	•	•	•	•	•		nitrate
Joe Pool Lake: Walnut Creek arm	0838_03	•		•	•	•		
Mountain Creek: Entire segment	0838A_01	•		•	•			
Sugar Creek: Entire segment	0838B_01	•	•	•	•			
Walnut Creek: From the confluence with Joe Pool Lake up to the headwaters at Spring Street in Burleson	0838C_01	•	•	•	•		bacteria	
Hollings Branch from the confluence of Mountain Creek arm of Joe Pool Lake upstream to the headwater 500 m downstream of US 67 in Midlothian	0838D_01	•	•	•				
Soap Creek from the confluence of the Maountain Creek arm of Joe Pool Lake upstream to the headwater 6.6 km (3.98 miles) upstream of US 67 in Midlothian	0838E_01	•	•	•				
Unnamed tributary of Mountain Creek: Intermittent stream from the confluence with Mountain Creek south of Mansfield upstream to the headwaters approximately 2.0 k, upstream of FM 157 in Mansfield	0838F_01							

**note: blanks in the "Designated Uses" column indicate that no data was available for a specific designated use in the corresponding segment, or that a specific designated use does not apply for that segment.*

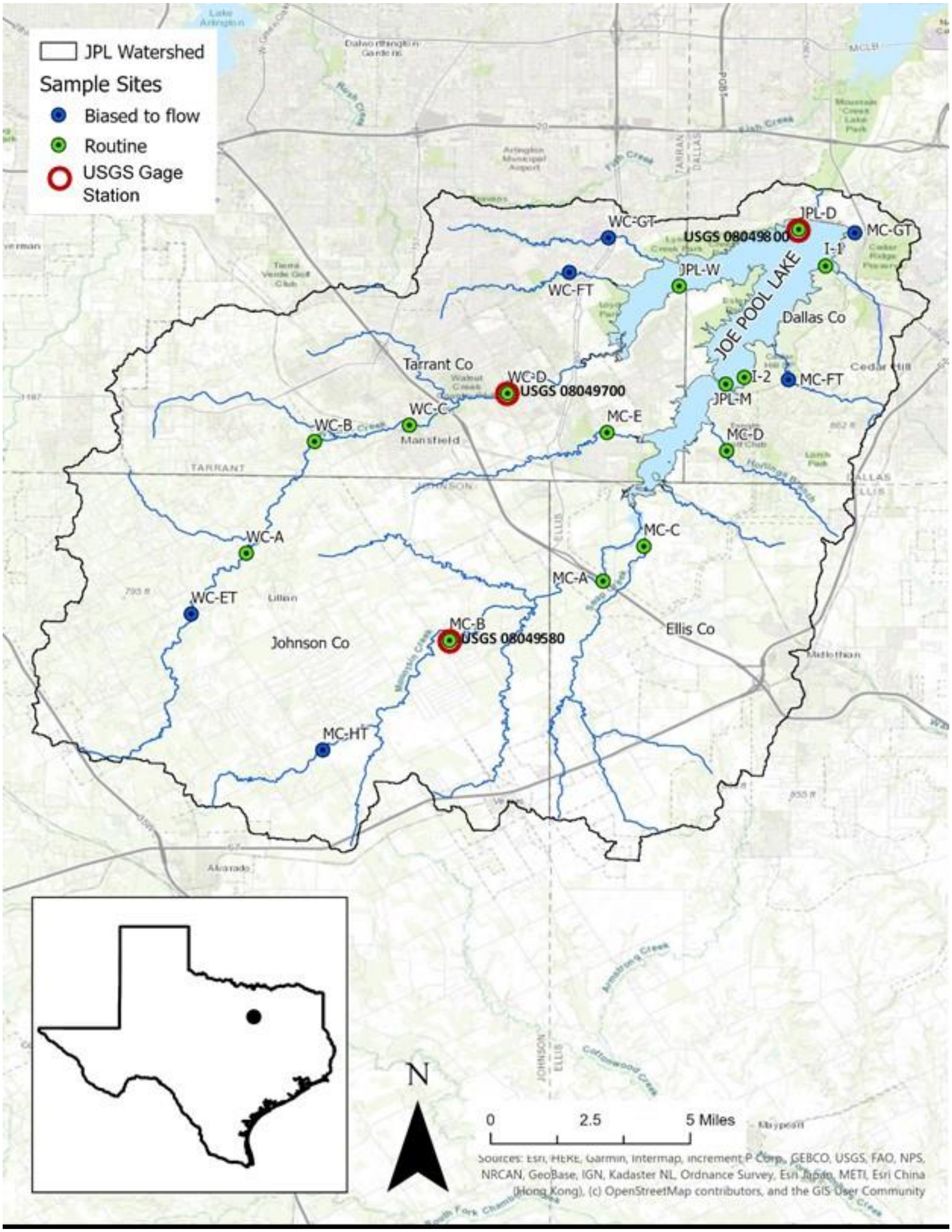
4.0 Summary of Sample Collection Efforts

The data in this report summarizes a 11-month collection effort from June 2019 to April 2020. A collection of all the data sampled as part of this project is provided in Appendix A and Appendix B. Data was collected at 14 sites across the watershed with an additional six sites during high flow conditions (Figure 4-1).

Specific site selection criteria for each site are detailed below.

- 22131(WC-A) – WALNUT CREEK AT FM 2738/LILLIAN HIGHWAY IN JOHNSON COUNTY
    - Site is upstream of the Valley Branch confluence, allowing for differentiation between it and King Branch as pollutant load sources.
- 20790 (WC-B) – WALNUT CREEK AT RETTA ROAD IN SOUTHEAST TARRANT COUNTY
    - Site is upstream of the Willow Branch confluence, just outside of the city limits of Mansfield. This will allow for differentiation between the more rural land uses upstream and downstream urban land uses as pollutant load sources.
- 21990 (WC-C) – WALNUT CREEK AT KATHERINE ROSE MEMORIAL PARK FOOT BRIDGE 400 METERS UPSTREAM OF N WALNUT CREEK DRIVE IN MANSFIELD
    - Site is located within a municipal park near the center of Mansfield, characterizing urban land uses.
- 13621 (WC-D) – WALNUT CREEK AT MATLOCK ROAD 2.6 MI NORTHEAST OF MANSFIELD
    - Most downstream site on Walnut Creek, also the site of a USGS flow gage. Will likely be used for calculating pollutant load contributions to Joe Pool Lake from Walnut Creek.
- 22132 (WC-ET) – WALNUT CREEK AT JOHNSON COUNTY ROAD 519 WEST OF LILLIAN IN JOHNSON COUNTY
    - Site is upstream of the King Branch confluence, allowing for differentiation between it and the Walnut Creek headwaters as pollutant load sources (high-flow events only).
- 22133 (WC-FT) – BOWMAN BRANCH AT SOUTH SH 360 IN THE CITY OF GRANDE PRAIRE IN TARRANT COUNTY
    - Site will characterize pollutant load contributions from Bowman Branch (high-flow events only).
- 17198 (WC-GT) – LYNN CREEK 136 METERS DOWNSTREAM OF WEBB LYNN ROAD 2.6 KM UPSTREAM OF JOE POOL LAKE IN GRAND PRAIRIE
    - Site will characterize pollutant load contributions from Lynn Creek (high-flow events only).
- 16434 (MC-A) – MOUNTAIN CREEK AT US287 1.6KM NORTHWEST OF INTERSECTION OF US 287 AND FM 661
    - Most downstream point on Mountain Creek accessible to vehicle traffic, although it is assumed to be under influence of the lake for some periods of time throughout the year. May or may not be acceptable as point of load calculation for Mountain Creek, depending on results of the characterization study.
- 13622 (MC-B) – MOUNTAIN CREEK AT FM 157 3.9 MI NORTH OF VENUS 3.0 MI UPSTREAM FROM GRASSY CREEK
    - Site of a USGS flow gage. Will likely be used for calculating pollutant load contributions to Joe Pool Lake from Mountain Creek, should 16434 prove not to be ideal for load calculation.
- 22134 (MC-C) – SOAP CREEK 1.1 KILOMETERS UPSTREAM OF THE CONFLUENCE WITH MOUNTAIN CREEK IN ELLIS COUNTY
    - Site is downstream of several smaller Soap Branch tributaries, one of which carries treated wastewater effluent.
- 16433 (MC-D) – HOLLINGS BRANCH AT TANGLE RIDGE ROAD 1KM UPSTREAM OF CONFLUENCE OF HOLLINGS BRANCH WITH JOE POOL LAKE
    - Characterizes loads originating from the east side of the lake.

- 22135 (MC-E) – LOW BRANCH AT SOUTH HOLLAND ROAD EAST OF THE CITY OF MANSFIELD IN TARRANT COUNTY
    - Characterizes contributions to Mountain Creek from urban sources.
- 22136 (MC-FT) – BAGGETT BRANCH AT MANSFIELD ROAD IN THE CITY OF CEDAR HILL IN DALLAS COUNTY
    - Characterizes contributions to Joe Pool Lake from heavily wooded areas (high-flow events only).
- 22137 (MC-GT) – MOUNTAIN CREEK TRIBUTARY 2 AT FM 1382/BELT LINE ROAD ALONG THE NORTHERN BOUNDARY OF CEDAR HILL STATE PARK IN DALLAS COUNTY
    - Characterizes loads originating from heavily wooded areas on the east side of the lake (high flow events only).
- 22138 (MC-HT) – MOUNTAIN CREEK AT FM 2738 IN JOHNSON COUNTY
    - Site is upstream of the Fish Spring Branch confluence, allowing for differentiation between it and the Mountain Creek headwaters as pollutant load sources (high-flow events only).
- 11073 (JPL-D) – JOE POOL LAKE MID LAKE AT DAM 48 METERS SOUTH AND 2.24 KM WEST OF INTERSECTION OF MANSFIELD ROAD AND FM 1382
    - Characterizes pollutant concentrations in the main body of the reservoir
- 11072 (JPL-W) – JOE POOL LAKE WALNUT CREEK ARM AT LAKE RIDGE PARKWAY 1.43 KM NORTH AND 503 M WEST OF INTERSECTION OF LAKE RIDGE PKWY AND HANGER LOWE RD
    - Characterizes pollutant concentrations in the western arm of the reservoir
- 11071 (JPL-M) – JOE POOL LAKE MOUNTAIN CREEK ARM AT LAKE RIDGE PKWY/MANSFIELD ROAD 251 M N AND 1.19 KM W OF INTERSECTION OF ANDERSON RD AND LK RIDGE USGS SITE DC 323503097012201
    - Characterizes pollutant concentrations in the eastern arm of the reservoir
- 22139 (I-1) – JOE POOL LAKE AT INTAKE STRUCTURE 423 METERS WEST OF THE BOAT RAMP AT JOE POOL MARINA IN CEDAR HILL STATE PARK
    - Park Characterizes pollutant concentrations near the northern water treatment intake.
- 22140 (I-2) – JOE POOL LAKE AT INTAKE STRUCTURE 785 METERS NORTHWEST FROM THE INTERSECTION OF ANDERSON ROAD AND MANSFIELD ROAD IN DALLAS COUNTY
    - Characterizes pollutant concentrations near the northern water treatment intake.



Basemap: ESRI World Streetmap.

Figure 4-1. Sampling sites and USGS gage sites in the Joe Pool Lake Watershed.

4.1 Statistics Summary Tables

Table 4-1 through Table 4-3 contain the summary statistics for Joe Pool Lake watershed for data collected June 2019 to April 2020. This includes basic statistical parameters, such as the data range, mean, standard deviation (st. dev), as well as measures of dataset completeness (count and percent completeness). Mountain Creek watershed summary includes routine stations 13622, 16434, 22134, 16433, and 22135 as well as flow-targeted stations 22138, 22136, and 22137. Walnut Creek watershed summary includes routine stations 22131, 20790, 21990, and 13621 as well as flow-targeted stations 22132, 22133, and 17198. Joe Pool Lake summary includes routine stations 11071, 11072, 11073, 22139, and 22140.

Table 4-1. Statistics summary table for Mountain Creek watershed.

