NPDES Phase I Annual Stormwater Monitoring Report for Water Year 2019

Prepared for

Ada County Highway District

January 6, 2020

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Table of Contents

List of Figures

List of Tables

Executive Summary

The National Pollutant Discharge Elimination System (NPDES) Phase I Permit No. IDS-027561 (NPDES Permit) was issued by the United States Environmental Protection Agency to Ada County Highway District (ACHD), Boise State University, City of Boise, City of Garden City, Drainage District #3, and the Idaho Transportation Department District #3, referred to as the "Permittees." The current NPDES Permit was effective on February 1, 2013. Water year (WY) 2019 is the sixth year of stormwater outfall monitoring under this permit.

The NPDES Permit requires the collection of stormwater runoff samples to monitor the quality of stormwater runoff within the permitted area. ACHD currently has four outfall monitoring sites and during WY 2019, began subcatchment monitoring in the Americana subwatershed. At each outfall monitoring location ACHD collects grab stormwater runoff samples manually and uses automated equipment to collect flow-proportional stormwater runoff samples. The automated equipment is programmed for the expected amount of runoff based on National Weather Service forecasts and runoff coefficients calculated from historical flow data and subwatershed characteristics such as percent impervious ground cover and stormwater controls.

Americana subwatershed monitoring conducted in WY 2019 consisted of flow monitoring at seven locations, in addition to the Americana outfall monitoring station, to develop a better understanding of wet and dry weather flows in the subwatershed and help to meet the monitoring objectives outlined in the Americana subwatershed monitoring plan (ACHD, 2019). This information will also be used to help select subcatchment water quality monitoring location(s) for use during WY 2020.

Methods used for stormwater outfall monitoring are detailed in Section 2. The NPDES Permit requires that stormwater runoff samples be collected from each monitoring station during three separate storm events each year and analyzed according to the constituent list shown in Table 2. All successful WY 2019 samples were collected during five storm events as detailed in Table 3. Monitored and targeted storms are presented in Table 4, and event flow and precipitation summaries are presented in Table 5. Monitored storms details are provided in Section 3.

Stormwater runoff samples were collected during each event and submitted to the City of Boise Water Quality Laboratory of Boise, Idaho, for laboratory analysis of selected components. Laboratory and field analytical results are presented in Tables 6 and 7. Event pollutant loading estimates are presented in Tables 8 and 9. Analytical data results are summarized in Section 4.

During WY 2019, six storm events were targeted, and at least three successful grab samples were collected for all permit-required constituents at all monitoring sites. Three successful composite samples were collected for all permit-required constituents at all sites except Lucky. Dissolved metals were only analyzed for two successful sampling events during WY 2019 at Lucky.

During WY 2019, precipitation data were recorded at station-specific rain gauges throughout the year. Flow data were recorded continuously at the Whitewater and Americana locations and during targeted events at the other monitoring stations. Flow and rain data are discussed in Section 5 and presented in Table 5 for the monitored events.

Quality assurance/quality control (QA/QC) measures were used to validate monitoring data according to the *Quality Assurance Program Plan* and the *Storm Water Outfall Monitoring Plan*. Both documents are appendices of the *ACHD Phase I Stormwater Management Plan*. Data included in this report has been validated according to the performance criteria outlined in these documents.

Section 7 provides an overview of data management activities under this NPDES Permit. QA/QC measures conducted during WY 2019 are discussed in Section 6. Quality control sample results are reported in Tables 10 through 12.

Section 8 includes a statistical analysis of the analytical data collected to date under the current permit, and the results are presented in Appendix B and Figures 7 through 10.

Section 9 provides an overview of Americana subwatershed monitoring during WY 2019. The complete Americana subwatershed monitoring summary is attached as Appendix C

Section 10 includes a permit requirement summary and planned future program improvements.

Section 11 is a list of references used in compiling information for this report.

Section 1

Introduction

The United States Environmental Protection Agency (EPA) regulates municipal stormwater discharges under the Clean Water Act. The Phase I Stormwater Rules require Municipal Separate Storm Sewer Systems (MS4s) serving incorporated places or counties with a 1990 population of over 100,000 to have a discharge permit under the National Pollutant Discharge Elimination System (NPDES). EPA Region 10 issued the second cycle Phase I NPDES MS4 Permit No. IDS-027561 (NPDES Permit) to Ada County Highway District (ACHD), Boise City, Ada County Drainage District No. 3, Idaho Transportation Department District 3, Boise State University, and Garden City (permittees), effective February 1, 2013, and expiring January 30, 2018. Water year (WY) 2019 is the sixth year of stormwater monitoring activities under the NPDES Permit and the second year under administrative extension.

The Stilson monitoring site was uninstalled in WY 2018 due to an intersection upgrade that resulted in reconfiguring the MS4 and an inaccessible monitoring location. This change left ACHD with four outfall monitoring sites for WY 2019. ACHD communicated these circumstances to EPA Region 10 and outlined a plan to conduct additional monitoring in the Americana subwatershed instead of replacing the Stilson monitoring site with another outfall monitoring site. The EPA communicated an understanding of ACHD’s need to adapt the monitoring plan in a letter dated June 14, 2018. WY 2019 was the first year of additional monitoring in the Americana subwatershed.

This annual report describes stormwater monitoring conducted during WY 2019, extending from October 1, 2018, through September 30, 2019. This report includes a summary of the monitoring methods used, storm descriptions, rain gauge data, hydrologic data, stormwater quality data, quality assurance and quality control (QA/QC) results, data management, statistical analysis, and an overall program summary. Boise and Garden City are located in the lower Boise River watershed (United States Geological Survey Hydrologic Unit Code 17050114) in southwest Idaho. Boise is the state capital and the largest urban area in Idaho. According to the United States Census Bureau, Boise and Garden City had a combined population of 216,643 in 2010 (United States Census Bureau, 2015). The Phase I area is served by MS4s operated by several different entities.

The average elevation of the area is approximately 2,710 feet (ft). The Boise Front rises to elevations of approximately 6,000 ft within a few miles to the northeast of the permit area, and the Owyhee mountains about 35 miles southwest of the permit area reach over 7,500 ft. The orographic influences of each of these ranges impact the precipitation patterns through the area. This situation contributes to less effective and variable forecasting of storm events. Reported weather data and forecast information comes from the local National Weather Service (NWS) station (WBAN #24131), located since 1948 at the Boise airport (NWS, 2009).

The climate is semi-arid; winters are cool and wet, and summers are warm and dry. The 30-year average precipitation is 11.73 inches, with 16.67 inches observed at the Boise airport during WY 2019 (NWS, 2019). WY 2019 was a wet year, with most precipitation in the early spring months. An annual summer drought is typical with precipitation events consisting mostly of convective storm events with short duration and high intensity.

Flow in the Boise River between Lucky Peak Dam (River Mile 64) and the mouth is controlled primarily through reservoir regulation, irrigation withdrawals, irrigation return flows, and shallow groundwater seepage (Thomas and Dion, 1974). About half of the annual runoff (1 million acre feet) from the watershed above Boise is stored behind three upstream dams (Lucky Peak, Arrowrock, and Anderson Ranch). These upstream reservoirs supply about 350,000 acres in the lower Boise River basin with irrigation water and provide flood control for the lower Boise watershed. Flood control releases from Lucky Peak can occur during the winter and spring and can result in high stream flows. Typically, minimum flows in the reach of the river adjacent to Boise and Garden City occur during the months of October through April.

The 2.32-mile section of the Lower Boise River (LBR) between Lucky Peak and the diversion dam has been altered substantially. The Idaho Department of Environmental Quality (Idaho DEQ) has designated this segment as impaired or threatened by low flow alteration but does not require a total maximum daily load (TMDL) allocation.

The EPA approved a sediment and bacteria TMDL in January 2000 for the LBR from Veterans Memorial Parkway to the mouth (Idaho DEQ, 1998). An addendum to this TMDL was published in June 2008. The bacteria loading in the LBR TMDL was originally based on the Idaho criteria for fecal coliform. However, TMDL compliance is now based on *E. coli* due to changes to the State of Idaho water quality criteria during 2000. In 2011, a phosphorus TMDL was developed for Lake Lowell in the LBR watershed.

The final Snake River-Hells Canyon (SR-HC) TMDL document was approved by the EPA in July 2004, which addresses bacteria, nutrients, nuisance algae and dissolved oxygen (DO), pesticides, pH, sediment, temperature, and total dissolved gas. Mercury has also been identified as a concern. However, developing a TMDL for mercury has been postponed (Idaho DEQ, 2006b). The final SR-HC TMDL document includes a seasonal (May through September) phosphorus TMDL and a LBR phosphorus load allocation of 242 kilograms (534 pounds) per day. In 2009, the EPA added the LBR to Idaho’s 2008 Section 303(d) list for total phosphorus, sediment, and bacteria. There is currently a Boise River TMDL for sediment and bacteria. The Boise River phosphorous TMDL addendum was approved by EPA Region 10 in December 2015. A sediment and bacteria TMDL addendum was approved by EPA Region 10 in September 2015 for tributaries of the Boise River including Fivemile Creek, Tenmile Creek, Ninemile Creek, and Indian Creek. Stormwater has wasteload allocations in each of the 2015 TMDL addendums.

Section 2

Sampling Stations and Components

Stormwater monitoring methodology for this program has been developed in compliance with the NPDES Permit. The sampling locations and methods are summarized below, and additional details are provided in the *Quality Assurance Program Plan* (QAPP) (ACHD, 2014a) and the *Storm Water Outfall Monitoring Plan* (SWOMP) (ACHD, 2014b).

The objective of stormwater outfall monitoring is to collect a minimum of three representative stormwater monitoring events each year from four different monitoring locations (Figure 1), as stipulated in the NPDES Permit. Both grab and flow-weighted composite samples are collected during storm events to meet this objective.

2.1 Monitored Subwatersheds

The stormwater monitoring network consists of four monitored subwatersheds (Lucky, Whitewater, Main, and Americana). Monitoring stations are located near the subwatershed outfalls with dedicated monitoring and sampling equipment installed at each location. The Main and Americana systems discharge directly to the Boise River. The Lucky and Whitewater drainages both discharge to tributaries of the Boise River.

Monitoring station locations, subwatershed areas, land use, and groundcover characteristics are described in Table 1. Drainage area maps for sites are presented in Figures 2 through 5.

2.2 Monitoring Equipment

This section provides details on the monitoring equipment used to characterize stormwater flows in the individual monitoring subwatersheds. This equipment includes flowmeters, automatic samplers, handheld field parameter instruments, and rain gauges. Monitoring methods reflect the sample collection recommendations for each analytical method for each constituent.

2.2.1 Flowmeters and Automatic Samplers

Monitoring stations are equipped with Hach flow and sampling equipment: Hach 950 area velocity (AV) flowmeters and 900 MAX portable liquid samplers are installed at Whitewater and Main. Americana also had this equipment configuration at the beginning of WY 2019, but the sampler was replaced with a Hach AS 950 portable liquid sampler in August 2019. Lucky started WY 2019 with a Hach AS 950 portable sampler and Hach 950 flowmeter, but the Hach 950 flowmeter was replaced later in the year with a Hach AV9000S AV analyzer module. Each autosampler is equipped with, and programmed to fill, one 15-liter low-density polyethylene carboy for flow-weighted composite sample collection. The submerged AV sensors and sample intakes are mounted on the inverts of existing stormwater pipes. Specific monitoring equipment orientation is detailed in the SWOMP.

The monitoring station flowmeters trigger the associated autosamplers to collect flow-proportional composite stormwater runoff samples using a “trigger volume.” The trigger volume is based on the expected total precipitation as described in Section 3.

2.2.2 Handheld Field Parameter Instruments

Handheld multiparameter instruments are used to collect instantaneous data during grab sample collection. Field parameters were collected using an In-Situ smarTROLL multiparameter handheld device. This multiparameter instrument allows the instant collection of water quality parameters from a mobile device. An iPhone 5 was used to connect to the instrument on site and display live data.

2.2.3 Rain Gauges

ACHD currently maintains four rain gauge sites representative of the monitored drainage areas (locations shown on Figure 1). The rain gauges provide continuous precipitation data throughout the water year. The program uses Global Water and Hach tipping-bucket style rain gauges that measure rainfall depths in 0.01-inch increments. The Cynthia Mann, Front Street, and East rain gauges are equipped with HOBO data loggers. A Hach rain gauge is installed at Whitewater and is connected to the continuously monitoring flowmeter installed at that site. At sites equipped with HOBO data loggers, a primary and a backup data logger are used to record tip measurements. The NWS maintains and reports measured rain events from a rain gauge located at the Boise airport. This data is used to supplement the data collected at the rain gauge sites maintained by ACHD, as needed.

2.3 Sampling Criteria

The flowmeters and autosamplers are manually programmed, based on weather predictions issued by the NWS. Target criteria for monitoring storm events are listed below.

- The probability of measurable precipitation should be at least 60 percent.
- The predicted precipitation should be greater than 0.10 inch in a 12-hour period.
- The event should be separated by a permit-required minimum of 48 hours and/or program-identified minimum of 72 hours of dry weather from the previous measurable storm event (rainfall greater than 0.10 inch).
- Sampling events are ideally separated by at least 30 days.

2.4 Monitored Components

Stormwater runoff samples were analyzed according to the analytical requirements listed in the NPDES Permit. These constituents and associated analytical methods are presented in Table 2. The NPDES Permit requires the following:

> *Sample collection, preservation, and analysis must be conducted according to sufficiently sensitive methods/test procedures approved under 40 Code of Federal Regulations (CFR) Part 136, unless otherwise approved by EPA. Where an approved 40 CFR Part 136 method does not exist, and other test procedures have not been specified, any available method may be used after approval from EPA*.

As such, the methods identified in Table 2 are the preferred options. Sample, laboratory, or instrument conditions may require substituting an alternate method.

Field parameter measurements provide pH, temperature, conductivity, and DO data. Additional water quality data is provided by laboratory analyses of both grab and composite samples. Table 2 also identifies the components to be collected by grab sampling and as flow-weighted composite samples.

2.5 Laboratory Analysis

During WY 2019, all laboratory analyses for both grab and composite samples were performed by the City of Boise Water Quality Laboratory (WQL). Laboratory analytical reports are included in Appendix B with copies of chain-of-custody forms for each sample.

Section 3

Stormwater Monitoring Events

The NPDES Permit requires that stormwater runoff samples be collected from each monitoring station during three separate storm events each year and analyzed according to the methods listed in Table 2. Six individual storm events were targeted during WY 2019. Successful stormwater runoff samples were collected from the first five events:

- October 9, 2018
- November 27, 2018
- February 2, 2019
- April 14, 2019
- May 16, 2019
- September 6, 2019

Additional storms are typically targeted due to low composite sample volume (insufficient volume for completion of all requested analyses), or unmet QA/QC criteria. In this way, more than three storm events are generally targeted to collect complete analytical parameters. During WY 2019, the six storms listed above were targeted to attempt to get a full set of three stormwater runoff samples from each site. Weather forecasting is often complex and inconsistent. Many storms that are targeted do not meet program criteria at one or more monitoring stations. In this case, sample results from storm events that do not meet acceptance criteria do not count for program requirements and create a void in sample requirements for that monitoring station. Toward the end of WY 2019, only monitoring stations that were lacking accepted samples were targeted. Further discussion of QA/QC measures as well as sampling and equipment comments is included in Section 6.

Information about the storms monitored during WY 2019, including types of samples collected and composite sample information, is summarized in Tables 3 and 4. Velocity cutoffs as well as flow and precipitation volumes during monitored storms are summarized in Table 5, and hydrographs are included as Appendix A. Stormwater runoff water quality data for field parameters and analytical samples are summarized in Tables 6 and 7, respectively.

3.1 October 9, 2018, Storm Event

The following narrative summary includes a discussion of the forecast on which monitoring decisions were based as well as setup and sampling activities for the October 9, 2018, storm event.

Monday, October 8, 2018

- On Monday morning, the NWS issued a forecast for rain showers in the Boise area from 0600 Tuesday into the afternoon and evening. Precipitation for the event was expected to total 0.10–0.30 inch.
- Setup was accomplished Monday afternoon. An expected precipitation depth of 0.11 inch was used to set trigger volumes.

Tuesday, October 9, 2018

- Precipitation started around 0815 on Tuesday morning, continuing throughout the morning and early afternoon. This large wave ended around 1300.
- Smaller amounts of rain continued into the evening.
- Precipitation totals ranged between 0.88 and 0.97 inch at local rain gauges.

Sample Collection

Main, Americana, and Whitewater monitoring stations were programmed to collect flow proportional composite samples during the storm. Site-specific velocity cutoff values were calculated and programmed into the flowmeters. Wet grab samples were collected at all monitoring sites within the first 2 hours of flow. All grab samples were submitted to the WQL at 1045 on October 9.

Composite samples were collected at Whitewater, Main, and Americana monitoring stations. Volumes of composite samples submitted were sufficient for all parameters. Analytical results for Whitewater are qualified for representativeness. The composite sample represents only 54 percent of the total storm flow and does not include the first hour of flow. More information can be found in Section 6. All composite samples were submitted to the WQL at 1057 on October 10.

3.2 November 27, 2018, Storm Event

The following narrative summary includes a discussion of the forecast on which monitoring decisions were based as well as setup and sampling activities for the November 27, 2018, storm event.

Monday, November 26, 2018

- On Monday morning, the NWS issued a forecast for rain showers in the Boise area from late morning Tuesday into the afternoon and evening. Chance of precipitation was 100 percent for Tuesday evening; a total precipitation depth of 0.20 inch was predicted.
- Setup was accomplished Monday afternoon. An expected precipitation depth of 0.11 inch was used to set trigger volumes.

Tuesday, November 27, 2018

- Precipitation started around 1700 on Tuesday evening, and continued until around 2200.
- Precipitation totals ranged between 0.14 and 0.17 inch at local rain gauges

Sample Collection

Lucky, Main, Americana, and Whitewater monitoring stations were programmed to collect flow proportional composite samples during the storm. Site-specific velocity cutoff values were calculated and programmed into the flowmeters. Wet grab samples were collected at all monitoring sites within the first 2 hours of flow. Grab samples were submitted to the WQL at 2102 on November 27.

Composite samples were collected at Lucky, Main, and Americana monitoring stations. Volumes of composite samples submitted were sufficient for all parameters. All composite samples were submitted to the WQL at 1327 on November 28. The Lucky monitoring station experienced an equipment error; therefore, the composite sample did not meet sampling criteria. More information can be found in Section 6.

3.3 February 2, 2019, Storm Event

The following narrative summary includes a discussion of the forecast on which monitoring decisions were based as well as setup and sampling activities for the February 2, 2019, storm event.

Friday, February 1, 2019

- On Friday morning, the NWS issued a forecast for rain showers in the Boise area from around midnight throughout the day on Saturday. Rain was expected to continue into late Saturday night and early Sunday.
- Setup was accomplished Friday afternoon. An expected precipitation depth of 0.11 inch was used to set trigger volumes at all monitoring sites.

Saturday, February 2, 2019

- Precipitation started around 2000 on Saturday evening, and precipitation continued until 1200 on February 3.
- Precipitation totals ranged between 0.49 and 0.51 inch at local rain gauges.

Sample Collection

All four monitoring stations were programmed to collect flow proportional composite samples during the storm. Site-specific velocity cutoff values were calculated and programmed into the flowmeters. Wet grab samples were collected at all monitoring sites within the first 2 hours of flow. The grab samples were submitted to the WQL at 2112 on February 2. *E. coli* samples were analyzed outside of holding time. Reported values are qualified and considered estimates. More information can be found in Section 6.

Composite samples were collected at all four monitoring stations. Volumes of composite samples submitted were sufficient for all parameters. Composite samples were submitted to the WQL at 1000 on February 3. Analytical results for Lucky and Whitewater are qualified for representativeness, with only 64 percent and 67 percent of total runoff volume sampled, respectively. More information can be found in Section 6.

3.4 April 14, 2019, Storm Event

The following narrative summary includes a discussion of the forecast on which monitoring decisions were based as well as setup and sampling activities for the April 14, 2019, storm event.

Friday, April 12, 2019

- On Friday morning, the NWS issued a forecast for rain showers in the Boise area from Saturday evening until Sunday morning.
- Setup of Lucky and Whitewater was accomplished Friday afternoon. An expected precipitation depth of 0.11 inch was used to set trigger volumes.

Saturday, April 13, 2019

- Precipitation started around 2245 on Saturday evening and continued throughout the night and early morning of April 14.
- Precipitation totals ranged between 0.43 and 0.55 inch at local rain gauges.

Sample Collection

Lucky and Whitewater monitoring stations were programmed to collect flow proportional composite samples during the storm. Site-specific velocity cutoff values were calculated and programmed into the flowmeters. Wet grab samples were collected at all monitoring sites within the first 2 hours of flow. All grab samples were submitted to the WQL at 0127 on April 14.

Composite samples were collected at both targeted monitoring stations. Volumes of composite samples submitted were sufficient for all parameters. Composite samples were submitted to the WQL at 1135 on April 14.

3.5 May 16, 2019, Storm Event

The following narrative summary includes a discussion of the forecast on which monitoring decisions were based as well as setup and sampling activities for the May 16, 2019, storm event.

Wednesday, May 15, 2019

- On Thursday morning, the NWS issued a forecast for rain showers in the Boise area from mid-day Thursday to continue through Friday afternoon. The first 12 hours were expected to receive 0.29 inch.
- Setup of Lucky and Whitewater was accomplished Wednesday afternoon. An expected precipitation depth of 0.19 inch was used to set trigger volumes.

Thursday, May 16, 2019

- Precipitation started around 1630 on Thursday and was finished by 2000 that evening
- Precipitation totaled 0.22 inch at the Whitewater rain gauge. The Cynthia Mann rain gauge was clogged during this event, so Whitewater is referenced for Lucky.

Sample Collection

Lucky and Whitewater were programmed to collect flow proportional composite samples during the storm. Site-specific velocity cutoff values were calculated and programmed into the flowmeters.

Composite samples were collected at Lucky and Whitewater monitoring stations. Composite sample volume at Whitewater was sufficient for all parameters. However, the volume of the composite sample collected at Lucky was not sufficient to complete all analyses; dissolved parameters were not analyzed for this storm event at the Lucky monitoring station. Composite samples were submitted to the WQL at 1110 on May 17.

3.6 September 6, 2019, Storm Event

The following narrative summary includes a discussion of the forecast on which monitoring decisions were based as well as setup and sampling activities for the September 6, 2019, storm event.

Thursday, September 5, 2019

- On Thursday morning, the NWS issued a forecast for rain showers in the Boise area from Thursday evening through Friday morning. Chance of precipitation was 80 percent for Thursday evening; a total precipitation depth of 0.25 inch was predicted in localized areas.
- Setup of Lucky and Whitewater was accomplished Thursday afternoon. An expected precipitation depth of 0.19 inch was used to set trigger volumes.

Friday, September 6, 2019

- Continuous precipitation started around 1030 on Friday and was finished by 1230 that day.
- Precipitation totaled 0.22 inch at the Cynthia Mann rain gauge and 0.18 inch at the Whitewater rain gauge.

Sample Collection

Lucky and Whitewater were programmed to collect flow proportional composite samples during the storm. Site-specific velocity cutoff values were calculated and programmed into the flowmeters.

Composite samples were collected at Lucky and Whitewater monitoring stations. Composite sample volume at Whitewater was not sufficient for water quality analysis. Lucky experienced a power failure during the event, which prevented composite sampling. No samples were submitted to the WQL.

3.7 Runoff Coefficients

In order to collect a flow-weighted composite sample throughout each storm, estimates were calculated for the runoff volume expected at each station. The total estimated runoff calculation is a function of the rainfall amount expected (default value of 0.11 inch used during WY 2019) and the site-specific runoff coefficient. The site-specific runoff coefficients are derived from the percentage of impervious ground cover in the subwatershed and empirical values from observed storm data.

The expected runoff volume was then divided by the planned number of sample aliquots, and the resulting value was used as the trigger volume for programming the flowmeter. The trigger volume is the amount of flow that will be measured before the automatic sampler is triggered to collect a subsample. Therefore, the number of samples collected over the course of a storm is a result of the runoff volume expected for the total storm as forecasted at the time of station setup.

Refining runoff coefficients is an ongoing effort that is important to more accurately predict individual storm event runoff volumes and produce trigger volumes that are more likely to consistently result in composite samples of adequate volume that are representative of the whole storm. Historical data suggests that variability in the size, duration, and intensity of a storm, along with variability within the drainage area including soil moisture, temperature, snow cover, and a multitude of other smaller variables, all contribute to the actual volume of runoff discharging at each monitoring station.

Because of this variability, a revised set of runoff coefficients was developed near the end of WY 2018 based on site-specific flow and rain measurements recorded since 2012, effective impervious area values, and the unique characteristics of each subwatershed. These new coefficients more accurately represent the subwatersheds and are based on actual runoff volumes and characteristics of each subwatershed. The new runoff coefficients were used during WY 2019 to increase composite sample collection success and improve runoff volume estimates when measured flow data is not available.

3.8 Velocity Cutoffs

To reduce the possibility of collecting sample aliquots from base flows at the monitoring stations, the flowmeter at each station is programmed with a velocity cutoff value, as needed, during setup. The SWOMP identifies the approach to calculating event-specific velocity cutoffs. All calculated velocity cutoffs used during WY 2019 are included in Table 5.

Section 4

Water Quality Results and Monitored Event Pollutant Loading

Stormwater quality results and storm event pollutant loading calculations are presented in this section and the referenced tables and figures. The ultimate receiving water for all stormwater discharges monitored in this program is the LBR, either directly or indirectly (see Table 1). Designated uses (as defined in the Idaho Administrative Procedures Act 58.01.02.140.12 and 58.01.02.100.03.c) for the LBR include cold water aquatic life, salmonid spawning, domestic and agricultural water supply, and primary and secondary contact recreation.

4.1 Wet Weather Analytical Results

Comprehensive analytical results for monitored storm events during WY 2019 are presented in Tables 6 and 7. Components detected in stormwater runoff samples collected during this water year are discussed below. The data presented in the tables and text are reported with the same significant figures reported by the WQL.

The following individual constituent assessments offer WY 2019 minimum and maximum measured values. Qualified data are included in the range of measured/reported values. Each constituent detected during WY 2019 is described below using a calculated minimum and maximum concentration to determine range during WY 2019. Dissolved cadmium, total cadmium, and dissolved lead are the only constituents not detected in any WY 2019 wet weather samples.

4.1.1 Dissolved Oxygen and Oxygen Demand

DO is recorded in the field using a handheld DO meter, and results are presented in Table 6. Oxygen demand concentrations are measured in composite samples and are presented in Table 7. All measurements are recorded in accordance with QAPP and SWOMP procedures. The ranges of values are presented below.

- DO ranged from 0.24 to 10.59 milligrams per liter (mg/L).
- Biological oxygen demand—5-day (BOD5) concentrations ranged from 10.5 to >185 mg/L.
- Chemical oxygen demand (COD) concentrations ranged from 66.0 to 543 mg/L.

4.1.2 pH, Temperature, Conductivity, Hardness, and Turbidity

This section includes the definition of the range of values sampled during wet weather monitoring. Temperature, pH, and conductivity results are presented in Table 6. The onsite measurement values were recorded in the field according to QAPP and SWOMP guidance. Hardness and turbidity values are measured at the WQL from composite samples. Results are presented in Table 7. The ranges of values are presented below.

- pH values ranged from 6.33 to 9.67 standard units.
- Temperature values ranged from 6.42 to 14.67 degrees Celsius.
- Conductivity values ranged from 22.6 to 314.6 micro Siemens per centimeter.
- Hardness values ranged from 13.6 to 85.3 mg/L as calcium carbonate.

- Turbidity values ranged from 12.7 to 59.9 nephelometric turbidity units.

4.1.3 Bacteria

Bacteria samples collected for this program are grab samples. Samples were collected in accordance with QAPP and SWOMP guidance. *E. coli* concentration values ranged from 79.8 to 15,530 (most probable number per 100 milliliters).

4.1.4 Solids

Total suspended solids (TSS) and total dissolved solids (TDS) are measured from the composite samples collected at each site. All samples were collected in accordance with QAPP and SWOMP procedures. The concentration value ranges are presented below.

- TSS concentrations ranged from 37.5 to 253 mg/L.
- TDS concentrations ranged from 30.3 to 282 mg/L.

4.1.5 Nutrients

Nutrients include total phosphorus (TP); dissolved orthophosphate, as P (DOP); ammonia as N; nitrate + nitrite as N; and total Kjeldahl nitrogen (TKN). All samples were collected in accordance with QAPP and SWOMP procedures. The ranges of values are presented below.

- TP ranged from 0.303 to 2.19 mg/L.
- DOP concentrations ranged from 0.065 to 0.863 mg/L as P.
- Ammonia concentrations ranged from 0.145 to 2.67 mg/L as N.
- Nitrate + nitrite concentrations ranged from 0.153 to 0.747 mg/L as N.
- TKN concentrations ranged from 1.73 to 10.8 mg/L.

4.1.6 Metals

Total and dissolved metals are analyzed from composite samples. All samples were collected in accordance with QAPP and SWOMP procedures. The following metals were analyzed: total arsenic, dissolved and total cadmium, dissolved copper, dissolved and total lead, total mercury, and dissolved zinc. The concentration value ranges are presented below.

- Total arsenic values ranged from below the method detection limit (mdl) (5.72 micrograms per liter [µg/L]) to 7.60 µg/L.
- Dissolved cadmium concentrations were all below the mdl of < 1.00 µg/L.
- Total cadmium concentrations were all below the mdl of < 1.00 µg/L.
- Dissolved copper concentrations were mostly below the mdl of < 10.0 µg/L, with other results ranging from 11.0 to 19.5 µg/L.
- Dissolved lead concentrations were all below the mdl of 6.94 µg/L.
- Total lead concentrations ranged from less than the mdl (6.94 µg/L) to 26.0 µg/L.
- Reported total mercury concentrations ranged from 0.00849 to 0.0353 µg/L.
- Concentrations for dissolved zinc ranged from 12.6 to 74.3 µg/L.

4.2 Monitored Event Pollutant Loading

Laboratory analytical results and stormwater discharge volumes measured at the flowmeter were used to calculate pollutant loading estimates for constituents of concern (TSS, TP, ammonia, nitrate

+ nitrite, and TKN) for each monitored storm. Table 8 presents the estimated pollutant loading for each monitored storm by constituent. Results are presented in total pounds for each monitored drainage area. Table 9 is a summary of event loading estimates in pounds per acre for comparison between monitored drainage areas.

Pollutant loading estimates for each event were calculated in pounds using reported concentrations for all constituents of concern except *E. coli*. *E. coli* loading was not calculated because it is reported as a most probable number which precludes calculation of a mass load. Reported concentrations were combined with runoff volumes measured during the storm event at each monitoring station. Formulas used, including conversion factors, are described in the SWOMP.

The following is a summary of the ranges of loading per acre as calculated for the storm events monitored during WY 2019.

- TSS loading estimates ranged from 0.25 to 3.794 pounds per acre.
- TP loading estimates ranged from 0.004 to 0.0350 pounds per acre.
- Ammonia loading estimates ranged from 0.0005 to 0.111 pounds per acre.
- Nitrate + nitrite loading estimates ranged from 0.002 to 0.04 pounds per acre.
- TKN loading estimates ranged from 0.024 to 0.297 pounds per acre.

Section 5

Flow and Precipitation Data

Flow and precipitation data were collected for each monitoring station during WY 2019. Precipitation data was collected on a continuous basis, as in previous years. Changes to continuous flow measurement are discussed in Section 5.2. The following sections provide an overview of the data collected from rain gauges and flowmeters during WY 2019.

5.1 Rain Gauge Data

Precipitation data from ACHD rain gauges were used to validate all targeted storms during WY 2019. Each monitoring station is associated with a rain gauge. Table 1 identifies the corresponding rain gauge location for each monitoring station. Rain gauge locations are shown in Figure 1.

The tipping-bucket rain gauges function by recording the date and time that 0.01 inch of precipitation is collected at the rain gauge. Cumulative precipitation at each rain gauge over the entire water year was calculated by multiplying the total number of these records by 0.01 inch. As discussed in Section 1, orographic effects and variations in rain shower conditions and weather patterns are expected to cause differences in both storm duration and precipitation depth from one drainage area to another. Recorded monthly totals for WY 2019 for the Phase I rain gauges are shown in Figure 6.

5.2 Flowmeter Data

Flow data for targeted events is shown on hydrographs in Appendix A. Evaluating storm flows at the Americana monitoring station confirmed that the grate secured to the end of the Americana outfall impacts level and velocity values at the monitoring station. During larger events, or when debris clogs the outfall grate, water cannot discharge fast enough to maintain the same in-pipe velocities as exist farther up the storm drain. Decreases in stormwater velocity at the flowmeter sensor are paired with an increase in level. This effect does not inhibit flow measurement except when velocities are reduced below the programmed velocity cutoff, at which point calculated flow drops to zero. ACHD is exploring opportunities to increase cleaning frequency of the outfall grate, particularly prior to targeted storm events. ACHD may also identify a grate that is equally effective but less obtrusive to stormwater discharge rates.

The flow sensor at the Whitewater monitoring station routinely records pulses of flow assumed to be attributable to irrigation, canal and ditch dewatering, and other activities within the monitored drainage area. The sensor has been fouled multiple times by debris, which is typically cleared by storm flows.

Section 6

Quality Assurance/Quality Control

QA/QC measures for the monitoring program utilize a combination of quality assurance measures for the planned and systematic approach to monitoring, as well as quality control measures to verify and validate program data and results. These measures are outlined and used in the SWOMP and QAPP.

Quality control sampling during WY 2019 consisted of a combination of field QC samples and laboratory QC samples. Field QC sample types are described in the QAPP. Field QC sampling intervals followed a predetermined schedule included in the SWOMP. Laboratory QC sample results are outlined in each analytical report included in Appendix B. A summary of QC samples collected during the five successful storm events is presented in Table 10, and all storm event QC sample results are included in Table 11. Analytical results from rinsate blank and equipment blank QC samples are included in Table 12.

A data validation review checklist was completed following each storm event during WY 2019. These checklists were used to compare monitoring methods and all monitoring data collected against performance criteria established to meet the data quality objectives described in the QAPP. A summary of the results of storm event QC reviews is included below along with a discussion of sampling and equipment issues that may have impacted sample collection and/or data quality.

6.1 Data Quality Discussion

The data validation review process was used to evaluate the analytical and field parameter results. Field parameter results that have been qualified are identified in Table 6. Lab analytical results that were qualified are identified in Table 7. Details for qualification are in the lab analytical results included as Appendix B and are discussed below. Composite samples are considered to be representative of stormwater runoff if aliquots were collected for greater than 75% of total runoff volume from the storm or a total of six hours of the storm, including the first hour of the storm. More information on representativeness and other data quality objectives is included in the Quality Assurance Program Plan.

6.2 October 9, 2018, Storm Event

A grab field duplicate and grab field blank were collected at Whitewater and submitted alongside the parent samples. The composite sample at Americana was submitted for laboratory composite duplicate analysis. Results of QC samples were within the acceptable range to meet data quality objectives.

Data Qualifications

- The composite sample collected at Whitewater monitoring station represented 54 percent of flow sampled over 8 hours of the storm event, but missing the first hour of flow. This sample is accepted with qualification for representativeness.
- All acceptance and performance criteria for non-analytical data were met for this storm event.

Sampling and Equipment Notes

- A dead battery at Americana resulted in missing flow data from 1251 to 1545.

- During setup, the flow module at Lucky was not collecting data or recognizing flow/level readings. This issue was not resolvable at the time of setup, and therefore a composite sample was not targeted at Lucky for this event. After this rain event, the AV9000 area velocity analyzer module was removed and replaced with a Hach 950 flow meter. Later, during WY 2019, a Hach AS 950 portable liquid sampler equipped with an AV9000S AV analyzer module was installed at Lucky.
- Although Lucky was not able to collect flow data, a grab sample was taken within two hours of the start of precipitation, and therefore is considered successful. A hydrograph is not available for this event.
- During rain gauge data download, it was found that the Cynthia Mann rain gauge was clogged and did not record accurate rainfall measurements during the event. Therefore, the Whitewater rain gauge is referenced for the Lucky monitoring station for this event.

6.3 November 27, 2018, Storm Event

A field blank and field duplicate were collected from the Lucky monitoring station during the November 27, 2018, storm event. All acceptance and performance criteria were met for this storm event with the exceptions listed below.

Data Qualifications

- The relative percent difference for Lucky field duplicate QC results could not be calculated due to an *E. coli* value above the quantification threshold. Both the parent and the field duplicate were above the threshold of 2,419.6. These results are not qualified.
- The composite sample collected at Lucky monitoring station represented 34 percent of flow sampled over 6 hours of the storm event; this sample was rejected.
- All other acceptance and performance criteria for non-analytical data were met for this storm event.

Sampling and Equipment Notes

- Once flow started at Lucky, it was discovered that the velocity sensor was recording negative values. The setting was switched from “upstream” to “downstream” to account for this error. However, by the time the sensor was corrected, the total discharge volume had a large negative value, which caused a delay in sampling until the negative value was overcome and the trigger volume was reached. Subsamples only accounted for 34 percent of flow, which does not meet sampling criteria. This sample was rejected.
- During the storm event, the Whitewater sampler was disabled and therefore did not collect any subsamples.

6.4 February 2, 2019, Storm Event

A field blank and field duplicate were collected from the Whitewater monitoring station. Results of both QC samples were within the acceptable range to meet data quality objectives. *E. coli* samples were analyzed outside of holding time for all monitoring sites and are therefore qualified. All other acceptance and performance criteria for non-analytical data were met for this storm event.

Data Qualifications

- All *E. coli* samples were analyzed outside of holding time and reported values are considered estimates.

- The composite sample collected at Lucky monitoring station represented 64 percent of flow sampled over 4.5 hours of the storm event and is therefore qualified.
- The composite sample collected at the Whitewater monitoring station represented 67 percent of flow sampled over 4.4 hours and is therefore qualified.
- All other acceptance and performance criteria for non-analytical data were met for this storm event.

Sampling and Equipment Notes

- Precipitation depth received in the monitored area was more than three times greater than expected based on the quantifiable precipitation forecast issued by the NWS. Higher than expected precipitation depth and inaccurate timing for the forecast made it extremely difficult to keep up with composite sample bottle changeouts across all four targeted sites for the duration of the event. When high precipitation depths are forecasted, an expected precipitation depth of 0.22 inch is used to calculate site-specific trigger volumes to increase the time between subsamples collected by the automatic samplers.

6.5 April 14, 2019, Storm Event

A field blank and field duplicate were collected from the Americana monitoring station. Results of both QC samples were within the acceptable range to meet data quality objectives. No analytical results were qualified for this storm event. All acceptance and performance criteria for non-analytical data were met for this storm event.

Sampling and Equipment Notes

- Main flow data is only available starting at 2308 on April 13. Precipitation was first recorded in the area at 2242 on April 13, while the grab samples at Main were collected at 0009 on April 14. It can be assumed that flow started after precipitation; therefore, grab samples were collected within 2 hours of the start of flow. Runoff is interpolated at the Main monitoring station to calculate total runoff volume.

6.6 May 16, 2019, Storm Event

There were no QC samples collected during the May 16, 2019, storm event. All acceptance and performance criteria were met for this storm event. All other acceptance and performance criteria for non-analytical data were met for this storm event.

Sampling and Equipment Notes

- The Cynthia Mann rain gauge was clogged during this storm event. Therefore, the Whitewater rain gauge is referenced for this report. The composite sample at Lucky did not collect enough stormwater volume to complete all analyses, so dissolved parameter data is not available. Since total storm flow is low for this event at Lucky, it is possible that Lucky received less rain than the Whitewater rain gauge

6.7 Equipment Maintenance

During routine monitoring station maintenance on September 19, 2018, an equipment blank was collected at the Main monitoring station. There were no detections reported for this sample.

A rinsate blank sample was collected from Main on August 21, 2019, during routine maintenance. There were no detections reported for this sample.

Section 7

Data Management

During WY 2019, ACHD used DataSight software version 3.3 for data management. All monitoring data collected during WY 2019, including water quality data and flow and rain data, are stored in the database and organized according to the established procedures documented in the ACHD Database Guidance Document (Brown and Caldwell, 2014).

Section 8

Review of Monitoring Data Collected under the 2013 NPDES Permit

WY 2019 represents the sixth year of stormwater outfall monitoring and analytical data collection under the 2013 NPDES Permit. This dataset equates to about 18 data points (sample results) for most analytes. An in-depth statistical analysis was conducted on the stormwater monitoring analytical dataset in WY 2019 to better account for non-detect values and explore for potential trends and correlations between variables. This section provides specific information about the approach used for statistical analysis and the statistics run on the monitoring dataset. Results and implications of the analysis are also included and described in associated tables.

8.1 Data Included in Review

Analysis included data from November 2013 to May 2019 for four monitoring locations: Americana, Lucky, Main, and Whitewater. Data from November 2013 to January 2018 was included for the Stilson monitoring station. The following list of analytes were evaluated.

Field Parameter Analytes

- pH
- temperature
- DO
- conductivity

Laboratory Sample Analytes

- turbidity
- *E. coli*
- biochemical oxygen demand—5-day
- COD
- TSS
- TDS
- hardness
- nutrients (TP DOP, ammonia, TKN, nitrate + nitrite)
- total metals (arsenic, cadmium, lead, mercury)
- dissolved metals (cadmium, copper, lead)

All laboratory sample analyte results, except *E. coli*, represent an event mean concentration (EMC) derived from flow weighted composite sample collection. Discrete grab samples were collected for laboratory analysis for *E. coli* and were coincident with field parameter measurements.

8.2 Methods

The dataset included 20 laboratory water quality parameters and 4 field parameters. A data evaluation was performed to determine the amount of non-detects present in the dataset for all combinations of station and parameter. A data subset that contains a high percentage of non-detects can affect descriptive statistics, trend analysis, and comparisons between stations or seasons.

For those parameters with more than 50 percent detections, descriptive statistics and goodness of fit tests were calculated using the EPA's ProUCL statistical software package, which has appropriate methods for calculating means and percentiles of data that include values recorded as being below the method detection limit. These descriptive statistics were calculated by station and included the minimum, maximum, mean, and various percentiles. For those parameters with a smaller percentage of detection, only minimum and maximum were reported.

8.3 Results

Results for field parameter and laboratory sample analytes are discussed in the subsections below. Information presented in tables and figures is included as attachments at the end of the report text.

8.3.1 Data Evaluation

All stations and laboratory parameters were evaluated for non-detects before summary statistics were calculated. Fourteen parameters (out of 20) (Table 8-1) had 90 percent or more detections at all stations, which gives the greatest confidence in descriptive statistics and statistical tests. Total lead and dissolved copper had between 10 percent and 91 percent detections, depending on the station, meaning statistics based on those datasets would be more questionable than the previous list of parameters. The four remaining parameters (total arsenic, dissolved cadmium, total cadmium, dissolved lead) had too few detections at most stations to perform statistics.

Table 8-1. Percent of Detections by Station and Parameter

Parameter	Americana	Lucky	Main	Stilson	Whitewater
Ammonia	100%	100%	100%	100%	90%
Arsenic, total	40%	24%	5%	18%	19%
BOD5	100%	100%	100%	100%	100%
Cadmium, dissolved	0%	0%	0%	6%	0%
Cadmium, total	4%	0%	14%	24%	5%
COD	100%	100%	100%	100%	100%
Copper, dissolved	48%	42%	37%	50%	42%
DOP	100%	100%	100%	100%	100%
E. coli	100%	100%	100%	100%	95%
Hardness as $CaCO_3$	100%	100%	100%	100%	100%
Lead, dissolved	0%	0%	0%	6%	0%
Lead, total	88%	10%	91%	88%	67%
Mercury, total	96%	90%	95%	100%	95%

Table 8-1. Percent of Detections by Station and Parameter

Parameter	Americana	Lucky	Main	Stilson	Whitewater
Nitrate + nitrite (N)	100%	100%	100%	100%	100%
Total dissolved solids	100%	100%	100%	100%	100%
Total Kjeldahl nitrogen	100%	100%	100%	100%	100%
TP	100%	100%	100%	100%	100%
TSS	100%	100%	100%	100%	100%
Turbidity	100%	100%	100%	100%	100%
Zinc, dissolved	100%	100%	100%	100%	95%

Descriptive statistics were calculated for all parameters with more than 50 percent detections (Appendix B, Table A-1). Most parameters with more than 50 percent detections were not consistently normally distributed, and some were not log-normally distributed either; therefore, non-parametric statistics were used in the analyses.

Parameters were compared with applicable water quality standards or other targets (Table 1). Temperatures observed in the samples are seldom above the cold-water biota criteria of 22 degrees Celsius (°C) (only during the July 22, 2015, sample); the daily average criteria were not able to be evaluated. Temperatures were observed above the 13°C temperature criteria for salmonid spawning more often (24–25 percent of the time), usually between April and October; the range of temperatures observed above 13°C was 13.1–21.9°C, although the majority of those temperatures were closer to 13–14°C. TSS was above 50 mg/L for 35 percent of the observations at Lucky and 71–83 percent of the observations at the other four stations; TSS was above 80 mg/L for 12 percent of the observations at Lucky and 48–63 percent of the observations at the other four stations. All TP observations were above the in-stream target of 0.07 mg/L (which does not apply to stormwater). The *E. coli* concentrations were above the standard of 406 most probable number per 100 milliliters in 20–25 percent of the samples at Lucky and Whitewater, 50–56 percent of the samples at Main and Stilson, and 70 percent of the samples at Americana.

8.3.2 Correlations Between Variables

Spearman correlation analysis was used to look for potential relationships within each station dataset between primary variables of concern and between primary and secondary variables of concern. Correlations were defined to be statistically significant if $p < 0.05$. The following paragraphs and tables summarize the statistically significant correlations.

All stations exhibited positive correlations between TP and DOP and between TSS and turbidity (Table 8-2), as expected from the properties of these two pairs of parameters. Other correlations between primary parameters were different by station. DOP and TP showed some negative correlations with turbidity at Whitewater (and Stilson for DOP), and orthophosphate also showed a negative correlation with TSS at Whitewater. DOP and TP showed some positive correlations with *E. coli* (Stilson and Main), DOP also had positive correlations with temperature at Lucky and Stilson, and TP was positively correlated with TSS at Lucky.

Table 8-2. Summarized Results of Spearman Correlation between Primary Variables of Concern, Listing Stations (by initial) with Statistically Significant Results (Labeled + or – for Positive or Negative correlations), 2013–2019

	DOP	TP	TSS	Turbidity	*E. coli*	Temp
DOP		All stations (+)	Whitewater (-)	Stilson (-) Whitewater (-)	Stilson (+)	Lucky (+) Stilson (-)
TP	All stations (+)		Lucky (+)	Whitewater (-)	Main (+)	
TSS	Whitewater (-)	Lucky (+)		All stations (+)	Main (+)	Whitewater (-)
Turbidity	Stilson (-) Whitewater (-)	Whitewater (-)	All stations (+)			
E. coli	Stilson (+)	Main (+)	Main (+)			Main (+)
Temp	Lucky (+) Stilson (+)		Whitewater (-)		Main (+)	

In addition to those correlations in primary parameters of concern, some of the secondary parameters were significantly correlated with primary parameters at some stations At all stations, BOD5 was positively correlated with DOP and TP, while COD was positively correlated with TP and TSS. At certain stations, BOD5 was positively correlated with *E. coli* (Main and Stilson) and temperature (Lucky), and COD was positively correlated with OP (Americana and Lucky), turbidity (all stations except Whitewater), and *E. coli* (Main). DO was negatively correlated with temperature (all stations), as is expected considering the inherent relationship between them. DO was also negatively correlated with DOP (Main, Stilson, Whitewater), TP (Whitewater), and *E. coli* (Main) and positively correlated with TSS (Whitewater). At some stations, pH showed negative correlations with OP (Main), *E. coli* (Main), and temperature (Lucky, Main, Stilson).

A Kruskal-Wallis test (non-parametric ANOVA) was performed to compare results for primary parameters of concern by station, from 2013 to present. According to the analyses, stations had significant differences for DOP, TP, TSS, and turbidity; *E. coli* and temperature did not show significant differences between stations. The box plots in Figure 7 include designation of the statistically different groups (post-hoc multiple comparisons test of medians, $p < 0.05$).

The Kruskal-Wallis test was also used to compare results for each station and primary parameter of concern for differences between years and between seasons. There were no statistically significant differences between years at any station for the six primary parameters. When parameters were compared by season (S4: Sep–Nov, S1: Dec–Feb, S2: Mar–May), there were differences for some stations and parameters; season 3 (Jun–Aug) did not have enough data to be compared to the other seasons, so it was omitted from the analysis. At all stations, OP in fall (S4) was higher than in winter (S1), with only Whitewater showing the same pattern for TP (Figure 8); temperature showed the same pattern as OP, with the lowest temperatures in the winter (Figure 9). TSS and turbidity did not show consistent differences between seasons at $p < 0.05$ but did at all stations except Lucky at the $p < 0.10$ level; the pattern of winter (S1) having higher TSS (Figure 10) and turbidity than fall (S4) is present but not as strong as the opposite pattern previously mentioned for OP. *E. coli* showed no statistically significant differences between seasons.

8.4 Statistical Conclusions

Most of the parameters sampled had enough detected observations to calculate descriptive statistics; metals were more likely to have non-detects in their datasets. Beyond descriptive statistics, additional statistical analysis focused on parameters of primary concern (DOP, TP, TSS, turbidity, *E. coli*, and temperature) and how they related to secondary parameters (DO, COD, BOD5, pH, precipitation, and runoff).

DOP and TP, as well as TSS and turbidity, were closely correlated at each station. The phosphorus-related parameters (DOP and TP) were sometimes negatively correlated with turbidity-related parameters (TSS and turbidity), DO, pH, runoff volume, and precipitation volume, depending on the station. The phosphorus-related parameters were sometimes positively correlated with *E. coli*, temperature, BOD5, and COD, depending on the station. Turbidity-related parameters were also positively correlated with *E. coli* and COD, depending on the station. Temperature was higher with lower DO and pH, as was *E. coli* at some stations.

Stations had different concentrations of some parameters, with Main having generally lower and Americana and Whitewater generally higher DOP and TP. TSS and turbidity were generally lower at Lucky and higher at Stilson. *E. coli* and temperature had no differences between stations. Some stations had seasonal differences between parameters, with DOP having higher concentrations in the fall than in the winter, and temperature having lower observations in the winter. TSS and turbidity had slightly higher concentrations in winter than in fall, but the relationship was weaker.

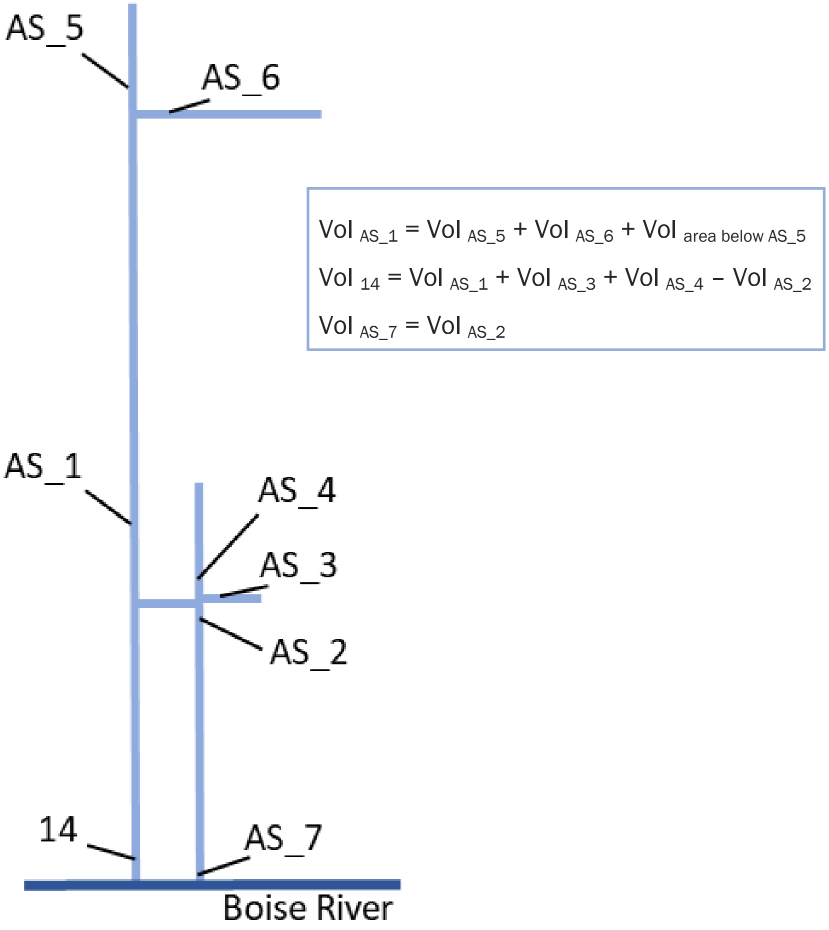
Although there are differences between stations and between seasons, there were no trends observed in the concentrations of primary parameters over time. Based on the results of this analysis, phosphorus is seen at higher concentrations in the fall and at Americana and Whitewater, and turbid waters (turbidity or TSS) are seen more often in the winter and at Stilson.

Section 9

Americana Subwatershed Monitoring Summary

At the beginning of WY 2019 ACHD began conducting systematic flow monitoring at major nodes within the Americana subwatershed storm drain system to supplement the stormwater outfall monitoring program and provide insight into Americana subwatershed. A full summary WY 2019 monitorng activities is included in this report as Appendix C. Below is a brief description of monitoring results and analysis conducted in WY 2019, as well as conclusions and potential activities for WY 2020.

Wet weather and dry weather flows were monitored continuously at eight monitoring sites within the Americana subwatershed, including the Americana outfall monitoring station (Site 14) and the secondary outfall (AS_7) that discharges next to the Americana outfall. These monitoring sites are represented below in Figure 9-1.



$$\text{Vol}_{\text{AS\_1}} = \text{Vol}_{\text{AS\_5}} + \text{Vol}_{\text{AS\_6}} + \text{Vol}_{\text{area below AS\_5}}$$

$$\text{Vol}_{14} = \text{Vol}_{\text{AS\_1}} + \text{Vol}_{\text{AS\_3}} + \text{Vol}_{\text{AS\_4}} - \text{Vol}_{\text{AS\_2}}$$

$$\text{Vol}_{\text{AS\_7}} = \text{Vol}_{\text{AS\_2}}$$

Figure 9-1. Conceptual layout of monitoring sites

Continuous flow monitoring data collected during WY 2019 were used to analyze 19 representative wet weather events and 10 representative dry weather events. The analysis of measured flows together with modeled flows, calculation of flow total correlations between sites, and development of a water balance for the Americana subwatershed led to several conclusions about flows in the subwatershed and provide additional direction for monitoring activities in WY 2020. These conclusions help ACHD better understand how to use the Americana subwatershed model as a predictive tool to inform management decisions by assessing limitations in light of actual observations to describe how they impact model results. Additionally, monitoring results from year one have narrowed down the areas within the subwatershed that contribute most significantly to dry weather flows and have helped to identify and document the timing and nature of dry weather flows.

Potential activities in WY 2020 include water quality monitoring at a subcatchment monitoring location within the Americana subwatershed and continued flow monitoring. Flow monitoring is planned to continue at some of the WY 2019 locations, and some new locations may be brought online as well to acquire additional data in support of program objectives.

Section 10

Summary of WY 2019 and Next Steps

During WY 2019, six storm events were targeted, and at least three successful grab samples were collected for all permit-required constituents at all monitoring sites. Three successful composite samples were collected for all permit-required constituents at all sites except Lucky. Dissolved metals were only analyzed for two successful sampling events during WY 2019 at Lucky.

In WY 2018, BC evaluated the ability of current runoff coefficients to accurately predict runoff volumes for rain events of varying depths and intensities. Updated runoff coefficients were developed for each monitoring station and were used in WY 2019's storm events. The goal of these new coefficients is to estimate more accurate runoff volumes for trigger volume calculation and reduce the number of low-volume composite samples as well as multiple-bottle composite samples.

Section 11

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Tables

Table 1. Monitoring Station Information

Station Information	Lucky (Site ID:3)	Whitewater (Site ID:11)	Main (Site ID: 12)	Americana (Site ID:14)
Subwatershed Area (acre)	105	498	79	875
Land Use Percentage	Right-of-Way (22%) Residential Med (78%)	Right-of-Way (36%) Commercial (4%) Residential Med (50%) Residential High (7%) Public and Schools (3%)	Right-of-Way (43%) Commercial (37%) Residential Med (14%) Residential High (5%) Public (1%)	Right-of-Way (30%) Commercial (13%) Residential (Hi/Med/Low) (39%) Parks and Open Space (14%) Public and Schools (4%)
Percent Impervious Ground Cover [1]	40%	43%	55%	39%
Receiving Water	Eagle Drain	Crane Creek to Farmers Union Canal to Boise River	Boise River	Boise River
Outfall Distance from Station (ft)	350	2,100	500	108
Rain Gauge Location	Cynthia Mann Elementary School	Whitewater (at monitoring station)	Front	Front and East
Rain Gauge Distance from Station (ft)	750	0	2,900	1,800 and 9,600

Notes:

[1] Impervious cover includes roads and streets, rooftops, and parking lots.

Table 2. Analytical Methods for Stormwater Constituents in Wet Weather Samples

Constituent	Analytical Method	Sample Collection Type
Ammonia (NH3)	SM 4500 NH3-D	C
Total Kjeldahl Nitrogen (TKN)	Perstorp PAI-DK01	C
Nitrite + Nitrate (NO2+NO3)	EPA 353.2	C
5-Day Biological Oxygen Demand (BOD5)	SM 5210 B	C
Chemical Oxygen Demand (COD)	Hach 8000	C
Total Dissolved Solids (TDS)	SM 2540 C	C
Turbidity	EPA 180.1	C
Arsenic – Total	EPA 200.7	C
Cadmium – Total and Dissolved	EPA 200.7	C
Copper – Dissolved	EPA 200.7	C
Lead – Total and Dissolved	EPA 200.7	C
Mercury – Total	EPA 245.2	C
Zinc – Dissolved	EPA 200.7	C
Hardness (as Calcium Carbonate [CaCO3])	SM 2340 B	C
Total Phosphorus	EPA 200.7	C
Dissolved Orthophosphate	EPA 365.1	C
Total Suspended Solids (TSS)	SM 2540 D	C
E. coli	IDEXX Colilert	G
Conductivity	EPA 120.1	G,f
DO	SM 4500 G	G,f
Temperature	EPA 170.1	G,f
pH	EPA 150.1	G,f
Flow/Discharge Volume	Non-Specific	f

Notes:

C = Constituent analysis conducted using a composite sample.

G = Constituent analysis conducted using a grab sample.

f = Constituent analysis conducted in the field.

Table 3. Monitored Storms and Samples Collected

Date	Sample Type	Lucky	Whitewater	Main	Americana
October 9, 2018	Wet	G	G, QC, C	G, C	G, C, QC
November 27, 2018	Wet	G, QC, C	G	G, C	G, C
February 2, 2019	Wet	G, C	G, QC, C	G, C	G, C
April 14, 2019	Wet	G, C	G, C	G	G, QC
May 16, 2019	Wet	C	C	–	–
September 6, 2019	Wet	–	–	–	–

Notes:

G = grab sample.

C = composite sample.

QC = quality control sample.

– = No sample.

Table 4. Monitored and Targeted Storms and Samples Collected

Event Date	Sampling Information	Lucky	Whitewater	Main	Americana
October 9, 2018	Grab samples collected and submitted?	YES	YES	YES	YES
	Composite samples collected and submitted?	NO	YES	YES	YES
	Composite sample duration (hrs.)	–	8.5	4	20+
	Number of composite bottles filled	–	4	5	4
	Composite sample volume (Approx.; mL)	–	> 34,500	> 56,000	> 34,500
November 27, 2018	Grab samples collected and submitted?	YES	YES	YES	YES
	Composite samples collected and submitted?	YES	NO	YES	YES
	Composite sample duration (hrs.)	5.5	–	6.5	11
	Number of composite bottles filled	1	–	1	1
	Composite sample volume (Approx.; mL)	7,250	–	9,500	13,500
February 2, 2019	Grab samples collected and submitted?	YES	YES	YES	YES
	Composite samples collected and submitted?	YES	YES	YES	YES
	Composite sample duration (hrs.)	4.5	4.4	1.9	6.2
	Number of composite bottles filled	3	3	2	3
	Composite sample volume (Approx.; mL)	35,750	45,000	25,500	41,000
April 14, 2019	Grab samples collected and submitted?	YES	YES	YES	YES
	Composite samples collected and submitted?	YES	YES	NO	NO
	Composite sample duration (hrs.)	10	6.5	–	–
	Number of composite bottles filled	3	3	–	–
	Composite sample volume (Approx.; mL)	30,000	46,500	–	–
May 16, 2019	Grab samples collected and submitted?	NO	NO	NO	NO
	Composite samples collected and submitted?	YES	YES	NO	NO
	Composite sample duration (hrs.)	3	4	–	–
	Number of composite bottles filled	1	1	–	–
	Composite sample volume (Approx.; mL)	5,000	5,750	–	–

Notes:

– = Composite sample collection not attempted during this event.

Table 5. Monitored Storm Flow Summary

Event Date	Sampling Information	Lucky	Whitewater	Main	Americana
October 9, 2018	Trigger volume (ft^3)	–	1357	456	2960
	Velocity cutoff (fps)	–	1.01	0.02	0.98
	Volume of discharge sampled (ft^3)	–	116,144	62,795	246,094
	Runoff volume (ft^3)	–	214,602	83,132	278,709
	Percent of storm flow sampled	–	54%	76%	88%
	Storm precipitation (in)	0.95 [1]	0.95	0.88	0.88/0.97
November 27, 2018	Trigger volume (ft^3)	387	–	456	2960
	Velocity cutoff (fps)	0.02	–	0.02	0.98
	Volume of discharge sampled (ft^3)	2,039	–	7,754	62,181
	Runoff volume (ft^3)	5,939	14,919	7,815	62,312
	Percent of storm flow sampled	34%	–	99%	100%
	Storm precipitation (in)	0.14	0.17	0.14	0.14/0.16
February 2, 2019	Trigger volume (ft^3)	387	1,357	456	2,960
	Velocity cutoff (fps)	0.02	0.02	0.02	1.74
	Volume of discharge sampled (ft^3)	26,423	88,326	19,427	193,721
	Runoff volume (ft^3)	40,983	132,429	21,021	214,402
	Percent of storm flow sampled	64%	67%	92%	90%
	Storm precipitation (in)	0.49	0.51	0.50	0.50/0.49
April 14, 2019	Trigger volume (ft^3)	387	1,357	–	–
	Velocity cutoff (fps)	0.02	0.02	–	–
	Volume of discharge sampled (ft^3)	22,952	104,417	–	–
	Runoff volume (ft^3)	32,161	154,910	39,524	– [2]
	Percent of storm flow sampled	70%	67%	–	–
	Storm precipitation (in)	0.49	0.51	0.43	0.43/0.55
May 16, 2019	Trigger volume (ft^3)	669	2,344	–	–
	Velocity cutoff (fps)	0.08	1.00	–	–
	Volume of discharge sampled (ft^3)	6,026	22,562	–	–
	Runoff volume (ft^3)	6,431	26,644	–	–
	Percent of storm flow sampled	94%	93%	–	–
	Storm precipitation (in)	0.22	0.22	–	–
	Referenced Rain Gauge	Cynthia Mann	Whitewater	Front	Front/East

Notes:

– = Station not targeted during this event.

[1] The Whitewater rain gauge is referenced for the Lucky station during this event.

[2] Americana flow data is not available for this event.

Table 6. Field Parameters Summary

Event Date	Monitoring Station	Field Parameters			
		Dissolved Oxygen	pH	Conductivity	Temperature
		mg/L	S.U.	uS/cm	C
October 9, 2018	Lucky	9.14	7.14	38.3	11.99
	Whitewater	6.46	6.33	104.9	14.67
	Main	9.82	7.45	32.1	12.21
	Americana	9.18	6.89	70.3	12.71
November 27, 2018	Lucky	0.24	7.03	314.6	12.91
	Whitewater	10.12	8.11	227.9	11.30
	Main	10.41	7.58	89.6	7.97
	Americana	9.38	7.64	251.5	11.1
February 2, 2019	Lucky	10.28	9.67	22.6	7.36
	Whitewater	10.57	8.54	58.8	6.42
	Main	10.59	8.55	55.5	7.12
	Americana	10.44	8.04	122.5	7.92
April 14, 2019	Lucky	6.73	8.13	70.5	13.12
	Whitewater	6.58	7.62	150.7	12.32
	Main	8.44	9.40	70.9	13.76
	Americana	9.04	8.72	124.8	13.26

Notes:

– = no sample.

Table 7. Analytical Results Summary

Event Date	Monitoring Station	Sample ID	E. coli	BOD_5	COD	Hardness as CaCO3	Turbidity	TSS	TDS	Total Phosphorus (P)	Dissolved Orthophosphate (P)	Ammonia (N)	Nitrate + Nitrite (N)	TKN	Arsenic, total	Cadmium, dissolved	Cadmium, total	Copper, dissolved	Lead, dissolved	Lead, total	Mercury, total	Zinc, dissolved
			MPN/100 mL	mg/L	mg/L	mg/L	NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
October 9, 2018	Lucky	181009-03-WG	3090.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Whitewater	181009-11-WG/WC[1]	11450	86.5	276	22.4	43.6	129.0	101	0.747	0.303	<0.0350	0.242	3.21	<5.72	< 1.00	< 1.00	< 10.0	< 6.94	8.23	0.0169	32.4
	Main	181009-12-WG/WC	770.1	17.2	128	16.0	44.3	95.8	52.0	0.314	0.120	0.414	0.236	1.88	< 5.72	< 1.00	< 1.00	< 10.0	< 6.94	17.8	0.0175	47.4
	Americana	181009-14-WG/WC	15530	53.8	216	39.2	45.7	81.1	101	0.500	0.196	0.145	0.375	2.50	5.81	< 1.00	< 1.00	< 10.0	< 6.94	11.5	0.0146	53.2
November 27, 2018	Lucky	181127-03-WG	>2419.6	45.4 [2R]	174 [2R]	27.6 [2R]	32.9 [2R]	66.5 [2R]	106 [2R]	0.810 [2R]	0.341 [2R]	0.232 [2R]	0.255 [2R]	2.59 [2R]	<5.72 [2R]	<1.00 [2R]	<1.00 [2R]	<10.0 [2R]	<6.94 [2R]	<6.94 [2R]	0.00819 [2R]	118 [2R]
	Whitewater	181127-11-WG	>2419.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Main	181127-12-WG/WC	79.8	23.7	150	26.7	59.9	83.1	73.5	0.338	0.137	1.09	0.390	2.91	<5.72	<1.00	<1.00	11.0	<6.94	12.8	0.0136	60.4
	Americana	181127-14-WG/WC	148.3	36.9	149	85.3	49.6	56.3	202	0.578	0.299	0.407	0.675	1.73	7.60	<1.00	<1.00	<10.0	<6.94	8.29	0.00849	35.3
February 2, 2019	Lucky	190202-03-WG/WC [3J]	461.1 [4J]	12.0	149	17.2	25.7	147	35.7	0.345	0.0716	0.355	0.170	2.88	<5.72	<1.00	<1.00	<10.0	<6.94	<6.94	0.0126	18.6
	Whitewater	190202-11-WG/WC [3J]	1553.1 [4J]	16.2	173	39.6	19.3	203	82.5	0.554	0.165	0.371	0.232	3.17	<5.72	<1.00	<1.00	<10.0	<6.94	18.0	0.0263	25.8
	Main	190202-12-WG/WC	235.9 [4J]	10.5	179	34.9	24.3	253	72.0	0.352	0.0650	0.471	0.153	2.50	<5.72	<1.00	<1.00	<10.0	<6.94	26.0	0.0353	24.9
	Americana	190202-14-WG/WC	609.0 [4J]	10.7	132	52.3	14.9	170	134	0.354	0.114	0.362	0.447	2.49	6.48	<1.00	<1.00	<10.0	<6.94	14.0	0.0218	18.8
April 14, 2019	Lucky	190414-03-WG/WC	156.5	11.8	66.0	13.6	12.7	37.5	30.3	0.303	0.132	0.483	0.157	2.00	<5.72	<1.00	<1.00	<10.0	<6.94	<6.94	0.00851	20.2
	Whitewater	190414-11-WG/WC	179.3	10.7	125	23.9	46.1	128	50	0.420	0.143	0.642	0.177	2.64	<5.72	<1.00	<1.00	<10.0	<6.94	9.6	0.0160	12.6
	Main	190414-12-WG	186.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Americana	190414-14-WG	325.5	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
May 16, 2019	Lucky	190516-03-WC [5]	–	>185	543	45.6	20.3	111	282	2.19	–[5]	2.67	–[5]	10.8	5.80	– [5]	<1.00	– [5]	– [5]	<6.94	0.0152	– [5]
	Whitewater	190516-11-WC	–	158	368	61.8	18.9	110	238	1.49	0.863	1.64	0.747	7.22	6.72	<1.00	<1.00	19.5	<6.94	10.1	0.0196	74.3
	Main	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Americana	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Notes:

– = no sample.

WG = wet grab sample.

WC = wet composite sample.

[1] Analytical results are qualified for representativeness. The composite sample only represents only 54% of the total storm flow and does not include the first hour of flow.

[2R] Analytical results are rejected for representativeness. The composite sample only represents only 34% of the total storm flow and does not include the rising limb or peak of the hydrograph.

[3J] Analytical results are qualified for representativeness. Lucky and Whitewater composite samples only represent 64% and 67%, respectively.

[4J] E. coli samples were analyzed outside of holding time. Reported values are considered estimates.

[5] Samples were not analyzed for dissolved parameters due to low sample volume.

Table 8. Event Loading for Monitored Drainages (pounds)

Event Date	Monitoring Station	TSS	Total Phosphorus	Ammonia	Nitrate + Nitrite	TKN
October 9, 2018	Lucky	–	–	–	–	–
	Whitewater	1,727.5	10.00	0.23^{U}	3.24	42.99
	Main	497.0	1.63	2.15	1.26	9.75
	Americana	1,410.4	8.70	2.52	6.52	43.47
November 27, 2018	Lucky	–	–	–	–	–
	Whitewater	–	–	–	–	–
	Main	40.5	4.526	14.596	5.223	38.968
	Americana	218.9	7.740	5.450	9.039	23.167
February 2, 2019	Lucky	376	0.88	0.91	0.43	7.37
	Whitewater	1,678	4.58	3.07	1.92	26.20
	Main	332	0.46	0.62	0.20	3.28
	Americana	2,274	4.74	4.84	5.98	33.32
April 14, 2019	Lucky	75.3	0.61	0.97	0.31	4.00
	Whitewater	1,238	4.06	6.21	1.71	25.52
	Main	–	–	–	–	–
	Americana	–	–	–	–	–
May 16, 2019	Lucky	45	0.88	1.07	–	4.33
	Whitewater	183	2.48	2.73	1.24	12.01
	Main	–	–	–	–	–
	Americana	–	–	–	–	–

Notes:

– = No sample or not calculated due to sample quality.

^{U} Concentrations are at or below the method detection limit (MDL). A value of half the MDL were used in calculations.

Table 9. Event Loading (pounds/acre)

Event Date	Monitoring Station	TSS	Total Phosphorus	Ammonia	Nitrate + Nitrite	TKN
October 9, 2018	Lucky	–	–	–	–	–
	Whitewater	3.469	0.02	0.0005[U]	0.007	0.086
	Main	3.794	0.012	0.016	0.01	0.074
	Americana	1.612	0.01	0.003	0.007	0.05
November 27, 2018	Lucky	–	–	–	–	–
	Whitewater	–	–	–	–	–
	Main	0.309	0.035	0.111	0.04	0.297
	Americana	0.25	0.009	0.006	0.01	0.026
February 2, 2019	Lucky	3.581	0.008	0.009	0.004	0.070
	Whitewater	3.369	0.009	0.006	0.004	0.053
	Main	2.534	0.004	0.005	0.002	0.025
	Americana	2.599	0.005	0.006	0.007	0.038
April 14, 2019	Lucky	0.717	0.006	0.009	0.003	0.038
	Whitewater	2.486	0.008	0.012	0.003	0.051
	Main	–	–	–	–	–
	Americana	–	–	–	–	–
May 16, 2019	Lucky	0.429	0.008	0.01	–	0.041
	Whitewater	0.367	0.005	0.005	0.002	0.024
	Main	–	–	–	–	–
	Americana	–	–	–	–	–

Notes:

-- = No sample or not calculated due to sample quality.

[U] Concentrations are at or below the method detection limit (MDL). A value of half the MDL were used in calculations.

Table 10. QC Samples Collected				
Date	Lucky (Site ID:3)	Whitewater (Site ID:11)	Main (Site ID:12)	Americana (Site ID:14)
October 9, 2018	–	FD,FB	–	LSD
November 27, 2018	FD,FB	–	–	–
February 2, 2019	–	FD,FB	–	–
April 14, 2019	–	–	–	FD,FB
May 16, 2019	–	–	–	

Notes:

– = no sample.

FD = field duplicate.

FB = field blank.

LSD = lab split duplicate.

Table 11. Storm Event QC Sample Summary

Event Date	Parent Sample	Sample ID	QC Sample Type	Analytical Parameters																			
				Turbidity	Hardness as CaCO3	E. coli	BOD_5	COD	TSS	TDS	Total Phosphorus (P)	Dissolved Orthophosphate (P)	Ammonia (N)	Nitrate + Nitrite (N)	TKN	Arsenic, total	Cadmium, dissolved	Cadmium, total	Copper, dissolved	Lead, dissolved	Lead, total	Mercury, total	Zinc, dissolved
				NTU	mg/L	MPN/100 mL	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
October 9, 2018	181009-11-WG	181009-11-001	Field Blank	–	–	<1.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	181009-11-WG	181009-11-101	Field Duplicate	–	–	11120	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	181009-14-WC	181009-14-103	Composite Split	47.7	58.8	–	54.6	192	92.1	105	0.774	0.195	0.150	0.376	2.24	7.60	<1.00	<1.00	<10.0	<6.94	28.3	0.0138	50.0
November 27, 2018	181127-03-WG	181127-03-001	Field Blank	–	–	< 1.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	181127-03-WG	181127-03-101	Field Duplicate	–	–	>2419.6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
February 2, 2019	190202-11-WG	190202-11-001	Field Blank	–	–	< 1.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	190202-11-WG	190202-11-101	Field Duplicate	–	–	1986.3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
April 14, 2019	190414-14-WG	190414-14-001	Field blank	–	–	<1.0	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	190414-14-WG	190414-14-101	Field duplicate	–	–	328.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Notes:

– = no sample.