Mountain Creek watershed							
Parameter	Data Points	Range			Mean	St. Dev	% Complete
E. coli (MPN/100 mL)	65	2	-	12000	945	2627	94%
DO	66	2.5	-	11.8	8.00	2.12	96%
TDS (mg/L)	66	269	-	1112	607	192	96%
Nitrate (mg/L)	66	0.08	-	4.8	0.94	1.08	96%
Nitrite (mg/L)	67	n/a	-	n/a	n/a	n/a	96%
TKN (mg/L)	66	0.22	-	2.35	0.67	0.45	96%
TP (mg/L)	66	0.02	-	0.858	0.15	0.17	96%
OP (mg/L)	66	0.02	-	0.38	0.10	0.08	96%
Chlorophyll a (μg/L)	66	4.0	-	113.0	19.0	23.0	96%

Table 4-2. Statistics summary table for Walnut Creek watershed.

Walnut Creek watershed							
Parameter	Data Points	Range			Mean	St. Dev	% Complete
E. coli (MPN/100 mL)	52	8	-	37000	3895	6925	90%
DO (mg/L)	52	0.5	-	12.8	7	3	90%
TDS (mg/L)	52	217	-	1044	504	204	90%
Nitrate (mg/L)	52	0.05	-	1.18	0.33	0.28	90%
Nitrite (mg/L)	52	n/a	-	n/a	n/a	n/a	90%
TKN (mg/L)	52	0.21	-	2.19	0.68	0.49	90%
TP (mg/L)	52	0.03	-	0.98	0.17	0.18	90%
OP (mg/L)	52	0.02	-	0.17	0.07	0.04	90%
Chlorophyll a (μg/L)	52	3.0	-	45.0	11.0	8.0	90%

Table 4-3. Statistics summary table for Joe Pool Lake.

Joe Pool Lake							
Parameter	Data Points	Range			Mean	St. Dev	% Complete
E. coli (MPN/100 mL)	60	2	-	51	8.0	10	100%
DO (mg/L)	60	6.4	-	11.2	9.3	1.18	100%
TDS (mg/L)	60	154	-	317	267	25	100%
Nitrate (mg/L)	60	0.05	-	0.49	0.20	0.10	100%
Nitrite (mg/L)	60	n/a	-	n/a	n/a	n/a	100%
TKN (mg/L)	60	0.2	-	0.52	0.38	0.09	100%
TP (mg/L)	60	0.02	-	0.05	0.03	0.01	100%
OP (mg/L)	60	n/a	-	n/a	n/a	n/a	100%
Chlorophyll a (µg/L)	60	4.0	-	24.0	12.0	6.0	100%

4.2 Parameter Summaries

Table 4-4. Summary of E. coli measurements in the Joe Pool Lake Watershed June 2019 – April 2020. contain the geomean statistics for *E.coli* and averages for each parameter of interest in the Joe Pool Lake watershed, for data collected June 2019 to April 2020. Geomeans for *E.coli* and averages for the parameter at each monitoring station are presented, except when sufficient data were unavailable for the purposes of the calculation. Each table includes routine and flow-targeted data. Six columns representing the results of three flow-targeted samples have cells blacked out indicating that sampling was not scheduled. Of the fourteen routine data columns, five columns have grayed out cells indicating that a sampling event was scheduled, but a sample was either unable to be taken because the site was dry, samples were lost or the quality control measurements did not pass the requirements specified in the QAPP for Monitoring and Data Acquisition for this project. Due to the 2014 Texas Integrated Report listing and subsequent 2018 TCEQ Texas Integrated Report delisting of Walnut Creek Assessment Unit (0838C_01) bacteria impairment, a geomean or average calculation is provided based on information from all sites within the Walnut Creek Assessment Unit (0838C_01), which excludes Site WC-ET (22132), Site WC-FT (22133) and Site WC-GT (17198). In addition, due to the 2014 Texas Integrated Report listing and subsequent 2018 Texas Integrated Report removal of Mountain Creek Assessment Unit (0838_02) for nitrate concern, an average calculation was provided based on information from site JPL-M (11071) within the Mountain Creek Assessment Unit (0838_02). Where relevant data were available, this was compared to the geomean or average presented in the 2014, 2016, 2018 and 2020 Texas Integrated Report assessment results for the Trinity River (TCEQ 2015, 2019a, 2019b, 2020).

4.2.1 E. coli

Table 4-4. Summary of E. coli measurements in the Joe Pool Lake Watershed June 2019 – April 2020. contains all the *E. coli* measurements collected as part of this project. The TCEQ Standard for *E.coli* is equivalent in both streams and lakes. Geomeans in red signify that the water quality criterion (126 MPN/100 mL) has been exceeded at that site for data taken over the duration of the project. The overall Mountain Creek watershed geomean is 100.25 MPN/100 mL. The overall Walnut Creek geomean is 537.74 MPN/100 mL. The overall Joe Pool Lake geomean is 4.94 MPN/100 mL. The geomean for the entire Joe Pool Lake watershed is 59.17 mpn/100mL.

The Walnut Creek Assessment Unit (0838C_01) geomean for data at all Walnut Creek main stem sites was then calculated for comparison to the geomean calculated for the 2014, 2016, 2018 and 2020 Texas Integrated Report assessment results for the Trinity River (TCEQ 2015, 2019a, 2019b, 2020). The results are in Table 4-4. Summary of E. coli measurements in the Joe Pool Lake Watershed June 2019 – April 2020. .

Table 4-4. Summary of E. coli measurements in the Joe Pool Lake Watershed June 2019 – April 2020.

Site	MC-HT	MC-B	MC-A	MC-C	MC-D	MC-E	MC-FT	MC-GT	WC-ET	WC-A	WC-B	WC-C	WC-D	WC-FT	WC-GT	JPL-W	JPL-D	I-1	I-2	JPL-M
TCEQ #	22138	13622	16434	22134	16433	22135	22136	22137	22132	22131	20790	21990	13621	22133	17198	11072	11073	22139	22140	11071
E. coli (MPN/ 100 mL)	150	210	240	410	180	87	100	4		6500	12000	13000	14000	430	1500	4	4	4	8	4
	12000	15	2	24	84	35	290	270	63	280	130	100	26	7900	9700	2	2	2	2	2
	1100	15	2	37	4	2	480	4400	7900	85	290	500	20	12000	37000	4	2	2	2	2
		4	2	56		8			1100		63	75	16			2	4	2	2	2
		140		110		30						1600	320			2	2	8	2	2
		150	8	34	30	16					30	34	81			4	21	4	4	4
		10	13	40	57	25					8	170	8			8	29	12	6	15
		440	80	270	130	270				120	80	1200	840			4	16	4	4	12
		70	48	39	21	43				30	74	140	25			2	51	24	15	2
		12000	12000	2200	430					6000	6000	5600	5200			6	6	13	29	42
		220	620	440	110	400				240	730	730	2200			8	4	4	4	8
		400	450	3300	1400	5200				1200	12000	9200	24000			4	4	8	4	8
	Site Geomeans																			
	1256	*102*	*47*	*147*	*85*	*55*	*241*	*168*	*818*	*420*	*305*	*614*	*268*	*3442*	*8135*	*4*	*7*	*5*	*5*	*5*
	MC Geomean							100.25	WC Geomean						537.74	JPL Geomean				4.94

**note: TCEQ Standard for E. coli is 126 MPN/100 mL. Values in red exceed the standard.*

Table 4-5. Walnut Creek Assessment Unit E.coli geomean compared to 2014, 2016, 2018 and 2020 Texas Integrated Report.

WC-A	WC-B	WC-C	WC-D	Site
22131	20790	21990	13621	TCEQ #
6500	12000	13000	14000	*E. coli* (MPN/ 100 mL)
280	130	100	26	
85	290	500	20	
	63	75	16	
		1600	320	
	30	34	81	
	8	170	8	
120	80	1200	840	
30	74	140	25	
6000	6000	5600	5200	
240	730	730	2200	
1200	12000	9200	24000	
Walnut Creek AU geomean			379.58	
2014 Texas Integrated Report			195.6	
2016 Texas Integrated Report			126.62	
2018 Texas Integrated Report			94.75	
2020 Texas Integrated Report			96.6	

4.2.2 Total Dissolved Solids

Table 4-6 contains all the Total Dissolved Solids (TDS) measurements collected as part of this project. Averages in red signify that the water quality criterion for streams (300 mg/L) has been exceeded at that site for data taken over the duration of the project. The average for Mountain Creek watershed was 606.91 mg/L. The average for Walnut Creek watershed was 503.96 mg/L. The averages for data taken over the duration of the project within Joe Pool Lake due not exceed the water quality criterion for lakes (500 mg/L).

Table 4-6. Summary of TDS measurements in the Joe Pool Lake Watershed June 2019 – April 2020.

Site	MC-HT	MC-B	MC-A	MC-C	MC-D	MC-E	MC-FT	MC-GT	WC-ET	WC-A	WC-B	WC-C	WC-D	WC-FT	WC-GT	JPL-W	JPL-D	I-1	I-2	JPL-M
TCEQ #	22138	13622	16434	22134	16433	22135	22136	22137	22132	22131	20790	21990	13621	22133	17198	11072	11073	22139	22140	11071
TDS (mg/L)	352	269	358	567	444	430	660	577	359	258	279	267	252	731	562	249	260	262	280	259
	333	720	720	563	519	1014	567	388		834	626	729	870	309	217	242	229	249	255	248
	1001	715	643	605	481	1095	354	388	344	1044	654	552	979	544	285	278	241	254	272	251
		729	796	652		914			768		673	447	738			297	317	317	303	283
		729		666		672						480	286			269	258	270	271	271
		369	638	666	694	751					305	556	316			252	262	251	235	237
		431	594	748	677	602					311	493	436			268	279	278	275	263
		295	442	755	548	439				371	268	452	316			259	255	279	235	154
		617	619	767	589	692				416	504	564	512			240	278	253	270	266
		349	426	599	526	423				299	354	380	310			291	263	283	304	305
		958	684	743	512	645				727	713	652	653			279	282	267	285	303
		1112	743	758	358	366				713	593	479	426			275	274	270	280	287
	Site Average																			
	562	*608*	*606*	*674*	*535*	*670*	*527*	*451*	*490*	*583*	*480*	*504*	*508*	*528*	*355*	*267*	*267*	*269*	*272*	*261*
	MC Average							606.91	WC Average						503.96	JPL Average				267.03

**note: TCEQ Standard for TDS is 300 mg/L for streams and 500 mg/L for lakes. Values in red exceed the standard.*

4.2.3 Nitrogen

Table 4-7 contains all the Nitrate (NO_3) measurements collected as part of this project. Averages in yellow signify that the TCEQ screening level for streams (1.95 mg/L) and for lakes (0.37 mg/L) has been exceeded at that site for data taken over the duration of the project. The average for Mountain Creek watershed is 0.94 mg/L. The average for Walnut Creek watershed is 0.33 mg/L. The average for Joe Pool Lake is 0.20 mg/L. The overall average for data at all Joe Pool Lake watershed sites was calculated to be 0.53 mg/L.

The Mountain Creek Assessment Unit (0838_02) overall average for data at site JPL-M (11071) was then calculated for comparison to the average calculated for the 2014, 2016, 2018, and 2020 Texas Integrated Report assessment results for the Trinity River (TCEQ 2015, 2019a, 2019b, 2020). The results are in Table 4-4. Summary of E. coli measurements in the Joe Pool Lake Watershed June 2019 – April 2020. .

Table 4-7. Summary of NO3 measurements in the Joe Pool Lake Watershed June 2019 – April 2020.