Table 12. Equipment QC Sample Summary

Sample Collection Date	Monitoring Station	Sample ID	QC Sample Type	Analytical Parameters																		
				Turbidity	Hardness as $CaCO_3$	BOD_5	COD	TSS	TDS	Total Phosphorus (P)	Dissolved Orthophosphate (P)	Ammonia (N)	Nitrate + Nitrite (N)	TKN	Arsenic, total	Cadmium, dissolved	Cadmium, total	Copper, dissolved	Lead, dissolved	Lead, total	Mercury, total	Zinc, dissolved
				NTU	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
September 19, 2018	Main	180919-12-003	Equipment Blank	<0.3	<1.00	<2.00	<7.00	<0.900	<20.0	<0.006	<0.002	0.036	<0.0240	<0.130	<5.72	<1.00	<1.00	<10.0	<6.94	<6.94	<0.00471	<10.0
August 21, 2019	Main	190821-12-004	Rinsate Blank	<0.3	<0.125	<2.00	<7.00	<0.900	<20.0	<0.006	<0.002	<0.0350	<0.0250	<0.130	<5.50	<0.500	<0.500	<8.50	<4.50	<4.50	<0.00470	<8.50

Table 13. Field Parameter Results for Individual Sites WY 2014 to WY 2019

Site	Variable	Number Detects	Number Non-Detects (ND)	% Non-Detects	Minimum	Maximum	Mean	Median	SD	Skewness	CV
Lucky	Dissolved Oxygen (mg/L)	14	0	0	1.72	10.28	6.64	6.35	2.84	-0.22	0.43
	Temperature (°C)	25	0	0	4.8	22.3	12.05	11.75	4.53	0.51	0.38
	pH (S.U.)	14	0	0	6.46	8.95	7.77	7.69	0.73	0.03	0.09
	Conductivity (uS/cm)	14	0	0	51.2	356.5	140.49	103.2	101.99	1.18	0.73
Americana	Dissolved Oxygen (mg/L)	15	0	0	6.85	10.83	8.43	8.23	1.37	0.59	0.16
	Temperature (°C)	15	0	0	6.7	19.8	12.57	12	3.6	0.57	0.29
	pH (S.U.)	15	0	0	6.51	8.23	7.55	7.85	0.62	-1.86	0.08
	Conductivity (uS/cm)	15	0	0	120	662	236.99	225.6	133.91	2.47	0.57
Main	Dissolved Oxygen (mg/L)	15	0	0	5.56	11.06	8.38	8.36	1.68	-0.28	0.2
	Temperature (°C)	15	0	0	5.6	23.9	11.34	9.7	5.1	1.09	0.45
	pH (S.U.)	15	0	0	4.99	8.85	7.59	8.09	1.09	-1.1	0.14
	Conductivity (uS/cm)	16	0	0	2.2	542	156.56	128.9	135.47	1.79	0.87
Stilson	Dissolved Oxygen (mg/L)	14	0	0	5.21	12.02	8.69	9.15	1.94	-0.43	0.22
	Temperature (°C)	14	0	0	6.1	22.8	11.9	9.9	5.16	-0.43	0.43
	pH (S.U.)	25	0	0	6.47	8.58	7.94	8.07	0.55	-1.69	0.07
	Conductivity (uS/cm)	14	0	0	64.7	370.4	187.09	167.15	90.33	0.91	0.48
Whitewater	Dissolved Oxygen (mg/L)	14	0	0	3.91	9.37	6.55	6.69	1.78	0.13	0.27
	Temperature (°C)	14	0	0	6.7	21.7	12.44	11.6	4.11	-0.43	0.33
	pH (S.U.)	13	0	0	5.22	8.41	7.61	7.86	0.86	-2.12	0.11
	Conductivity (uS/cm)	13	0	0	132.5	342.9	230.57	206.8	74.32	0.35	0.32

Table 14. Laboratory Sample Analyte Results for Americana WY 2014 to WY 2019

Variable	Number Detects	Number Non-Detects	% Non-Detects	Minimum	Maximum	Mean	Median	SD	Skewness	CV
Turbidity (NTU)	22	0	0	10.80	280.00	70.15	57.15	60.44	2.24	0.86
Hardness as $CaCO_3$ (mg/L)	22	0	0	30.00	155.00	65.84	56.25	33.92	1.52	0.52
E. coli (MPN/100 mL)	18	0	0	27.20	14390.00	2452.57	1332.55	3557.26	2.63	1.45
BOD_5 (mg/L)	21	0	0	8.00	76.00	29.18	23.00	20.31	1.08	0.70
COD (mg/L)	22	0	0	60.50	574.00	183.05	145.00	125.05	1.88	0.68
TSS (mg/L)	21	0	0	15.20	390.00	123.93	95.70	112.36	1.78	0.91
TDS (mg/L)	21	0	0	67.00	279.00	158.05	138.00	63.28	0.59	0.40
Total phosphorus (P) (mg/L)	22	0	0	0.24	1.43	0.56	0.45	0.30	1.28	0.53
Dissolved orthophosphate (P) (mg/L)	18	0	0	0.09	0.86	0.31	0.22	0.22	1.19	0.70
Ammonia (N) (mg/L)	22	0	0	0.21	1.72	0.61	0.46	0.42	1.28	0.68
Nitrate + nitrite (N) (mg/L)	18	0	0	0.26	0.71	0.50	0.52	0.14	-0.05	0.28
TKN (mg/L)	22	0	0	1.04	9.35	2.90	2.11	2.34	1.97	0.81
Arsenic, total (ug/L)	6	15	71	5.92	12.00	7.97	7.36	2.17	1.57	0.27
Cadmium, dissolved (ug/L)	0	18	100	<0.50	<0.50	NC	NC	NC	NC	NC
Cadmium, total (ug/L)	1	21	95	<0.50	2.24	NC	NC	NC	NC	NC
Copper, dissolved (ug/L)	9	8	47	3.70	15.70	9.58	9.00	4.74	0.28	0.49
Lead, dissolved (ug/L)	0	18	100	<4.00	<4.00	<4.00	<4.00	NC	NC	NC
Lead, total (ug/L)	17	3	15	<3.00	34.4	12.15	9.01	8.10	1.80	0.67
Mercury, total (ug/L)	21	1	5	0.01	0.05	0.02	0.02	0.01	0.87	0.47
Zinc, dissolved (ug/L)	18	0	0	16.20	116.00	41.93	36.35	25.88	1.43	0.62

Notes:

NC = not calculated due to low number of detections.

Table 15. Laboratory Sample Analyte Results for Lucky WY 2014 to WY 2019

Variable	Number Detects	Number Non-Detects	% Non-Detects	Minimum	Maximum	Mean	Median	SD	Skewness	CV
Turbidity (NTU)	16	0	0	10.00	80.40	28.74	26.55	16.64	2.03	0.58
Hardness as $CaCO_3$ (mg/L)	17	0	0	13.00	66.30	34.03	34.90	14.64	0.40	0.43
E. coli (MPN/100 mL)	16	0	0	14.80	12110.00	1427.33	140.00	3192.82	2.96	2.24
BOD_5 (mg/L)	17	0	0	5.40	68.30	27.01	15.20	20.95	0.96	0.78
COD (mg/L)	17	0	0	52.00	212.00	115.53	103.00	52.93	0.81	0.46
TSS (mg/L)	17	0	0	9.08	170.00	43.60	35.70	37.10	2.71	0.85
TDS (mg/L)	17	0	0	39.00	151.00	94.01	83.80	39.14	0.11	0.42
Total phosphorus (P) (mg/L)	17	0	0	0.18	1.11	0.50	0.47	0.26	1.11	0.52
Dissolved orthophosphate (P) (mg/L)	16	0	0	0.10	0.76	0.29	0.23	0.19	1.43	0.66
Ammonia (N) (mg/L)	16	0	0	0.09	1.25	0.60	0.60	0.35	0.13	0.58
Nitrate + nitrite (N) (mg/L)	16	0	0	0.10	0.76	0.37	0.34	0.20	0.78	0.55
TKN (mg/L)	17	0	0	0.55	4.10	2.18	1.98	1.10	0.29	0.51
Arsenic, total (ug/L)	3	16	84	<5.00	7.57	6.77	6.97	0.91	-0.93	NC
Cadmium, dissolved (ug/L)	0	18	100	NC	NC	NC	NC	NC	NC	NC
Cadmium, total (ug/L)	0	20	100	NC	NC	NC	NC	NC	NC	NC
Copper, dissolved (ug/L)	6	10	63	3.3	14.8	8.38	6.60	4.83	0.68	0.58
Lead, dissolved (ug/L)	0	18	100	NC	NC	NC	NC	NC	NC	NC
Lead, total (ug/L)	1	19	95	7.74	7.74	7.74	7.74	NC	NC	NC
Mercury, total (ug/L)	14	3	18	0.01	0.03	0.01	0.01	0.01	0.74	0.55
Zinc, dissolved (ug/L)	16	0	0	15.00	66.80	39.21	34.30	15.69	0.32	0.40

Notes:

NC = not calculated due to low number of detections.

Table 16. Laboratory Sample Analyte Results for Main WY 2014 to WY 2019

Variable	Number Detects	Number Non-Detects	% Non-Detects	Minimum	Maximum	Mean	Median	SD	Skewness	CV
Turbidity (NTU)	18	0	0	14.80	344.00	79.28	61.00	75.76	2.85	0.96
Hardness as $CaCO_3$ (mg/L)	18	0	0	16.90	79.60	30.21	23.45	16.90	1.94	0.56
E. coli (MPN/100 mL)	19	0	0	4.10	5200.00	827.53	410.60	1258.49	2.68	1.52
BOD_5 (mg/L)	18	0	0	6.30	36.30	17.41	14.15	9.38	0.74	0.54
COD (mg/L)	17	0	0	56.00	466.00	151.18	148.00	94.82	2.40	0.63
TSS (mg/L)	16	0	0	11.10	495.00	100.11	68.10	113.30	3.15	1.13
TDS (mg/L)	17	0	0	46.00	146.00	75.82	72.80	26.56	1.30	0.35
Total phosphorus (P) (mg/L)	18	0	0	0.14	1.74	0.38	0.27	0.36	3.40	0.96
Dissolved orthophosphate (P) (mg/L)	17	0	0	0.06	0.25	0.13	0.11	0.07	0.78	0.52
Ammonia (N) (mg/L)	18	0	0	0.30	1.24	0.77	0.68	0.31	0.22	0.40
Nitrate + nitrite (N) (mg/L)	16	0	0	0.15	0.63	0.31	0.29	0.13	0.81	0.43
TKN (mg/L)	18	0	0	0.99	4.00	2.11	2.11	0.84	0.75	0.40
Arsenic, total (ug/L)	1	18	95	10.30	10.30	10.30	10.30	NC	NC	NC
Cadmium, dissolved (ug/L)	0	16	100	NC	NC	NC	NC	NC	NC	NC
Cadmium, total (ug/L)	3	16	84	0.60	2.47	1.25	0.68	1.06	1.72	0.85
Copper, dissolved (ug/L)	5	10	67	4.80	8.80	6.46	5.50	1.98	0.54	0.31
Lead, dissolved (ug/L)	0	16	100	NC	NC	NC	NC	NC	NC	NC
Lead, total (ug/L)	14	2	13	5.02	138.00	22.17	10.90	34.81	3.27	1.57
Mercury, total (ug/L)	18	1	5	0.01	0.06	0.02	0.02	0.01	1.98	0.65
Zinc, dissolved (ug/L)	16	0	0	22.30	109.00	39.54	32.35	22.32	2.25	0.56

Notes:

NC = not calculated due to low number of detections.

Table 17. Laboratory Sample Analyte Results for Stilson WY 2014 to WY 2019

Variable	Number Detects	Number Non-Detects	% Non-Detects	Minimum	Maximum	Mean	Median	SD	Skewness	CV
Turbidity (NTU)	17	0	0	27.60	698.00	132.98	55.50	169.22	2.67	1.27
Hardness as $CaCO_3$ (mg/L)	17	0	0	28.40	160.00	58.91	44.20	37.81	1.99	0.64
E. coli (MPN/100 mL)	18	0	0	6.20	86640.00	6952.91	633.05	20465.65	3.89	2.94
BOD_5 (mg/L)	17	0	0	7.90	98.70	31.53	25.30	23.69	1.64	0.75
COD (mg/L)	16	0	0	77.50	777.00	229.38	175.50	169.90	2.42	0.74
TSS (mg/L)	17	0	0	15.00	901.00	168.36	100.00	205.73	3.11	1.22
TDS (mg/L)	17	0	0	74.00	834.00	165.65	112.00	179.68	3.60	1.08
Total phosphorus (P) (mg/L)	17	0	0	0.22	0.89	0.51	0.43	0.23	0.25	0.45
Dissolved orthophosphate (P) (mg/L)	15	0	0	0.08	0.47	0.25	0.24	0.14	0.28	0.55
Ammonia (N) (mg/L)	16	0	0	0.27	1.80	0.84	0.72	0.44	1.11	0.53
Nitrate + nitrite (N) (mg/L)	16	0	0	0.15	0.62	0.34	0.32	0.13	0.53	0.37
TKN (mg/L)	16	0	0	1.10	5.10	2.85	2.51	1.33	0.53	0.47
Arsenic, total (ug/L)	1	15	94	15.50	15.50	15.50	15.50	NC	NC	NC
Cadmium, dissolved (ug/L)	0	16	100	NC	NC	NC	NC	NC	NC	NC
Cadmium, total (ug/L)	4	13	76	0.50	4.12	1.57	0.84	1.71	1.94	1.08
Copper, dissolved (ug/L)	6	8	57	4.80	13.40	8.37	8.15	3.28	0.52	0.39
Lead, dissolved (ug/L)	1	15	94	< 4.00	4.38	4.38	4.38	NC	NC	NC
Lead, total (ug/L)	13	2	13	4.00	78.70	20.86	12.00	24.21	1.96	1.16
Mercury, total (ug/L)	17	0	0	0.01	0.12	0.02	0.02	0.03	3.66	1.12
Zinc, dissolved (ug/L)	16	0	0	15.30	189.00	45.88	34.35	41.39	3.06	0.90

Notes:

NC = not calculated due to low number of detections.

Table 18. Laboratory Sample Analyte Results for Whitewater WY 2014 to WY 2019

Variable	Number Detects	Number Non-Detects	% Non-Detects	Minimum	Maximum	Mean	Median	SD	Skewness	CV
Turbidity (NTU)	17	0	0	16.00	204.00	67.26	44.60	51.48	1.32	0.77
Hardness as $CaCO_3$ (mg/L)	17	0	0	27.00	231.00	69.88	54.00	49.95	2.45	0.71
E. coli (MPN/100 mL)	15	0	0	4.10	4640.00	431.72	135.40	1170.19	3.81	2.71
BOD_5 (mg/L)	17	0	0	7.90	143.00	42.73	27.40	40.23	1.48	0.94
COD (mg/L)	16	0	0	86.50	414.00	176.38	156.50	83.17	1.58	0.47
TSS (mg/L)	17	0	0	5.50	269.00	92.29	66.20	77.59	1.08	0.84
TDS (mg/L)	17	0	0	84.00	402.00	175.29	150.00	77.48	1.72	0.44
Total phosphorus (P) (mg/L)	17	0	0	0.35	1.24	0.67	0.57	0.29	0.65	0.44
Dissolved orthophosphate (P) (mg/L)	14	0	0	0.12	0.94	0.37	0.29	0.24	1.38	0.65
Ammonia (N) (mg/L)	16	1	6	0.05	1.48	0.52	0.38	0.42	0.87	0.81
Nitrate + nitrite (N) (mg/L)	15	0	0	0.10	1.41	0.49	0.41	0.33	1.88	0.68
TKN (mg/L)	17	0	0	1.00	6.65	2.60	2.07	1.55	1.32	0.60
Arsenic, total (ug/L)	3	14	82	6.30	9.78	8.55	9.56	1.95	-1.71	0.23
Cadmium, dissolved (ug/L)	0	15	100	NC	NC	NC	NC	NC	NC	NC
Cadmium, total (ug/L)	1	16	94	1.25	1.25	1.25	1.25	NC	NC	NC
Copper, dissolved (ug/L)	5	8	62	6.80	15.00	10.36	9.90	3.22	0.60	0.31
Lead, dissolved (ug/L)	0	15	100	NC	NC	NC	NC	NC	NC	NC
Lead, total (ug/L)	10	7	41	3.00	30.40	13.40	11.90	7.32	1.33	0.55
Mercury, total (ug/L)	16	1	6	0.01	0.05	0.02	0.02	0.01	1.48	0.57
Zinc, dissolved (ug/L)	14	1	7	10.20	62.80	30.92	28.75	15.86	0.95	0.51

Notes:

NC = not calculated due to low number of detections.

Figures

Vicinity Map
Phase I NPDES Outfall Sampling Stations

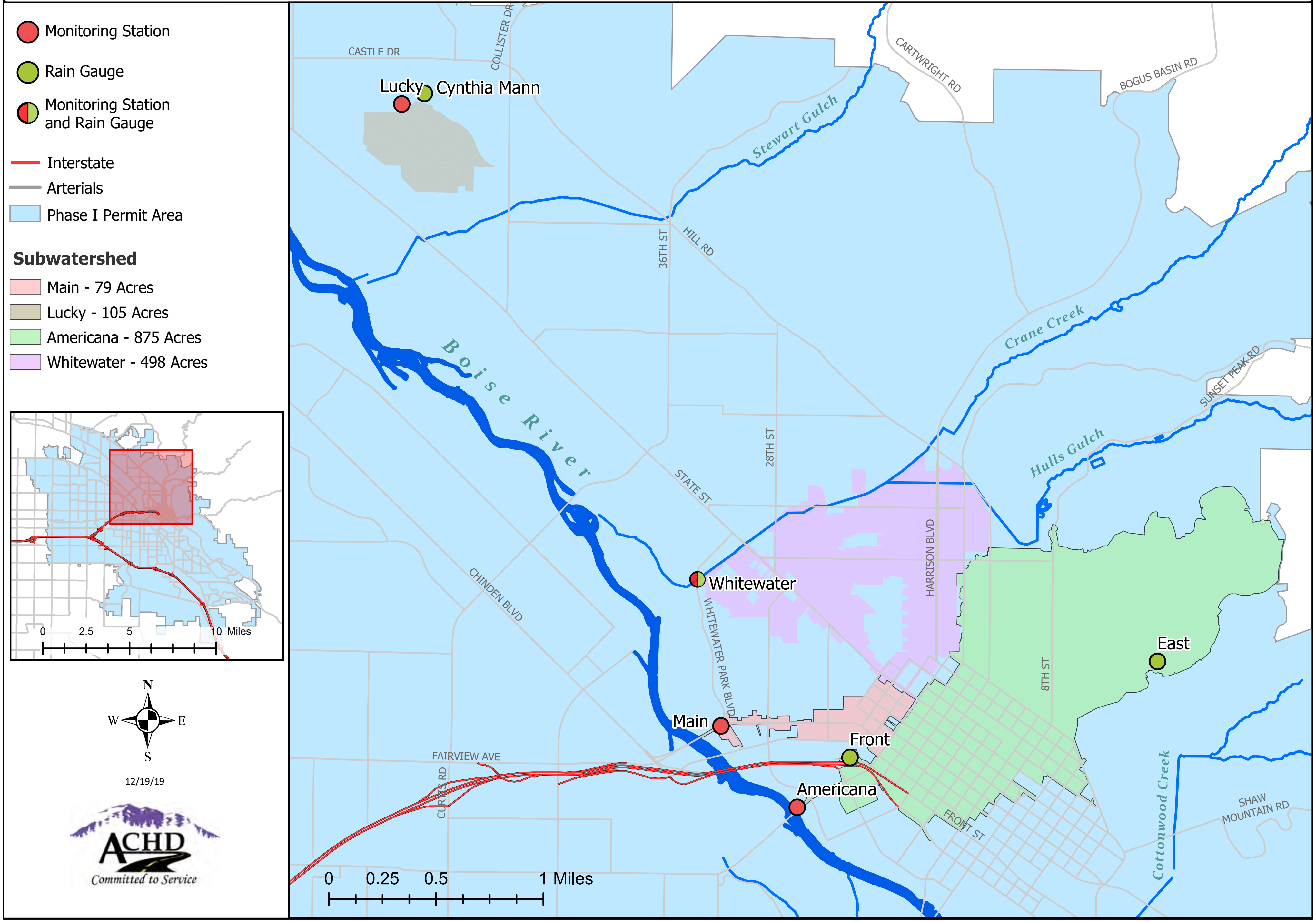
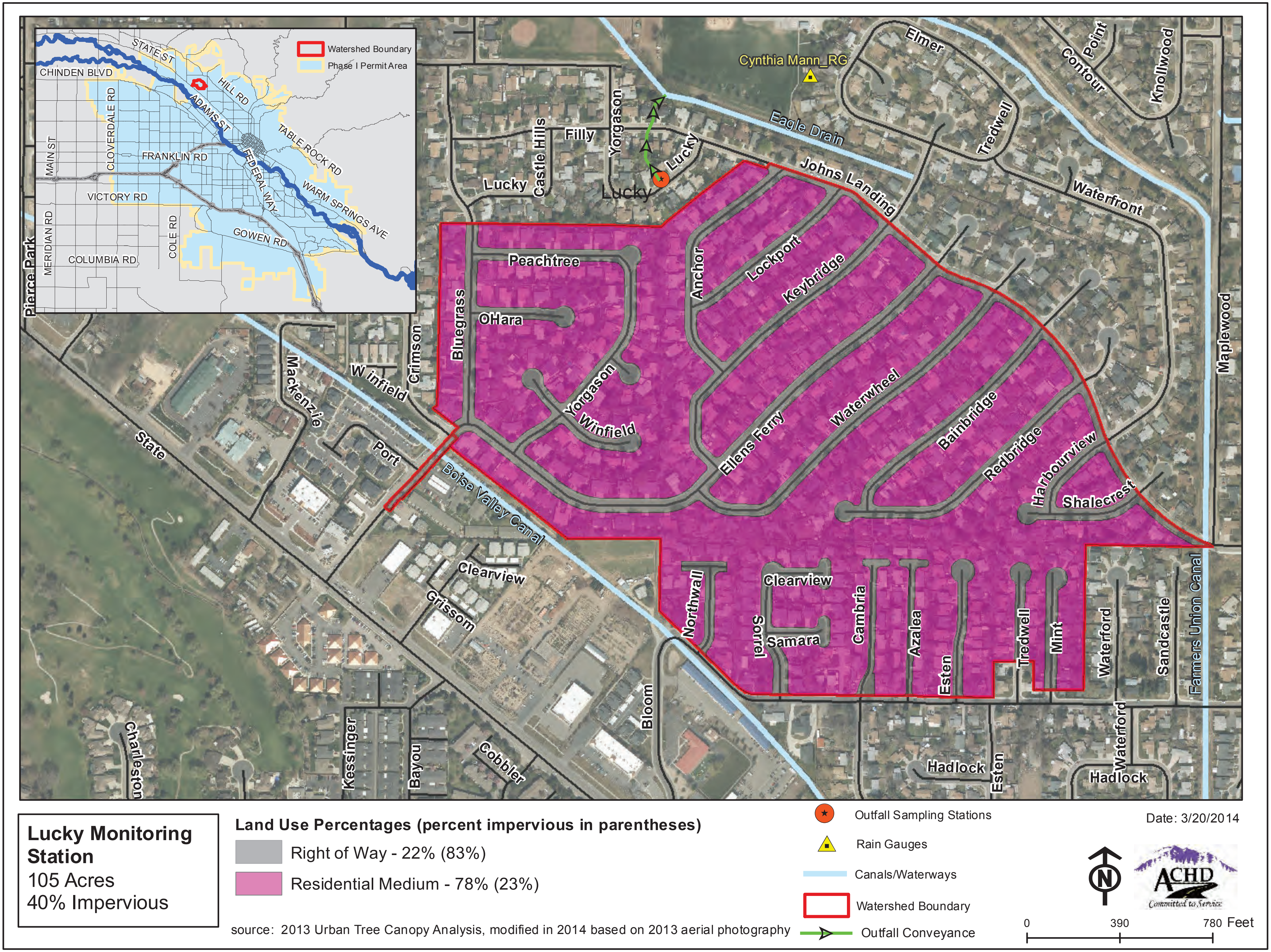


Figure 2



Lucky Monitoring Station
105 Acres
40% Impervious

Land Use Percentages (percent impervious in parentheses)

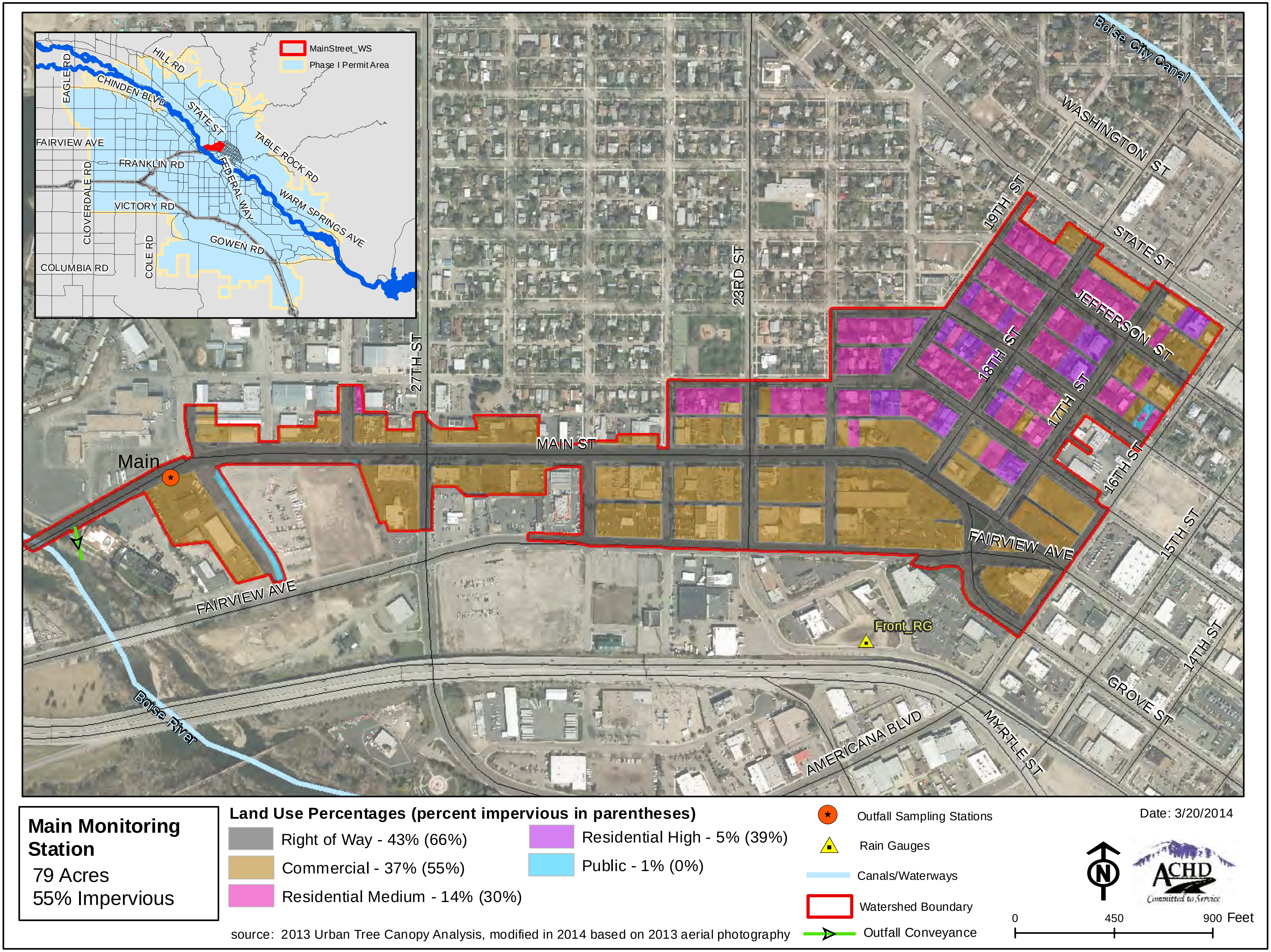
- ▨ Right of Way - 22% (83%)
- ▨ Residential Medium - 78% (23%)

source: 2013 Urban Tree Canopy Analysis, modified in 2014 based on 2013 aerial photography

- ● Outfall Sampling Stations
- ▲ Rain Gauges
- Canals/Waterways
- 🟥 Watershed Boundary
- Outfall Conveyance

Date: 3/20/2014

Figure 4



Main Monitoring Station

79 Acres

55% Impervious

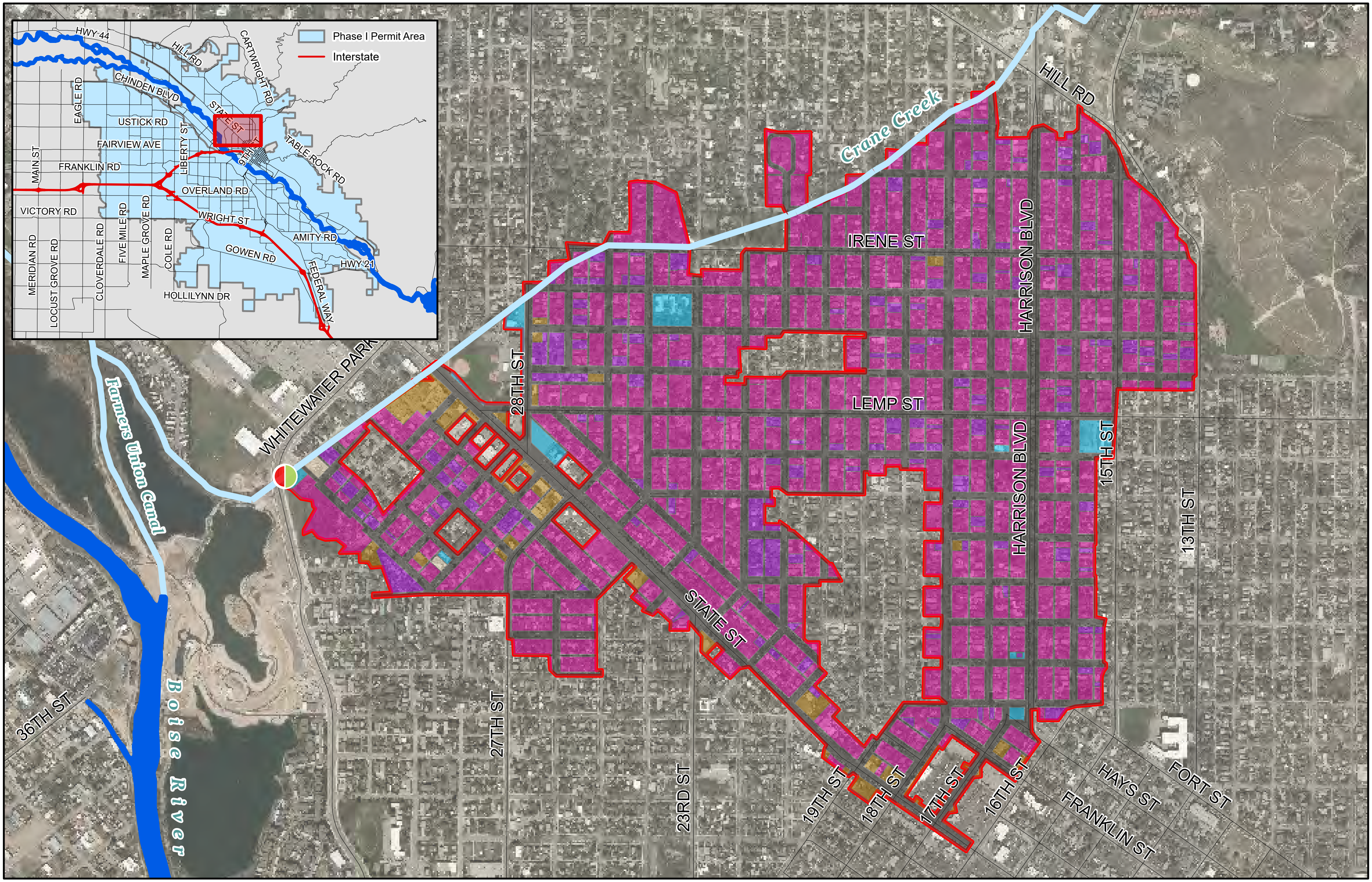
Land Use Percentages (percent impervious in parentheses)

- ▨ Right of Way - 43% (66%)
- ▨ Commercial - 37% (55%)
- ▨ Residential Medium - 14% (30%)
- ▨ Residential High - 5% (39%)
- ▨ Public - 1% (0%)

source: 2013 Urban Tree Canopy Analysis, modified in 2014 based on 2013 aerial photography

- ● Outfall Sampling Stations
- ▲ Rain Gauges
- Canals/Waterways
- ☐ Watershed Boundary
- Outfall Conveyance

Date: 3/20/2014



Whitewater Monitoring Station
498 Acres
43% Impervious

Land Use Percentages (percent impervious in parentheses)

- ▨ Right of Way - 36% (70%)
- 🟫 Commercial - 4% (41%)
- 🟪 Residential Medium - 50% (25%)
- 🟪 Residential High - 7% (31%)
- 🟦 Public and Schools - 3% (51%)

- ◐ Monitoring Station and Rain Gauge
- ━ Waterways
- ☐ Watershed Boundary

source: 2013 Urban Tree Canopy Analysis, modified in 2014 based on 2013 aerial photography

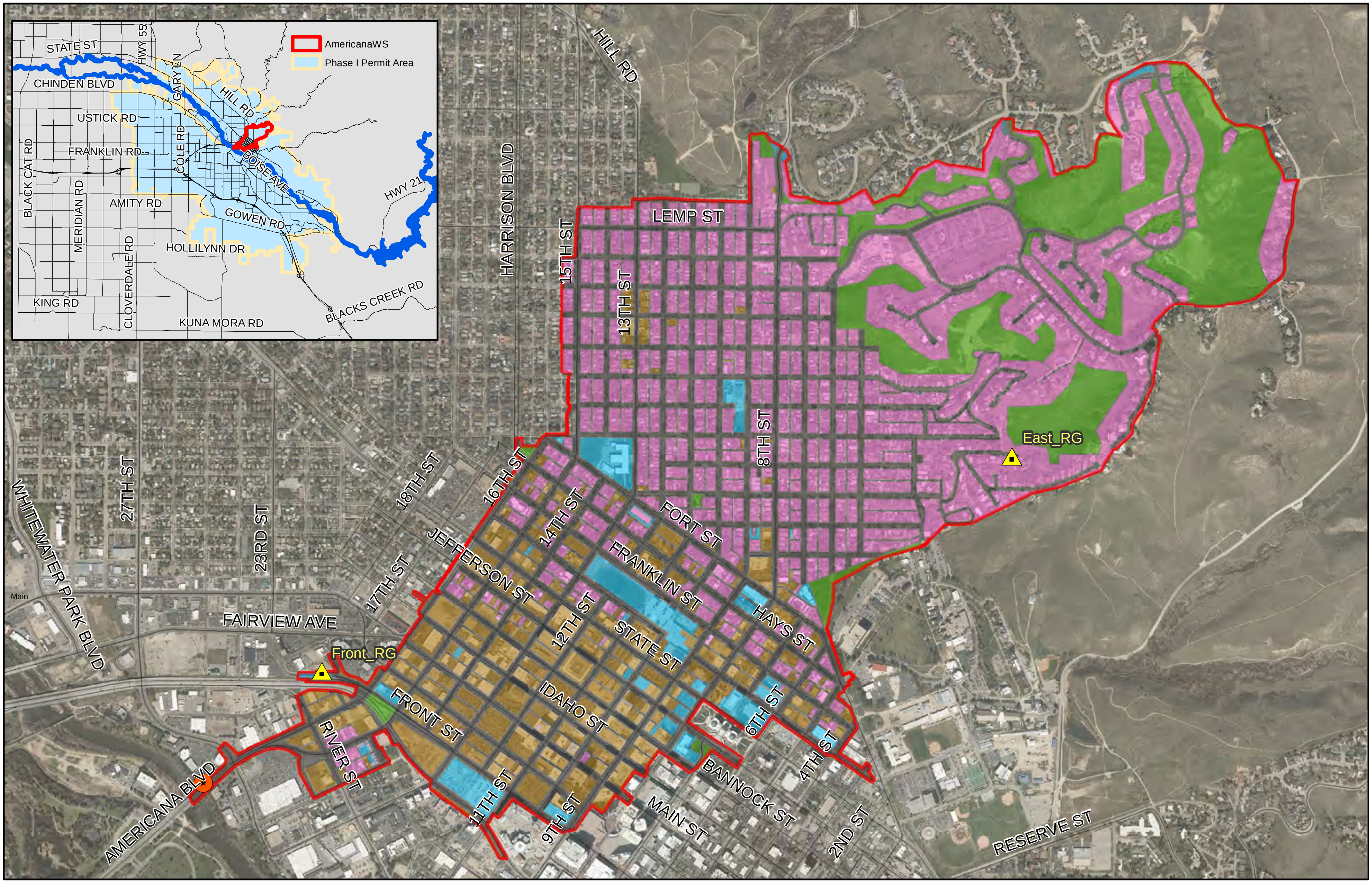
Date: 12/20/2019

N

Committed to Service

0 750 1,500 Feet

Figure 5



Americana Monitoring Station
875 Acres
39% Impervious

Land Use Percentages (percent impervious in parentheses)

- ▨ Right of Way - 30% (69%)
- ▨ Commercial - 13% (56%)
- ▨ Residential (Hi/Med/Low) 39% (23%)
- ▨ Parks and Open Space - 14% (2%)
- ▨ Public and Schools - 4% (45%)

source: 2013 Urban Tree Canopy Analysis, modified in 2014 based on 2013 aerial photography

- ● Outfall Sampling Stations
- ▲ Rain Gauges
- Canals/Waterways
- ☐ Watershed Boundary
- ➤ Outfall Conveyance