Site	MC-HT	MC-B	MC-A	MC-C	MC-D	MC-E	MC-FT	MC-GT	WC-ET	WC-A	WC-B	WC-C	WC-D	WC-FT	WC-GT	JPL-W	JPL-D	I-1	I-2	JPL-M
TCEQ #	22138	13622	16434	22134	16433	22135	22136	22137	22132	22131	20790	21990	13621	22133	17198	11072	11073	22139	22140	11071
Nitrate (mg/L)	0.3	0.75	0.75	1.29	0.53	0.51	0.1	0.41	<0.05	0.45	0.62	0.67	0.71	0.84	1.18	0.09	0.12	0.15	0.23	0.22
	0.14	<0.05	<0.05	0.29	0.16	1.16	0.6	<0.05		<0.05	<0.05	0.16	<0.05	0.92	0.33	<0.05	<0.05	<0.05	<0.05	<0.05
	<0.05	<0.05	<0.05	0.55	<0.05	1.29	0.54	0.19	0.15	<0.05	<0.05	0.14	<0.05	0.66	0.53	<0.05	<0.05	<0.05	<0.05	<0.05
		<0.05	<0.05	0.67		0.69			<0.05		<0.05	<0.05	<0.05			<0.05	<0.05	<0.05	<0.05	<0.05
		<0.05		2.14		0.36						0.06	0.32			<0.05	<0.05	<0.05	<0.05	<0.05
		1.55	<0.05	4.8	<0.05	0.61					<0.05	<0.05	0.11			<0.05	<0.05	<0.05	<0.05	<0.05
		<0.05	<0.05	<0.05	<0.05	0.48					<0.05	<0.05	0.07			0.05	0.05	0.05	0.06	0.06
		0.64	<0.05	3.35	0.2	0.41				0.42	0.11	0.23	0.36			0.15	0.15	0.15	0.16	0.22
		0.39	<0.05	4.71	0.08	0.56				<0.05	0.28	0.05	<0.05			0.19	0.17	0.19	0.23	0.22
		1.31	0.77	2.57	0.23	0.45				0.09	0.15	0.18	0.2			0.19	0.26	0.3	0.45	0.49
		<0.05	<0.05	2.23	0.41	0.39				<0.05	0.16	0.17	0.17			0.22	0.3	0.31	0.28	0.29
		<0.05	0.08	1.32	0.58	0.58				0.07	0.23	0.25	0.34			0.16	0.22	0.22	0.26	0.24
	Site Average																			
	0.22	*0.93*	*0.53*	*2.17*	*0.31*	*0.62*	*0.41*	*0.30*	*0.15*	*0.26*	*0.26*	*0.21*	*0.29*	*0.81*	*0.68*	*0.15*	*0.18*	*0.20*	*0.24*	*0.25*
	MC Average							0.94	WC Average						0.33	JPL Average				0.20

**note: TCEQ Screening level for nitrate in streams is 1.95 mg/L and 0.37 mg/L in lakes. Values in yellow exceed the screening level.*

Table 4-8. Mountain Creek Assessment Unit (0838_02) NO3 average compared to 2014, 2016, 2018 and 2020 Texas Integrated Report.

	JPL-M	Site
	11071	TCEQ #
	0.22	Nitrate (mg/L)
	<0.05	
	<0.05	
	<0.05	
	<0.05	
	<0.05	
	0.06	
	0.22	
	0.22	
	0.49	
	0.29	
	0.24	
Mountain Creek AU average	0.25	
2014 Texas Integrated Report	0.74	
2016 Texas Integrated Report	1.52	
2018 Texas Integrated Report	n/a	
2020 Texas Integrated Report	n/a	

Table 4-9 contains all the Nitrite (NO_2) measurements collected as part of this project. Literature values from Utah State Water Quality Extension for NO_2 in polluted waters is 0.02 mg/L. However, the limit of quantitation for NO_2 is 0.05 mg/L. Values in yellow exceed the limit of quantitation and thus the screening level. For the purposes of this analysis, none of the measurements that fell below the limit of quantitation were considered to be exceedances of the screening level. Due to the amount of non-detects, no averages for the Joe Pool Lake Watershed overall could be generated.

Table 4-9. Summary of nitrite measurements in the Joe Pool Lake Watershed June 2019 – April 2020.

Site	MC-HT	MC-B	MC-A	MC-C	MC-D	MC-E	MC-FT	MC-GT	WC-ET	WC-A	WC-B	WC-C	WC-D	WC-FT	WC-GT	JPL-W	JPL-D	I-1	I-2	JPL-M
TCEQ #	22138	13622	16434	22134	16433	22135	22136	22137	22132	22131	20790	21990	13621	22133	17198	11072	11073	22139	22140	11071
Nitrite (mg/L)	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.05	< 0.05	< 0.05		<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	<0.05	<0.05	<0.05	0.07	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	<0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
	< 0.05	<0.05	<0.1	0.07		< 0.05			< 0.05		< 0.05	< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		<0.05		0.14		< 0.05						< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		0.08	<0.05	0.2	<0.05	< 0.05					< 0.05	< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		<0.05	<0.05	0.08	<0.05	< 0.05					< 0.05	< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		<0.05	<0.05	0.08	<0.05	< 0.05				<0.05	< 0.05	< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		<0.05	<0.05	0.08	<0.05	< 0.05				<0.05	< 0.05	< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		0.1	0.07	0.07	<0.05	< 0.05				<0.05	< 0.05	< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		<0.05	<0.05	<0.05	<0.05	< 0.05				<0.05	< 0.05	< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		<0.05	<0.05	<0.05	<0.05	< 0.05				<0.05	< 0.05	< 0.05	< 0.05			< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

**note: Literature values from Utah State Water Quality Extension for nitrite in polluted waters is 0.02 mg/L. However, the limit of quantitation for nitrite is 0.05 mg/L. Values in yellow exceed the limit of quantitation and thus the screening level. Due to the limited dataset, no averages could be generated.*

Table 4-10 contains all the total Kjehdahl nitrogen (TKN) measurements collected as part of this project. Averages in yellow signify that the EPA Reference Criteria (0.4 mg/L) for streams and (0.41 mg/L) for lakes in this ecoregion (Ecoregion 29) has been exceeded at that site for data taken over the duration of the project. This point of reference differs significantly from both a water quality criteria (as is used with *E. coli* and TDS) and from TCEQ screening levels (NO_3, TP, OP) in that it does not indicate a cause for concern, but rather is a reference to TKN levels found in healthy, functioning streams in the region (USEPA 2000b). For that reason, several more yellow averages for each site appear in the dataset.

The average for Mountain Creek watershed is 0.67 mg/L. The average for Walnut Creek watershed is 0.68 mg/L. The average for Joe Pool Lake is 0.38 mg/L. The overall average for data at all Joe Pool Lake watershed sites was calculated to be 0.57 mg/L.

Table 4-10. Summary of TKN measurements in the Joe Pool Lake Watershed June 2019 – April 2020.

Site	MC-HT	MC-B	MC-A	MC-C	MC-D	MC-E	MC-FT	MC-GT	WC-ET	WC-A	WC-B	WC-C	WC-D	WC-FT	WC-GT	JPL-W	JPL-D	I-1	I-2	JPL-M
TCEQ #	22138	13622	16434	22134	16433	22135	22136	22137	22132	22131	20790	21990	13621	22133	17198	11072	11073	22139	22140	11071
Total Kjeldahl Nitrogen (mg/L)	0.55	0.8	0.64	1.1	<0.2	0.52	<0.2	0.22	0.24	1.24	1.54	1.77	2.19	<0.2	0.35	0.5	0.49	0.4	0.26	0.48
	1.01	0.44	0.44	1.29	<0.2	<0.2	0.23	0.38		<0.2	0.39	0.32	0.37	1.1	0.64	0.47	0.41	0.43	0.46	0.52
	0.38	<0.2	0.4	0.85	<0.2	<0.2	0.4	0.34	1	0.21	0.22	0.43	0.34	1.29	2.16	0.34	0.34	0.21	0.35	0.29
		0.29	0.42	1.74		0.33			0.29		0.32	0.56	0.24			0.4	<0.2	0.28	0.26	0.2
		0.43		1.52		0.46						0.83	0.57			0.48	0.52	0.45	0.51	0.52
		0.28	0.54	1.17	<0.2	0.32					0.63	0.37	0.75			0.23	0.32	0.34	0.32	0.39
		0.46	0.39	1.24	<0.2	0.24					0.95	0.29	0.27			0.41	0.42	0.34	0.33	0.37
		0.59	0.34	0.77	<0.2	0.47				0.29	0.71	0.38	0.34			0.38	0.33	0.45	0.4	0.42
		0.76	0.49	1.58	<0.2	0.22				0.26	0.53	0.27	0.37			0.27	0.29	0.49	0.34	0.42
		1.35	1.04	1.12	0.27	0.64				0.85	1.2	1.19	1.22			0.44	0.34	0.34	0.52	<0.2
		0.49	0.62	0.81	<0.2	0.28				0.3	0.33	0.59	0.34			<0.2	<0.2	<0.2	<0.2	<0.2
		0.31	0.57	2.35	0.4	0.98				0.25	0.81	0.79	0.94			0.42	0.33	0.28	0.3	0.32
	Site Average																			
	0.65	*0.56*	*0.54*	*1.30*	*0.34*	*0.45*	*0.32*	*0.31*	*0.51*	*0.49*	*0.69*	*0.65*	*0.66*	*1.20*	*1.05*	*0.39*	*0.38*	*0.36*	*0.37*	*0.39*
	MC Average							0.67	WC Average						0.68	JPL Average				0.38

**note: EPA reference criteria for TKN in pristine streams is 0.4 mg/L and pristine Lake/Reservoirs is 0.41 mg/L. Values in yellow indicate that this condition is not being met.*

4.2.4 Phosphorus

Table 4-11 contains all the Total Phosphorus (TP) measurements collected as part of this project. None of the site averages exceeded the TCEQ screening level (0.69 mg/L) for streams nor the (0.20 mg/L) for lakes over the duration of the project. The average for Mountain Creek watershed is 0.15 mg/L. The average for Walnut Creek watershed is 0.17 mg/L. The average for Joe Pool Lake is 0.03 mg/L. The overall average for data at all Joe Pool Lake watershed sites was calculated to be 0.12 mg/L.

Table 4-11. Summary of total phosphorus measurements in the Joe Pool Lake Watershed June 2019 – April 2020.

Site	MC-HT	MC-B	MC-A	MC-C	MC-D	MC-E	MC-FT	MC-GT	WC-ET	WC-A	WC-B	WC-C	WC-D	WC-FT	WC-GT	JPL-W	JPL-D	I-1	I-2	JPL-M
TCEQ #	22138	13622	16434	22134	16433	22135	22136	22137	22132	22131	20790	21990	13621	22133	17198	11072	11073	22139	22140	11071
Total Phosphorus (mg/L)	0.07	0.15	0.14	0.23	<0.02	0.04	<0.02	0.18	0.09	0.38	0.57	0.65	0.98	0.04	0.08	0.02	<0.02	0.02	0.03	0.03
	0.179	0.04	0.03	0.18	<0.02	<0.02	<0.02	0.0321		0.03	0.05	0.04	0.06	0.18	0.13	0.03	<0.02	<0.02	0.03	0.03
	0.0331	0.04	0.05	0.3	0.02	<0.02	0.0764	0.129	0.39	0.06	0.07	0.09	0.05	0.16	0.43	0.03	0.02	0.02	0.03	0.04
		0.03	0.03	0.36		<0.02			0.0601		0.21	0.23	0.04			0.03	<0.02	<0.02	0.04	0.04
		0.03		0.61		0.02						0.19	0.08			0.03	0.03	0.02	0.03	0.02
		0.19	0.12	0.58	0.03	0.03					0.29	0.15	0.08			0.03	0.03	0.02	0.04	0.03
		0.11	0.04	0.36	<0.02	<0.02					0.34	0.07	0.06			0.03	0.03	0.03	0.03	0.03
		0.17	0.07	0.3	<0.02	0.05				0.06	0.21	0.11	0.07			0.03	0.02	0.02	0.03	0.03
		0.09	0.06	0.41	<0.02	0.02				0.05	0.1	0.06	0.04			0.03	0.02	0.03	0.03	0.04
		0.2	0.19	0.25	<0.02	0.0761				0.16	0.23	0.18	0.23			0.03	0.02	0.03	0.05	0.05
		0.0434	0.063	0.244	<0.02	0.033				0.0425	0.0767	0.0856	0.0678			0.0309	0.0211	0.0259	0.0335	0.0317
		0.0438	0.099	0.858	0.0943	0.271				0.0667	0.264	0.167	0.193			0.0229	<0.02	<0.02	0.0212	0.0313
	Site Average																			
	0.09	*0.09*	*0.08*	*0.39*	*0.05*	*0.07*	*0.08*	*0.11*	*0.18*	*0.11*	*0.22*	*0.17*	*0.16*	*0.13*	*0.21*	*0.03*	*0.02*	*0.02*	*0.03*	*0.03*
	MC Average							0.15	WC Average						0.17	JPL Average				0.03

**note: TCEQ screening level for TP in streams is 0.69 mg/L and in lakes is 0.20 mg/L. Values in yellow exceed the screening level.*

Table 4-12 contains all the orthophosphate (OP) measurements collected as part of this project. OP is no longer used for TCEQ screening purposes, as of the 2014 Texas Integrated Report (TCEQ 2015). Averages in yellow signify that the previously-used TCEQ screening level for streams (0.37 mg/L) and (0.05 mg/L) for lakes has been exceeded at that site for data taken over the duration of the project. The average for Mountain Creek watershed is 0.10 mg/L. The average for Walnut Creek watershed is 0.07 mg/L. The average for Joe Pool Lake is <0.02 mg/L. The overall average for data at all Joe Pool Lake watershed sites was calculated to be 0.08 mg/L.