Date: 12/12/2016

N

ACHD Committed to Service

0 1,200 2,400 Feet

Figure 6

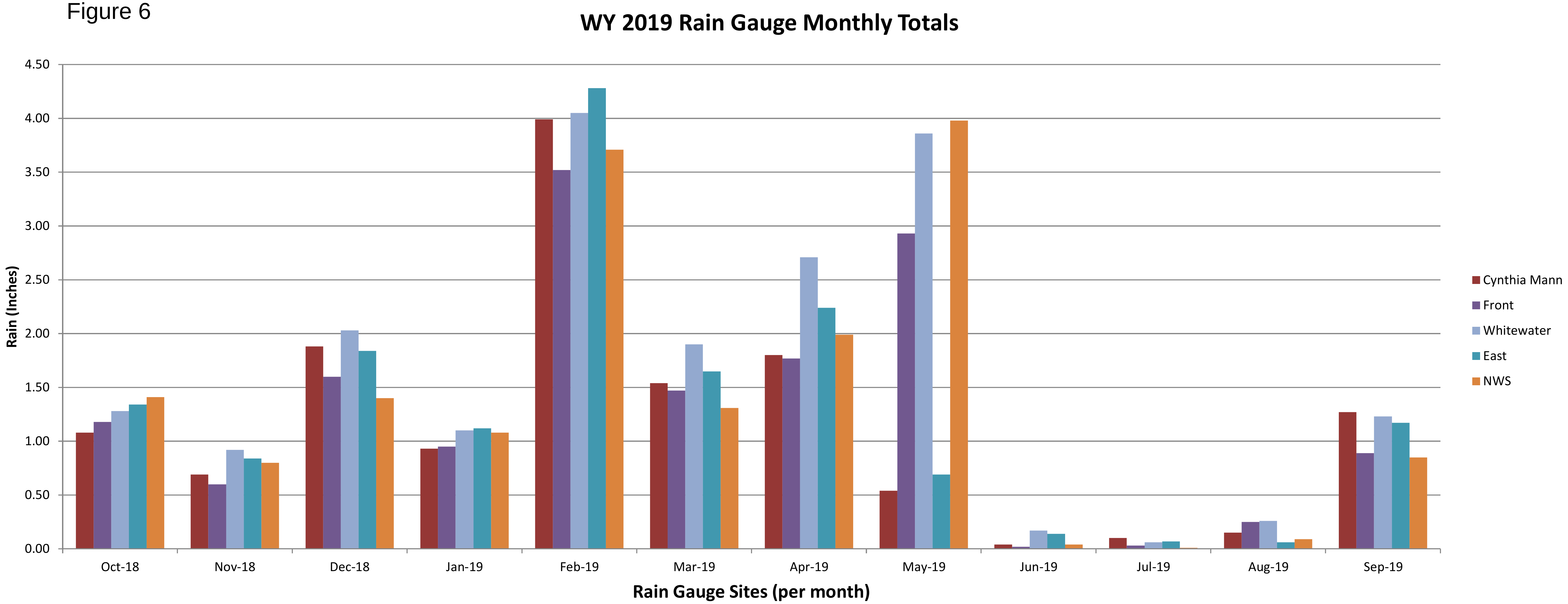

WY 2019 Rain Gauge Monthly Totals
Rain (Inches)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Oct-18
Nov-18
Dec-18
Jan-19
Feb-19
Mar-19
Apr-19
May-19
Jun-19
Jul-19
Aug-19
Sep-19
Rain Gauge Sites (per month)
Cynthia Mann
Front
Whitewater
East
NWS

Figure 7

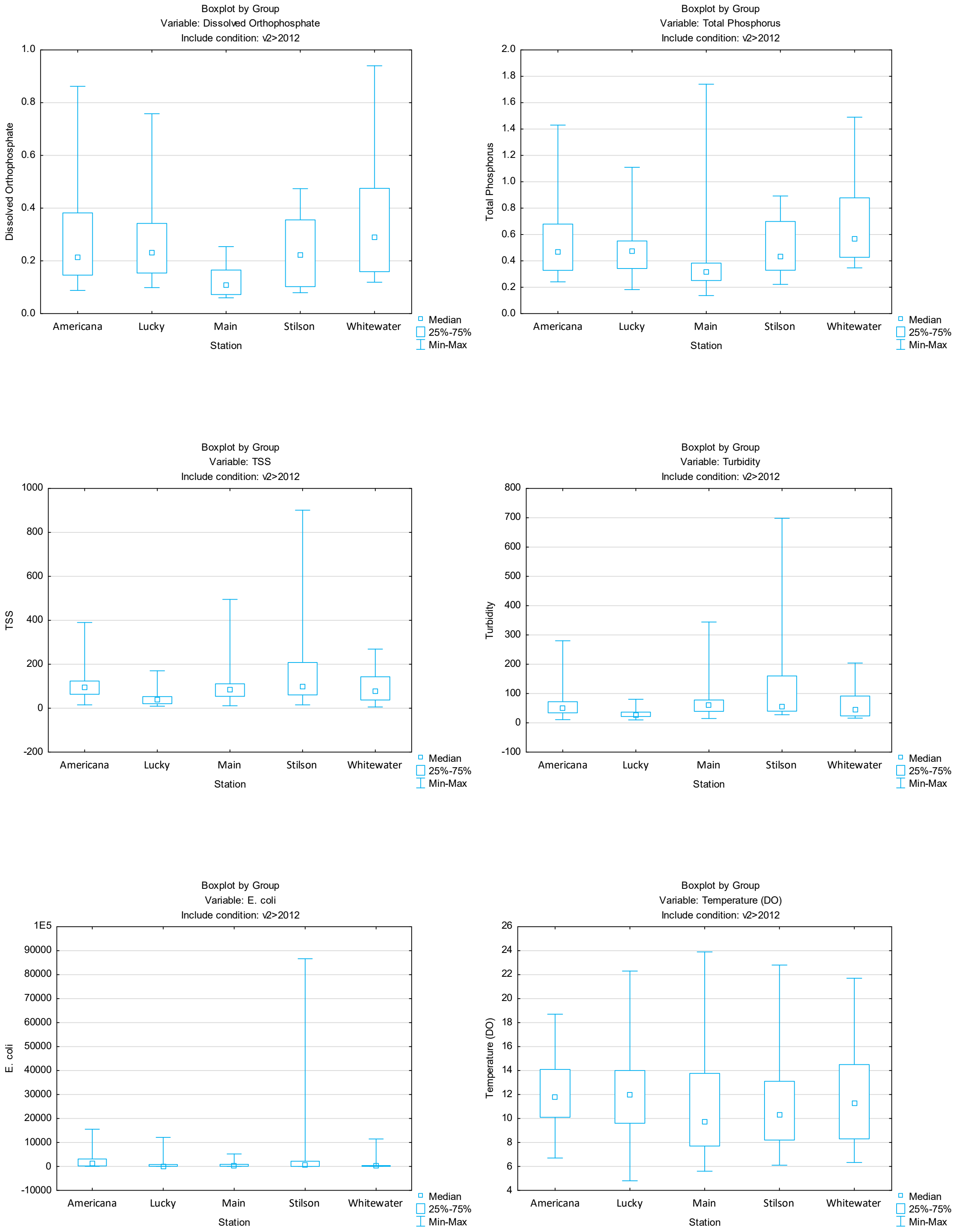

Boxplot by Group
Variable: Dissolved Orthophosphate
Include condition: v2>2012
Dissolved Orthophosphate
1.0
0.8
0.6
0.4
0.2
0.0
Americana
Lucky
Main
Stilson
Whitewater
Station
Median
25%-75%
Min-Max
Boxplot by Group
Variable: Total Phosphorus
Include condition: v2>2012
Total Phosphorus
2.0
1.8
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
Americana
Lucky
Main
Stilson
Whitewater
Station
Median
25%-75%
Min-Max
Boxplot by Group
Variable: TSS
Include condition: v2>2012
TSS
1000
800
600
400
200
0
-200
Americana
Lucky
Main
Stilson
Whitewater
Station
Median
25%-75%
Min-Max
Boxplot by Group
Variable: Turbidity
Include condition: v2>2012
Turbidity
800
700
600
500
400
300
200
100
0
-100
Americana
Lucky
Main
Stilson
Whitewater
Station
Median
25%-75%
Min-Max
Boxplot by Group
Variable: E. coli
Include condition: v2>2012
E. coli
1E5
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
Americana
Lucky
Main
Stilson
Whitewater
Station
Median
25%-75%
Min-Max
Boxplot by Group
Variable: Temperature (DO)
Include condition: v2>2012
Temperature (DO)
26
24
22
20
18
16
14
12
10
8
6
4
Americana
Lucky
Main
Stilson
Whitewater
Station
Median
25%-75%
Min-Max

Figure 8

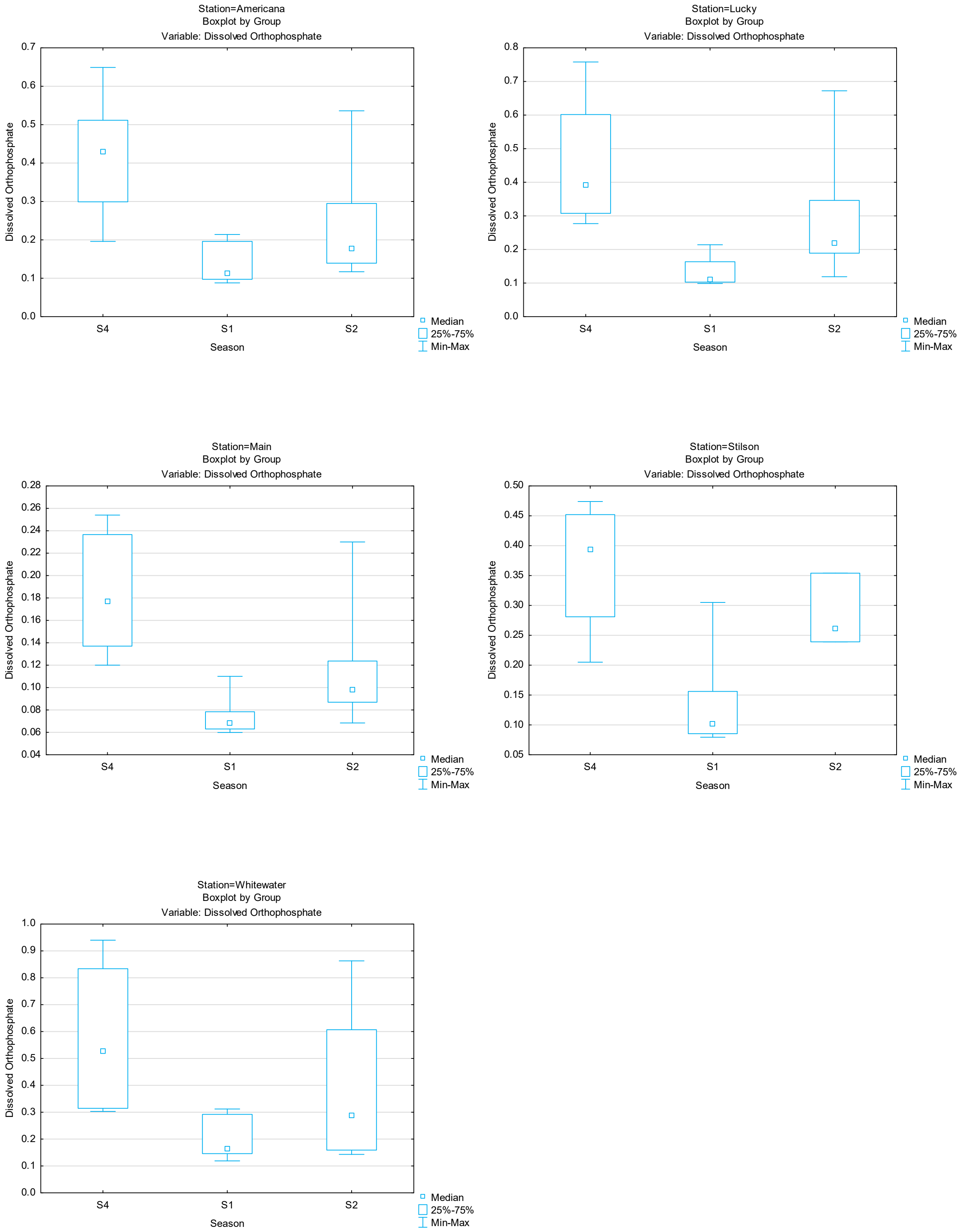
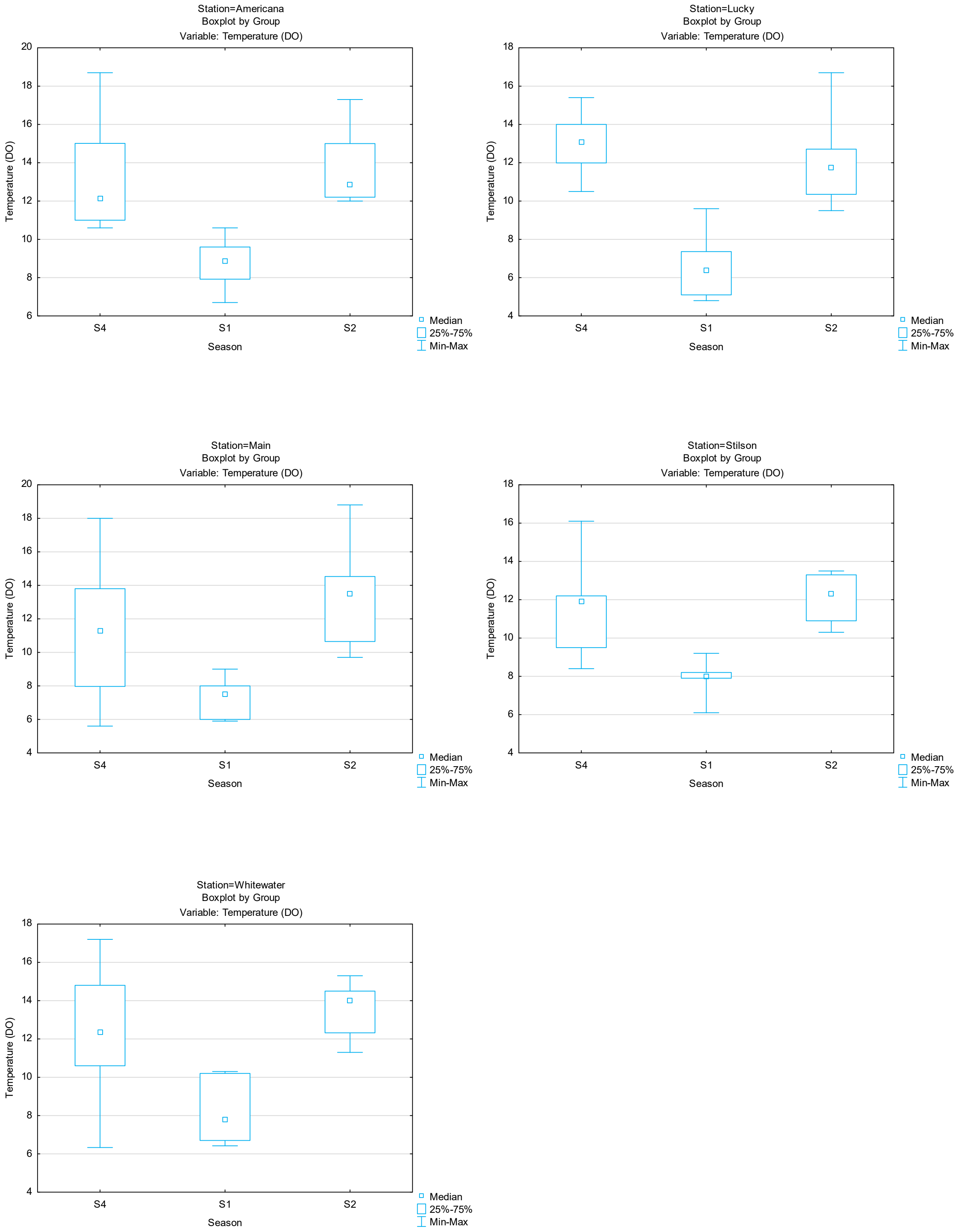
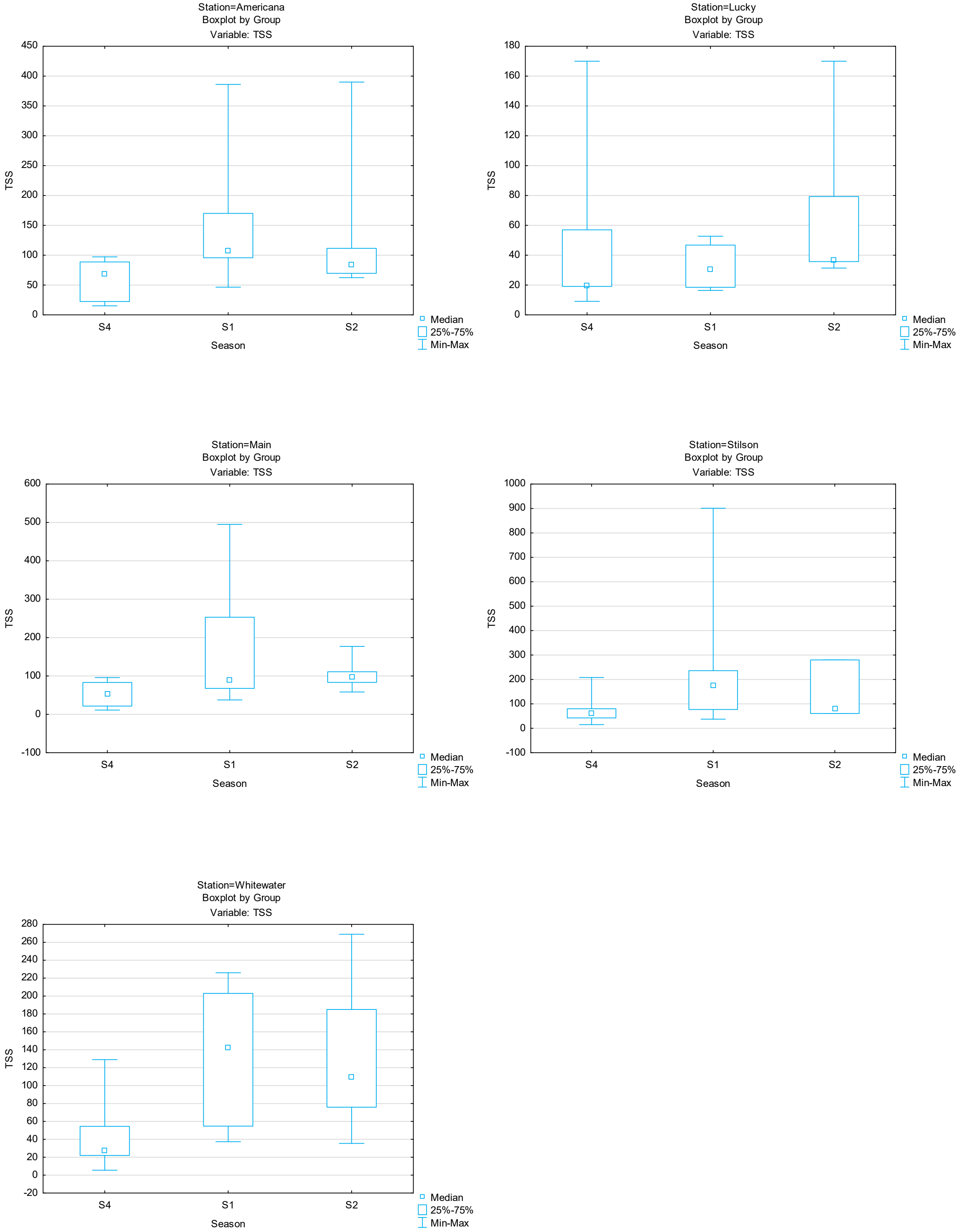

Station=Americana
Boxplot by Group
Variable: Dissolved Orthophosphate
Dissolved Orthophosphate
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Lucky
Boxplot by Group
Variable: Dissolved Orthophosphate
Dissolved Orthophosphate
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Main
Boxplot by Group
Variable: Dissolved Orthophosphate
Dissolved Orthophosphate
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.18
0.20
0.22
0.24
0.26
0.28
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Stilson
Boxplot by Group
Variable: Dissolved Orthophosphate
Dissolved Orthophosphate
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
0.50
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Whitewater
Boxplot by Group
Variable: Dissolved Orthophosphate
Dissolved Orthophosphate
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
S4
S1
S2
Season
Median
25%-75%
Min-Max

Figure 9



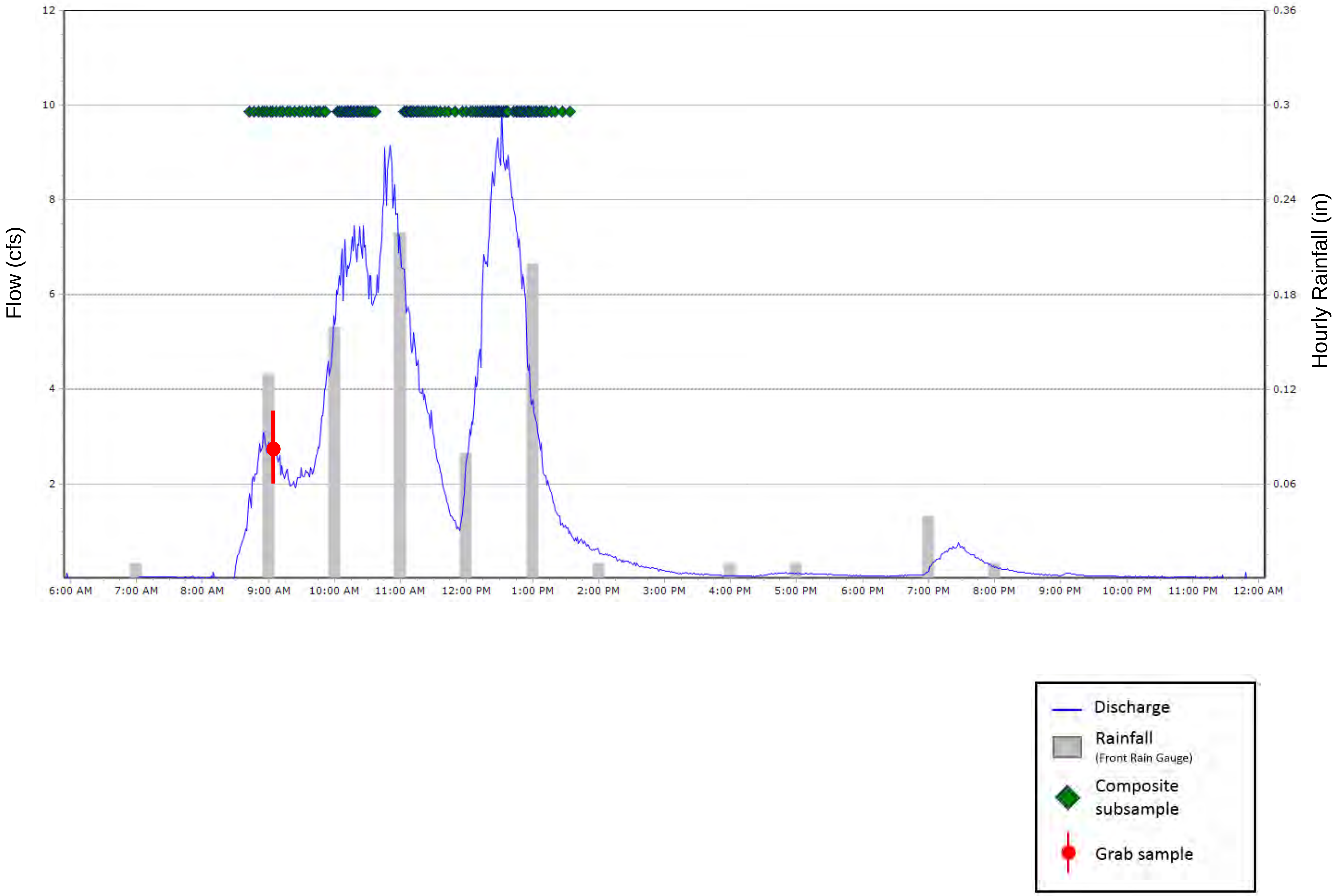
Station=Americana
Boxplot by Group
Variable: Temperature (DO)
Temperature (DO)
20
18
16
14
12
10
8
6
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Lucky
Boxplot by Group
Variable: Temperature (DO)
Temperature (DO)
18
16
14
12
10
8
6
4
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Main
Boxplot by Group
Variable: Temperature (DO)
Temperature (DO)
20
18
16
14
12
10
8
6
4
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Stilson
Boxplot by Group
Variable: Temperature (DO)
Temperature (DO)
18
16
14
12
10
8
6
4
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Whitewater
Boxplot by Group
Variable: Temperature (DO)
Temperature (DO)
18
16
14
12
10
8
6
4
S4
S1
S2
Season
Median
25%-75%
Min-Max

Figure 10

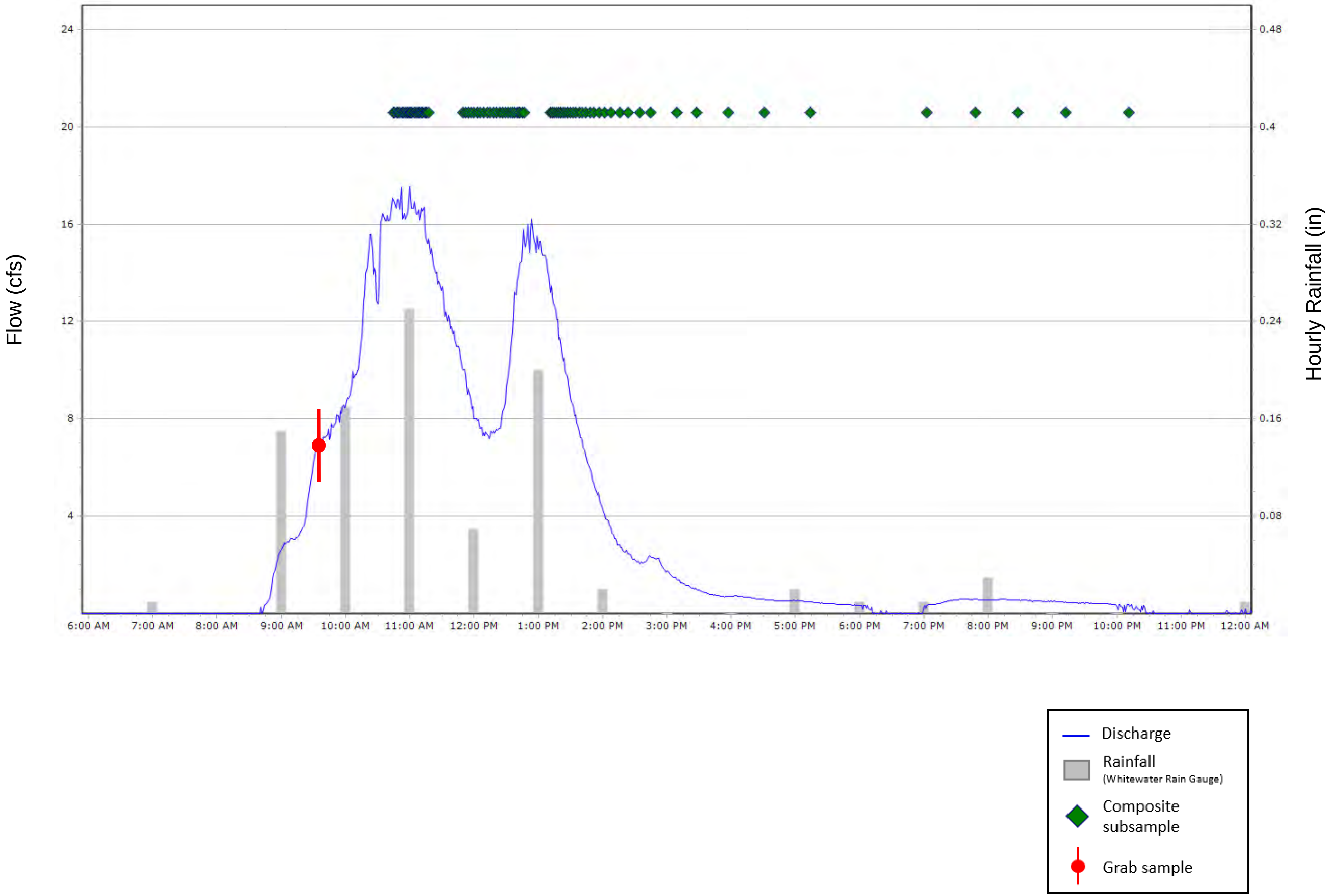

Station=Americana
Boxplot by Group
Variable: TSS
TSS
450
400
350
300
250
200
150
100
50
0
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Lucky
Boxplot by Group
Variable: TSS
TSS
180
160
140
120
100
80
60
40
20
0
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Main
Boxplot by Group
Variable: TSS
TSS
600
500
400
300
200
100
0
-100
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Stilson
Boxplot by Group
Variable: TSS
TSS
1000
900
800
700
600
500
400
300
200
100
0
-100
S4
S1
S2
Season
Median
25%-75%
Min-Max
Station=Whitewater
Boxplot by Group
Variable: TSS
TSS
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
-20
S4
S1
S2
Season
Median
25%-75%
Min-Max