Table 4-12. Summary of orthophosphate measurements in the Joe Pool Lake Watershed June 2019 – April 2020.

Site	MC-HT	MC-B	MC-A	MC-C	MC-D	MC-E	MC-FT	MC-GT	WC-ET	WC-A	WC-B	WC-C	WC-D	WC-FT	WC-GT	JPL-W	JPL-D	I-1	I-2	JPL-M
TCEQ #	22138	13622	16434	22134	16433	22135	22136	22137	22132	22131	20790	21990	13621	22133	17198	11072	11073	22139	22140	11071
Orthophosphate (mg/L)	0.04	0.09	0.06	0.03	<0.02	<0.02	<0.02	0.02	0.04	0.11	0.1	0.09	0.09	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02
	0.07	<0.02	<0.02	0.05	<0.02	<0.02	<0.02	<0.02		<0.02	<0.02	0.02	<0.02	0.07	0.05	<0.02	<0.02	<0.02	<0.02	<0.02
	<0.02	<0.02	<0.02	0.09	<0.02	<0.02	<0.02	0.03	0.17	<0.02	<0.02	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
		<0.02	<0.02	0.1		<0.02			<0.02		<0.02	0.09	<0.02			<0.02	<0.02	<0.02	<0.02	<0.02
		<0.02		0.23		<0.02						0.06	0.04			<0.02	<0.02	<0.02	<0.02	<0.02
		0.13	0.06	0.38	<0.02	<0.02					0.12	0.08	<0.02			<0.02	<0.02	<0.02	<0.02	<0.02
		<0.02	<0.02	0.25	<0.02	<0.02					0.09	<0.02	<0.02			<0.02	<0.02	<0.02	<0.02	<0.02
		0.07	<0.02	0.1	<0.02	<0.02				0.03	0.11	0.03	0.02			<0.02	<0.02	<0.02	<0.02	<0.02
		0.03	0.02	0.14	<0.02	<0.02				0.04	0.03	<0.02	<0.02			<0.02	<0.02	<0.02	<0.02	<0.02
		0.08	0.07	0.1	<0.02	<0.02				0.07	0.1	0.09	0.09			<0.02	<0.02	<0.02	<0.02	<0.02
		<0.02	<0.02	0.1	<0.02	<0.02				0.03	0.03	<0.02	<0.02			<0.02	<0.02	<0.02	<0.02	<0.02
		<0.02	<0.02	<0.02	<0.02	<0.02				0.03	<0.02	<0.02	<0.02			<0.02	<0.02	<0.02	<0.02	<0.02
	Site Average																			
	0.06	*0.08*	*0.05*	*0.14*	*#DIV/0!*	*#DIV/0!*	*#DIV/0!*	*0.03*	*0.11*	*0.05*	*0.08*	*0.06*	*0.06*	*0.07*	*0.04*	*#DIV/0!*	*#DIV/0!*	*#DIV/0!*	*#DIV/0!*	*#DIV/0!*
	MC Average							0.10	WC Average						0.07	JPL Average				#DIV/0!

**note: TCEQ screening level previously used for orthophosphate is 0.37 mg/L for streams and 0.05 mg/L for lakes. Values in yellow exceed the screening level.*

4.2.5 Chlorophyll-a

Table 4-13 contains all the chl-a measurements collected as part of this project. Averages in yellow signify that the TCEQ screening level (14.1 µg/L) for streams and (26.7 µg/L) for lakes has been exceeded at that site for data taken over the duration of the project. The average for Mountain Creek watershed is 18.97 µg/L. The average for Walnut Creek watershed is 10.85 µg/L. The average for Joe Pool Lake is 11.67 mg/L. The overall average for data at all Joe Pool Lake watershed sites is 13.51 µg/L.

Table 4-13. Summary of chlorophyll a measurements in Joe Pool Lake Watershed June 2019 – April 2020.

Site	MC-HT	MC-B	MC-A	MC-C	MC-D	MC-E	MC-FT	MC-GT	WC-ET	WC-A	WC-B	WC-C	WC-D	WC-FT	WC-GT	JPL-W	JPL-D	I-1	I-2	JPL-M
TCEQ #	22138	13622	16434	22134	16433	22135	22136	22137	22132	22131	20790	21990	13621	22133	17198	11072	11073	22139	22140	11071
Chlorophyll a (µg/L	<3	8	<3	38	<3	<3	<3	5	<3	12	15	14	19	<3	<3	17	14	10	14	15
	7	9	4	17	4	<3	<3	<3		5	26	10	17	<3	<3	22	15	14	19	24
	<3	<3	5	14	<3	<3	4	<3	14	3	4	11	9	6	45	14	13	11	14	18
		4	<3	51		<3			<3		9	9	8			18	16	14	11	18
		5		113		5						24	5			21	19	22	18	20
		5	<3	77	<3	<3					6	<3	<3			14	15	15	14	17
		9	9	26	<3	<3					16	7	<3			4	4	<3	<3	<3
		10	31	13	<3	<3				6	15	3	3			7	4	<3	4	4
		18	15	48	<3	<3				<3	15	9	6			7	5	5	7	5
		6	5	20	<3	<3				7	10	9	6			12	5	<3	10	10
		9	9	25	<3	<3				<3	4	4	5			7	6	8	7	7
		8	10	48	4	23				<3	22	9	7			8	4	5	5	6
	Site Average																			
	7.00	*8.27*	*11.00*	*40.83*	*4.00*	*14.00*	*4.00*	*5.00*	*14.00*	*6.60*	*12.91*	*9.91*	*8.50*	*6.00*	*45.00*	*12.58*	*10.00*	*11.56*	*11.18*	*13.09*
	MC Average							18.97	WC Average						10.85	JPL Average				11.67

**note: TCEQ screening level for chlorophyll a in streams is 14.1 µg/L and 26.7 µg/L in lakes. Values in yellow exceed the screening level.*

4.2.6 Dissolved Oxygen

Table 4-14 contains all the dissolved oxygen measurements collected as part of this project. Yellow signifies that the water quality criterion for minimum DO (3 mg/L) has not been met at that site. The Mountain Creek watershed average is 8.03 mg/L. The Walnut Creek watershed average is 7.34 mg/L. The Joe Pool Lake average is 9.27 mg/L. The overall average for dissolved oxygen data at all Joe Pool Lake watershed sites is 8.25 mg/L.

Table 4-14. Summary of dissolved oxygen measurements in Joe Pool Lake Watershed June 2019 – April 2020.

Site	MC-HT	MC-B	MC-A	MC-C	MC-D	MC-E	MC-FT	MC-GT	WC-ET	WC-A	WC-B	WC-C	WC-D	WC-FT	WC-GT	JPL-W	JPL-D	I-1	I-2	JPL-M
TCEQ #	22138	13622	16434	22134	16433	22135	22136	22137	22132	22131	20790	21990	13621	22133	17198	11072	11073	22139	22140	11071
DO (mg/L)	9.6	4.6	6.3	7.8	8.0	7.0	10.6	8.4	6.3	7.4	7.3	7.0	7.4	10.9	10.7	9.2	9.0	8.4	8.1	8.9
	8.5	4.5	6.3	4.9	8.2	4.6	9.3	8.6	5.3	5.7	4.3	5.0	6.0	10.1	9.7	8.7	8.4	8.8	8.6	8.9
	8.2	5.4	6.2	5.0	2.5	8.4	8.5	7.2	9.6	4.6	4.4	2.4	6.0	7.9	7.5	7.7	8.1	8.6	7.2	6.7
		5.7	6.8	6.5		7.2			4.8		4.2		5.7			6.6	8.0	8.4	7.1	6.4
		5.1		8.4		8.7						12.8	4.2			9.0	7.9	8.4	9.8	9.7
		4.6	4.2	11.5	8.4	6.7					5.3	0.5	6.5			10.0	9.8	9.4	10.6	10.5
		6.5	9.0	11.5	11.1	10.9					2.7	5.2	8.9			9.8	9.5	9.8	10.3	10.4
		5.4	10.5	11.1	11.8	10.5				10.7	9.0	9.6	10.4			10.4	10.3	10.0	10.5	10.0
		8.4	8.8	9.6	11.3	10.4				8.8	9.4	9.8	11.2			10.6	10.5	10.6	10.9	10.8
		8.2	9.0	9.0	10.0	8.3				8.8	8.6	8.8	9.1			11.2	11.0	10.9	10.8	10.8
		6.9	9.0	9.2	11.2	9.8				9.4	8.6	7.5	9.3			9.0	9.0	8.8	9.2	9.1
		8.2	8.0	7.7	8.6	7.7				5.9	6.4	6.8	7.1			9.8	9.1	9.0	9.0	8.6
	Site Average																			
	9	*6*	*8*	*9*	*9*	*8*	*9*	*8*	*7*	*8*	*6*	*7*	*8*	*10*	*9*	*9*	*9*	*9*	*9*	*9*
	MC Average							8.03	WC Average						7.34	JPL Average				9.28

**note: TCEQ Standard for DO 24 hr min is 3 mg/L for streams. Values in yellow are below the standard.*

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Appendix A

Analytical and Field Data for Stations in
AUs 0838 and 0838A-F

Appendix A: Raw Data for Stations in AUs 0838 and 0838A-F

Table A. Color Codes for Appendix A

Verified Outlier
Parameter not in QAPP
Error - Out of hold time
Error - Failed LCS Recovery
Error - Failed LOQ

Station	Date	Time	Depth	TEMPERATURE, WATER (DEGREES CENTIGRADE) 00010	TEMPERATURE, AIR (DEGREES CENTIGRADE) 00020	FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC) 00061	TRANSPARENCY, SECCHI DISC (METERS) 00078	SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C) 00094	OXYGEN, DISSOLVED (MG/L) 00300	PH (STANDARD UNITS) 00400	RESIDUE, TOTAL NONFILTRABLE (MG/L) 00530	RESIDUE, VOLATILE NONFILTRABLE (MG/L) 00535	NITRITE NITROGEN, TOTAL (MG/L AS N) 00615	NITRATE NITROGEN, TOTAL (MG/L AS N) 00620	NITROGEN, KJELDAHL, TOTAL (MG/L AS N) 00625	PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P) 00665	FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood, 5=High,6=Dry 01351	E. COLI, COLILERT, IDEXX METHOD, MPN/100ML 31699	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH 32211	RESIDUE,TOTAL FILTRABLE (DRIED AT 180C) (MG/L) 70300	ORTHOPHOSPHATE PHOSPHORUS,DISS,MG/L,FILTER >15MIN 70507	DAYS SINCE PRECIPITATION EVENT (DAYS) 72053	Field Turbidity NTU 82078	DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE 82903	FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER 89835	Blue Green Algae RFU BGA RFU	Total Chlorophyll RFU Chlor RFU	RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL) 00052	RESERVOIR PERCENT FULL 00053
22131	06/24/2019	10:55	0.1	24.1	25.0	45	0.06	347	7.4	7.5	115	16	<0.05	0.45	1.24	0.38	3	6500	12	258	0.11	3	58.4	0.3	2	0.36	1.025		
20790	06/24/2019	12:45	0.3	24.2	27.0	90	0.55	341	7.3	6.1	253	29	<0.05	0.62	1.54	0.57	5	12000	15	279	0.1	3	50		5	0.47	1		
21990	06/24/2019	13:59	0.3	24.2	27.0	85	0.04	338	7.0	7.5	372	47	<0.05	0.67	1.77	0.65	5	13000	14	267	0.09	3	92		5	0.5	0.93		
13621	06/24/2019	14:34	0.3	25.1	29.0	115	0.04	354	7.4	6.7	438	54	<0.05	0.71	2.19	0.98	5	14000	19	252	0.09	3			1	0.57	0.95		
16434	06/26/2019	12:00	0.08	25.6	29.0	6.9	0.16	549	6.3	7.4	31	<5	<0.05	0.75	0.64	0.14	3	240	<3	358	0.06	5	18.4		2	0.12	0.74		
13622	06/26/2019	11:20	0.3	25.4	29.0	2	0.28	464	4.6	6.6	12	3	<0.05	0.75	0.8	0.15	3	210	8	269	0.09	5	11.2		1	0.15	0.75		
22134	06/25/2019	12:11	0.3	27.3	29.0	45	0.07	796	7.8	8.2	112	14	<0.05	1.29	1.1	0.23	3	410	38	567	0.03	5	50.2		5	0.68	1.53		
16433	06/26/2019	10:30	0.05	23.7	29.0	1.6	>0.6	690	8.0	8.0	8	<2	<0.05	0.53	<0.2	<0.02	3	180	<3	444	<0.02	5	4.1		2	0	0.11		
22135	06/26/2019	13:52	0.04	26.9	31.0	1.4	0.42	649	7.0	7.6	11	<2	<0.05	0.51	0.52	0.04	3	87	<3	430	<0.02	5	6.4		2	0.07	0.32		
11073	06/25/2019	09:34	0.3	27.9	25.0		0.62	423	9.0	8.1	6	2	<0.05	0.12	0.49	<0.02		4	14	260	<0.02	4	2.75			0.38	0.73	522.63	100.12
11072	06/25/2019	10:02	0.3	27.9	27.0		0.67	425	9.2	8.2	5	2	<0.05	0.09	0.5	0.02		<4	17	249	<0.02	4	2.75			0.46	0.82	522.63	100.12
11071	06/25/2019	11:00	0.3	27.5	29.0		0.34	435	8.9	8.2	10	3	<0.05	0.22	0.48	0.03		<4	15	259	<0.02	4	5.7			0.45	0.85	522.63	100.12
22139	06/25/2019	12:59	0.3	28.8	31.0		0.46	427	8.4	8.2	10	2	<0.05	0.15	0.4	0.02		4	10	262	<0.02	4	4.83			0.25	0.36	522.63	100.12
22140	06/25/2019	10:38	0.3	27.1	28.0		0.33	437	8.1	7.9	13	<3	<0.05	0.23	0.26	0.03		8	14	280	<0.02	4	6.84			0.36	0.75	522.63	100.12
22131	07/23/2019	10:22	0.03	25.2	28.0	0.01	>0.6	1240	5.7	7.3	5	<2	<0.05	<0.05	<0.2	0.03	3	280	5	834	<0.02	12	2.35		2	0.06	0.55		
20790	07/23/2019	11:02	0.3	28.0	29.0	0	0.42	991	4.3	7.3	16	<5	<0.05	<0.05	0.39	0.05	1	130	26	626	<0.02	12	5.92			0.5	3.17		
21990	07/23/2019	11:43	0.1	26.0	29.0	0.2	0.59	1140	5.0	7.4	6	<2	<0.05	0.16	0.32	0.04	2	100	10	729	0.02	12	3.58	0.3	2	0.23	1.37		
13621	07/23/2019	13:29	0.3	28.2	31.0	9.6	0.28	1300	6.0	7.5	23	<7	<0.05	<0.05	0.37	0.06	3	26	17	870	<0.02	12	11.4		1	0.75	5.08		
16434	07/24/2019	10:05	0.04	24.9	25.0	0.03	0.51	1050	6.3	7.6	8	<2	<0.05	<0.05	0.44	0.03	2	2	4	720	<0.02	13	4.6	0.12	2	0.021	0.408		
13622	07/24/2019	09:26	0.3	26.7	22.0	0.04	0.47	1030	4.5	7.4	12	<3	<0.05	<0.05	0.44	0.04	3	15	9	720	<0.02	13	5.24		1	0.283	0.982		
22134	07/22/2019	12:51	0.1	30.7	34.0	0.4	0.11	907	4.9	8.1	65	<7	<0.05	0.29	1.29	0.18	3	24	17	563	0.05	11	35.3	0.3	2	0.46	0.57		
16433	07/24/2019	11:05	0.1	24.2	25.0	0.2	>0.6	772	8.2	7.7	2	<2	<0.05	0.16	<0.2	<0.02	3	84	4	519	<0.02	13	6.32	0.3	2	0.104	0.958		
22135	07/23/2019	14:09	0.02	25.8	32.0	0.07	>0.6	1380	4.6	6.9	11	2	<0.05	1.16	<0.2	<0.02	3	35	<3	1014	<0.02	12	1.61	0.06	2	0	0.1		
11073	07/22/2019	10:28	0.3	30.1	31.0		0.75	422	8.4	8.4	6	3	<0.05	<0.05	0.41	<0.02		2	15	229	<0.02	11	3.38			0.58	0.9	521.57	99.91
11072	07/22/2019	11:01	0.3	29.8	32.0		0.51	427	8.7	8.5	11	4	<0.05	<0.05	0.47	0.03		<2	22	242	<0.02	11	5.4			0.89	1.33	521.57	99.91
11071	07/22/2019	11:52	0.3	29.9	33.0		0.34	435	8.9	8.5	16	5	<0.05	<0.05	0.52	0.03		2	24	248	<0.02	11	8.94			0.93	1.36	521.57	99.91
22139	07/22/2019	13:40	0.3	31.0	32.0		0.59	421	8.8	8.6	7	3	<0.05	<0.05	0.43	<0.02		2	14	249	<0.02	11	3.47			0.54	0.91	521.57	99.91
22140	07/22/2019	11:38	0.3	30.1	33.0		0.36	434	8.6	8.5	14	4	<0.05	<0.05	0.46	0.03		2	19	255	<0.02	11	8.6			0.76	0.89	521.57	99.91