Appendix A: Storm Event Hydrographs

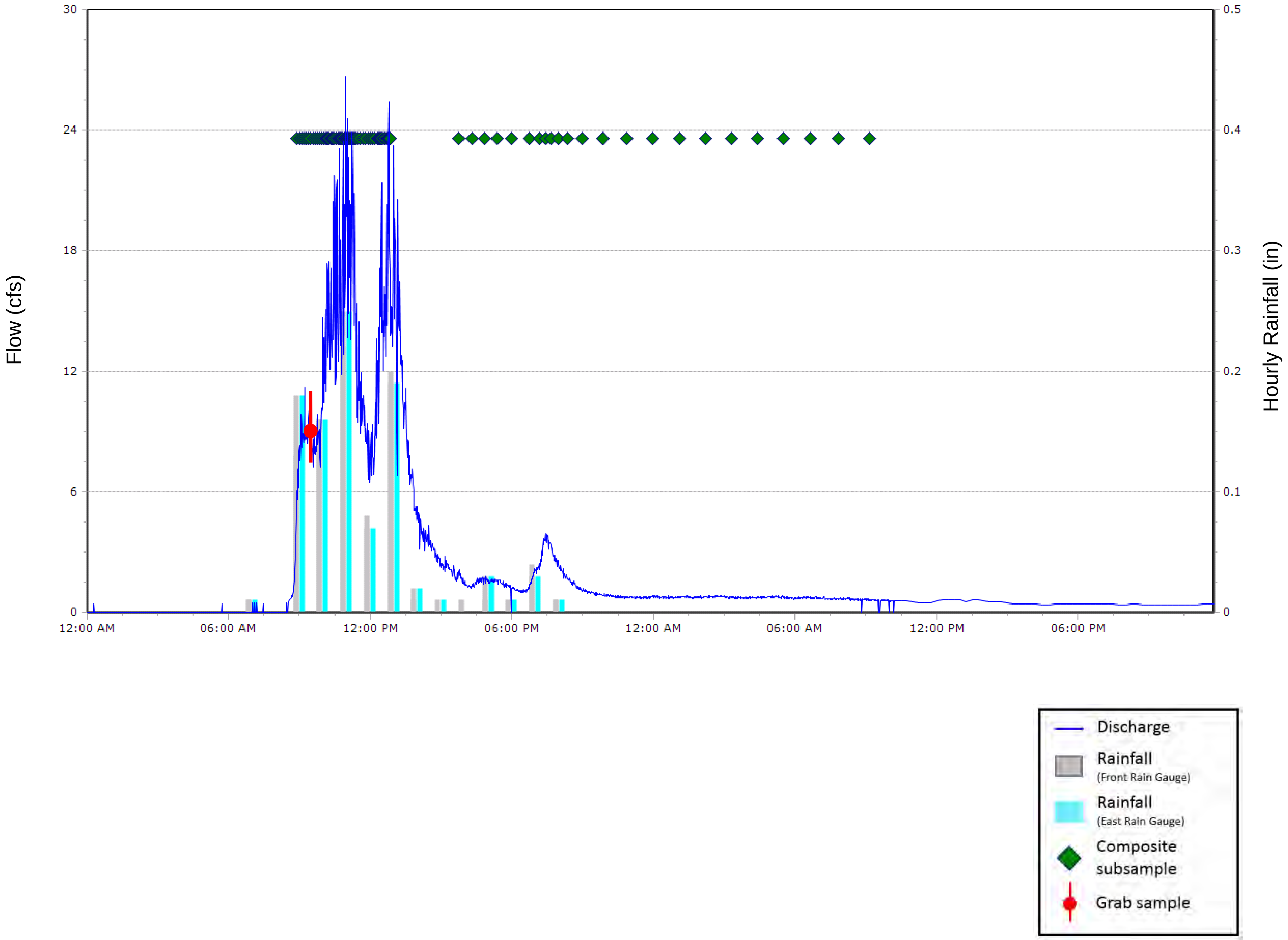
Main - 10/9/2018 Event



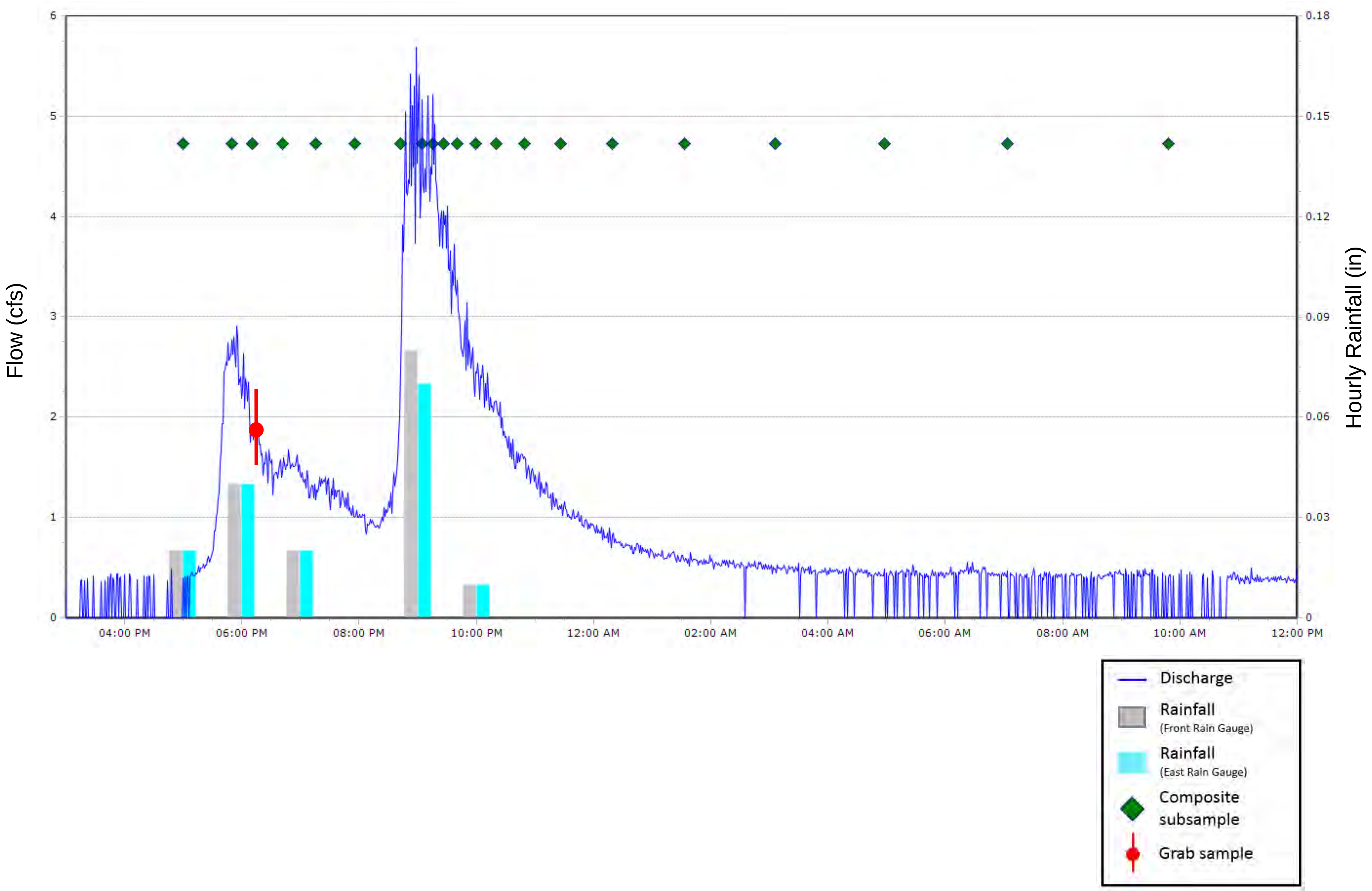
Whitewater - 10/9/2018 Event



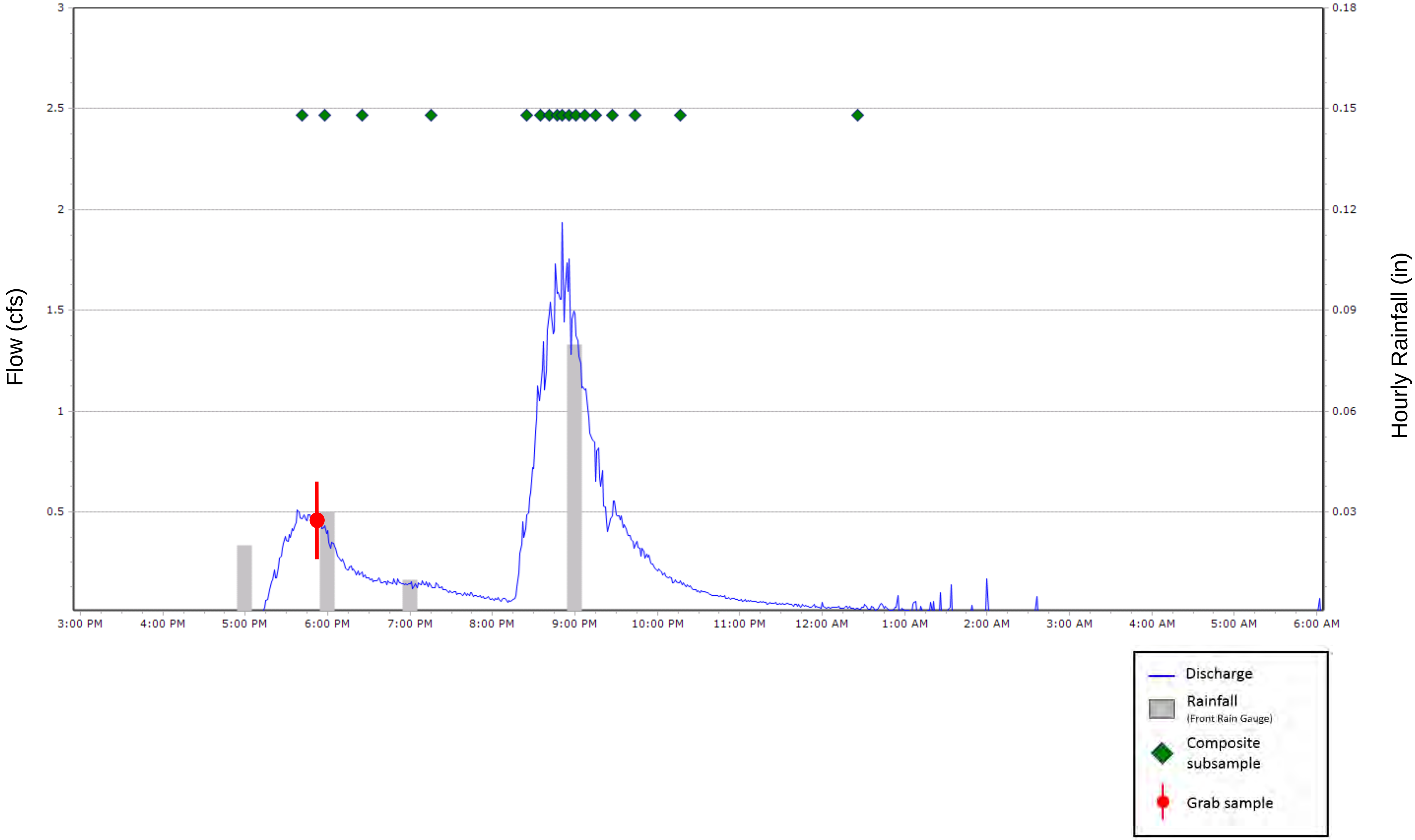
Americana - 10/9/2018 Event



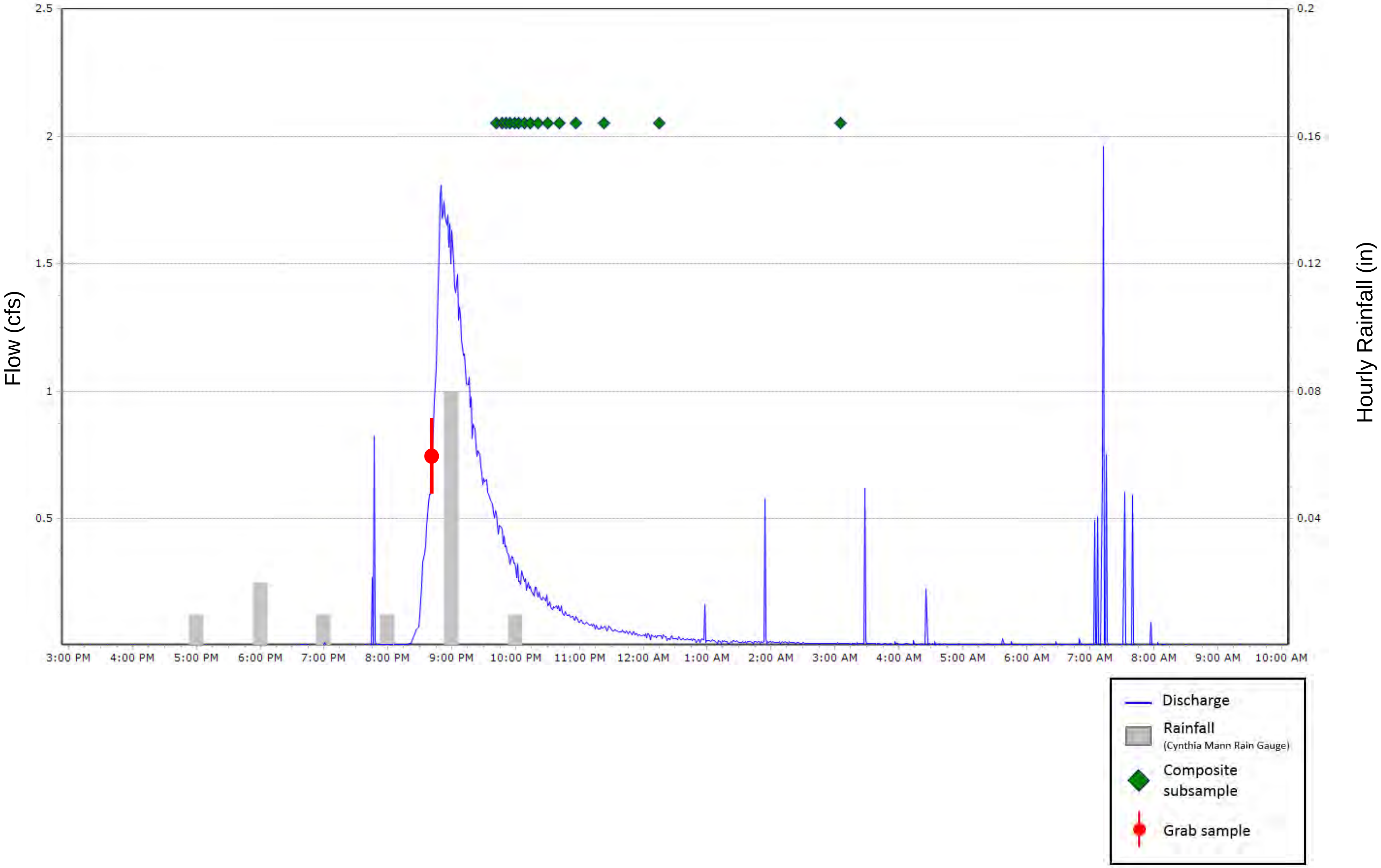
Americana - 11/27/2018 Event



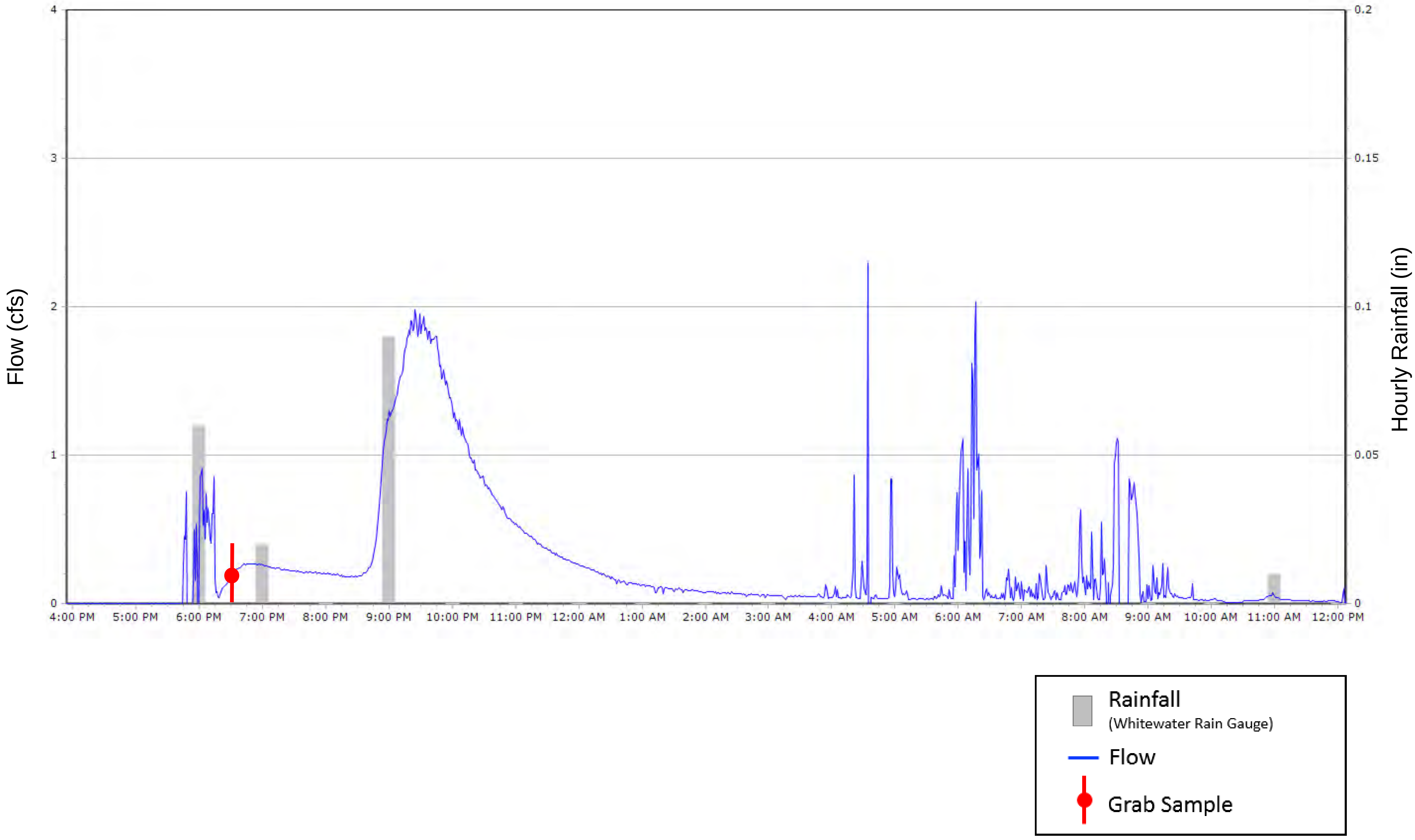
Main - 11/27/2018 Event



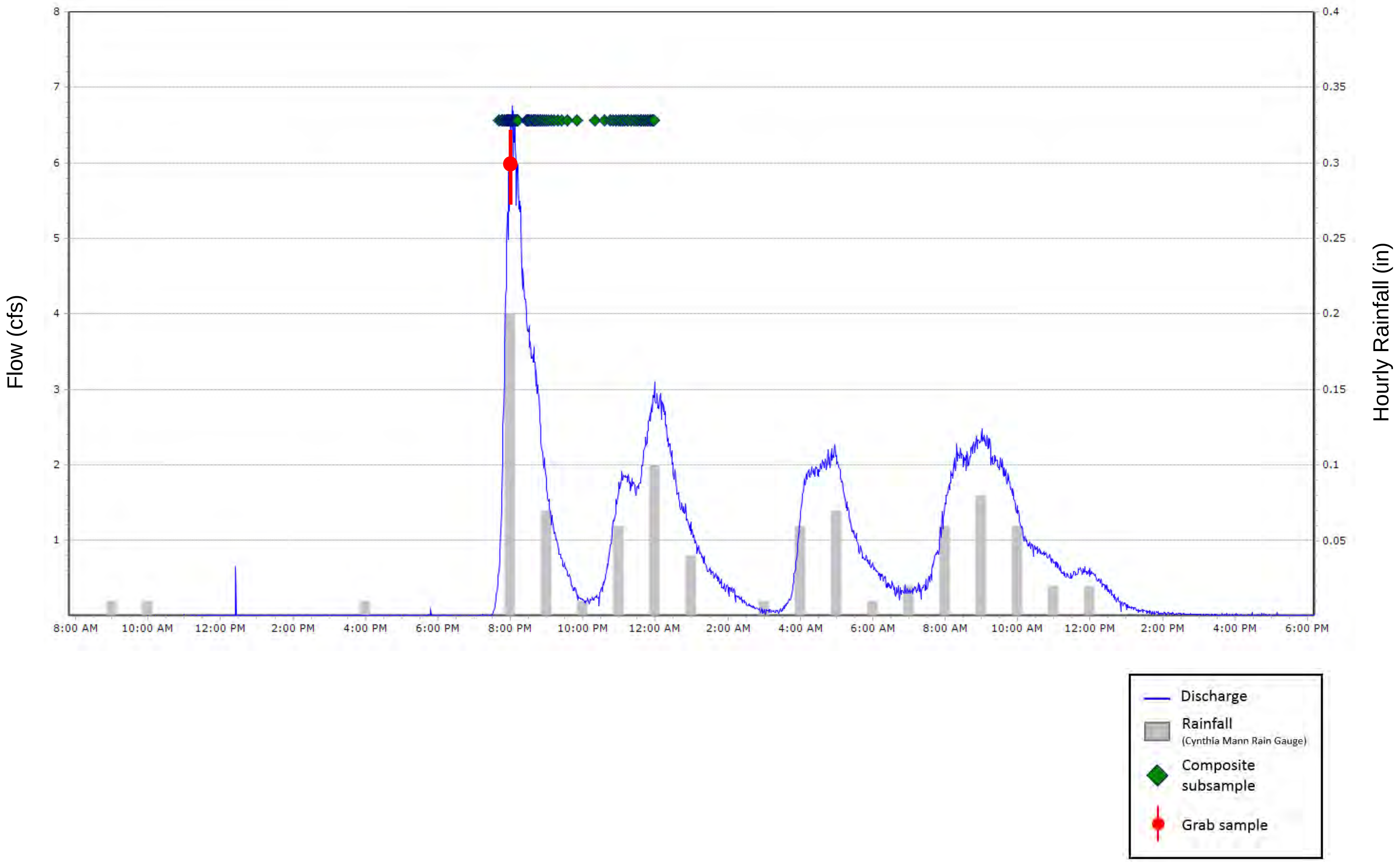
Lucky - 11/27/2018 Event



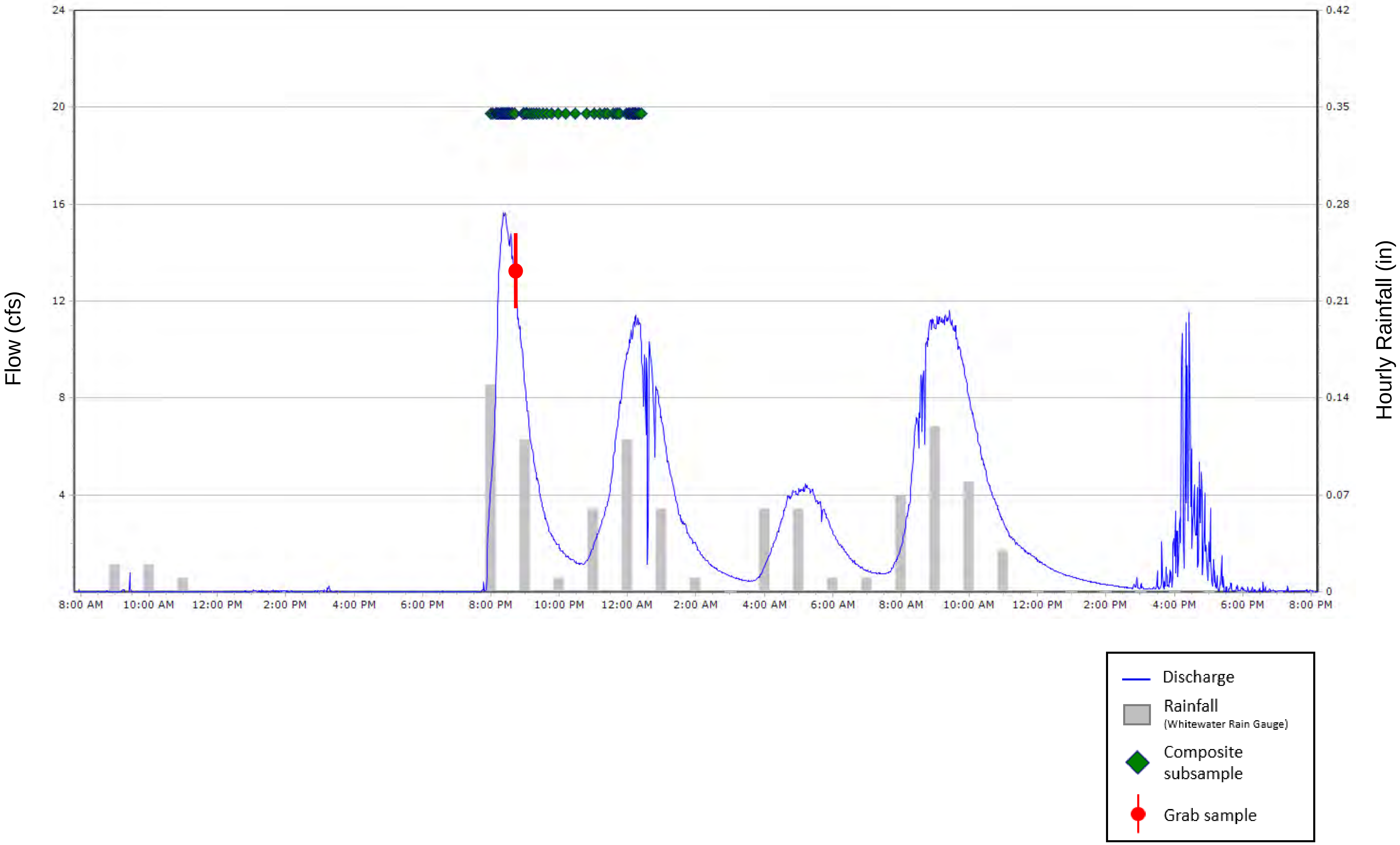
Whitewater - 11/27/2018 Event



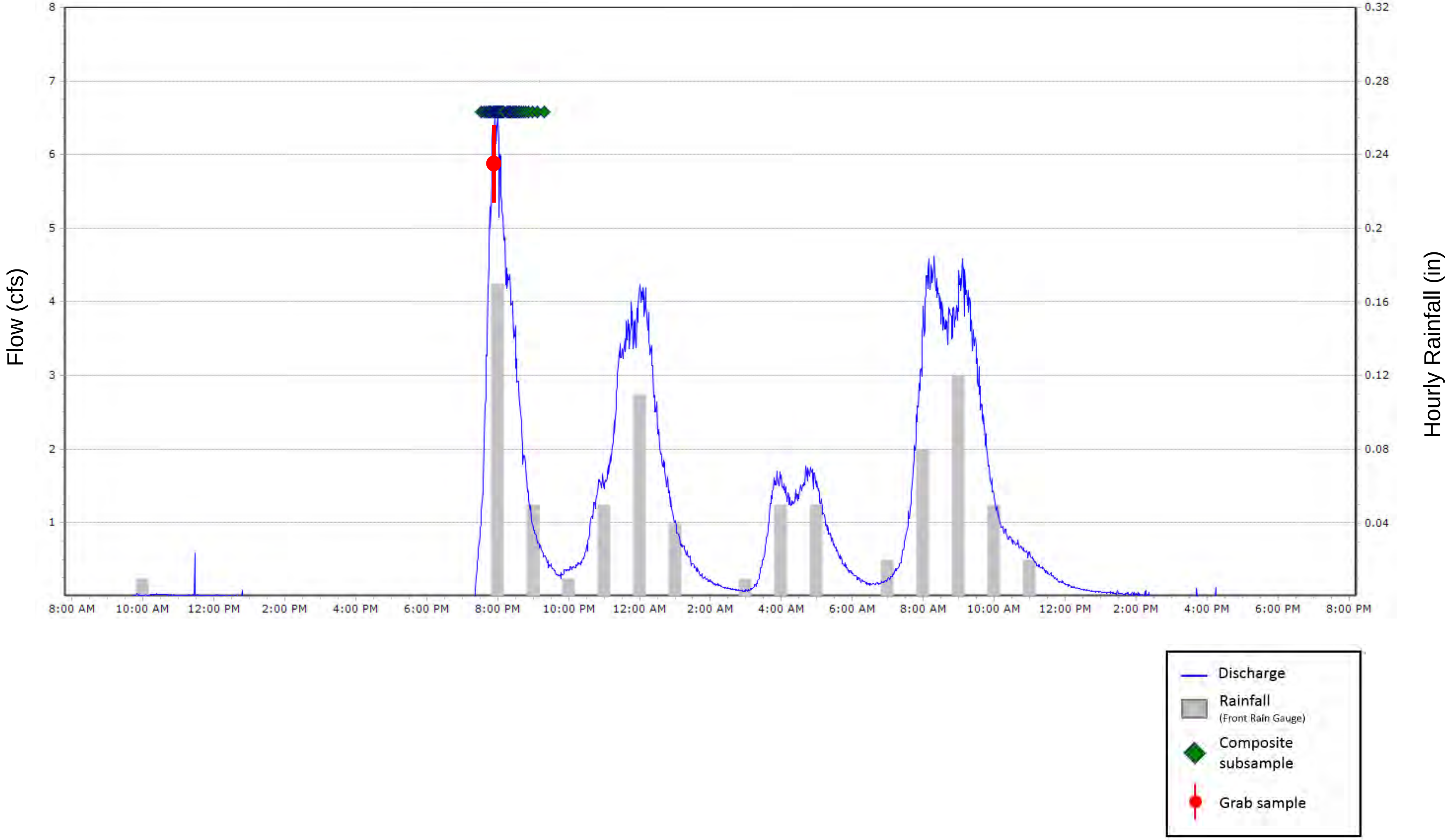
Lucky - 2/2/2019 Event



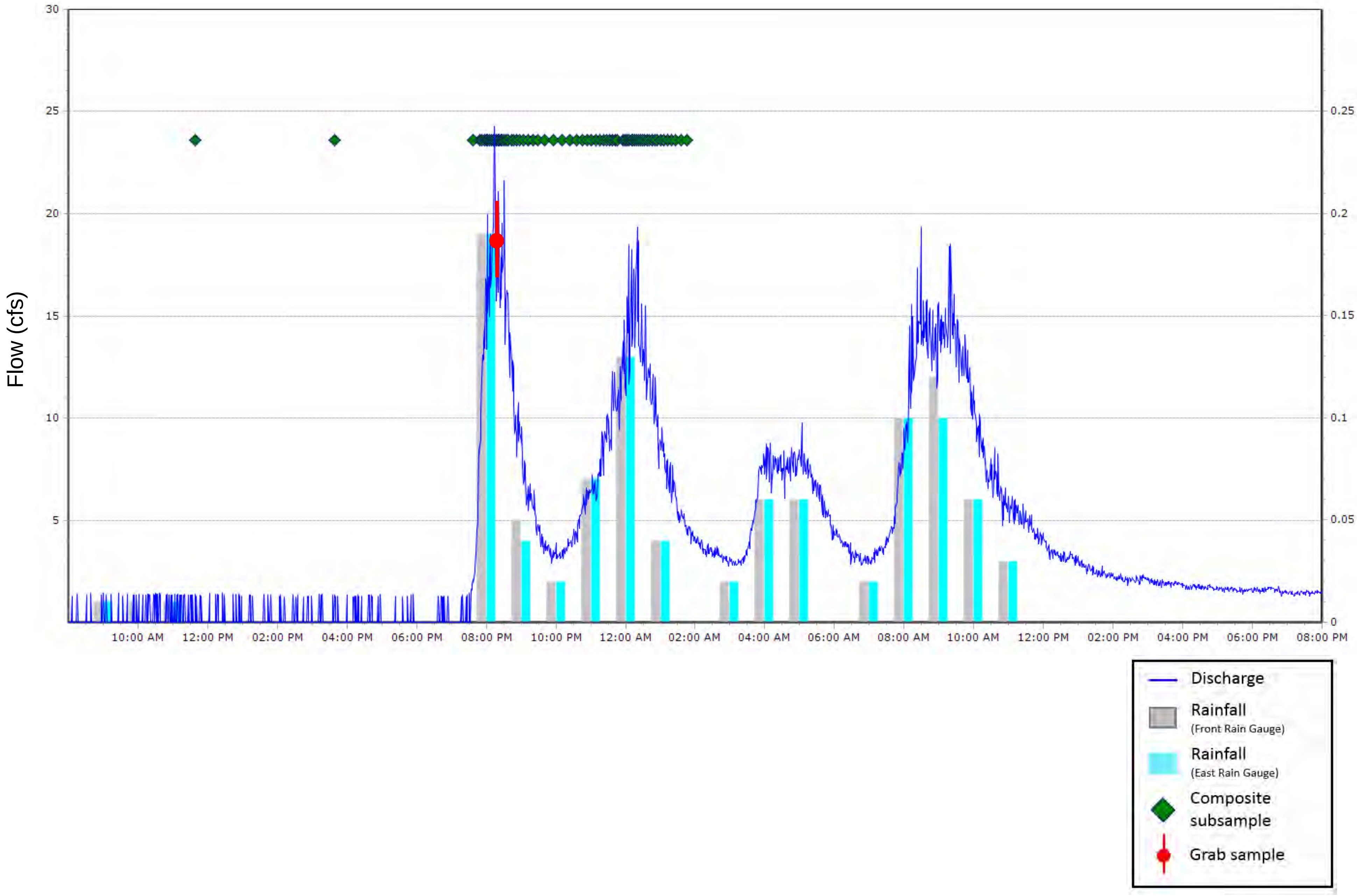
Whitewater - 2/2/2019 Event



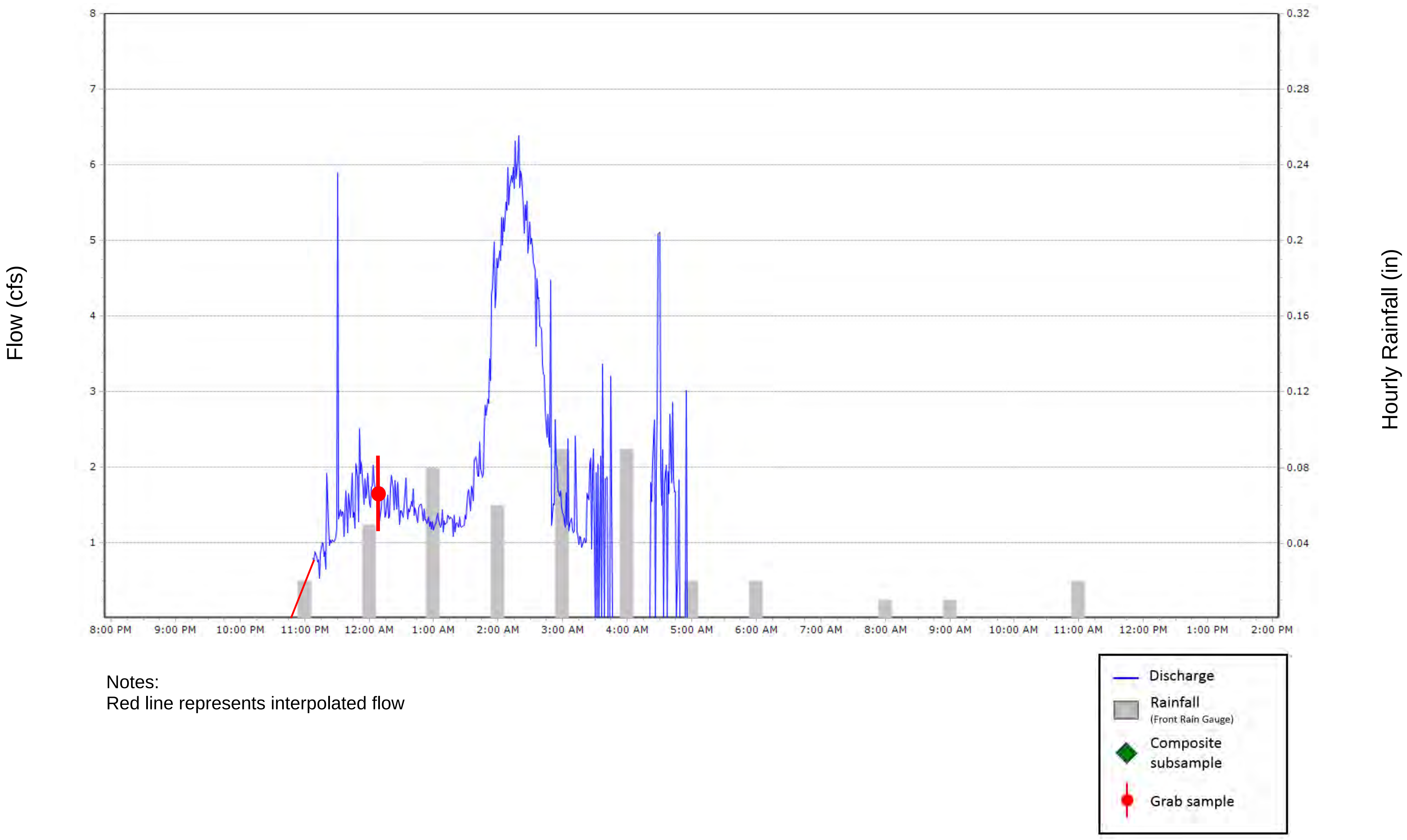
Main - 2/2/2019 Event



Americana - 2/2/2019 Event

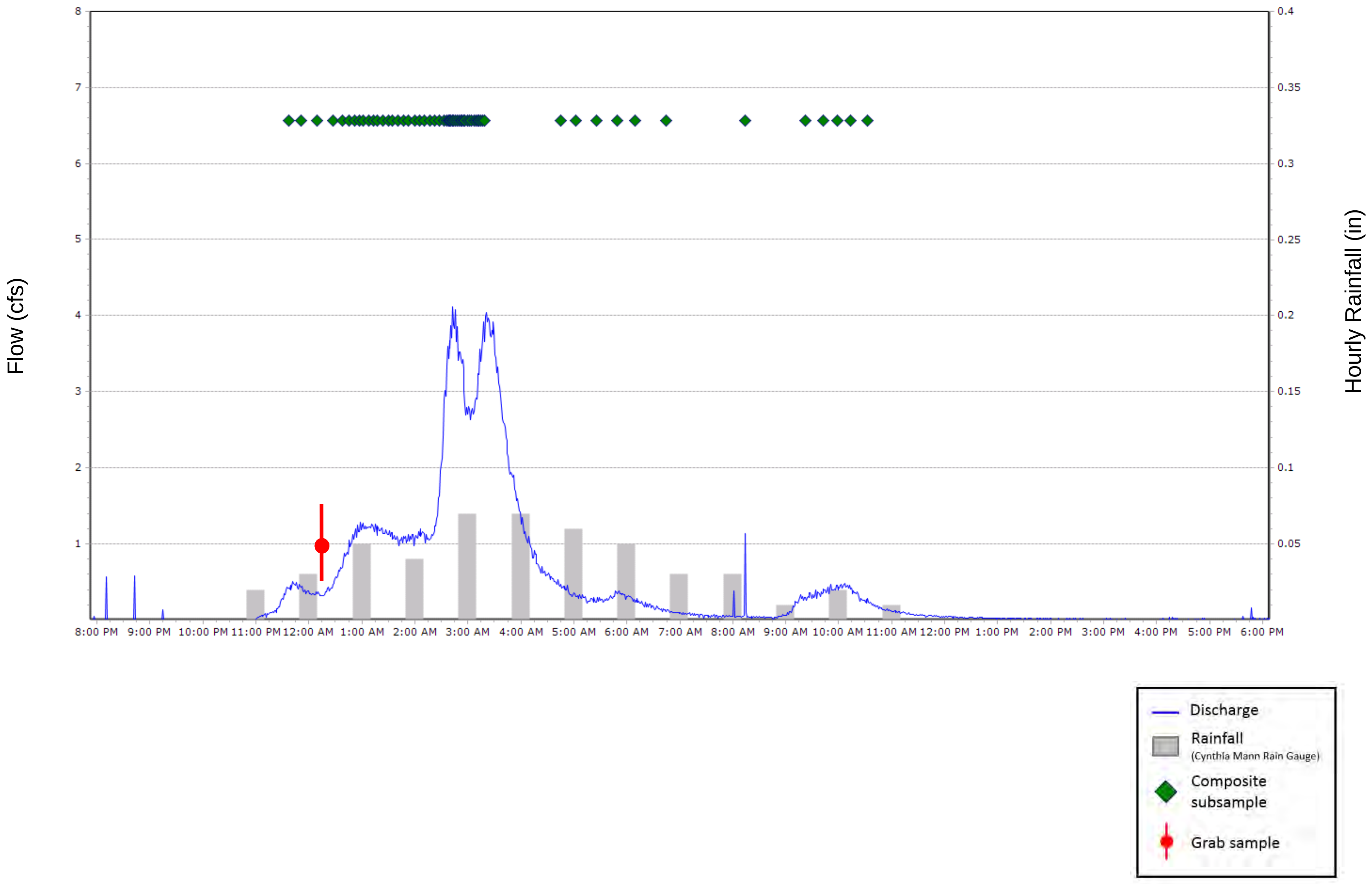


Main - 4/14/2019 Event

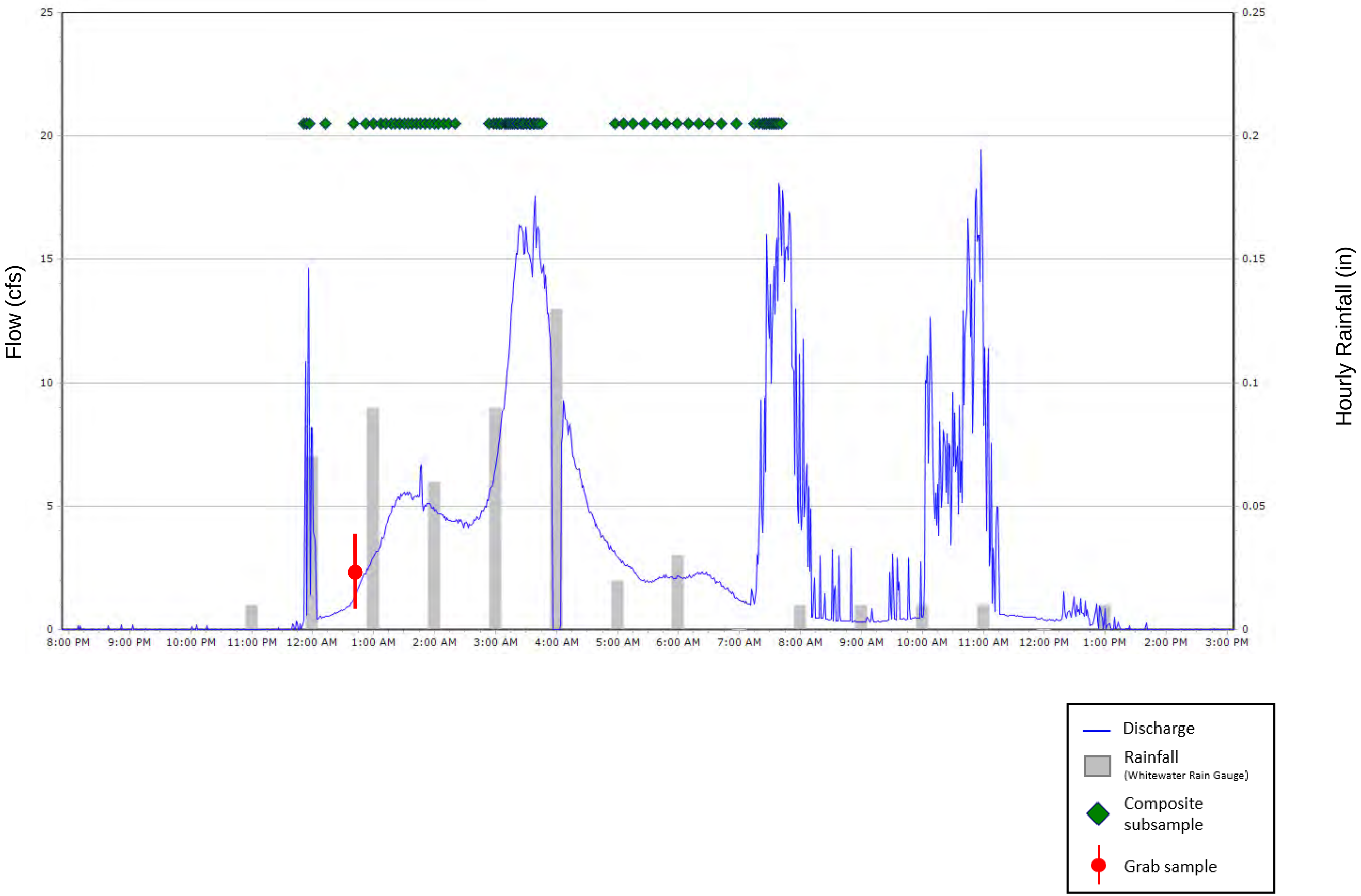


Notes:
Red line represents interpolated flow

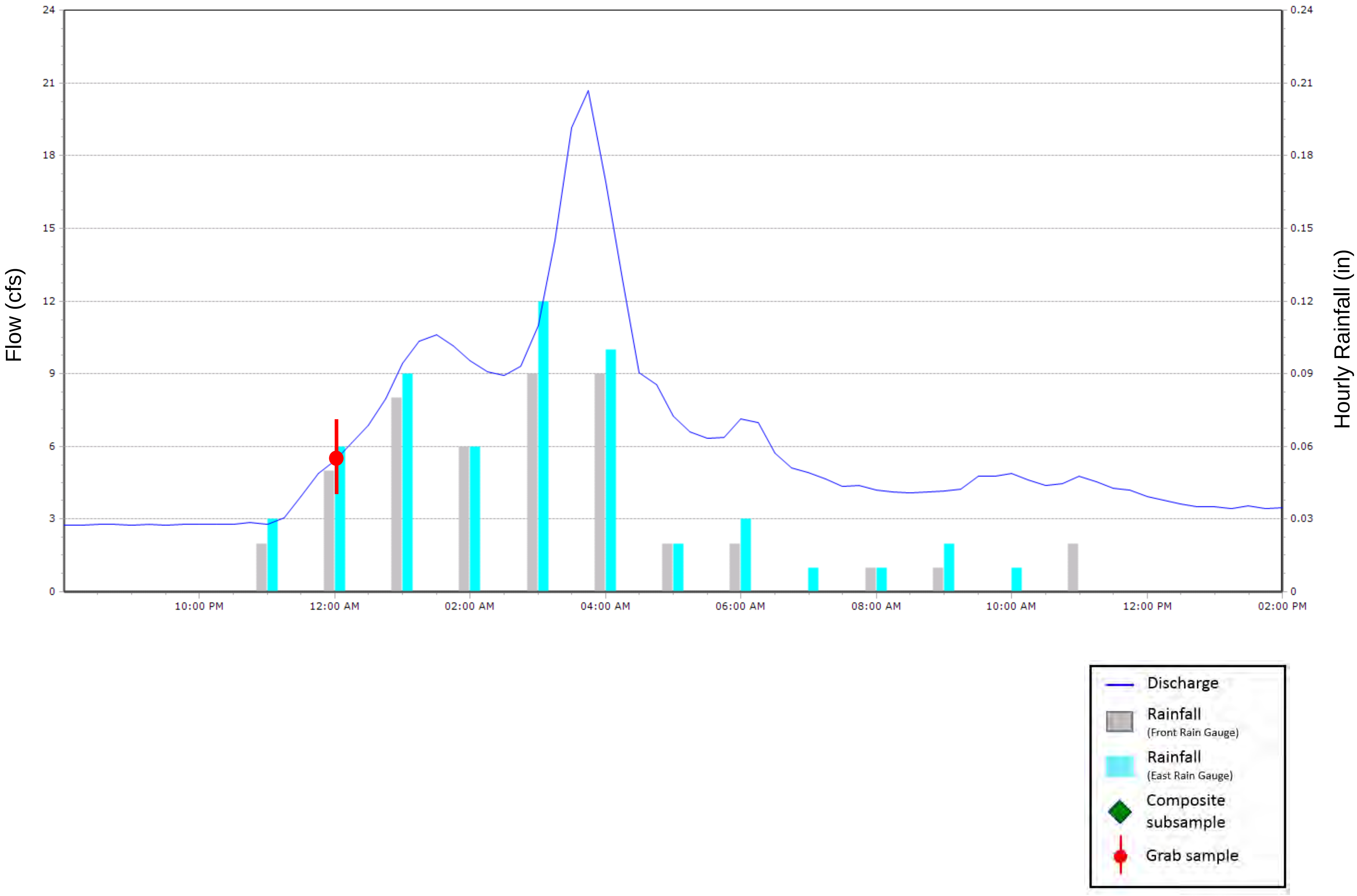
Lucky - 4/14/2019 Event



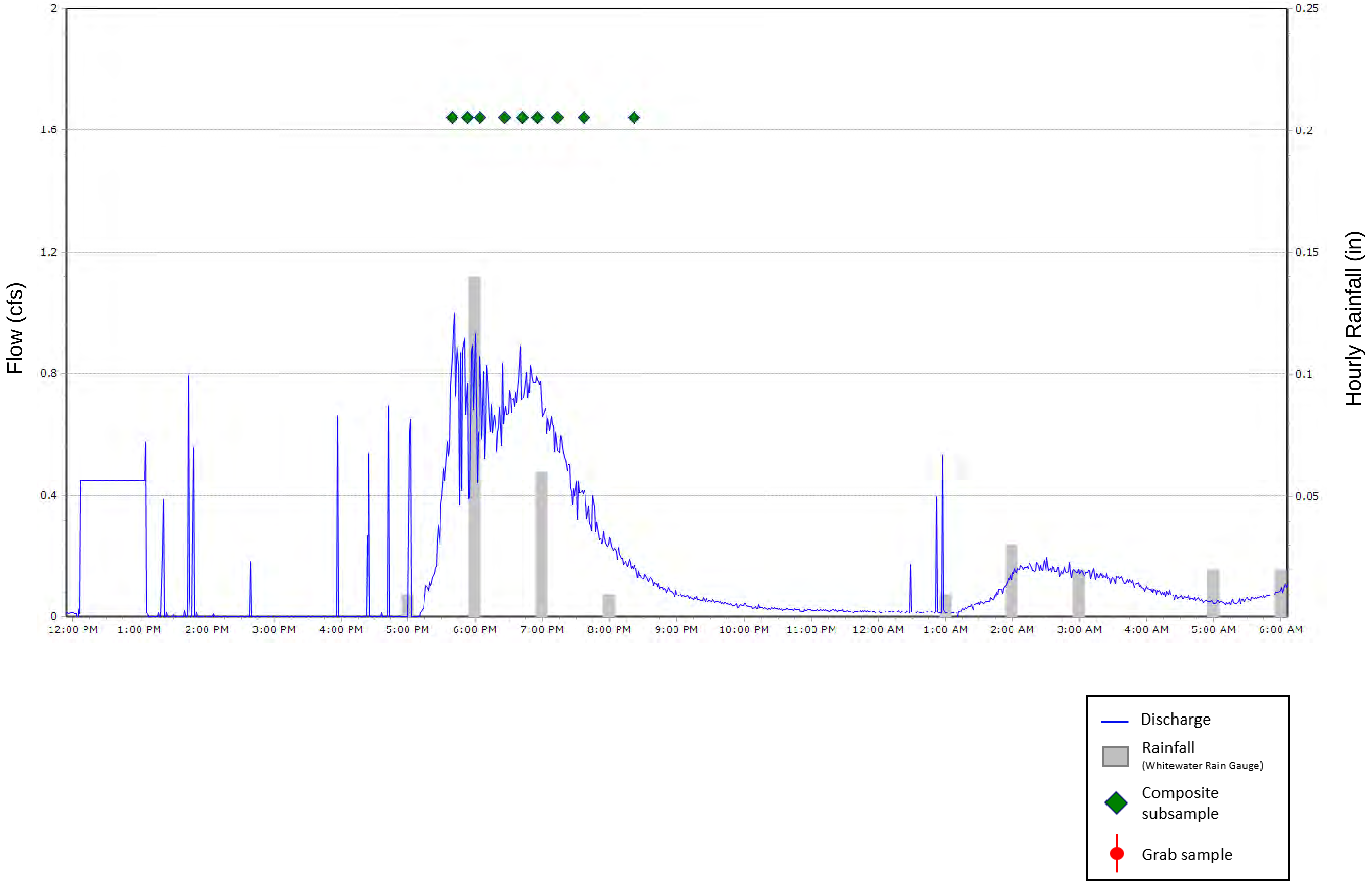
Whitewater - 4/14/2019 Event



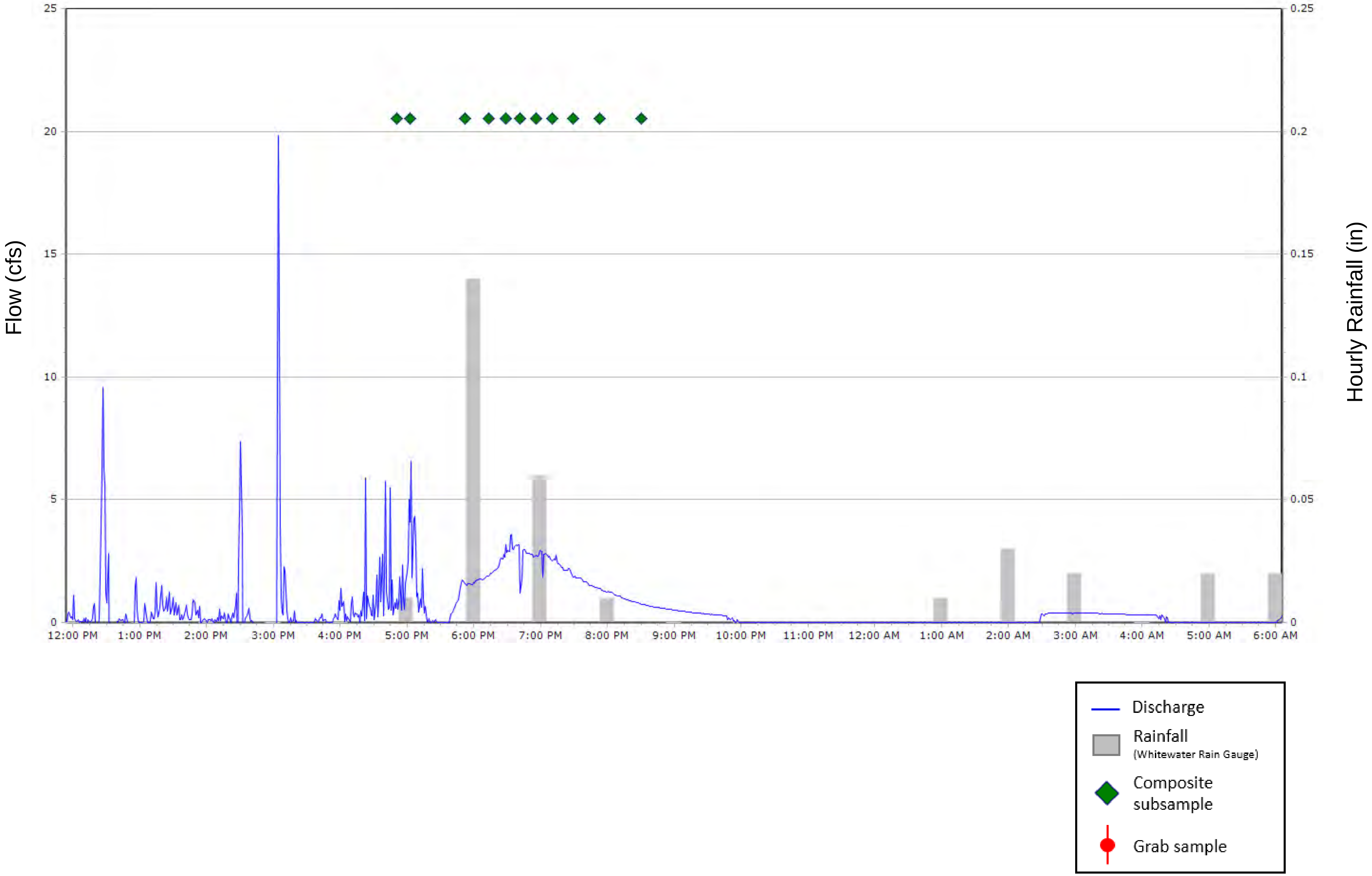
Americana - 4/14/2019 Event



Lucky - 5/16/2019 Event



Whitewater - 5/16/2019 Event



Appendix B: Laboratory Analytical Reports

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Report Date: 10/17/2018 11:21

Samples in this Report

Lab ID	Sample	Sample Description	Matrix	Qualifiers	Date Sampled	Date Received
8AC0084-01	ACST1B	181009-03-WG	Water		10/09/2018	10/09/2018
8AC0084-02	ACST1B	181009-11-WG	Water		10/09/2018	10/09/2018
8AC0084-03	ACST1B	181009-11-001	Water		10/09/2018	10/09/2018
8AC0084-04	ACST1B	181009-11-101	Water		10/09/2018	10/09/2018
8AC0084-05	ACST1B	181009-12-WG	Water		10/09/2018	10/09/2018
8AC0084-06	ACST1B	181009-14-WG	Water		10/09/2018	10/09/2018

Report Date: 10/17/2018 11:21

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location:	ACST1B	Location Description:	181009-03-WG
Date/Time Collected:	10/09/2018 08:55		
Lab Number:	8AC0084-01	Sample Collector:	AML
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8J0908	3090.0	MPN/100 mL	100.0	1.0	Colilert	10/09/18 11:58	10/10/18 12:00	JJR	D
Wet Chemistry										
Chlorine Screen	B8J0912	Absent				SM 4500-CL G-2000 mod	10/09/18	10/9/18 11:32	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 10/17/2018 11:21

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location: ACST1B
Date/Time Collected: 10/09/2018 09:35
Lab Number: 8AC0084-02
Sample Type: Grab

Location Description: 181009-11-WG
Sample Collector: AML
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8J0908	11450	MPN/100 mL	100.0	1.0	Colilert	10/09/18 11:58	10/10/18 12:00	JJR	D
Wet Chemistry										
Chlorine Screen	B8J0912	Absent				SM 4500-CL G-2000 mod	10/09/18	10/9/18 11:32	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location:	ACST1B	Location Description:	181009-11-001
Date/Time Collected:	10/09/2018 12:00		
Lab Number:	8AC0084-03	Sample Collector:	AML
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8J0908	<1.0	MPN/100 mL	1.0	1.0	Colilert	10/09/18 11:58	10/10/18 12:00	JJR	U
Wet Chemistry										
Chlorine Screen	B8J0912	Absent				SM 4500-CL G-2000 mod	10/09/18	10/9/18 11:32	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 10/17/2018 11:21

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location:	ACST1B	Location Description:	181009-11-101
Date/Time Collected:	10/09/2018 12:01		
Lab Number:	8AC0084-04	Sample Collector:	AML
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8J0908	11120	MPN/100 mL	100.0	1.0	Colilert	10/09/18 11:58	10/10/18 12:00	JJR	D
Wet Chemistry										
Chlorine Screen	B8J0912	Absent				SM 4500-CL G-2000 mod	10/09/18	10/9/18 11:32	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location:	ACST1B	Location Description:	181009-12-WG
Date/Time Collected:	10/09/2018 09:03		
Lab Number:	8AC0084-05	Sample Collector:	ABC
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8J0908	770.1	MPN/100 mL	1.0	1.0	Colilert	10/09/18 11:58	10/10/18 12:00	JJR	
Wet Chemistry										
Chlorine Screen	B8J0912	Absent				SM 4500-CL G-2000 mod	10/09/18	10/9/18 11:32	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location:	ACST1B	Location Description:	181009-14-WG
Date/Time Collected:	10/09/2018 09:19		
Lab Number:	8AC0084-06	Sample Collector:	ABC
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8J0908	15530	MPN/100 mL	100.0	1.0	Colilert	10/09/18 11:58	10/10/18 12:00	JJR	D
Wet Chemistry										
Chlorine Screen	B8J0912	Absent				SM 4500-CL G-2000 mod	10/09/18	10/9/18 11:32	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Quality Control Report

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Microbiology									
Batch: B8J0908									
Blank (B8J0908-BLK1)									
E. Coli	Absent						10/10/2018	JJR	
LCS (B8J0908-BS1)									
E. Coli				Present			10/10/2018	JJR	
Duplicate (B8J0908-DUP1) Source ID: 8LS0351-06									
E. Coli					Fail	128	10/10/2018	JJR	
Duplicate (B8J0908-DUP3) Source ID: 8AC0084-06RE1									
E. Coli					Pass	128	10/10/2018	JJR	

Notes and Definitions

Item	Definition
D	Data reported from a dilution
U	Analyte included in the analysis, but not detected

Method Reference Acronyms

Colilert	Colilert, IDEXX Laboratories, Inc.
EPA	Manual of Methods for Chemical Analysis of Water and Wastes, USEPA
GS	USGS Techniques of Water-Resources Investigations
HH	Hach Spectrophotometer Procedures Manual
SM	Standard Methods for the Examination of Water and Wastewater
SW	Test methods for Evaluating Solid Waste, SW-846

J Finegan-Kelly

Janet Finegan-Kelly
Water Quality Laboratory Manager

Stephen Quintero or Heather Rankin
QA/QC Coordinator

Ada County Highway District

Attn: Monica Lowe
3775 Adams Street
Garden City, Idaho 83714–6418
Tel. (208) 387–6255
Fax (208) 387–6391

Purchase Order: 63046445
Project: Stormwater-PI
Sampler(s): A. Carlson
A. Leonard

							Matrix	Type																	
Lab#	Begin Date	End Date	Begin Time	End Time	Sample Identification	Sampler Initials	Water	Grab	Composite	BOD$_5$ - SM 5210 B	COD - Hach 8000	TSS - SM 2540 D	TDS - SM 2540 C	TKN - Perstorp PAI-DK01	TP - EPA 200.7	Orthophosphate - EPA 365.1	Total As, Cd, Pb - EPA 200.7	Diss. Cd Cu, Pb, Zn - EPA 200.7	Total Hg - EPA 245.2	E. Coli - IDEXX Colilert	Turbidity - EPA 180.1	Hardness - SM2340 B	NO$_3$+NO$_2$ -EPA 353.2	NH$_3$ - SM 4500 NH$_3$ - D	Total Containers
8AC0084-01	10-9-18	10-9-18	0855		181009-03-WG	AML	✓	✓												X					1
-02	10-9-18	10-9-18	0935		181009-11-WG	AML	✓	✓												X					1
-03	10-9-18	10-9-18	1200		181009-11-001	AML	✓	✓												X					1
-04	10-9-18	10-9-18	1201		181009-11-101	AML	✓	✓												X					1
-05	10-9-18	10-9-18	0903		181009-12-WG	ABC	✓	✓												X					1
-06	10-9-18	10-9-18	0919		181009-14-WG	ABC	✓	✓												X					1

Relinquished by (sign)	Date & Time Transferred	Received by (sign)	Comments/Special Instructions:
	10-9-18 1045	10-9-18 1045	

8AC0084

Report Date: 11/05/2018 13:46

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Samples in this Report

Lab ID	Sample	Sample Description	Matrix	Qualifiers	Date Sampled	Date Received
8AC0085-01	ACST1C	181009-11-WC	Water		10/09/2018	10/10/2018
8AC0085-02	ACST1C	181009-12-WC	Water		10/09/2018	10/10/2018
8AC0085-03	ACST1C	181009-14-WC	Water		10/10/2018	10/10/2018
8AC0085-04	ACST1C	181009-14-103	Water		10/10/2018	10/10/2018

Analysis Report

Location: ACST1C
Location Description: 181009-11-WC
Date/Time Collected: 10/09/2018 10:45 - 10/09/2018 22:11
Lab Number: 8AC0085-01
Sample Collector: ABC
Sample Type: Composite
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B8J1503	<0.0350	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	10/15/18	10/15/18 12:17	CJP	U
BOD5	B8J1013	86.5	mg/L	2.00	2.00	SM 5210 B-2001	10/10/18	10/15/18 10:15	BAK	
COD	B8J1008	276	mg/L	7.00	7.00	HH 8000-1979	10/10/18	10/10/18 14:00	JAL	
Nitrate-Nitrite, as N	B8J1003	0.242	mg/L	0.0200	0.0200	EPA 353.2	10/10/18	10/10/18 15:35	SMC	
TKN	B8K0104	3.21	mg/L	0.130	0.130	EPA 351.2	11/01/18	11/2/18 11:43	SMC	
Total Dissolved Solids	B8J1015	101	mg/L	20.0	20.0	SM 2540 C-1997	10/10/18	10/10/18 15:30	CJP	
Total Suspended Solids	B8J1103	129	mg/L	0.900	0.900	SM 2540 D-1997	10/11/18	10/11/18 11:04	KMG	
Turbidity	B8J1009	43.6	NTU	3.0	0.3	EPA180.1 R2.0 (1993)	10/10/18	10/10/18 11:49	CJP	D
Dissolved Wet Chemistry										
Orthophosphate, as P	B8J1108	0.303	mg/L	2.00E-3	2.00E-3	EPA 365.1	10/11/18	10/11/18 11:36	A.E	
Total Metals										
Mercury	B8J1017	0.0169	ug/L	4.71E-3	4.71E-3	EPA 245.2	10/11/18	10/12/18 8:08	SAS	
Arsenic	B8J1117	<5.72	ug/L	5.72	5.72	EPA 200.7	10/11/18	10/12/18 11:58	AMO	U
Cadmium	B8J1117	<1.00	ug/L	1.00	1.00	EPA 200.7	10/11/18	10/12/18 11:58	AMO	U
Calcium	B8J1117	6.52	mg/L	0.0500	0.0500	EPA 200.7	10/11/18	10/12/18 11:58	AMO	
Lead	B8J1117	8.23	ug/L	6.94	6.94	EPA 200.7	10/11/18	10/12/18 11:58	AMO	
Magnesium	B8J1117	1490	ug/L	50.0	50.0	EPA 200.7	10/11/18	10/12/18 11:58	AMO	
Phosphorus as P	B8J1117	0.747	mg/L	6.00E-3	6.00E-3	EPA 200.7	10/11/18	10/12/18 11:58	AMO	
Hardness	B8J1117	22.4	mg/L	1.00	1.00	EPA 200.7	10/11/18	10/12/18 11:58	AMO	
Dissolved Metals										
Cadmium	B8J1217	<1.00	ug/L	1.00	1.00	EPA 200.7	10/12/18	10/12/18 12:39	EDM	U
Copper	B8J1217	<10.0	ug/L	10.0	10.0	EPA 200.7	10/12/18	10/12/18 12:39	EDM	U
Lead	B8J1217	<6.94	ug/L	6.94	6.94	EPA 200.7	10/12/18	10/12/18 12:39	EDM	U
Zinc	B8J1217	32.4	ug/L	10.0	10.0	EPA 200.7	10/12/18	10/12/18 12:39	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 11/05/2018 13:46

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location: ACST1C
Location Description: 181009-12-WC
Date/Time Collected: 10/09/2018 08:35 - 10/09/2018 13:34
Lab Number: 8AC0085-02
Sample Collector: ABC
Sample Type: Composite
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B8J1503	0.414	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	10/15/18	10/15/18 12:14	CJP	
BOD5	B8J1013	17.2	mg/L	2.00	2.00	SM 5210 B-2001	10/10/18	10/15/18 10:08	BAK	
COD	B8J1008	128	mg/L	7.00	7.00	HH 8000-1979	10/10/18	10/10/18 14:55	JAL	
Nitrate-Nitrite, as N	B8J1003	0.236	mg/L	0.0200	0.0200	EPA 353.2	10/10/18	10/10/18 15:36	SMC	
TKN	B8K0104	1.88	mg/L	0.130	0.130	EPA 351.2	11/01/18	11/2/18 11:48	SMC	
Total Dissolved Solids	B8J1015	52.0	mg/L	20.0	20.0	SM 2540 C-1997	10/10/18	10/10/18 15:30	CJP	
Total Suspended Solids	B8J1103	95.8	mg/L	0.900	0.900	SM 2540 D-1997	10/11/18	10/11/18 11:02	KMG	
Turbidity	B8J1009	44.3	NTU	3.0	0.3	EPA180.1 R2.0 (1993)	10/10/18	10/10/18 13:52	CJP	D
Dissolved Wet Chemistry										
Orthophosphate, as P	B8J1108	0.120	mg/L	2.00E-3	2.00E-3	EPA 365.1	10/11/18	10/11/18 11:37	A.E	
Total Metals										
Mercury	B8J1017	0.0175	ug/L	4.71E-3	4.71E-3	EPA 245.2	10/11/18	10/12/18 8:43	SAS	
Arsenic	B8J1117	<5.72	ug/L	5.72	5.72	EPA 200.7	10/11/18	10/12/18 12:23	AMO	U
Cadmium	B8J1117	<1.00	ug/L	1.00	1.00	EPA 200.7	10/11/18	10/12/18 12:23	AMO	U
Calcium	B8J1117	4.48	mg/L	0.0500	0.0500	EPA 200.7	10/11/18	10/12/18 12:23	AMO	
Lead	B8J1117	17.8	ug/L	6.94	6.94	EPA 200.7	10/11/18	10/12/18 12:23	AMO	
Magnesium	B8J1117	1160	ug/L	50.0	50.0	EPA 200.7	10/11/18	10/12/18 12:23	AMO	
Phosphorus as P	B8J1117	0.314	mg/L	6.00E-3	6.00E-3	EPA 200.7	10/11/18	10/12/18 12:23	AMO	
Hardness	B8J1117	16.0	mg/L	1.00	1.00	EPA 200.7	10/11/18	10/12/18 12:23	AMO	
Dissolved Metals										
Cadmium	B8J1217	<1.00	ug/L	1.00	1.00	EPA 200.7	10/12/18	10/12/18 12:44	EDM	U
Copper	B8J1217	<10.0	ug/L	10.0	10.0	EPA 200.7	10/12/18	10/12/18 12:44	EDM	U
Lead	B8J1217	<6.94	ug/L	6.94	6.94	EPA 200.7	10/12/18	10/12/18 12:44	EDM	U
Zinc	B8J1217	47.4	ug/L	10.0	10.0	EPA 200.7	10/12/18	10/12/18 12:44	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location:	ACST1C	Location Description:	181009-14-WC
Date/Time Collected:	10/09/2018 08:54 - 10/10/2018 09:09		
Lab Number:	8AC0085-03	Sample Collector:	ABC
Sample Type:	Composite	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B8J1503	0.145	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	10/15/18	10/15/18 12:27	CJP	
BOD5	B8J1013	53.8	mg/L	2.00	2.00	SM 5210 B-2001	10/10/18	10/15/18 10:36	BAK	Chlor-01
COD	B8J1008	216	mg/L	7.00	7.00	HH 8000-1979	10/10/18	10/10/18 14:30	JAL	
Nitrate-Nitrite, as N	B8J1003	0.375	mg/L	0.0200	0.0200	EPA 353.2	10/10/18	10/10/18 15:38	SMC	
TKN	B8K0104	2.50	mg/L	0.130	0.130	EPA 351.2	11/01/18	11/2/18 11:49	SMC	
Total Dissolved Solids	B8J1015	101	mg/L	20.0	20.0	SM 2540 C-1997	10/10/18	10/10/18 15:30	CJP	
Total Suspended Solids	B8J1103	81.1	mg/L	0.900	0.900	SM 2540 D-1997	10/11/18	10/11/18 11:03	KMG	
Turbidity	B8J1009	45.7	NTU	3.0	0.3	EPA180.1 R2.0 (1993)	10/10/18	10/10/18 12:09	CJP	D
Dissolved Wet Chemistry										
Orthophosphate, as P	B8J1108	0.196	mg/L	2.00E-3	2.00E-3	EPA 365.1	10/11/18	10/11/18 11:42	A.E	
Total Metals										
Mercury	B8J1017	0.0146	ug/L	4.71E-3	4.71E-3	EPA 245.2	10/11/18	10/12/18 8:22	SAS	
Arsenic	B8J1117	5.81	ug/L	5.72	5.72	EPA 200.7	10/11/18	10/12/18 12:29	AMO	
Cadmium	B8J1117	<1.00	ug/L	1.00	1.00	EPA 200.7	10/11/18	10/12/18 12:29	AMO	U
Calcium	B8J1117	11.9	mg/L	0.0500	0.0500	EPA 200.7	10/11/18	10/12/18 12:29	AMO	
Lead	B8J1117	11.5	ug/L	6.94	6.94	EPA 200.7	10/11/18	10/12/18 12:29	AMO	
Magnesium	B8J1117	2290	ug/L	50.0	50.0	EPA 200.7	10/11/18	10/12/18 12:29	AMO	
Phosphorus as P	B8J1117	0.500	mg/L	6.00E-3	6.00E-3	EPA 200.7	10/11/18	10/12/18 12:29	AMO	
Hardness	B8J1117	39.2	mg/L	1.00	1.00	EPA 200.7	10/11/18	10/12/18 12:29	AMO	
Dissolved Metals										
Cadmium	B8J1217	<1.00	ug/L	1.00	1.00	EPA 200.7	10/12/18	10/12/18 12:54	EDM	U
Copper	B8J1217	<10.0	ug/L	10.0	10.0	EPA 200.7	10/12/18	10/12/18 12:54	EDM	U
Lead	B8J1217	<6.94	ug/L	6.94	6.94	EPA 200.7	10/12/18	10/12/18 12:54	EDM	U
Zinc	B8J1217	53.2	ug/L	10.0	10.0	EPA 200.7	10/12/18	10/12/18 12:54	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location:	ACST1C	Location Description:	181009-14-103
Date/Time Collected:	10/09/2018 08:54 - 10/10/2018 09:09		
Lab Number:	8AC0085-04	Sample Collector:	ABC
Sample Type:	Composite	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B8J1503	0.150	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	10/15/18	10/15/18 12:22	CJP	
BOD5	B8J1013	54.6	mg/L	2.00	2.00	SM 5210 B-2001	10/10/18	10/15/18 10:42	BAK	
COD	B8J1008	192	mg/L	7.00	7.00	HH 8000-1979	10/10/18	10/10/18 14:40	JAL	
Nitrate-Nitrite, as N	B8J1003	0.376	mg/L	0.0200	0.0200	EPA 353.2	10/10/18	10/10/18 15:39	SMC	
TKN	B8K0104	2.24	mg/L	0.130	0.130	EPA 351.2	11/01/18	11/2/18 11:50	SMC	
Total Dissolved Solids	B8J1015	105	mg/L	20.0	20.0	SM 2540 C-1997	10/10/18	10/10/18 15:30	CJP	
Total Suspended Solids	B8J1103	92.1	mg/L	0.900	0.900	SM 2540 D-1997	10/11/18	10/11/18 11:01	KMG	
Turbidity	B8J1009	47.7	NTU	3.0	0.3	EPA180.1 R2.0 (1993)	10/10/18	10/10/18 13:44	CJP	D
Dissolved Wet Chemistry										
Orthophosphate, as P	B8J1108	0.195	mg/L	2.00E-3	2.00E-3	EPA 365.1	10/11/18	10/11/18 11:43	A.E	
Total Metals										
Mercury	B8J1017	0.0138	ug/L	4.71E-3	4.71E-3	EPA 245.2	10/11/18	10/12/18 8:46	SAS	
Arsenic	B8J1117	7.60	ug/L	5.72	5.72	EPA 200.7	10/11/18	10/12/18 12:34	AMO	
Cadmium	B8J1117	<1.00	ug/L	1.00	1.00	EPA 200.7	10/11/18	10/12/18 12:34	AMO	U
Calcium	B8J1117	18.5	mg/L	0.0500	0.0500	EPA 200.7	10/11/18	10/12/18 12:34	AMO	
Lead	B8J1117	28.3	ug/L	6.94	6.94	EPA 200.7	10/11/18	10/12/18 12:34	AMO	
Magnesium	B8J1117	3070	ug/L	50.0	50.0	EPA 200.7	10/11/18	10/12/18 12:34	AMO	
Phosphorus as P	B8J1117	0.774	mg/L	6.00E-3	6.00E-3	EPA 200.7	10/11/18	10/12/18 12:34	AMO	
Hardness	B8J1117	58.8	mg/L	1.00	1.00	EPA 200.7	10/11/18	10/12/18 12:34	AMO	
Dissolved Metals										
Cadmium	B8J1217	<1.00	ug/L	1.00	1.00	EPA 200.7	10/12/18	10/12/18 12:49	EDM	U
Copper	B8J1217	<10.0	ug/L	10.0	10.0	EPA 200.7	10/12/18	10/12/18 12:49	EDM	U
Lead	B8J1217	<6.94	ug/L	6.94	6.94	EPA 200.7	10/12/18	10/12/18 12:49	EDM	U
Zinc	B8J1217	50.0	ug/L	10.0	10.0	EPA 200.7	10/12/18	10/12/18 12:49	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Quality Control Report

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry									
Batch: B8J1003									
Blank (B8J1003-BLK1)									
Nitrate-Nitrite, as N	< 0.02	mg/L					10/10/2018	SMC	U
LCS (B8J1003-BS1)									
Nitrate-Nitrite, as N			100	90-110			10/10/2018	SMC	
LCS (B8J1003-BS2)									
Nitrate-Nitrite, as N			102	90-110			10/10/2018	SMC	
LCS (B8J1003-BS3)									
Nitrate-Nitrite, as N			101	90-110			10/10/2018	SMC	
Duplicate (B8J1003-DUP1) Source ID: 8AC0081-02									
Nitrate-Nitrite, as N					0.532	10	10/10/2018	SMC	
Duplicate (B8J1003-DUP2) Source ID: 8CN0014-03									
Nitrate-Nitrite, as N					0.343	10	10/10/2018	SMC	D
Duplicate (B8J1003-DUP3) Source ID: 8TM0058-03									
Nitrate-Nitrite, as N					0.399	10	10/10/2018	SMC	
Duplicate (B8J1003-DUP4) Source ID: 8ES0062-03									
Nitrate-Nitrite, as N					0.370	10	10/10/2018	SMC	
Matrix Spike (B8J1003-MS1) Source ID: 8AC0081-02									
Nitrate-Nitrite, as N			100	90-110			10/10/2018	SMC	
Matrix Spike (B8J1003-MS2) Source ID: 8CN0014-03									
Nitrate-Nitrite, as N			98.2	90-110			10/10/2018	SMC	D
Matrix Spike (B8J1003-MS3) Source ID: 8TM0058-03									
Nitrate-Nitrite, as N			102	90-110			10/10/2018	SMC	
Matrix Spike (B8J1003-MS4) Source ID: 8ES0062-03									
Nitrate-Nitrite, as N			97.2	90-110			10/10/2018	SMC	
Matrix Spike (B8J1003-MS5) Source ID: 8BB0634-01									
Nitrate-Nitrite, as N			92.2	90-110			10/10/2018	SMC	D
Matrix Spike (B8J1003-MS6) Source ID: 8EP0127-01									
Nitrate-Nitrite, as N			102	90-110			10/10/2018	SMC	
Matrix Spike Dup (B8J1003-MSD1) Source ID: 8AC0081-02									
Nitrate-Nitrite, as N			99.7	90-110	0.577	10	10/10/2018	SMC	
Matrix Spike Dup (B8J1003-MSD2) Source ID: 8CN0014-03									
Nitrate-Nitrite, as N			97.9	90-110	0.113	10	10/10/2018	SMC	D
Matrix Spike Dup (B8J1003-MSD3) Source ID: 8TM0058-03									
Nitrate-Nitrite, as N			101	90-110	0.403	10	10/10/2018	SMC	
Matrix Spike Dup (B8J1003-MSD4) Source ID: 8ES0062-03									
Nitrate-Nitrite, as N			98.0	90-110	0.465	10	10/10/2018	SMC	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry (Continued)									
Batch: B8J1008									
Blank (B8J1008-BLK1)									
COD	< 7	mg/L					10/10/2018	JAL	U
LCS (B8J1008-BS1)									
COD			98.7	90-110			10/10/2018	JAL	
Duplicate (B8J1008-DUP1) Source ID: 8LS0354-01									
COD					3.28	10	10/10/2018	JAL	
Batch: B8J1009									
Blank (B8J1009-BLK1)									
Turbidity	< 0.3	NTU					10/10/2018	CJP	U
LCS (B8J1009-BS1)									
Turbidity			102	90-110			10/10/2018	CJP	
Duplicate (B8J1009-DUP1) Source ID: 8ES0062-06									
Turbidity					2.30	25	10/10/2018	CJP	
Batch: B8J1013									
Blank (B8J1013-BLK1)									
BOD5	< 2	mg/L					10/15/2018	BAK	U
LCS (B8J1013-BS1)									
BOD5			91.0	84.6-115.4			10/15/2018	BAK	
Duplicate (B8J1013-DUP1) Source ID: 8AC0085-01									
BOD5					5.46	30	10/15/2018	BAK	
Batch: B8J1015									
Blank (B8J1015-BLK1)									
Total Dissolved Solids	< 20	mg/L					10/10/2018	CJP	U
LCS (B8J1015-BS1)									
Total Dissolved Solids			99.7	90-110			10/10/2018	CJP	
Duplicate (B8J1015-DUP1) Source ID: 8LS0354-01									
Total Dissolved Solids					0.507	10	10/10/2018	CJP	

Quality Control Report

(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry (Continued)									
Batch: B8J1103									
Blank (B8J1103-BLK1)									
Total Suspended Solids	< 0.9	mg/L					10/11/2018	KMG	U
LCS (B8J1103-BS1)									
Total Suspended Solids			91.0	90-110			10/11/2018	KMG	
Duplicate (B8J1103-DUP1) Source ID: 8BB0676-02									
Total Suspended Solids					3.23	20	10/11/2018	KMG	
Duplicate (B8J1103-DUP2) Source ID: 8BB0677-02									
Total Suspended Solids					3.59	20	10/11/2018	KMG	
Batch: B8J1503									
Blank (B8J1503-BLK1)									
Ammonia, as N	< 0.035	mg/L					10/15/2018	CJP	U
Blank (B8J1503-BLK2)									
Ammonia, as N	< 0.035	mg/L					10/15/2018	CJP	U
LCS (B8J1503-BS1)									
Ammonia, as N			102	90-110			10/15/2018	CJP	
LCS (B8J1503-BS2)									
Ammonia, as N			105	90-110			10/15/2018	CJP	
Duplicate (B8J1503-DUP1) Source ID: 8BB0543-01RE1									
Ammonia, as N					23.9	10	10/15/2018	CJP	QC-01
Duplicate (B8J1503-DUP2) Source ID: 8WB0617-05									
Ammonia, as N					0.511	10	10/15/2018	CJP	
Duplicate (B8J1503-DUP3) Source ID: 8WB0625-07									
Ammonia, as N					1.53	10	10/15/2018	CJP	
Duplicate (B8J1503-DUP4) Source ID: 8EW0008-01									
Ammonia, as N					0.117	10	10/15/2018	CJP	
Matrix Spike (B8J1503-MS1) Source ID: 8BB0543-01RE1									
Ammonia, as N			89.3	80-120			10/15/2018	CJP	
Matrix Spike (B8J1503-MS2) Source ID: 8WB0617-05									
Ammonia, as N			111	80-120			10/15/2018	CJP	
Matrix Spike (B8J1503-MS3) Source ID: 8WB0625-07									
Ammonia, as N			112	80-120			10/15/2018	CJP	
Matrix Spike (B8J1503-MS4) Source ID: 8EW0008-01									
Ammonia, as N			107	80-120			10/15/2018	CJP	
Matrix Spike Dup (B8J1503-MSD1) Source ID: 8BB0543-01RE1									
Ammonia, as N			88.3	80-120	0.761	10	10/15/2018	CJP	
Matrix Spike Dup (B8J1503-MSD2) Source ID: 8WB0617-05									
Ammonia, as N			112	80-120	0.362	10	10/15/2018	CJP	
Matrix Spike Dup (B8J1503-MSD3) Source ID: 8WB0625-07									
Ammonia, as N			110	80-120	0.846	10	10/15/2018	CJP	