Station	Date	Time	Depth	TEMPERATURE, WATER (DEGREES CENTIGRADE) 00010	TEMPERATURE, AIR (DEGREES CENTIGRADE) 00020	FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC) 00061	TRANSPARENCY, SECCHI DISC (METERS) 00078	SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C) 00094	OXYGEN, DISSOLVED (MG/L) 00300	PH (STANDARD UNITS) 00400	RESIDUE, TOTAL NONFILTRABLE (MG/L) 00530	RESIDUE, VOLATILE NONFILTRABLE (MG/L) 00535	NITRITE NITROGEN, TOTAL (MG/L AS N) 00615	NITRATE NITROGEN, TOTAL (MG/L AS N) 00620	NITROGEN, KJELDAHL, TOTAL (MG/L AS N) 00625	PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P) 00665	FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood, 5=High,6=Dry 01351	E. COLI, COLILERT, IDEXX METHOD, MPN/100ML 31699	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH 32211	RESIDUE,TOTAL FILTRABLE (DRIED AT 180C) (MG/L) 70300	ORTHOPHOSPHATE PHOSPHORUS,DISS,MG/L,FILTER >15MIN 70507	DAYS SINCE PRECIPITATION EVENT (DAYS) 72053	Field Turbidity NTU 82078	DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE 82903	FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER 89835	Blue Green Algae RFU BGA RFU	Total Chlorophyll RFU Chlor RFU	MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS) 89864	MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS) 89865	POOL LENGTH, METERS 89869	% POOL COVERAGE IN 500 METER REACH 89870	RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL) 00052	RESERVOIR PERCENT FULL 00053
22131	08/19/2019	09:54	0.3	26.5	28.0	0	0.4	1500	4.6	6.8	20	<3	<0.05	<0.05	0.21	0.06	1	85	3	1044	<0.02	4	6.33			0.12	0.748	12	0.4	45	9		
20790	08/19/2019	11:05	0.3	28.5	32.0	0	0.2	986	4.4	7.6	26	<5	<0.05	<0.05	0.22	0.07	1	290	4	654	<0.02	4	14.9			0.221	0.732	10	1.5	140	28		
21990	08/19/2019	12:05	0.3	28.0	32.0	0.04	>0.6	898	2.4	7.3	8	<2	<0.05	0.14	0.43	0.09	2	500	11	552	0.04	4	6.03	0.9	2	0.362	1.139						
13621	08/19/2019	13:00	0.13	30.2	32.0	0.3	>0.6	1430	6.0	7.5	12	<2	<0.05	<0.05	0.34	0.05	2	20	9	979	<0.02	4	2.78	0.2	1	0.921	0.714						
16434	08/20/2019	10:50	0.05	28.1	32.0	0	0.55	1060	6.2	7.6	24	<2	<0.05	<0.05	0.4	0.05	1	<2	5	643	<0.02	5	5.02	0.53		0	0.306	2.8	0.53	90	80		
13622	08/20/2019	13:10	0.3	29.1	41.0	0	0.53	1040	5.4	7.5	8	<2	<0.05	<0.05	<0.2	0.04	1	15	<3	715	<0.02	5	3.44		1	0.105	0.435	16	1.5	500	100		
22134	08/20/2019	11:47	0.25	30.4	38.0	1.1	0.09		5.0	7.8	112	<20	0.07	0.55	0.85	0.3	3	37	14	605	0.09	5	48.5	0.85	2	0.618	0.584						
16433	08/20/2019	09:50	0.15	26.1	32.0	0	0.55	721	2.5	7.1	9	<2	<0.05	<0.05	<0.2	0.02	1	4	<3	481	<0.02	5	3.31	0.24		0.005	0.192	4.9	0.46	12			
22135	08/20/2019	14:02	0.05	29.0	38.0	0.05	>0.6	1540	8.4	7.0	3	<2	<0.05	1.29	<0.2	<0.02	2	2	<3	1095	<0.02	5	1.23	0.25	2	0	0.284						
11073	08/19/2019	10:44	0.3	30.8	32.0		0.66	412	8.1	8.4	5	<2	<0.05	<0.05	0.34	0.02		<2	13	241	<0.02	4	2.65			0.3	0.62					520.79	99.76
11072	08/19/2019	11:41	0.3	30.6	34.0		0.56	414	7.7	8.2	6	3	<0.05	<0.05	0.34	0.03		4	14	278	<0.02	4	2.65			0.48	0.87					520.79	99.76
11071	08/19/2019	13:09	0.3	30.2	36.0		0.42	433	6.7	8.0	10	<3	<0.05	<0.05	0.29	0.04		2	18	251	<0.02	4	5.94			0.47	0.88					520.79	99.76
22139	08/19/2019	14:00	0.3	31.7	37.0		0.52	414	8.6	8.4	8	<2	<0.05	<0.05	0.21	0.02		<2	11	254	<0.02	4	3.51			0.17	0.35					520.79	99.76
22140	08/19/2019	12:49	0.3	30.4	36.0		0.37	433	7.2	8.1	10	<4	<0.05	<0.05	0.35	0.03		2	14	272	<0.02	4	5.83			0.4	0.72					520.79	99.76
22131	09/09/2019	10:00	0		28.0												6					9											
20790	09/09/2019	10:33	0.1	24.6	28.0	0	0.14	952	4.2	7.5	84	<14	<0.05	<0.05	0.32	0.21	1	63	9	673	<0.02	9	19.6	0.3		0.542	2.26	12	0.55	56	25		
21990	09/09/2019	11:05	0.1	25.4	29.0	0.2	0.22	681		7.3	18	<4	<0.05	<0.05	0.56	0.23	2	75	9	447	0.09	9	14.9	0.3	2	0.242	0.73						
13621	09/09/2019	11:42	0.3	27.1	29.0	5.9	0.38	1050	5.7	7.4	11	<4	<0.05	<0.05	0.24	0.04	2	16	8	738	<0.02	9	6.25		1	0.249	1.177						
16434	09/11/2019	11:20	0.1	25.3	28.0	0	>0.6	1070	6.8	7.7	6	<2	<0.1	<0.05	0.42	0.03	1	2	<3	796	<0.02	11	3.69	0.3		0.167	0.78	10	0.3	84	70		
13622	09/11/2019	10:10	0.3	27.5	27.0	0	0.48	1030	5.7	7.6	9	<2	<0.05	<0.05	0.29	0.03	1	4	4	729	<0.02	11	7.19		1	0.134	0.501			500	100		
22134	09/11/2019	11:59	0.1	27.4	29.0	1.4	0.05	932	6.5	8.1	124	<20	0.07	0.67	1.74	0.36	2	56	51	652	0.1	11	67.4	0.3	2	2.735	0.759						
16433	09/11/2019	13:51	0		33.0												6					11											
22135	09/09/2019	12:07	0.066	27.6	31.0	0.1	>0.6	1300	7.2	7.1	12	2	<0.05	0.69	0.33	<0.02	2	8	<3	914	<0.02	9	0.56	0.2	2	0.206	0.328						
11073	09/10/2019	11:15	0.3	29.3	32.0		0.75	414	8.0	8.3	4	2	<0.05	<0.05	<0.2	<0.02		4	16	317	<0.02	10	3.92			0.63	0.82					520.13	99.64
11072	09/10/2019	11:43	0.3	28.8	32.0		0.42	422	6.6	7.9	9	<4	<0.05	<0.05	0.4	0.03		<2	18	297	<0.02	10	6.05			1.11	1.02					520.13	99.64
11071	09/10/2019	12:38	0.3	28.3	33.0		0.28	429	6.4	7.8	15	<3	<0.05	<0.05	0.2	0.04		<2	18	283	<0.02	10	8.65			1.13	1.26					520.13	99.64
22139	09/10/2019	13:05	0.3	29.8	38.0		0.76	414	8.4	8.3	8	<3	<0.05	<0.05	0.28	<0.02		2	14	317	<0.02	10	3.6			0.8	1					520.13	99.64
22140	09/10/2019	12:18	0.3	28.7	33.0		0.32	427	7.1	7.8	17	<5	<0.05	<0.05	0.26	0.04		2	11	303	<0.02	10	8.68			1.06	1.24					520.13	99.64
22131	10/15/2019	10:47	0		26.0												6					3											
20790	10/15/2019	11:00	0		24.0												6					3											
21990	10/15/2019	11:26	0.03	19.0	24.0	0.9	0.31	700	12.8	7.2	22	6	<0.05	0.06	0.83	0.19	2	1600	24	480	0.06	3	17.6	0.1	2	0.46	2						
13621	10/15/2019	11:59	0.3	19.2	24.0	0.5	>0.6	487	4.2	7.0	6	<2	<0.05	0.32	0.57	0.08	2	320	5	286	0.04	3	7.34		1	0.13	0.75						
16434	10/16/2019	11:01	0		16.0												6					4											
13622	10/16/2019	10:25	0.3	19.0	15.0	0	0.36	1050	5.1	7.1	14	<3	<0.05	<0.05	0.43	0.03	1	140	5	729	<0.02	4	8.26		1	0.17	0.78	20	1	500	100		
22134	10/16/2019	11:39	0.05	18.4	16.0	2.2	0.07	1000	8.4	8.3	132	<22	0.14	2.14	1.52	0.61	2	110	113	666	0.23	4	66	0.15	2	4.49	0.9						
16433	10/16/2019	13:25	0		18.0												6					4											
22135	10/16/2019	14:15	0.05	20.8	21.0	0.2	>0.6	992	8.7	7.1	4	<2	<0.05	0.36	0.46	0.02	2	30	5	672	<0.02	4	2.16	0.15	2	0.05	0.36						
11073	10/14/2019	11:49	0.3	23.1	22.0		0.39	423	7.9	7.9	8	<3	<0.05	<0.05	0.52	0.03		<2	19	258	<0.02	2				1.26	1.32					519.13	99.45
11072	10/14/2019	12:28	0.3	22.9	23.0		0.46	421	9.0	8.3	8	<3	<0.05	<0.05	0.48	0.03		2	21	269	<0.02	3				1.31	1.58					519.13	99.45
11071	10/14/2019	13:23	0.3	22.0	24.0		0.43	419	9.7	8.4	8	<3	<0.05	<0.05	0.52	0.02		2	20	271	<0.02	2				1.11	1.35					519.13	99.45
22139	10/14/2019	13:50	0.3	25.0	25.0		0.48	429	8.4	8.0	8	<3	<0.05	<0.05	0.45	0.02		8	22	270	<0.02	2				1.25	1.45					519.13	99.45
22140	10/14/2019	13:02	0.3	22.1	24.0		0.43	424	9.8	8.4	12	4	<0.05	<0.05	0.51	0.03		<2	18	271	<0.02	2				1.03	1.27					519.13	99.45
22131	11/19/2019	09:25	0		13.0												6					11											
20790	11/19/2019	09:48	0.3	6.2	18.0	0	0.3	478	5.3	6.8	22	<10	<0.05	<0.05	0.63	0.29	1	30	6	305	0.12	11	12.7	0.3		0.22	1.04	10	1.2	130	80		
21990	11/19/2019	10:31	0.1	8.9	18.0	0.08	>0.6	862	0.5	7.0	6	<2	<0.05	<0.05	0.37	0.15	2	34	<3	556	0.08	11	3.51	0.3	2	0.35	0.256						
13621	11/11/2019	12:14	0.3	13.4	7.0	1.7	0.59	515	6.5	6.7	12	<3	<0.05	0.11	0.75	0.08	3	81	<3	316	<0.02	3	6.22		1	0.27	1.12						
16434	11/12/2019	11:05	0.1	6.0	1.0	0.1	0.59	937	4.2	7.3	11	<3	<0.05	<0.05	0.54	0.12	3	8	<3	638	0.06	4	7.29	0.3	2	0.2	0.67						
13622	11/12/2019	10:12	0.3	10.2	-1.0	0.03	0.35	582	4.6	6.7	23	<5	0.08	1.55	0.28	0.19	3	150	5	369	0.13	4	11.25		1	0.35	1.24						
22134	11/12/2019	12:12	0.1	6.8	2.0	2.6	0.1	1020	11.5	8.1	60	18	0.2	4.8	1.17	0.58	3	34	77	666	0.38	4	35.9	0.3	2	2.15	0.72						
16433	11/11/2019	14:50	0.02	13.3	3.0	0.2	>0.6	1000	8.4	7.7	8	<2	<0.05	<0.05	<0.2	0.03	3	30	<3	694	<0.02	3	4.05	0.06	2	0.06	0.14						
22135	11/12/2019	13:54	0.03	14.6	4.0	0.2	>0.6	1070	6.7	7.0	5	<2	<0.05	0.61	0.32	0.03	3	16	<3	751	<0.02	4	3.29	0.1	2	0.06	0.16						
11073	11/11/2019	10:14	0.3	16.0	18.0		0.44	418	9.8	7.9	9	<3	<0.05	<0.05	0.32	0.03		21	15	262	<0.02	3	5.61			1	1.35					519.25	99.47
11072	11/14/2019	10:39	0.3	12.7	10.0		0.49	416	10.0	8.0	8	<2	<0.05	<0.05	0.23	0.03		4	14	252	<0.02	6	3.76			8	1.29					519.25	99.47
11071	11/14/2019	11:32	0.3	11.5	12.0		0.43	422	10.5	8.1	11	<3	<0.05	<0.05	0.39	0.03		4	17	237	<0.02	6	6.57			0.81	0.75					519.25	99.47
22139	11/14/2019	09:59	0.3	13.5	9.0		>0.6	424	9.4	7.7	6	<2	<0.05	<0.05	0.34	0.02		4	15	251	<0.02	6	2.39			0.79	1.03					519.25	99.47
22140	11/14/2019	11:58	0.3	11.8	12.0		0.42	423	10.6	8.2	13	<3	<0.05	<0.05	0.32	0.04		<4	14	235	<0.02	6	6.52			0.68	0.6					519.25	99.47