Quality Control Report

(Continued)

Wet Chemistry (Continued)

Batch: B8J1503 (Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Matrix Spike Dup (B8J1503-MSD4) Source ID: 8EW0008-01									
Ammonia, as N			106	80-120	0.469	10	10/15/2018	CJP	

Batch: B8K0104

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B8K0104-BLK1)									
TKN	< 0.13	mg/L					11/02/2018	SMC	U
LCS (B8K0104-BS1)									
TKN			98.2	80-120			11/02/2018	SMC	
Duplicate (B8K0104-DUP1) Source ID: 8AC0085-01									
TKN					6.74	20	11/02/2018	SMC	
Duplicate (B8K0104-DUP2) Source ID: 8LS0354-01									
TKN					9.77	20	11/02/2018	SMC	D
Matrix Spike (B8K0104-MS1) Source ID: 8AC0085-01									
TKN			132	80-120			11/02/2018	SMC	QC-05
Matrix Spike (B8K0104-MS2) Source ID: 8LS0354-01									
TKN			96.3	80-120			11/02/2018	SMC	D
Matrix Spike (B8K0104-MS3) Source ID: 8WB0626-08									
TKN			88.2	80-120			11/02/2018	SMC	D
Matrix Spike Dup (B8K0104-MSD1) Source ID: 8AC0085-01									
TKN			87.8	80-120	18.5	20	11/02/2018	SMC	
Matrix Spike Dup (B8K0104-MSD2) Source ID: 8LS0354-01									
TKN			95.8	80-120	0.385	20	11/02/2018	SMC	D

Dissolved Wet Chemistry

Batch: B8J1108

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B8J1108-BLK1)									
Orthophosphate, as P	< 0.002	mg/L					10/11/2018	A.E	U
LCS (B8J1108-BS1)									
Orthophosphate, as P			99.3	90-110			10/11/2018	A.E	
Duplicate (B8J1108-DUP1) Source ID: 8WB0672-03									
Orthophosphate, as P					8.40	10	10/11/2018	A.E	
Duplicate (B8J1108-DUP2) Source ID: 8AC0085-02									
Orthophosphate, as P					0.733	10	10/11/2018	A.E	
Matrix Spike (B8J1108-MS1) Source ID: 8WB0672-03									
Orthophosphate, as P			95.3	90-110			10/11/2018	A.E	
Matrix Spike (B8J1108-MS2) Source ID: 8AC0085-02									
Orthophosphate, as P			101	90-110			10/11/2018	A.E	
Matrix Spike Dup (B8J1108-MSD1) Source ID: 8WB0672-03									
Orthophosphate, as P			95.2	90-110	0.128	10	10/11/2018	A.E	
Matrix Spike Dup (B8J1108-MSD2) Source ID: 8AC0085-02									
Orthophosphate, as P			101	90-110	0.119	10	10/11/2018	A.E	

Quality Control Report
(Continued)

Total Metals

Batch: B8J1017

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B8J1017-BLK1)									
Mercury	< 0.00471	ug/L					10/12/2018	SAS	U
LCS (B8J1017-BS1)									
Mercury			99.2	85-115			10/12/2018	SAS	
Duplicate (B8J1017-DUP1) Source ID: 8AC0085-01									
Mercury					5.53	20	10/12/2018	SAS	
Duplicate (B8J1017-DUP2) Source ID: 8AC0085-03									
Mercury					0.515	20	10/12/2018	SAS	
Matrix Spike (B8J1017-MS1) Source ID: 8AC0085-01									
Mercury			99.1	70-130			10/12/2018	SAS	
Matrix Spike (B8J1017-MS2) Source ID: 8AC0085-03									
Mercury			99.4	70-130			10/12/2018	SAS	
Matrix Spike Dup (B8J1017-MSD1) Source ID: 8AC0085-01									
Mercury			97.4	70-130	1.62	20	10/12/2018	SAS	
Matrix Spike Dup (B8J1017-MSD2) Source ID: 8AC0085-03									
Mercury			99.4	70-130	0.0234	20	10/12/2018	SAS	

Batch: B8J1117

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B8J1117-BLK1)									
Arsenic	< 5.72	ug/L					10/12/2018	AMO	U
Cadmium	< 1	ug/L					10/12/2018	AMO	U
Calcium	< 0.05	mg/L					10/12/2018	AMO	U
Lead	< 6.94	ug/L					10/12/2018	AMO	U
Magnesium	< 50	ug/L					10/12/2018	AMO	U
Phosphorus as P	< 0.006	mg/L					10/12/2018	AMO	U
Hardness	< 1	mg/L					10/12/2018	AMO	U
LCS (B8J1117-BS1)									
Arsenic			107	85-115			10/12/2018	AMO	
Cadmium			105	85-115			10/12/2018	AMO	
Calcium			105	85-115			10/12/2018	AMO	
Lead			102	85-115			10/12/2018	AMO	
Magnesium			106	85-115			10/12/2018	AMO	
Phosphorus as P			101	85-115			10/12/2018	AMO	
Duplicate (B8J1117-DUP1) Source ID: 8AC0085-01									
Arsenic					NR	20	10/12/2018	AMO	
Cadmium					NR	20	10/12/2018	AMO	U
Calcium					1.13	20	10/12/2018	AMO	
Lead					21.7	20	10/12/2018	AMO	QC-02
Magnesium					1.21	20	10/12/2018	AMO	
Phosphorus as P					0.285	20	10/12/2018	AMO	
Hardness					1.15	200	10/12/2018	AMO	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Total Metals (Continued)									
Batch: B8J1117 (Continued)									
Matrix Spike (B8J1117-MS1) Source ID: 8AC0085-01									
Arsenic			112	70-130			10/12/2018	AMO	
Cadmium			106	70-130			10/12/2018	AMO	
Calcium			104	70-130			10/12/2018	AMO	
Lead			104	70-130			10/12/2018	AMO	
Magnesium			108	70-130			10/12/2018	AMO	
Phosphorus as P			103	70-130			10/12/2018	AMO	
Matrix Spike Dup (B8J1117-MSD1) Source ID: 8AC0085-01									
Arsenic			113	70-130	0.990	20	10/12/2018	AMO	
Cadmium			108	70-130	1.09	20	10/12/2018	AMO	
Calcium			105	70-130	0.589	20	10/12/2018	AMO	
Lead			106	70-130	1.81	20	10/12/2018	AMO	
Magnesium			108	70-130	0.360	20	10/12/2018	AMO	
Phosphorus as P			102	70-130	0.472	20	10/12/2018	AMO	
Dissolved Metals									
Batch: B8J1217									
Blank (B8J1217-BLK1)									
Cadmium	< 1	ug/L					10/12/2018	EDM	U
Copper	< 10	ug/L					10/12/2018	EDM	U
Lead	< 6.94	ug/L					10/12/2018	EDM	U
Zinc	< 10	ug/L					10/12/2018	EDM	U
LCS (B8J1217-BS1)									
Cadmium			99.4	85-115			10/12/2018	EDM	
Copper			96.2	85-115			10/12/2018	EDM	
Lead			103	85-115			10/12/2018	EDM	
Zinc			105	85-115			10/12/2018	EDM	
Duplicate (B8J1217-DUP1) Source ID: 8AC0085-03									
Cadmium					NR	10	10/12/2018	EDM	U
Copper					NR	10	10/12/2018	EDM	U
Lead					NR	10	10/12/2018	EDM	U
Zinc					0.696	10	10/12/2018	EDM	
Matrix Spike (B8J1217-MS1) Source ID: 8AC0085-03									
Cadmium			98.8	70-130			10/12/2018	EDM	
Copper			103	70-130			10/12/2018	EDM	
Lead			102	70-130			10/12/2018	EDM	
Zinc			102	70-130			10/12/2018	EDM	
Matrix Spike Dup (B8J1217-MSD1) Source ID: 8AC0085-03									
Cadmium			99.7	70-130	0.905	10	10/12/2018	EDM	
Copper			107	70-130	3.98	10	10/12/2018	EDM	
Lead			103	70-130	0.418	10	10/12/2018	EDM	
Zinc			103	70-130	0.285	10	10/12/2018	EDM	

Notes and Definitions

Item	Definition
Chlor-01	The sample exhibited a false positive for the chlorine screen.
D	Data reported from a dilution
QC-01	The RPD is greater than the method acceptance criteria. The QC sample was non-homogeneous.
QC-02	The RPD is greater than the method acceptance criteria. At least one of the values used to calculate the RPD is less than PQL.
QC-05	The spike recovery of either the MS or MSD is outside method acceptance limits. The batch was accepted because the LCS is within method acceptance criteria.
U	Analyte included in the analysis, but not detected

Method Reference Acronyms

Colilert	Colilert, IDEXX Laboratories, Inc.
EPA	Manual of Methods for Chemical Analysis of Water and Wastes, USEPA
GS	USGS Techniques of Water-Resources Investigations
HH	Hach Spectrophotometer Procedures Manual
SM	Standard Methods for the Examination of Water and Wastewater
SW	Test methods for Evaluating Solid Waste, SW-846

J Finegan-Kelly

Janet Finegan-Kelly
Water Quality Laboratory Manager

Stephen Quintero or Heather Rankin
QA/QC Coordinator

Ada County Highway District

Attn: Monica Lowe
3775 Adams Street
Garden City, Idaho 83714–6418
Tel. (208) 387–6255
Fax (208) 387–6391
Purchase Order: 63046445
Project: Stormwater-PI
Sampler(s): Andy Carlson
Andrea Leonard

							Matrix	Type																	
Lab#	Begin Date	End Date	Begin Time	End Time	Sample Identification	Sampler Initials	Water	Grab	Composite	BOD$_5$ - SM 5210 B	COD - Hach 8000	TSS - SM 2540 D	TDS - SM 2540 C	TKN - Perstorp PAI-DK01	TP - EPA 200.7	Orthophosphate - EPA 365.1	Total As, Cd, Pb - EPA 200.7	Diss. Cd Cu, Pb, Zn - EPA 200.7	Total Hg - EPA 245.2	E. Coli - IDEXX Colilert	Turbidity - EPA 180.1	Hardness - SM2340 B	NO$_2$+NO$_3$ - EPA 353.2	NH$_3$ - SM 4500 NH$_3$ - D	Total Containers
8AC0085 -01	10/9/18	10/9/18	1045	2211	181009 - 11 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	4
-02	10/9/18	10/9/18	0835	1334	181009 - 12 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	5
-03	10/9/18	10/10/18	0854	0909	181009 - 14 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	4

Relinquished by (sign)	Date & Time Transferred	Received by (sign)
	10/10/18	April 10-10-18 1057

Comments/Special Instructions:

Please split 181009 - 14 - WC and run a duplicate with the label: 181009 - 14 - 103

8AC0085-04 181009-14-103

8AC0085

Report Date: 12/05/2018 08:41

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Samples in this Report

Lab ID	Sample	Sample Description	Matrix	Qualifiers	Date Sampled	Date Received
8AC0091-01	ACST1B	181127-03-WG	Water		11/27/2018	11/27/2018
Comments:						
	Chunks of sediment noted by the analyst.					
8AC0091-02	ACST1B	181127-11-WG	Water		11/27/2018	11/27/2018
Comments:						
	Analyst noted that sample appeared to have dissolved solids.					
8AC0091-03	ACST1B	181127-12-WG	Water		11/27/2018	11/27/2018
8AC0091-04	ACST1B	181127-14-WG	Water		11/27/2018	11/27/2018
8AC0091-05	ACST1B	181127-03-001	Water		11/27/2018	11/27/2018
8AC0091-06	ACST1B	181127-03-101	Water		11/27/2018	11/27/2018
Comments:						
	Analyst noted that sample is brown with lots of sediment.					

Report Date: 12/05/2018 08:41

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location:	ACST1B	Location Description:	181127-03-WG
Date/Time Collected:	11/27/2018 20:37		
Lab Number:	8AC0091-01	Sample Collector:	A.L
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8K2704	>2419.6	MPN/100 mL	1.0	1.0	Colilert	11/27/18 22:55	11/28/18 23:05	KMR	M-09
Wet Chemistry										
Chlorine Screen	B8K2811	Absent				SM 4500-CL G-2000 mod	11/27/18	11/27/18 21:38	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 12/05/2018 08:41

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
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Fax (208) 608-7319

Analysis Report

Location:	ACST1B	Location Description:	181127-11-WG
Date/Time Collected:	11/27/2018 18:32		
Lab Number:	8AC0091-02	Sample Collector:	A.L
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8K2704	>2419.6	MPN/100 mL	1.0	1.0	Colilert	11/27/18 22:55	11/28/18 23:05	KMR	M-09
Wet Chemistry										
Chlorine Screen	B8K2811	Absent				SM 4500-CL G-2000 mod	11/27/18	11/27/18 21:38	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 12/05/2018 08:41

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Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location:	ACST1B	Location Description:	181127-12-WG
Date/Time Collected:	11/27/2018 17:52		
Lab Number:	8AC0091-03	Sample Collector:	A.L
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8K2704	79.8	MPN/100 mL	1.0	1.0	Colilert	11/27/18 22:55	11/28/18 23:05	KMR	
Wet Chemistry										
Chlorine Screen	B8K2811	Absent				SM 4500-CL G-2000 mod	11/27/18	11/27/18 21:38	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 12/05/2018 08:41

Boise City Public Works
Water Quality Laboratory
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Boise, Idaho 83714-1076
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Fax (208) 608-7319

Analysis Report

Location:	ACST1B	Location Description:	181127-14-WG
Date/Time Collected:	11/27/2018 18:08		
Lab Number:	8AC0091-04	Sample Collector:	A.L
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8K2704	148.3	MPN/100 mL	1.0	1.0	Colilert	11/27/18 22:55	11/28/18 23:05	KMR	
Wet Chemistry										
Chlorine Screen	B8K2811	Absent				SM 4500-CL G-2000 mod	11/27/18	11/27/18 21:38	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 12/05/2018 08:41

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
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Fax (208) 608-7319

Analysis Report

Location:	ACST1B	Location Description:	181127-03-001
Date/Time Collected:	11/27/2018 12:00		
Lab Number:	8AC0091-05	Sample Collector:	A.L
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8K2704	<1.0	MPN/100 mL	1.0	1.0	Colilert	11/27/18 22:55	11/28/18 23:05	KMR	H U
Wet Chemistry										
Chlorine Screen	B8K2811	Absent				SM 4500-CL G-2000 mod	11/27/18	11/27/18 21:38	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location:	ACST1B	Location Description:	181127-03-101
Date/Time Collected:	11/27/2018 12:00		
Lab Number:	8AC0091-06	Sample Collector:	A.L
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B8K2704	>2419.6	MPN/100 mL	1.0	1.0	Colilert	11/27/18 22:55	11/28/18 23:05	KMR	H M-09
Wet Chemistry										
Chlorine Screen	B8K2811	Absent				SM 4500-CL G-2000 mod	11/27/18	11/27/18 21:38	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Quality Control Report

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Microbiology									
Batch: B8K2704									
Blank (B8K2704-BLK1)									
E. Coli	Absent						11/28/2018	JJR	
LCS (B8K2704-BS1)									
E. Coli				Present			11/28/2018	JJR	
Duplicate (B8K2704-DUP1)	Source ID: 8WB0733-06								
E. Coli					Pass	128	11/28/2018	JJR	

Notes and Definitions

Item	Definition
H	Hold time Exceeded.
M-09	Sample could not be analyzed at a lesser dilution due to matrix interference.
U	Analyte included in the analysis, but not detected

Method Reference Acronyms

Colilert	Colilert, IDEXX Laboratories, Inc.
EPA	Manual of Methods for Chemical Analysis of Water and Wastes, USEPA
GS	USGS Techniques of Water-Resources Investigations
HH	Hach Spectrophotometer Procedures Manual
SM	Standard Methods for the Examination of Water and Wastewater
SW	Test methods for Evaluating Solid Waste, SW-846

Janet Finegan-Kelly
Water Quality Laboratory Manager

Stephen Quintero or Heather Rankin
QA/QC Coordinator

Ada County Highway District

Attn: Monica Lowe
3775 Adams Street
Garden City, Idaho 83714–6418
Tel. (208) 387–6255
Fax (208) 387–6391

Purchase Order: 63046445
Project: Stormwater-PI
Sampler(s): A. Carlson
A. Leonard

Lab# 8AC0091	Begin Date	End Date	Begin Time	End Time	Sample Identification	Sampler Initials	Matrix	Type																
							Water	Grab	Composite	BOD$_5$ - SM 5210 B	COD - Hach 8000	TSS - SM 2540 D	TDS - SM 2540 C	TKN - Perstorp PAI-DK01	TP - EPA 200.7	Orthophosphate - EPA 365.1	Total As, Cd, Pb - EPA 200.7	Diss. Cd Cu, Pb, Zn - EPA 200.7	Total Hg - EPA 245.2	E. Coli - IDEXX Colilert	Turbidity - EPA 180.1	Hardness - SM2340 B	NO$_2$+NO$_3$ - EPA 353.2	NH$_3$ - SM 4500 NH$_3$ - D	Total Containers
-01	11-27-18		2037		181127-03-WG	AL	X	X												X					1
-02			1832		181127-11-WG	AL	X	X												X					1
-03			1752		181127-12-WG	AL	X	X												X					1
-04			1808		181127-14-WG	AL	X	X												X					1
-05			1200		181127-03-001	AL	X	X												X					1
-06			1200		181127-03-101	AL	X	X												X					1

Relinquished by (sign)	Date & Time Transferred	Received by (sign)	Comments/Special Instructions:
	11/27/18 2102	11/27/18 2130	

8AC0091

Report Date: 12/13/2018 11:31

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Samples in this Report

Lab ID	Sample	Sample Description	Matrix	Qualifiers	Date Sampled	Date Received
8AC0093-01	ACST1C	181127-03-WC	Water		11/28/2018	11/28/2018
8AC0093-02	ACST1C	181127-12-WC	Water		11/28/2018	11/28/2018
8AC0093-03	ACST1C	181127-14-WC	Water		11/28/2018	11/28/2018

Analysis Report

Location: ACST1C
Location Description: 181127-03-WC
Date/Time Collected: 11/27/2018 21:42 - 11/28/2018 03:05
Lab Number: 8AC0093-01
Sample Collector: ABC
Sample Type: Composite
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B8K3001	0.232	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	11/30/18	11/30/18 11:25	ASM	
BOD5	B8K2901	45.4	mg/L	2.00	2.00	SM 5210 B-2001	11/29/18	12/4/18 8:13	ASM	
COD	B8K2814	174	mg/L	7.00	7.00	HH 8000-1979	11/28/18	11/28/18 16:35	KMR	
Nitrate-Nitrite, as N	B8L1002	0.255	mg/L	0.0200	0.0200	EPA 353.2	12/10/18	12/10/18 12:04	SMC	
TKN	B8L1004	2.59	mg/L	0.130	0.130	EPA 351.2	12/10/18	12/11/18 8:42	LRF	
Total Dissolved Solids	B8K2807	106	mg/L	20.0	20.0	SM 2540 C-1997	11/28/18	11/30/18 13:23	CJP	
Total Suspended Solids	B8K2915	66.5	mg/L	0.900	0.900	SM 2540 D-1997	11/29/18	11/29/18 9:19	ALD	
Turbidity	B8K2812	32.9	NTU	0.3	0.3	EPA180.1 R2.0 (1993)	11/28/18	11/28/18 14:12	JAL	
Dissolved Wet Chemistry										
Orthophosphate, as P	B8K2907	0.341	mg/L	2.00E-3	2.00E-3	EPA 365.1	11/29/18	11/29/18 11:15	SMC	M-06
Total Metals										
Mercury	B8K2818	8.19E-3	ug/L	4.71E-3	4.71E-3	EPA 245.2	11/29/18	11/30/18 9:07	SAS	
Arsenic	B8K2920	<5.72	ug/L	5.72	5.72	EPA 200.7	11/29/18	11/30/18 16:46	EDM	U
Cadmium	B8L0515	<1.00	ug/L	1.00	1.00	EPA 200.7	12/05/18	12/6/18 17:37	AMO	U
Calcium	B8K2920	8.07	mg/L	0.0500	0.0500	EPA 200.7	11/29/18	11/30/18 16:46	EDM	
Lead	B8K2920	<6.94	ug/L	6.94	6.94	EPA 200.7	11/29/18	11/30/18 16:46	EDM	U
Magnesium	B8K2920	1810	ug/L	50.0	50.0	EPA 200.7	11/29/18	11/30/18 16:46	EDM	
Phosphorus as P	B8K2920	0.810	mg/L	6.00E-3	6.00E-3	EPA 200.7	11/29/18	11/30/18 16:46	EDM	
Hardness	B8K2920	27.6	mg/L	1.00	1.00	EPA 200.7	11/29/18	11/30/18 16:46	EDM	
Dissolved Metals										
Cadmium	B8L0621	<1.00	ug/L	1.00	1.00	EPA 200.7	12/06/18	12/6/18 16:25	AMO	U
Copper	B8L0320	<10.0	ug/L	10.0	10.0	EPA 200.7	12/03/18	12/3/18 17:54	EDM	U
Lead	B8L0320	<6.94	ug/L	6.94	6.94	EPA 200.7	12/03/18	12/3/18 17:54	EDM	U
Zinc	B8L0320	118	ug/L	10.0	10.0	EPA 200.7	12/03/18	12/3/18 17:54	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location: ACST1C
Date/Time Collected: 11/27/2018 17:41 - 11/28/2018 00:26
Lab Number: 8AC0093-02
Sample Type: Composite
Location Description: 181127-12-WC
Sample Collector: ABC
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B8K3001	1.09	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	11/30/18	11/30/18 11:17	ASM	
BOD5	B8K2901	23.7	mg/L	2.00	2.00	SM 5210 B-2001	11/29/18	12/4/18 8:09	ASM	
COD	B8K2814	150	mg/L	7.00	7.00	HH 8000-1979	11/28/18	11/28/18 16:35	KMR	
Nitrate-Nitrite, as N	B8L1002	0.390	mg/L	0.0200	0.0200	EPA 353.2	12/10/18	12/10/18 12:05	SMC	
TKN	B8L1004	2.91	mg/L	0.130	0.130	EPA 351.2	12/10/18	12/11/18 8:43	LRF	
Total Dissolved Solids	B8K2807	73.5	mg/L	20.0	20.0	SM 2540 C-1997	11/28/18	11/30/18 13:23	CJP	
Total Suspended Solids	B8K2915	83.1	mg/L	0.900	0.900	SM 2540 D-1997	11/29/18	11/29/18 9:20	ALD	
Turbidity	B8K2812	59.9	NTU	0.6	0.3	EPA180.1 R2.0 (1993)	11/28/18	11/28/18 14:25	JAL	D
Dissolved Wet Chemistry										
Orthophosphate, as P	B8K2907	0.137	mg/L	2.00E-3	2.00E-3	EPA 365.1	11/29/18	11/29/18 11:16	SMC	
Total Metals										
Mercury	B8K2818	0.0136	ug/L	4.71E-3	4.71E-3	EPA 245.2	11/29/18	11/30/18 9:10	SAS	
Arsenic	B8K2920	<5.72	ug/L	5.72	5.72	EPA 200.7	11/29/18	11/30/18 16:22	EDM	U
Cadmium	B8L0515	<1.00	ug/L	1.00	1.00	EPA 200.7	12/05/18	12/6/18 17:42	AMO	U
Calcium	B8K2920	7.78	mg/L	0.0500	0.0500	EPA 200.7	11/29/18	11/30/18 16:22	EDM	
Lead	B8K2920	12.8	ug/L	6.94	6.94	EPA 200.7	11/29/18	11/30/18 16:22	EDM	
Magnesium	B8K2920	1760	ug/L	50.0	50.0	EPA 200.7	11/29/18	11/30/18 16:22	EDM	
Phosphorus as P	B8K2920	0.338	mg/L	6.00E-3	6.00E-3	EPA 200.7	11/29/18	11/30/18 16:22	EDM	
Hardness	B8K2920	26.7	mg/L	1.00	1.00	EPA 200.7	11/29/18	11/30/18 16:22	EDM	
Dissolved Metals										
Cadmium	B8L0621	<1.00	ug/L	1.00	1.00	EPA 200.7	12/06/18	12/6/18 16:30	AMO	U
Copper	B8L0320	11.0	ug/L	10.0	10.0	EPA 200.7	12/03/18	12/3/18 17:59	EDM	
Lead	B8L0320	<6.94	ug/L	6.94	6.94	EPA 200.7	12/03/18	12/3/18 17:59	EDM	U
Zinc	B8L0320	60.4	ug/L	10.0	10.0	EPA 200.7	12/03/18	12/3/18 17:59	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location:	ACST1C	Location Description:	181127-14-WC
Date/Time Collected:	11/27/2018 17:00 - 11/28/2018 09:48		
Lab Number:	8AC0093-03	Sample Collector:	ABC
Sample Type:	Composite	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B8K3001	0.407	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	11/30/18	11/30/18 11:31	ASM	
BOD5	B8K2901	36.9	mg/L	2.00	2.00	SM 5210 B-2001	11/29/18	12/4/18 8:20	ASM	
COD	B8K2814	149	mg/L	7.00	7.00	HH 8000-1979	11/28/18	11/28/18 16:35	KMR	
Nitrate-Nitrite, as N	B8L1002	0.675	mg/L	0.0200	0.0200	EPA 353.2	12/10/18	12/10/18 12:10	SMC	
TKN	B8L1004	1.73	mg/L	0.130	0.130	EPA 351.2	12/10/18	12/11/18 8:45	LRF	
Total Dissolved Solids	B8K2807	202	mg/L	20.0	20.0	SM 2540 C-1997	11/28/18	11/30/18 13:23	CJP	
Total Suspended Solids	B8K2915	56.3	mg/L	0.900	0.900	SM 2540 D-1997	11/29/18	11/29/18 9:20	ALD	
Turbidity	B8K2812	49.6	NTU	0.6	0.3	EPA180.1 R2.0 (1993)	11/28/18	11/28/18 14:34	JAL	D
Dissolved Wet Chemistry										
Orthophosphate, as P	B8K2907	0.299	mg/L	2.00E-3	2.00E-3	EPA 365.1	11/29/18	11/29/18 11:21	SMC	M-06
Total Metals										
Mercury	B8K2818	8.49E-3	ug/L	4.71E-3	4.71E-3	EPA 245.2	11/29/18	11/30/18 9:14	SAS	
Arsenic	B8K2920	7.60	ug/L	5.72	5.72	EPA 200.7	11/29/18	11/30/18 16:51	EDM	
Cadmium	B8L0515	<1.00	ug/L	1.00	1.00	EPA 200.7	12/05/18	12/6/18 17:47	AMO	U
Calcium	B8K2920	24.6	mg/L	0.0500	0.0500	EPA 200.7	11/29/18	11/30/18 16:51	EDM	
Lead	B8K2920	8.29	ug/L	6.94	6.94	EPA 200.7	11/29/18	11/30/18 16:51	EDM	
Magnesium	B8K2920	5780	ug/L	50.0	50.0	EPA 200.7	11/29/18	11/30/18 16:51	EDM	
Phosphorus as P	B8K2920	0.578	mg/L	6.00E-3	6.00E-3	EPA 200.7	11/29/18	11/30/18 16:51	EDM	
Hardness	B8K2920	85.3	mg/L	1.00	1.00	EPA 200.7	11/29/18	11/30/18 16:51	EDM	
Dissolved Metals										
Cadmium	B8L0621	<1.00	ug/L	1.00	1.00	EPA 200.7	12/06/18	12/6/18 16:35	AMO	U
Copper	B8L0320	<10.0	ug/L	10.0	10.0	EPA 200.7	12/03/18	12/3/18 18:09	EDM	U
Lead	B8L0320	<6.94	ug/L	6.94	6.94	EPA 200.7	12/03/18	12/3/18 18:09	EDM	U
Zinc	B8L0320	35.3	ug/L	10.0	10.0	EPA 200.7	12/03/18	12/3/18 18:09	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
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Quality Control Report

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry									
Batch: B8K2807									
Blank (B8K2807-BLK1)									
Total Dissolved Solids	< 20	mg/L					11/30/2018	CJP	U
LCS (B8K2807-BS1)									
Total Dissolved Solids			94.5	90-110			11/30/2018	CJP	
Duplicate (B8K2807-DUP1)	Source ID: 8LS0420-01								
Total Dissolved Solids					6.23	10	11/30/2018	CJP	
Batch: B8K2812									
Blank (B8K2812-BLK1)									
Turbidity	< 0.3	NTU					11/28/2018	JAL	U
LCS (B8K2812-BS1)									
Turbidity			101	90-110			11/28/2018	JAL	
Duplicate (B8K2812-DUP1)	Source ID: 8LS0420-01								
Turbidity					9.72	25	11/28/2018	JAL	
Batch: B8K2814									
Blank (B8K2814-BLK2)									
COD	< 7	mg/L					11/28/2018	KMR	U
LCS (B8K2814-BS1)									
COD			98.7	90-110			11/28/2018	KMR	
Duplicate (B8K2814-DUP1)	Source ID: 8LS0420-01								
COD					8.22	10	11/28/2018	KMR	
Batch: B8K2901									
Blank (B8K2901-BLK1)									
BOD5	< 2	mg/L					12/04/2018	ASM	Seed-01, U
LCS (B8K2901-BS1)									
BOD5			104	84.6-115.4			12/04/2018	ASM	
Duplicate (B8K2901-DUP1)	Source ID: 8AC0094-01								
BOD5					1.99	30	12/04/2018	ASM	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry (Continued)									
Batch: B8K2915									
Blank (B8K2915-BLK1)									
Total Suspended Solids	< 0.9	mg/L					11/29/2018	ALD	U
LCS (B8K2915-BS1)									
Total Suspended Solids			93.2	90-110			11/29/2018	ALD	
Duplicate (B8K2915-DUP1) Source ID: 8BB0755-02									
Total Suspended Solids					4.47	20	11/29/2018	ALD	
Batch: B8K3001									
Blank (B8K3001-BLK1)									
Ammonia, as N	< 0.035	mg/L					11/30/2018	ASM	U
LCS (B8K3001-BS1)									
Ammonia, as N			101	90-110			11/30/2018	ASM	
Duplicate (B8K3001-DUP1) Source ID: 8WB0727-05									
Ammonia, as N					0.866	10	11/30/2018	ASM	
Duplicate (B8K3001-DUP2) Source ID: 8LS0420-05									
Ammonia, as N					0.789	10	11/30/2018	ASM	
Matrix Spike (B8K3001-MS1) Source ID: 8WB0727-05									
Ammonia, as N			104	80-120			11/30/2018	ASM	
Matrix Spike (B8K3001-MS2) Source ID: 8LS0420-05									
Ammonia, as N			116	80-120			11/30/2018	ASM	
Matrix Spike Dup (B8K3001-MSD1) Source ID: 8WB0727-05									
Ammonia, as N			104	80-120	0.0542	10	11/30/2018	ASM	
Matrix Spike Dup (B8K3001-MSD2) Source ID: 8LS0420-05									
Ammonia, as N			110	80-120	3.88	10	11/30/2018	ASM	
Batch: B8L1002									
Blank (B8L1002-BLK1)									
Nitrate-Nitrite, as N	< 0.02	mg/L					12/10/2018	SMC	U
LCS (B8L1002-BS1)									
Nitrate-Nitrite, as N			96.4	90-110			12/10/2018	SMC	
LCS (B8L1002-BS2)									
Nitrate-Nitrite, as N			103	90-110			12/10/2018	SMC	
Duplicate (B8L1002-DUP1) Source ID: 8AC0093-02									
Nitrate-Nitrite, as N					0.281	10	12/10/2018	SMC	
Duplicate (B8L1002-DUP2) Source ID: 8BB0778-02									
Nitrate-Nitrite, as N					0.0703	10	12/10/2018	SMC	
Matrix Spike (B8L1002-MS2) Source ID: 8BB0778-02									
Nitrate-Nitrite, as N			92.1	90-110			12/10/2018	SMC	
Matrix Spike (B8L1002-MS3) Source ID: 8BB0732-01RE1									
Nitrate-Nitrite, as N			96.4	90-110			12/10/2018	SMC	
Matrix Spike (B8L1002-MS4) Source ID: 8AC0093-02									
Nitrate-Nitrite, as N			99.9	90-110			12/10/2018	SMC	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry (Continued)									
Batch: B8L1002 (Continued)									
Matrix Spike (B8L1002-MS5) Source ID: 8BB0769-02									
Nitrate-Nitrite, as N			104	90-110			12/10/2018	SMC	
Matrix Spike Dup (B8L1002-MSD2) Source ID: 8BB0778-02									
Nitrate-Nitrite, as N			93.4	90-110	0.553	10	12/10/2018	SMC	
Matrix Spike Dup (B8L1002-MSD4) Source ID: 8AC0093-02									
Nitrate-Nitrite, as N			101	90-110	0.456	10	12/10/2018	SMC	
Batch: B8L1004									
Blank (B8L1004-BLK1)									
TKN	< 0.13	mg/L					12/11/2018	LRF	U
LCS (B8L1004-BS1)									
TKN			92.3	80-120			12/11/2018	LRF	
Duplicate (B8L1004-DUP1) Source ID: 8LS0420-01									
TKN					4.52	20	12/11/2018	LRF	D
Duplicate (B8L1004-DUP2) Source ID: 8AC0094-01									
TKN					13.3	20	12/11/2018	LRF	
Matrix Spike (B8L1004-MS1) Source ID: 8LS0420-01									
TKN			95.0	80-120			12/11/2018	LRF	D
Matrix Spike (B8L1004-MS2) Source ID: 8AC0094-01									
TKN			102	80-120			12/11/2018	LRF	
Matrix Spike Dup (B8L1004-MSD1) Source ID: 8LS0420-01									
TKN			96.6	80-120	1.21	20	12/11/2018	LRF	D
Matrix Spike Dup (B8L1004-MSD2) Source ID: 8AC0094-01									
TKN			98.3	80-120	2.48	20	12/11/2018	LRF	
Dissolved Wet Chemistry									
Batch: B8K2907									
Blank (B8K2907-BLK1)									
Orthophosphate, as P	< 0.002	mg/L					11/29/2018	SMC	U
LCS (B8K2907-BS1)									
Orthophosphate, as P			94.3	90-110			11/29/2018	SMC	
Duplicate (B8K2907-DUP1) Source ID: 8AC0093-02									
Orthophosphate, as P					0.0699	10	11/29/2018	SMC	
Matrix Spike (B8K2907-MS1) Source ID: 8AC0093-02									
Orthophosphate, as P			100	90-110			11/29/2018	SMC	
Matrix Spike Dup (B8K2907-MSD1) Source ID: 8AC0093-02									
Orthophosphate, as P			101	90-110	0.262	10	11/29/2018	SMC	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Total Metals									
Batch: B8K2818									
Blank (B8K2818-BLK1)									
Mercury	< 0.00471	ug/L					11/30/2018	SAS	U
LCS (B8K2818-BS1)									
Mercury			99.8	85-115			11/30/2018	SAS	
Duplicate (B8K2818-DUP1) Source ID: 8BB0732-01									
Mercury					13.6	20	11/30/2018	SAS	D
Matrix Spike (B8K2818-MS1) Source ID: 8BB0732-01									
Mercury			94.9	70-130			11/30/2018	SAS	D
Matrix Spike Dup (B8K2818-MSD1) Source ID: 8BB0732-01									
Mercury			95.6	70-130	0.651	20	11/30/2018	SAS	D
Batch: B8K2920									
Blank (B8K2920-BLK1)									
Arsenic	< 5.72	ug/L					11/30/2018	EDM	U
Calcium	< 0.05	mg/L					11/30/2018	EDM	U
Lead	< 6.94	ug/L					11/30/2018	EDM	U
Magnesium	< 50	ug/L					11/30/2018	EDM	U
Phosphorus as P	< 0.006	mg/L					11/30/2018	EDM	U
Hardness	< 1	mg/L					11/30/2018	EDM	U
LCS (B8K2920-BS1)									
Arsenic			106	85-115			11/30/2018	EDM	
Calcium			96.5	85-115			11/30/2018	EDM	
Lead			106	85-115			11/30/2018	EDM	
Magnesium			103	85-115			11/30/2018	EDM	
Phosphorus as P			109	85-115			11/30/2018	EDM	
Duplicate (B8K2920-DUP1) Source ID: 8AC0093-02									
Arsenic					NR	20	11/30/2018	EDM	U
Calcium					0.737	20	11/30/2018	EDM	
Lead					4.55	20	11/30/2018	EDM	
Magnesium					0.520	20	11/30/2018	EDM	
Phosphorus as P					0.805	20	11/30/2018	EDM	
Hardness					0.678	200	11/30/2018	EDM	
Matrix Spike (B8K2920-MS1) Source ID: 8AC0093-02									
Arsenic			110	70-130			11/30/2018	EDM	
Calcium			97.2	70-130			11/30/2018	EDM	
Lead			104	70-130			11/30/2018	EDM	
Magnesium			104	70-130			11/30/2018	EDM	
Phosphorus as P			110	70-130			11/30/2018	EDM	
Matrix Spike Dup (B8K2920-MSD1) Source ID: 8AC0093-02									
Arsenic			109	70-130	0.873	20	11/30/2018	EDM	
Calcium			97.9	70-130	0.646	20	11/30/2018	EDM	
Lead			105	70-130	0.660	20	11/30/2018	EDM	
Magnesium			104	70-130	0.128	20	11/30/2018	EDM	
Phosphorus as P			111	70-130	0.524	20	11/30/2018	EDM	