Station	Date	Time	Depth	TEMPERATURE, WATER (DEGREES CENTIGRADE) 00010	TEMPERATURE, AIR (DEGREES CENTIGRADE) 00020	FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC) 00061	TRANSPARENCY, SECCHI DISC (METERS) 00078	SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C) 00094	OXYGEN, DISSOLVED (MG/L) 00300	PH (STANDARD UNITS) 00400	RESIDUE, TOTAL NONFILTRABLE (MG/L) 00530	RESIDUE, VOLATILE NONFILTRABLE (MG/L) 00535	NITRITE NITROGEN, TOTAL (MG/L AS N) 00615	NITRATE NITROGEN, TOTAL (MG/L AS N) 00620	NITROGEN, KJELDAHL, TOTAL (MG/L AS N) 00625	PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P) 00665	FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry 01351	E. COLI, COLILERT, IDEXX METHOD, MPN/100ML 31699	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH 32211	RESIDUE,TOTAL FILTRABLE (DRIED AT 180C) (MG/L) 70300	ORTHOPHOSPHATE PHOSPHORUS,DISS,MG/L,FILTER >15MIN 70507	DAYS SINCE PRECIPITATION EVENT (DAYS) 72053	Field Turbidity NTU 82078	DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE 82903	FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER 89835	Blue Green Algae RFU BGA RFU	Total Chlorophyll RFU Chlor RFU	MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS) 89864	MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS) 89865	POOL LENGTH, METERS 89869	% POOL COVERAGE IN 500 METER REACH 89870	RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL) 00052	RESERVOIR PERCENT FULL 00053
22131	12/16/2019	08:55	0		3.0												6					6											
20790	12/16/2019	09:22	0.1	7.2	3.0	0.0	0.52	576	2.7	6.5	18	14	<0.05	<0.05	0.95	0.34	1	8	16	311	0.09	6	5.28	1		1.552	3.786						
21990	12/16/2019	09:56	0.1	9.7	5.0	0.2	>0.6	761	5.2	6.9	5	2	<0.05	<0.05	0.29	0.07	3	170	7	493	<0.02	6	4.48	0.3	2	0.578	2.05						
13621	12/16/2019	10:47	0.3	9.5	5.0	1	>0.6	704	8.9	6.6	7	<2	<0.05	0.07	0.27	0.06	3	8	<3	436	<0.02	6	3.48		1	0.36	0.566						
16434	12/17/2019	09:55	0.05	5.6	1.0	0.2	>0.6	650	9.0	7.5	5	<2	<0.05	<0.05	0.39	0.04	3	13	9	594	<0.02	7	7.13	0.15	2	0.83	2.58						
13622	12/17/2019	09:04	0.3	9.1	0.0	0.04	0.55	670	6.5	7.0	10	<3	<0.05	<0.05	0.46	0.11	3	10	9	431	<0.02	7	8.84		1	0.42	1						
22134	12/17/2019	10:42	0.1	6.6	5.0	4.2	0.22	1160	11.5	8.5	26	<5	0.08	<0.05	1.24	0.36	3	40	26	748	0.25	7	14.7	0.3	2	0.55	1.02						
16433	12/17/2019	11:50	0.05	7.2	5.0	0.06	>0.6	985	11.1	7.8	6	<2	<0.05	<0.05	<0.2	<0.02	3	57	<3	677	<0.02	7	5.61	0.15	2	0.33	0.24						
22135	12/16/2019	12:10	0.1	12.3	5.0	0.4	>0.6	918	10.9	7.3	3	<2	<0.05	0.48	0.24	<0.02	3	25	<3	602	<0.02	6	0.63	0.2	2	0.224	0.277						
11073	12/18/2019	10:45	0.3	11.5	9.0		0.42	451	9.5	7.7	8	<2	<0.05	0.05	0.42	0.03		29	4	279	<0.02	8	3.5			0.26	0.32					519.1	99.4
11072	12/18/2019	10:12	0.3	11.0	6.0		0.46	453	9.8	7.8	7	<2	<0.05	0.05	0.41	0.03		8	4	268	<0.02	8	2.68			0.35	0.56					519.1	99.4
11071	12/18/2019	12:20	0.3	10.7	14.0		0.5	458	10.4	7.8	7	<2	<0.05	0.06	0.37	0.03		15	<3	263	<0.02	8	4.66			0.32	0.56					519.1	99.4
22140	12/18/2019	11:55	0.3	11.2	12.0		0.32	457	10.3	7.7	8	<2	<0.05	0.06	0.33	0.03		6	<3	275	<0.02	8	4.11			0.3	0.36					519.1	99.4
22139	12/18/2019	11:20	0.3	11.6	12.0		0.43	452	9.8	7.6	7	<2	<0.05	0.05	0.34	0.03		12	<3	278	<0.02	8	4.11			0.23	0.19					519.1	99.4
22131	01/22/2020	12:15	0.1	7.4	5.6	0.0	>0.6	620	10.7	7.4	5	<2	<0.05	0.42	0.29	0.06	1	120	6	371	0.03	<1	4.61	0.3		0.427	1.206	5.8	0.6	38	70		
20790	01/22/2020	12:55	0.3	7.2	6.1	0.0	0.38	511	9.0	6.5	10	<3	<0.05	0.11	0.71	0.21	1	80	15	268	0.11	<1	16.8			0.668	2.449	15	1	200	90		
21990	01/23/2020	10:18	0.1	8.6	8.0	3.9	0.33	690	9.6	7.6	22	<4	<0.05	0.23	0.38	0.11	3	1200	3	452	0.03	1	14	0.3	2	0.04	0.57						
13621	01/23/2020	11:06	0.3	9.0	8.0	5	0.37	526	10.4	7.3	17	<3	<0.05	0.36	0.34	0.07	3	840	3	316	0.02	1	12.1		1	0.04	0.28						
16434	01/22/2020	13:05	0.1	8.1	5.0	1.6	0.5	762	10.5	7.8	12	4	<0.05	<0.05	0.34	0.07	5	80	31	442	<0.02	<1	9.63	0.3	2	0.248	3.038						
13622	01/22/2020	12:25	0.3	9.0	4.0	0.06	0.17	533	5.4	6.9	28	<7	<0.05	0.64	0.59	0.17	3	440	10	295	0.07	<1	21.4		1	0.121	0.964						
22134	01/23/2020	13:05	0.1	9.8	12.0	13	0.08	1120	11.1	8.2	89	<14	0.08	3.35	0.77	0.3	3	270	13	755	0.1	1	40.1	0.3	2	0.18	0.63						
16433	01/23/2020	14:22	0.03	11.8	14.0	0.4	>0.6	935	11.8	8.1	7	<2	<0.05	0.2	<0.2	<0.02	3	130	<3	548	<0.02	1	1.13	0.1	2	0.01	0						
22135	01/23/2020	11:38	0.1	9.5	9.0	4.6	0.39	717	10.5	7.8	18	<3	<0.05	0.41	0.47	0.05	3	270	<3	439	<0.02	1	9	0.3	2	0.04	0.26						
11073	01/21/2020	10:55	0.3	11.7	12.0		0.92	443	10.3	7.5	4	<2	<0.05	0.15	0.33	0.02		16	4	255	<0.02	4	2.71			0.032	0.27					519.45	99.5
11072	01/21/2020	11:20	0.3	11.8	12.0		0.65	443	10.4	7.4	8	2	<0.05	0.15	0.38	0.03		<4	7	259	<0.02	4	4.53			0.073	0.555					519.45	99.5
11071	01/21/2020	09:48	0.3	11.7	11.0		0.38	471	10.0	7.5	13	<3	<0.05	0.22	0.42	0.03		12	4	154	<0.02	4	6.84			0.052	0.421					519.45	99.5
22139	01/21/2020	10:37	0.3	11.5	10.0		0.84	445	10.0	7.1	5	<2	<0.05	0.15	0.45	0.02		<4	<3	279	<0.02	4	2.3			0.034	0.201					519.45	99.5
22140	01/21/2020	10:12	0.3	11.6	10.0		0.78	450	10.5	7.6	5	<2	<0.05	0.16	0.4	0.03		4	4	235	<0.02	4	3.45			0.049	0.315					519.45	99.5
22132	01/22/2020	11:25	0.03	7.7	5.0	0.03	>0.6	604	6.3	6.6	4	<3	<0.05	<0.05	0.24	0.09	3		<3	359	0.04	<1	2.45	0.1	2	0.294	0.467						
22133	01/22/2020	10:15	0.22	9.4	4.4	11	0.39	1000	10.9	7.7	13	2	<0.05	0.84	<0.2	0.04	3	430	<3	731	<0.02	<1	6.8	0.66	2	0.332	0.449						
17198	01/22/2020	09:05	0.22	9.0	4.4	6.1	0.2	965	10.7	7.3	33	5	<0.05	1.18	0.35	0.08	3	1500	<3	562	0.03	<1	14	0.66	2	0.238	0.255						
22136	01/22/2020	10:30	0.06	8.6	4.0	0.9	>0.6	967	10.6	7.7	<2	<2	<0.05	0.1	<0.2	<0.02	3	100	<3	660	<0.02	<1	1.28	0.2	2	0.011	0.118						
22137	01/22/2020	09:16	0.1	9.2	4.0	0.03	0.14	791	8.4	7.3	231	<20	<0.05	0.41	0.22	0.18	5	4	5	577	0.02	<1	16.5	0.2	2	0.76	0.28						
22138	01/22/2020	11:33	0.33	7.6	4.0	0.08	>0.6	568	9.6	7.5	5	<2	<0.05	0.3	0.55	0.07	5	150	<3	352	0.04	<1	7.6	0.1	2	0.071	0.667						
22132	01/23/2020	09:34	0.03	8.8	8.0	0.05	>0.6	610	5.3	7.0							3	63				1	1.93	0.1	2	0.02	0.26						
22131	02/03/2020	10:18	0.1	11.8	17.0	0.0	>0.6	698	8.8	7.0	3	<2	<0.05	<0.05	0.26	0.05	1	30	<3	416	0.04	6	0.26	0.3		0.426	1.995	9	0.6	61	70		
20790	02/03/2020	10:55	0.3	9.2	17.0	0.0	0.3	807	9.4	7.4	13	3	<0.05	0.28	0.53	0.1	1	74	15	504	0.03	6	12			1.304	0.41	35	2	70	85		
21990	02/03/2020	11:35	0.1	11.1	18.0	0.5	0.46	916	9.8	7.2	12	<3	<0.05	0.05	0.27	0.06	3	140	9	564	<0.02	6	7.18	0.3	2	0.249	0.923						
13621	02/03/2020	12:25	0.3	11.6	16.0	0.7	0.6	830	11.2	7.0	12	3	<0.05	<0.05	0.37	0.04	3	25	6	512	<0.02	6	3.43		5	0.246	0.889						
16434	02/04/2020	10:40	0.06	13.1	9.0	0.7	0.53	965	8.8	7.8	9	2	<0.05	<0.05	0.49	0.06	3	48	15	619	0.02	7	5.24	0.2	2	0.4	1.39						
13622	02/04/2020	09:59	0.3	11.8	11.0	0.05	0.34	933	8.4	7.2	19	5	<0.05	0.39	0.76	0.09	3	70	18	617	0.03	7	5.49		1	0.47	1.91						
22134	02/04/2020	11:35	0.1	14.0	7.0	5.5	0.08	1100	9.6	8.3	107	<20	0.08	4.71	1.58	0.41	3	39	48	767	0.14	7	34	0.3	2	1.25	5.46						
16433	02/04/2020	13:44	0.1	13.5	8.0	0.2	>0.6	913	11.3	8.2	16	<2	<0.05	0.08	<0.2	<0.02	3	21	<3	589	<0.02	7	1.63	0.3	2	0.22	0.21						
22135	02/03/2020	13:05	0.06	14.1	17.0	0.4	>0.6	1020	10.4	7.1	3	<2	<0.05	0.56	0.22	0.02	3	43	<3	692	<0.02	6	7.73	0.2	2	0.141	0.338						
11073	02/10/2020	09:45	0.3	11.0	8.0		0.58	458	10.5	7.6	8	<2	<0.05	0.17	0.29	0.02		51	5	278	<0.02	13	3.95			0.408	0.62					519.48	99.52
11072	02/10/2020	10:35	0.3	11.1	7.0		0.49	463	10.6	7.8	10	2	<0.05	0.19	0.27	0.03		2	7	240	<0.02	13	4.56			0.371	0.978					519.48	99.52
11071	02/10/2020	11:45	0.3	10.7	8.0		0.35	472	10.8	7.9	17	<3	<0.05	0.22	0.42	0.04		2	5	266	<0.02	13	7.88			0.352	0.898					519.48	99.52
22139	02/10/2020	11:15	0.3	11.2	8.0		0.46	458	10.6	7.8	12	<2	<0.05	0.19	0.49	0.03		24	5	253	<0.02	13	5.68			0.303	0.532					519.48	99.52
22140	02/10/2020	12:35	0.3	10.7	7.0		0.27	470	10.9	8.0	19	<4	<0.05	0.23	0.34	0.03		15	7	270	<0.02	13	7.85			0.368	0.898					519.48	99.52

Station	Date	Time	Depth	TEMPERATURE, WATER (DEGREES CENTIGRADE) 00010	TEMPERATURE, AIR (DEGREES CENTIGRADE) 00020	FLOW STREAM, INSTANTANEOUS (CUBIC FEET PER SEC) 00061	TRANSPARENCY, SECCHI DISC (METERS) 00078	SPECIFIC CONDUCTANCE,FIELD (US/CM @ 25C) 00094	OXYGEN, DISSOLVED (MG/L) 00300	PH (STANDARD UNITS) 00400	RESIDUE, TOTAL NONFILTRABLE (MG/L) 00530	RESIDUE, VOLATILE NONFILTRABLE (MG/L) 00535	NITRITE NITROGEN, TOTAL (MG/L AS N) 00615	NITRATE NITROGEN, TOTAL (MG/L AS N) 00620	NITROGEN, KJELDAHL, TOTAL (MG/L AS N) 00625	PHOSPHORUS, TOTAL, WET METHOD (MG/L AS P) 00665	FLOW SEVERITY:1=No Flow,2=Low,3=Normal,4=Flood,5=High,6=Dry 01351	E. COLI, COLILERT, IDEXX METHOD, MPN/100ML 31699	CHLOROPHYLL-A UG/L SPECTROPHOTOMETRIC ACID. METH 32211	RESIDUE,TOTAL FILTRABLE (DRIED AT 180C) (MG/L) 70300	ORTHOPHOSPHATE PHOSPHORUS,DISS,MG/L,FILTER >15MIN 70507	DAYS SINCE PRECIPITATION EVENT (DAYS) 72053	Field Turbidity NTU 82078	DEPTH OF BOTTOM OF WATER BODY AT SAMPLE SITE 82903	FLOW MTH 1=GAGE 2=ELEC 3=MECH 4=WEIR/FLU 5=DOPPLER 89835	Blue Green Algae RFU BGA RFU	Total Chlorophyll RFU Chlor RFU	MAXIMUM POOL WIDTH AT TIME OF STUDY (METERS) 89864	MAXIMUM POOL DEPTH AT TIME OF STUDY(METERS) 89865	POOL LENGTH, METERS 89869	% POOL COVERAGE IN 500 METER REACH 89870	RESERVOIR STAGE (FEET ABOVE MEAN SEA LEVEL) 00052	RESERVOIR PERCENT FULL 00053
22131	03/17/2020	10:30	0.1	16.7	17.0	10	0.42	579	8.8	7.9	11	2	<0.05	0.09	0.85	0.16	3	6000	7	299	0.07	1	8.54	0.3	2	0.27	1.12						
20790	03/17/2020	11:00	0.3	16.7	18.0	25	0.17	483	8.6	7.7	28	<4	<0.05	0.15	1.2	0.23	5	6000	10	354	0.1	1	8.9		5	0.36	1.7						
21990	03/17/2020	12:15	0.3	16.7	19.0	38	0.27	533	8.8	7.7	41	<5	<0.05	0.18	1.19	0.18	5	5600	9	380	0.09	1	22		2	0.29	1.3						
13621	03/17/2020	13:14	0.3	18.9	20.0	22	0.2	516	9.1	7.7	38	<5	<0.05	0.2	1.22	0.23	3	5200	6	310	0.09	1	24.6		1	0.31	1.24						
16434	03/17/2020	10:40	0.3	16.3	17.0	32	0.12	571	9.0	7.9	55	9	0.07	0.77	1.04	0.19	5	>12000	5	426	0.07	1	21.5		2	0.368	1.132						
13622	03/17/2020	09:13	0.3	16.6	17.0	15	0.12	528	8.2	7.6	39	8	0.1	1.31	1.35	0.2	3	12000	6	349	0.08	1	24.9		1	0.33	1.49						
22134	03/17/2020	15:00	0.3	18.6	19.0	21	0.12	911	9.0	8.1	167	8	0.07	2.57	1.12	0.25	5	2200	20	599	0.1	1	28.4		2	0.57	1.734						
16433	03/17/2020	11:55	0.025	17.0	18.0	1.9	>0.6	818	10.0	7.9	5	<2	<0.05	0.23	0.27	<0.02	5	430	<3	526	<0.02	1	2.79	0.1	2	0.209	0.29						
22135	03/17/2020	14:03	0.3	17.1	20.0	7	0.21	617	8.3	7.7	33	<5	<0.05	0.45	0.64	0.0761	5		<3	423	<0.02	1	17.9		2	0.14	0.62						
11073	03/11/2020	11:02	0.3	15.4	24.0		0.56	448	11.0	8.2	8	<2	<0.05	0.26	0.34	0.02		6		263	<0.02	6	4.14			0.23	0.49					522.26	100
11072	03/11/2020	11:34	0.3	14.5	24.0		0.4	451	11.2	8.6	11	<2	<0.05	0.19	0.44	0.03		6	12	291	<0.02	6	2.78			0.43	1.5					522.25	100
11071	03/11/2020	13:04	0.3	15.4	27.0		0.2	472	10.8	8.5	25	<4	<0.05	0.49	<0.2	0.05		42	10	305	<0.02	6	11.45			0.46	1.92					522.24	100
22139	03/11/2020	12:06	0.3	14.9	26.0		0.35	455	10.9	8.4	16	<3	<0.05	0.3	0.34	0.03		13	<3	283	<0.02	6	17.8			0.34	0.7					522.25	100
22140	03/11/2020	12:42	0.3	15.6	26.0		0.21	467	10.8	8.3	30	<4	<0.05	0.45	0.52	0.05		29	10	304	<0.02	6	11.56			0.42	1.75					522.25	100
22132	03/16/2020	11:03	0.3	14.4	13.0	38	0.11	503	9.6	7.7	73	<10	<0.05	0.15	1	0.39	5	7900	14	344	0.17	<1	34		5	0.41	1.38						
22133	03/16/2020	13:20	0.3	15.1	18.0	23	0.17	476	10.1	7.2	38	<5	<0.05	0.92	1.1	0.18	5	7900	<3	309	0.07	<1	34.04		5	0.26	0.68						
17198	03/16/2020	14:40	0.3	16.0	19.0	12	0.1	423	9.7	7.8	40	<4	<0.05	0.33	0.64	0.13	5	>9700	<3	217	0.05	<1	27.5		2	0.23	0.6						
22136	03/17/2020	12:40	0.3	16.8	19.0	1.9	>0.6	844	9.3	7.9	<2	<2	<0.05	0.6	0.23	<0.02	5	290	<3	567	<0.02	1	1.27		2	0.145	0.211						
22137	03/17/2020	13:15	0.1	16.3	19.0	0.3	>0.6	590	8.6	7.5	14	<2	<0.05	<0.05	0.38	0.0321	5	270	<3	388	<0.02	1	4.6		2	0.225	0.48						
22138	03/17/2020	09:33	0.1	16.8	17.0	5.9	0.18	4620	8.5	7.8	34	<5	<0.05	0.14	1.01	0.179	5	12000	7	333	0.07	1	25.7	0.2	2	0.317	1.2						
22131	04/13/2020	10:35	0.03	13.8	8.0	2	>0.6	1090	9.4	8.0	3	<2	<0.05	<0.05	0.3	0.0425	3	240	<3	727	0.03	2	0.06	0.091	2	0.095	0.208						
20790	04/13/2020	11:20	0.1	15.1	8.0	3.5	0.43	1050	8.6	7.8	15	3	<0.05	0.16	0.33	0.0767	3	730	4	713	0.03	2	5.25	0.3	2	0.202	0.525						
21990	04/13/2020	13:00	0.1	16.2	8.0	6.6	0.19	968	7.5	7.5	34	<4	<0.05	0.17	0.59	0.0856	3	730	4	652	<0.02	2	15.8	0.3	2	0.119	0.395						
13621	04/13/2020	14:15	0.3	16.9	12.0	22	0.34	963	9.3	7.7	13	2	<0.05	0.17	0.34	0.0678	3	2200	5	653	<0.02	2	6.8		1	0.161	0.449						
16434	04/13/2020	13:10	0.3	16.3	12.0	5.3	0.26	966	9.0	7.9	22	4	<0.05	<0.05	0.62	0.063	3	620	9	684	<0.02	2	8.17	1	2	0.3	1.36						
13622	04/13/2020	10:32	0.3	16.2	8.0	2	0.53	1290	6.9	7.3	9	2	<0.05	<0.05	0.49	0.0434	3	220	9	958	<0.02	1	3.11		1	0.34	1.59						
22134	04/13/2020	13:53	0.3	17.0	12.0		0.85	1090	9.2	8.2	86	13	<0.05	2.23	0.81	0.244	3	440	25	743	0.1	1	27.8			0.47	2.2						
16433	04/13/2020	11:58	0.3	14.6	10.0	1.1	>0.6	765	11.2	7.6	3	<2	<0.05	0.41	<0.2	<0.02	3	110	<3	512	<0.02	1	0.11		2	0.02	0.07						
22135	04/13/2020	15:00	0.05	17.3	14.0	2	0.4	920	9.8	7.4	19	<3	<0.05	0.39	0.28	0.033	3	400	<3	645	<0.02	2	5.67	0.15	2	0.205	0.303						
11073	04/14/2020	11:48	0.3	17.6	13.0		0.73	446	9.0	8.0	5	<2	<0.05	0.3	<0.2	0.0211		<4	6	282	<0.02	2	5.3			0.16	0.5					525.22	100
11072	04/14/2020	12:23	0.3	17.8	13.0		0.41	450	9.0	8.1	10	<3	<0.05	0.22	<0.2	0.0309		8	7	279	<0.02	2	3.82			0.27	0.95					525.21	100
11071	04/14/2020	10:28	0.3	17.3	10.0		0.28	458	9.1	7.9	18	4	<0.05	0.29	<0.2	0.0317		8	7	303	<0.02	2	17.52			0.39	0.64					525.25	100
22139	04/14/2020	11:28	0.3	17.4	11.0		0.42	447	8.8	8.1	10	<2	<0.05	0.31	<0.2	0.0259		<4	8	267	<0.02	2	4.32			0.22	0.64					525.22	100
22140	04/14/2020	10:53	0.3	17.1	11.0		0.35	453	9.2	8.1	13	3	<0.05	0.28	<0.2	0.0335		4	7	285	<0.02	2	5.9			0.39	0.64					525.24	100
22132	04/28/2020	10:00	0.1	20.4	27.0	0.4	0.49	1200	4.8	7.5	8	<2	<0.05	<0.05	0.29	0.0601	3	1100	<3	768	<0.02	<1	5.88	0.3	2	0.077	0.064						
22133	04/28/2020	10:45	0.3	21.2	25.0	18	0.12	839	7.9	7.5	94	12	<0.05	0.66	1.29	0.16	3	12000	6	544	<0.02	<1	30.9	0.57	2	0.254	0.848						
17198	04/28/2020	09:48	0.3	20.6	23.9	17	0.055	517	7.5	7.7	448	70	<0.05	0.53	2.16	0.43	5	37000	45	285	<0.02	<1	58	0.73	2	0.839	2.481						
22136	04/28/2020	12:45	0.3	18.4	25.0	3.4	0.14	565	8.5	7.6	52	9	<0.05	0.54	0.4	0.0764	5	480	4	354	<0.02	<1	24.4	0.61	2	0.204	0.753						
22137	04/28/2020	13:30	0.1	20.4	30.0	0.2	0.12	552	7.2	7.2	60	9	<0.05	0.19	0.34	0.129	3	4400	<3	388	0.03	<1	30.5	0.3	2	0.09	0.282						
22138	04/28/2020	09:45	0.03	21.8	23.0	0.2	>0.6	1390	8.2	7.6	17	3	<0.05	<0.05	0.38	0.0331	3	1100	<3	1001	<0.02	<1	2.83	0.1	2	0.14	0.61						
22131	04/28/2020	11:05	0.1	20.5	24.0	1	0.35	1100	5.9	7.6	10	<2	<0.05	0.07	0.25	0.0667	3	1200	<3	713	0.03	<1	8	0.3	2	0.129	0.142						
20790	04/28/2020	12:30	0.1	20.4	30.0	3.9	0.06	912	6.4	7.8	166	<20	<0.05	0.23	0.81	0.264	5	12000	22	593	<0.02	<1		0.3	2	0.256	0.855						
21990	04/28/2020	13:59	0.1	21.3	31.0	9.4	0.08	785	6.8	7.7	97	<13	<0.05	0.25	0.79	0.167	5	9200	9	479	<0.02	<1	41.1	0.3	2	0.263	0.783						
13621	04/28/2020	14:30	0.1	22.3	30.0	44	0.06	668	7.1	7.5	110	<20	<0.05	0.34	0.94	0.193	5	>24000	7	426	<0.02	<1	66.1	0.3	1	0.659	0.137						
16434	04/28/2020	12:35	0.3	21.8	29.0	15	0.2	1090	8.0	7.9	55	<7	<0.05	0.08	0.57	0.099	5	450	10	743	<0.02	<1	20.1	0.6	2	0.35	1.39						
13622	04/28/2020	10:28	0.3	20.7	24.0	0.6	0.37	1500	8.2	7.8	23	<4	<0.05	<0.05	0.31	0.0438	3	400	8	1112	<0.02	<1	6.85		1	0.36	0.99						
22134	04/28/2020	13:31	0.3	22.5	29.0	80	0.01	1140	7.7	7.9	936	<80	<0.05	1.32	2.35	0.858	5	3300	48	758	<0.02	<1	1292		2	1.73	2.57						
16433	04/28/2020	11:30	0.07	20.1	27.0	4.3	0.21	6160	8.6	7.9	88	<10	<0.05	0.58	0.4	0.0943	5	1400	4	358	<0.02	<1	25.3	0.23	2	0.18	0.44						
22135	04/28/2020	11:30	0.3	20.7	25.0	44	0.045	557	7.7	7.6	299	35	<0.05	0.58	0.98	0.271	5	5200	23	366	<0.02	<1	51	0.74	2	0.431	0.869						
11073	04/30/2020	11:51	0.3	22.8	25.0		>0.6	458	9.1	8.4	4	<2	<0.05	0.22	0.33	<0.02		4	4	274	<0.02	2	0.02			0.13	0.34					522.3	100
11072	04/30/2020	13:02	0.3	22.7	26.0		0.39	460	9.8	8.6	6	<2	<0.05	0.16	0.42	0.0229		4	8	275	<0.02	2	1.26			0.33	0.87					522.31	100
11071	04/30/2020	09:58	0.3	20.7	22.0		0.3	471	8.6	7.9	17	<4	<0.05	0.24	0.32	0.0313		8	6	287	<0.02	2	7.16			0.32	0.67					522.31	100
22139	04/30/2020	11:22	0.3	21.5	24.0		0.49	458	9.0	8.3	6	2	<0.05	0.22	0.28	<0.02		8	5	270	<0.02	2	2.89			0.25	0.33					522.3	100
22140	04/30/2020	10:55	0.3	20.9	23.0		0.38	461	9.0	8.3	13	<3	<0.05	0.26	0.3	0.0212		4	5	280	<0.02	2	3.66			0.29	0.63					522.31	100