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Quality Control Report

(Continued)

Total Metals (Continued)

Batch: B8L0515

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B8L0515-BLK1)									
Cadmium	< 1	ug/L					12/06/2018	AMO	U
LCS (B8L0515-BS1)									
Cadmium			99.6	85-115			12/06/2018	AMO	
Duplicate (B8L0515-DUP1) Source ID: 8BB0769-02									
Cadmium					NR	20	12/06/2018	AMO	U
Matrix Spike (B8L0515-MS1) Source ID: 8BB0769-02									
Cadmium			94.9	70-130			12/06/2018	AMO	
Matrix Spike Dup (B8L0515-MSD1) Source ID: 8BB0769-02									
Cadmium			94.5	70-130	0.358	20	12/06/2018	AMO	

Quality Control Report

(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Dissolved Metals									
Batch: B8L0320									
Blank (B8L0320-BLK1)									
Copper	< 10	ug/L					12/03/2018	EDM	U
Lead	< 6.94	ug/L					12/03/2018	EDM	U
Zinc	< 10	ug/L					12/03/2018	EDM	U
LCS (B8L0320-BS1)									
Copper			98.7	85-115			12/03/2018	EDM	
Lead			108	85-115			12/03/2018	EDM	
Zinc			108	85-115			12/03/2018	EDM	
Duplicate (B8L0320-DUP1) Source ID: 8AC0093-03									
Copper					NR	10	12/03/2018	EDM	U
Lead					NR	10	12/03/2018	EDM	U
Zinc					0.269	10	12/03/2018	EDM	
Matrix Spike (B8L0320-MS1) Source ID: 8AC0093-03									
Copper			112	70-130			12/03/2018	EDM	
Lead			102	70-130			12/03/2018	EDM	
Zinc			107	70-130			12/03/2018	EDM	
Matrix Spike Dup (B8L0320-MSD1) Source ID: 8AC0093-03									
Copper			109	70-130	2.86	10	12/03/2018	EDM	
Lead			102	70-130	0.119	10	12/03/2018	EDM	
Zinc			106	70-130	0.215	10	12/03/2018	EDM	
Batch: B8L0621									
Blank (B8L0621-BLK1)									
Cadmium	< 1	ug/L					12/06/2018	AMO	U
LCS (B8L0621-BS1)									
Cadmium			103	85-115			12/06/2018	AMO	
Duplicate (B8L0621-DUP1) Source ID: 8AC0094-01RE1									
Cadmium					NR	10	12/06/2018	AMO	U
Matrix Spike (B8L0621-MS1) Source ID: 8AC0094-01RE1									
Cadmium			90.2	70-130			12/06/2018	AMO	
Matrix Spike Dup (B8L0621-MSD1) Source ID: 8AC0094-01RE1									
Cadmium			91.5	70-130	1.43	10	12/06/2018	AMO	

Notes and Definitions

Item	Definition
D	Data reported from a dilution
M-06	The reported result has been confirmed by reanalysis.
Seed-01	The seed depletion is greater than that recommended by the method. The LCS is acceptable showing the seed supports the method.
U	Analyte included in the analysis, but not detected

Method Reference Acronyms

Colilert	Colilert, IDEXX Laboratories, Inc.
EPA	Manual of Methods for Chemical Analysis of Water and Wastes, USEPA
GS	USGS Techniques of Water-Resources Investigations
HH	Hach Spectrophotometer Procedures Manual
SM	Standard Methods for the Examination of Water and Wastewater
SW	Test methods for Evaluating Solid Waste, SW-846

Janet Finegan-Kelly
Water Quality Laboratory Manager

Stephen Quintero or Heather Rankin
QA/QC Coordinator

Ada County Highway District

Attn: Monica Lowe
3775 Adams Street
Garden City, Idaho 83714–6418
Tel. (208) 387–6255
Fax (208) 387–6391

Purchase Order: 63046445
Project: Stormwater-PI
Sampler(s): Andy Carlson

Lab#	Begin Date	End Date	Begin Time	End Time	Sample Identification	Sampler Initials	Matrix	Type																	
8AC0093							Water	Grab	Composite	BOD$_5$ - SM 5210 B	COD - Hach 8000	TSS - SM 2540 D	TDS - SM 2540 C	TKN - Perstorp PAI-DK01	TP - EPA 200.7	Orthophosphate - EPA 365.1	Total As, Cd, Pb - EPA 200.7	Diss. Cd Cu, Pb, Zn - EPA 200.7	Total Hg - EPA 245.2	E. Coli - IDEXX Colilert	Turbidity - EPA 180.1	Hardness - SM2340 B	NO_3+NO_2 - EPA 353.2	NH_3 - SM 4500 NH_3 - D	Total Containers
-01	11/27/18	11/28/18	2142	0305	181127 - 03 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	1
-02	11/27/18	11/28/18	1741	0026	181127 - 12 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	1
-03	11/27/18	11/28/18	1700	0948	181127 - 14 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	1

Relinquished by (sign)	Date & Time Transferred	Received by (sign)
	11/28/18 1327	11-28-18 1327

Comments/Special Instructions:

If not enough volume for any sample, please do Totals.

8AC0093

Report Date: 02/06/2019 10:06

Boise City Public Works
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11818 Joplin Road
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Samples in this Report

Lab ID	Sample	Sample Description	Matrix	Qualifiers	Date Sampled	Date Received
9AC0002-01	ACST1B	190202-03-WG	Water		02/02/2019	02/03/2019
9AC0002-02	ACST1B	190202-11-WG	Water		02/02/2019	02/03/2019
9AC0002-03	ACST1B	190202-11-001	Water		02/02/2019	02/03/2019
9AC0002-04	ACST1B	190202-11-101	Water		02/02/2019	02/03/2019
9AC0002-05	ACST1B	190202-12-WG	Water		02/02/2019	02/03/2019
9AC0002-06	ACST1B	190202-14-WG	Water		02/02/2019	02/03/2019

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Analysis Report

Location:	ACST1B	Location Description:	190202-03-WG
Date/Time Collected:	02/02/2019 20:07		
Lab Number:	9AC0002-01	Sample Collector:	ABW
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9B0413	461.1	MPN/100 mL	1.0	1.0	Colilert	02/03/19 07:15	2/4/19 7:15	JJR	H
Wet Chemistry										
Chlorine Screen	B9B0414	Absent				SM 4500-CL G-2000 mod	02/03/19	2/3/19 6:08	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 02/06/2019 10:06

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Analysis Report

Location:	ACST1B	Location Description:	190202-11-WG
Date/Time Collected:	02/02/2019 20:48		
Lab Number:	9AC0002-02	Sample Collector:	ABW
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9B0413	1553.1	MPN/100 mL	1.0	1.0	Colilert	02/03/19 07:15	2/4/19 7:15	JJR	H
Wet Chemistry										
Chlorine Screen	B9B0414	Absent				SM 4500-CL G-2000 mod	02/03/19	2/3/19 6:13	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 02/06/2019 10:06

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Analysis Report

Location: ACST1B

Location Description: 190202-11-001

Date/Time Collected: 02/02/2019 12:00

Lab Number: 9AC0002-03

Sample Collector: ABW

Sample Type: Grab

Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9B0413	<1.0	MPN/100 mL	1.0	1.0	Colilert	02/03/19 07:15	2/4/19 7:15	JJR	H U
Wet Chemistry										
Chlorine Screen	B9B0414	Absent				SM 4500-CL G-2000 mod	02/03/19	2/3/19 6:08	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 02/06/2019 10:06

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Analysis Report

Location: ACST1B
Date/Time Collected: 02/02/2019 12:01
Lab Number: 9AC0002-04
Sample Type: Grab

Location Description: 190202-11-101
Sample Collector: ABW
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9B0413	1986.3	MPN/100 mL	1.0	1.0	Colilert	02/03/19 07:15	2/4/19 7:15	JJR	H
Wet Chemistry										
Chlorine Screen	B9B0414	Absent				SM 4500-CL G-2000 mod	02/03/19	2/3/19 6:08	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 02/06/2019 10:06

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Analysis Report

Location:	ACST1B	Location Description:	190202-12-WG
Date/Time Collected:	02/02/2019 20:06		
Lab Number:	9AC0002-05	Sample Collector:	ABC
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9B0413	235.9	MPN/100 mL	1.0	1.0	Colilert	02/03/19 07:15	2/4/19 7:15	JJR	H
Wet Chemistry										
Chlorine Screen	B9B0414	Absent				SM 4500-CL G-2000 mod	02/03/19	2/3/19 6:13	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 02/06/2019 10:06

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location: ACST1B
Date/Time Collected: 02/02/2019 20:30
Lab Number: 9AC0002-06
Sample Type: Grab
Location Description: 190202-14-WG
Sample Collector: ABC
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9B0413	609.0	MPN/100 mL	10.0	1.0	Colilert	02/03/19 07:15	2/4/19 7:15	JJR	H D
Wet Chemistry										
Chlorine Screen	B9B0414	Absent				SM 4500-CL G-2000 mod	02/03/19	2/3/19 6:13	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Quality Control Report

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Microbiology									
Batch: B9B0413									
Blank (B9B0413-BLK1)									
E. Coli	Absent						02/04/2019	JJR	
LCS (B9B0413-BS1)									
E. Coli				Present			02/04/2019	JJR	
Duplicate (B9B0413-DUP1)	Source ID: 9AC0002-02								
E. Coli					1300	128	02/04/2019	JJR	

Notes and Definitions

Item	Definition
D	Data reported from a dilution
H	Hold time Exceeded.
U	Analyte included in the analysis, but not detected

Method Reference Acronyms

Colilert	Colilert, IDEXX Laboratories, Inc.
EPA	Manual of Methods for Chemical Analysis of Water and Wastes, USEPA
GS	USGS Techniques of Water-Resources Investigations
HH	Hach Spectrophotometer Procedures Manual
SM	Standard Methods for the Examination of Water and Wastewater
SW	Test methods for Evaluating Solid Waste, SW-846

J Finegan-Kelly

Janet Finegan-Kelly
Water Quality Laboratory Manager

Stephen Quintero or Azubike Emenari
QA/QC Coordinator

Ada County Highway District

Attn: Monica Lowe
3775 Adams Street
Garden City, Idaho 83714–6418
Tel. (208) 387–6255
Fax (208) 387–6391

Purchase Order: 63046445
Project: Stormwater-PI
Sampler(s): Andrea Leonard
Andy Weigel
Andy Carlson
Tammy Lightle

							Matrix	Type																	
Lab#	Begin Date	End Date	Begin Time	End Time	Sample Identification	Sampler Initials	Water	Grab	Composite	BOD_5 - SM 5210 B	COD - Hach 8000	TSS - SM 2540 D	TDS - SM 2540 C	TKN - Perstorp PAI-DK01	TP - EPA 200.7	Orthophosphate - EPA 365.1	Total As, Cd, Pb - EPA 200.7	Diss. Cd Cu, Pb, Zn - EPA 200.7	Total Hg - EPA 245.2	E. Coli - IDEXX Colilert	Turbidity - EPA 180.1	Hardness - SM2340 B	NO_3+NO_2 - EPA 353.2	NH_3 - SM 4500 NH_3 - D	Total Containers
60002-01	2/2/19		2007		190202-03-WG	ABU	x	X												x					1
-02	2/2/19		2048		190202-11-WG	ABD	x	X												x					1
-03	2/2/19		1200		190202-11-001	ABW	X	X												x					1
-04	2/2/19		1201		190202-11-101	ABW	x	X												X					1
-05	2/2/19		2006		190202-12-WG	ABC	X	X												x					1
-06	2/2/19		2030		190202-14-WG	ABC	x	X												x					1

Relinquished by (sign)	Date & Time Transferred	Received by (sign)	Comments/Special Instructions:
	02/02/19 2112		
	02/02/19 2214	02/3/19 0600	

9AC0002

Report Date: 02/27/2019 09:52

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Samples in this Report

Lab ID	Sample	Sample Description	Matrix	Qualifiers	Date Sampled	Date Received
9AC0003-01	ACST1C	190202-03-WC	Water		02/02/2019	02/03/2019
9AC0003-02	ACST1C	190202-11-WC	Water		02/03/2019	02/03/2019
9AC0003-03	ACST1C	190202-12-WC	Water		02/02/2019	02/03/2019
9AC0003-04	ACST1C	190202-14-WC	Water		02/03/2019	02/03/2019

Analysis Report

Location:	ACST1C	Location Description:	190202-03-WC
Date/Time Collected:	02/02/2019 19:41 - 02/02/2019 23:58		
Lab Number:	9AC0003-01	Sample Collector:	ABC
Sample Type:	Composite	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B9B0807	0.355	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	02/08/19	2/8/19 14:15	BAK	
BOD5	B9B0406	12.0	mg/L	2.00	2.00	SM 5210 B-2001	02/04/19	2/9/19 10:24	ALN	
COD	B9B0403	149	mg/L	7.00	7.00	HH 8000-1979	02/04/19	2/4/19 10:15	ASM	
Nitrate-Nitrite, as N	B9B2115	0.170	mg/L	0.0250	0.0250	EPA 353.2	02/21/19	2/21/19 12:41	JAL	
TKN	B9B2505	2.88	mg/L	0.130	0.130	EPA 351.2	02/25/19	2/26/19 9:20	LRF	
Total Dissolved Solids	B9B0405	35.7	mg/L	20.0	20.0	SM 2540 C-1997	02/04/19	2/4/19 13:00	CJP	
Total Suspended Solids	B9B0412	147	mg/L	0.900	0.900	SM 2540 D-1997	02/04/19	2/4/19 10:34	KMR	
Turbidity	B9B0411	25.7	NTU	0.3	0.3	EPA180.1 R2.0 (1993)	02/04/19	2/4/19 10:11	ALG	
Dissolved Wet Chemistry										
Orthophosphate, as P	B9B0402	0.0716	mg/L	2.00E-3	2.00E-3	EPA 365.1	02/04/19	2/4/19 10:08	SMC	
Total Metals										
Mercury	B9B0419	0.0126	ug/L	4.71E-3	4.71E-3	EPA 245.2	02/05/19	2/6/19 9:01	SAS	
Arsenic	B9B0506	<5.72	ug/L	5.72	5.72	EPA 200.7	02/05/19	2/7/19 13:41	EDM	U
Cadmium	B9B0506	<1.00	ug/L	1.00	1.00	EPA 200.7	02/05/19	2/7/19 13:41	EDM	U
Calcium	B9B0506	4.43	mg/L	0.0500	0.0500	EPA 200.7	02/05/19	2/7/19 13:41	EDM	
Lead	B9B0506	<6.94	ug/L	6.94	6.94	EPA 200.7	02/05/19	2/7/19 13:41	EDM	U
Magnesium	B9B0506	1490	ug/L	50.0	50.0	EPA 200.7	02/05/19	2/7/19 13:41	EDM	
Phosphorus as P	B9B0506	0.345	mg/L	6.00E-3	6.00E-3	EPA 200.7	02/05/19	2/7/19 13:41	EDM	
Hardness	B9B0506	17.2	mg/L	1.00	1.00	EPA 200.7	02/05/19	2/7/19 13:41	EDM	
Dissolved Metals										
Cadmium	B9B1114	<1.00	ug/L	1.00	1.00	EPA 200.7	02/11/19	2/11/19 15:02	EDM	U
Copper	B9B1114	<10.0	ug/L	10.0	10.0	EPA 200.7	02/11/19	2/11/19 15:02	EDM	U
Lead	B9B1114	<6.94	ug/L	6.94	6.94	EPA 200.7	02/11/19	2/11/19 15:02	EDM	U
Zinc	B9B1114	18.6	ug/L	10.0	10.0	EPA 200.7	02/11/19	2/11/19 15:02	EDM	

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Analysis Report

Location: ACST1C
Date/Time Collected: 02/02/2019 20:00 - 02/03/2019 00:24
Lab Number: 9AC0003-02
Sample Type: Composite
Location Description: 190202-11-WC
Sample Collector: ABC
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B9B0807	0.371	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	02/08/19	2/8/19 14:23	BAK	
BOD5	B9B0406	16.2	mg/L	2.00	2.00	SM 5210 B-2001	02/04/19	2/9/19 10:31	ALN	
COD	B9B0403	173	mg/L	7.00	7.00	HH 8000-1979	02/04/19	2/4/19 10:15	ASM	
Nitrate-Nitrite, as N	B9B2115	0.232	mg/L	0.0250	0.0250	EPA 353.2	02/21/19	2/21/19 12:46	JAL	
TKN	B9B2505	3.17	mg/L	0.130	0.130	EPA 351.2	02/25/19	2/26/19 9:21	LRF	
Total Dissolved Solids	B9B0405	82.5	mg/L	20.0	20.0	SM 2540 C-1997	02/04/19	2/4/19 13:00	CJP	
Total Suspended Solids	B9B0412	203	mg/L	0.900	0.900	SM 2540 D-1997	02/04/19	2/4/19 10:35	KMR	
Turbidity	B9B0411	19.3	NTU	0.3	0.3	EPA180.1 R2.0 (1993)	02/04/19	2/4/19 10:35	ALG	
Dissolved Wet Chemistry										
Orthophosphate, as P	B9B0402	0.165	mg/L	2.00E-3	2.00E-3	EPA 365.1	02/04/19	2/4/19 10:09	SMC	
Total Metals										
Mercury	B9B0419	0.0263	ug/L	4.71E-3	4.71E-3	EPA 245.2	02/05/19	2/6/19 9:35	SAS	
Arsenic	B9B0506	<5.72	ug/L	5.72	5.72	EPA 200.7	02/05/19	2/7/19 14:06	EDM	U
Cadmium	B9B0506	<1.00	ug/L	1.00	1.00	EPA 200.7	02/05/19	2/7/19 14:06	EDM	U
Calcium	B9B0506	7.45	mg/L	0.0500	0.0500	EPA 200.7	02/05/19	2/7/19 14:06	EDM	
Lead	B9B0506	18.0	ug/L	6.94	6.94	EPA 200.7	02/05/19	2/7/19 14:06	EDM	
Magnesium	B9B0506	5110	ug/L	50.0	50.0	EPA 200.7	02/05/19	2/7/19 14:06	EDM	
Phosphorus as P	B9B0506	0.554	mg/L	6.00E-3	6.00E-3	EPA 200.7	02/05/19	2/7/19 14:06	EDM	
Hardness	B9B0506	39.6	mg/L	1.00	1.00	EPA 200.7	02/05/19	2/7/19 14:06	EDM	
Dissolved Metals										
Cadmium	B9B1114	<1.00	ug/L	1.00	1.00	EPA 200.7	02/11/19	2/11/19 14:47	EDM	U
Copper	B9B1114	<10.0	ug/L	10.0	10.0	EPA 200.7	02/11/19	2/11/19 14:47	EDM	U
Lead	B9B1114	<6.94	ug/L	6.94	6.94	EPA 200.7	02/11/19	2/11/19 14:47	EDM	U
Zinc	B9B1114	25.8	ug/L	10.0	10.0	EPA 200.7	02/11/19	2/11/19 14:47	EDM	

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Analysis Report

Location: ACST1C

Location Description: 190202-12-WC

Date/Time Collected: 02/02/2019 19:32 - 02/02/2019 21:19

Lab Number: 9AC0003-03

Sample Collector: ABC

Sample Type: Composite

Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B9B0807	0.471	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	02/08/19	2/8/19 14:36	BAK	
BOD5	B9B0406	10.5	mg/L	2.00	2.00	SM 5210 B-2001	02/04/19	2/9/19 10:18	ALN	
COD	B9B0403	179	mg/L	7.00	7.00	HH 8000-1979	02/04/19	2/4/19 10:15	ASM	
Nitrate-Nitrite, as N	B9B2115	0.153	mg/L	0.0250	0.0250	EPA 353.2	02/21/19	2/21/19 12:47	JAL	
TKN	B9B2505	2.50	mg/L	0.130	0.130	EPA 351.2	02/25/19	2/26/19 9:23	LRF	
Total Dissolved Solids	B9B0405	72.0	mg/L	20.0	20.0	SM 2540 C-1997	02/04/19	2/4/19 13:00	CJP	
Total Suspended Solids	B9B0412	253	mg/L	0.900	0.900	SM 2540 D-1997	02/04/19	2/4/19 10:35	KMR	
Turbidity	B9B0411	24.3	NTU	0.3	0.3	EPA180.1 R2.0 (1993)	02/04/19	2/4/19 11:02	ALG	
Dissolved Wet Chemistry										
Orthophosphate, as P	B9B0402	0.0650	mg/L	2.00E-3	2.00E-3	EPA 365.1	02/04/19	2/4/19 10:10	SMC	
Total Metals										
Mercury	B9B0419	0.0353	ug/L	4.71E-3	4.71E-3	EPA 245.2	02/05/19	2/6/19 9:15	SAS	
Arsenic	B9B0506	<5.72	ug/L	5.72	5.72	EPA 200.7	02/05/19	2/7/19 14:11	EDM	U
Cadmium	B9B0506	<1.00	ug/L	1.00	1.00	EPA 200.7	02/05/19	2/7/19 14:11	EDM	U
Calcium	B9B0506	5.10	mg/L	0.0500	0.0500	EPA 200.7	02/05/19	2/7/19 14:11	EDM	
Lead	B9B0506	26.0	ug/L	6.94	6.94	EPA 200.7	02/05/19	2/7/19 14:11	EDM	
Magnesium	B9B0506	5390	ug/L	50.0	50.0	EPA 200.7	02/05/19	2/7/19 14:11	EDM	
Phosphorus as P	B9B0506	0.352	mg/L	6.00E-3	6.00E-3	EPA 200.7	02/05/19	2/7/19 14:11	EDM	
Hardness	B9B0506	34.9	mg/L	1.00	1.00	EPA 200.7	02/05/19	2/7/19 14:11	EDM	
Dissolved Metals										
Cadmium	B9B1114	<1.00	ug/L	1.00	1.00	EPA 200.7	02/11/19	2/11/19 14:52	EDM	U
Copper	B9B1114	<10.0	ug/L	10.0	10.0	EPA 200.7	02/11/19	2/11/19 14:52	EDM	U
Lead	B9B1114	<6.94	ug/L	6.94	6.94	EPA 200.7	02/11/19	2/11/19 14:52	EDM	U
Zinc	B9B1114	24.9	ug/L	10.0	10.0	EPA 200.7	02/11/19	2/11/19 14:52	EDM	

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Report Date: 02/27/2019 09:52

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
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Analysis Report

Location: ACST1C
Date/Time Collected: 02/02/2019 11:39 - 02/03/2019 01:45
Lab Number: 9AC0003-04
Sample Type: Composite
Location Description: 190202-14-WC
Sample Collector: ABC
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B9B0807	0.362	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	02/08/19	2/8/19 14:44	BAK	
BOD5	B9B0406	10.7	mg/L	2.00	2.00	SM 5210 B-2001	02/04/19	2/9/19 10:13	ALN	
COD	B9B0403	132	mg/L	7.00	7.00	HH 8000-1979	02/04/19	2/4/19 10:15	ASM	
Nitrate-Nitrite, as N	B9B2115	0.447	mg/L	0.0250	0.0250	EPA 353.2	02/21/19	2/21/19 12:49	JAL	
TKN	B9B2505	2.49	mg/L	0.130	0.130	EPA 351.2	02/25/19	2/26/19 9:24	LRF	
Total Dissolved Solids	B9B0405	134	mg/L	20.0	20.0	SM 2540 C-1997	02/04/19	2/4/19 13:00	CJP	
Total Suspended Solids	B9B0412	170	mg/L	0.900	0.900	SM 2540 D-1997	02/04/19	2/4/19 10:54	KMR	
Turbidity	B9B0411	14.9	NTU	0.3	0.3	EPA180.1 R2.0 (1993)	02/04/19	2/4/19 11:11	ALG	
Dissolved Wet Chemistry										
Orthophosphate, as P	B9B0402	0.114	mg/L	2.00E-3	2.00E-3	EPA 365.1	02/04/19	2/4/19 10:15	SMC	
Total Metals										
Mercury	B9B0419	0.0218	ug/L	4.71E-3	4.71E-3	EPA 245.2	02/05/19	2/6/19 9:39	SAS	
Arsenic	B9B0506	6.48	ug/L	5.72	5.72	EPA 200.7	02/05/19	2/7/19 14:16	EDM	
Cadmium	B9B0506	<1.00	ug/L	1.00	1.00	EPA 200.7	02/05/19	2/7/19 14:16	EDM	U
Calcium	B9B0506	11.8	mg/L	0.0500	0.0500	EPA 200.7	02/05/19	2/7/19 14:16	EDM	
Lead	B9B0506	14.0	ug/L	6.94	6.94	EPA 200.7	02/05/19	2/7/19 14:16	EDM	
Magnesium	B9B0506	5530	ug/L	50.0	50.0	EPA 200.7	02/05/19	2/7/19 14:16	EDM	
Phosphorus as P	B9B0506	0.354	mg/L	6.00E-3	6.00E-3	EPA 200.7	02/05/19	2/7/19 14:16	EDM	
Hardness	B9B0506	52.3	mg/L	1.00	1.00	EPA 200.7	02/05/19	2/7/19 14:16	EDM	
Dissolved Metals										
Cadmium	B9B1114	<1.00	ug/L	1.00	1.00	EPA 200.7	02/11/19	2/11/19 14:57	EDM	U
Copper	B9B1114	<10.0	ug/L	10.0	10.0	EPA 200.7	02/11/19	2/11/19 14:57	EDM	U
Lead	B9B1114	<6.94	ug/L	6.94	6.94	EPA 200.7	02/11/19	2/11/19 14:57	EDM	U
Zinc	B9B1114	18.8	ug/L	10.0	10.0	EPA 200.7	02/11/19	2/11/19 14:57	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Quality Control Report

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry									
Batch: B9B0403									
Blank (B9B0403-BLK1)									
COD	< 7	mg/L					02/04/2019	ASM	U
LCS (B9B0403-BS1)									
COD			98.0	90-110			02/04/2019	ASM	
Duplicate (B9B0403-DUP1) Source ID: 9AC0003-01									
COD					4.59	10	02/04/2019	ASM	
Batch: B9B0405									
Blank (B9B0405-BLK1)									
Total Dissolved Solids	< 20	mg/L					02/04/2019	CJP	U
LCS (B9B0405-BS1)									
Total Dissolved Solids			97.5	90-110			02/04/2019	CJP	
Duplicate (B9B0405-DUP1) Source ID: 9AC0003-01									
Total Dissolved Solids					15.6	10	02/04/2019	CJP	QC-02
Batch: B9B0406									
Blank (B9B0406-BLK1)									
BOD5	< 2	mg/L					02/09/2019	ALN	U
LCS (B9B0406-BS1)									
BOD5			103	84.6-115.4			02/09/2019	ALN	
LCS (B9B0406-BS2)									
BOD5			109	84.6-115.4			02/09/2019	ALN	
Duplicate (B9B0406-DUP1) Source ID: 9LS0048-01									
BOD5					1.82	30	02/09/2019	ALN	
Batch: B9B0411									
Blank (B9B0411-BLK1)									
Turbidity	< 0.3	NTU					02/04/2019	ALG	U
LCS (B9B0411-BS1)									
Turbidity			100	90-110			02/04/2019	ALG	
Duplicate (B9B0411-DUP1) Source ID: 9AC0003-02									
Turbidity					2.45	25	02/04/2019	ALG	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry (Continued)									
Batch: B9B0412									
Blank (B9B0412-BLK1)									
Total Suspended Solids	< 0.9	mg/L					02/04/2019	KMR	U
LCS (B9B0412-BS1)									
Total Suspended Solids			96.0	90-110			02/04/2019	KMR	
Duplicate (B9B0412-DUP1) Source ID: 9AC0003-03									
Total Suspended Solids					3.35	20	02/04/2019	KMR	
Batch: B9B0807									
Blank (B9B0807-BLK1)									
Ammonia, as N	< 0.035	mg/L					02/08/2019	BAK	U
LCS (B9B0807-BS1)									
Ammonia, as N			104	90-110			02/08/2019	BAK	
Duplicate (B9B0807-DUP1) Source ID: 9LS0048-04									
Ammonia, as N					0.286	10	02/08/2019	BAK	
Matrix Spike (B9B0807-MS1) Source ID: 9LS0048-04									
Ammonia, as N			104	80-120			02/08/2019	BAK	
Matrix Spike Dup (B9B0807-MSD1) Source ID: 9LS0048-04									
Ammonia, as N			103	80-120	0.390	10	02/08/2019	BAK	
Batch: B9B2115									
Blank (B9B2115-BLK1)									
Nitrate-Nitrite, as N	< 0.025	mg/L					02/21/2019	JAL	U
LCS (B9B2115-BS1)									
Nitrate-Nitrite, as N			97.7	90-110			02/21/2019	JAL	
Duplicate (B9B2115-DUP1) Source ID: 9AC0003-01									
Nitrate-Nitrite, as N					6.68	10	02/21/2019	JAL	
Duplicate (B9B2115-DUP2) Source ID: 9BB0083-01									
Nitrate-Nitrite, as N					0.641	10	02/21/2019	JAL	
Matrix Spike (B9B2115-MS1) Source ID: 9AC0003-01									
Nitrate-Nitrite, as N			98.7	90-110			02/21/2019	JAL	
Matrix Spike (B9B2115-MS2) Source ID: 9BB0083-01									
Nitrate-Nitrite, as N			94.9	90-110			02/21/2019	JAL	
Matrix Spike Dup (B9B2115-MSD1) Source ID: 9AC0003-01									
Nitrate-Nitrite, as N			98.3	90-110	0.293	10	02/21/2019	JAL	
Matrix Spike Dup (B9B2115-MSD2) Source ID: 9BB0083-01									
Nitrate-Nitrite, as N			95.3	90-110	0.220	10	02/21/2019	JAL	

Quality Control Report

(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry (Continued)									
Batch: B9B2505									
Blank (B9B2505-BLK1)									
TKN	< 0.13	mg/L					02/26/2019	LRF	U
LCS (B9B2505-BS1)									
TKN			97.5	80-120			02/26/2019	LRF	
Duplicate (B9B2505-DUP1) Source ID: 9LS0052-05RE1									
TKN					2.18	20	02/26/2019	LRF	D
Duplicate (B9B2505-DUP2) Source ID: 9WB0100-05RE1									
TKN					0.640	20	02/26/2019	LRF	D
Matrix Spike (B9B2505-MS1) Source ID: 9LS0052-05RE1									
TKN			106	80-120			02/26/2019	LRF	D
Matrix Spike (B9B2505-MS2) Source ID: 9WB0100-05RE1									
TKN			105	80-120			02/26/2019	LRF	D
Matrix Spike Dup (B9B2505-MSD1) Source ID: 9LS0052-05RE1									
TKN			107	80-120	0.506	20	02/26/2019	LRF	D
Matrix Spike Dup (B9B2505-MSD2) Source ID: 9WB0100-05RE1									
TKN			94.1	80-120	3.77	20	02/26/2019	LRF	D
Dissolved Wet Chemistry									
Batch: B9B0402									
Blank (B9B0402-BLK1)									
Orthophosphate, as P	< 0.002	mg/L					02/04/2019	SMC	U
LCS (B9B0402-BS1)									
Orthophosphate, as P			95.6	90-110			02/04/2019	SMC	
Duplicate (B9B0402-DUP1) Source ID: 9AC0003-03									
Orthophosphate, as P					0.299	10	02/04/2019	SMC	
Matrix Spike (B9B0402-MS1) Source ID: 9AC0003-03									
Orthophosphate, as P			101	90-110			02/04/2019	SMC	
Matrix Spike Dup (B9B0402-MSD1) Source ID: 9AC0003-03									
Orthophosphate, as P			99.8	90-110	0.629	10	02/04/2019	SMC	

Quality Control Report

(Continued)

Total Metals

Batch: B9B0419

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B9B0419-BLK1)									
Mercury	< 0.00471	ug/L					02/06/2019	SAS	U
LCS (B9B0419-BS1)									
Mercury			97.2	85-115			02/06/2019	SAS	
Duplicate (B9B0419-DUP1) Source ID: 9AC0003-01									
Mercury					4.27	20	02/06/2019	SAS	
Duplicate (B9B0419-DUP2) Source ID: 9AC0003-03									
Mercury					16.3	20	02/06/2019	SAS	
Matrix Spike (B9B0419-MS1) Source ID: 9AC0003-01									
Mercury			98.1	70-130			02/06/2019	SAS	
Matrix Spike (B9B0419-MS2) Source ID: 9AC0003-03									
Mercury			98.9	70-130			02/06/2019	SAS	
Matrix Spike Dup (B9B0419-MSD1) Source ID: 9AC0003-01									
Mercury			99.9	70-130	1.70	20	02/06/2019	SAS	
Matrix Spike Dup (B9B0419-MSD2) Source ID: 9AC0003-03									
Mercury			97.9	70-130	0.835	20	02/06/2019	SAS	

Batch: B9B0506

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B9B0506-BLK1)									
Arsenic	< 5.72	ug/L					02/07/2019	EDM	U
Cadmium	< 1	ug/L					02/07/2019	EDM	U
Calcium	< 0.05	mg/L					02/07/2019	EDM	U
Lead	< 6.94	ug/L					02/07/2019	EDM	U
Magnesium	< 50	ug/L					02/07/2019	EDM	U
Phosphorus as P	< 0.006	mg/L					02/07/2019	EDM	U
Hardness	< 1	mg/L					02/07/2019	EDM	U
LCS (B9B0506-BS1)									
Arsenic			105	85-115			02/07/2019	EDM	
Cadmium			104	85-115			02/07/2019	EDM	
Calcium			101	85-115			02/07/2019	EDM	
Lead			108	85-115			02/07/2019	EDM	
Magnesium			104	85-115			02/07/2019	EDM	
Phosphorus as P			109	85-115			02/07/2019	EDM	
Duplicate (B9B0506-DUP1) Source ID: 9AC0003-01									
Arsenic					NR	20	02/07/2019	EDM	U
Cadmium					NR	20	02/07/2019	EDM	U
Calcium					1.54	20	02/07/2019	EDM	
Lead					NR	20	02/07/2019	EDM	U
Magnesium					2.40	20	02/07/2019	EDM	
Phosphorus as P					2.39	20	02/07/2019	EDM	
Hardness					1.85	200	02/07/2019	EDM	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Total Metals (Continued)									
Batch: B9B0506 (Continued)									
Matrix Spike (B9B0506-MS1) Source ID: 9AC0003-01									
Arsenic			112	70-130			02/07/2019	EDM	
Cadmium			106	70-130			02/07/2019	EDM	
Calcium			100	70-130			02/07/2019	EDM	
Lead			114	70-130			02/07/2019	EDM	
Magnesium			104	70-130			02/07/2019	EDM	
Phosphorus as P			112	70-130			02/07/2019	EDM	
Matrix Spike Dup (B9B0506-MSD1) Source ID: 9AC0003-01									
Arsenic			112	70-130	0.594	20	02/07/2019	EDM	
Cadmium			106	70-130	0.141	20	02/07/2019	EDM	
Calcium			99.7	70-130	0.440	20	02/07/2019	EDM	
Lead			114	70-130	0.0328	20	02/07/2019	EDM	
Magnesium			105	70-130	0.153	20	02/07/2019	EDM	
Phosphorus as P			113	70-130	0.722	20	02/07/2019	EDM	
Dissolved Metals									
Batch: B9B1114									
Blank (B9B1114-BLK1)									
Cadmium	< 1	ug/L					02/11/2019	EDM	U
Copper	< 10	ug/L					02/11/2019	EDM	U
Lead	< 6.94	ug/L					02/11/2019	EDM	U
Zinc	< 10	ug/L					02/11/2019	EDM	U
LCS (B9B1114-BS1)									
Cadmium			96.1	85-115			02/11/2019	EDM	
Copper			95.1	85-115			02/11/2019	EDM	
Lead			100	85-115			02/11/2019	EDM	
Zinc			97.2	85-115			02/11/2019	EDM	
Duplicate (B9B1114-DUP1) Source ID: 9AC0003-01									
Cadmium					NR	10	02/11/2019	EDM	U
Copper					NR	10	02/11/2019	EDM	U
Lead					NR	10	02/11/2019	EDM	U
Zinc					2.16	10	02/11/2019	EDM	
Matrix Spike (B9B1114-MS1) Source ID: 9AC0003-01									
Cadmium			96.3	70-130			02/11/2019	EDM	
Copper			98.8	70-130			02/11/2019	EDM	
Lead			103	70-130			02/11/2019	EDM	
Zinc			97.3	70-130			02/11/2019	EDM	
Matrix Spike Dup (B9B1114-MSD1) Source ID: 9AC0003-01									
Cadmium			96.2	70-130	0.169	10	02/11/2019	EDM	
Copper			99.5	70-130	0.685	10	02/11/2019	EDM	
Lead			100	70-130	2.98	10	02/11/2019	EDM	
Zinc			97.5	70-130	0.147	10	02/11/2019	EDM	

Notes and Definitions

Item	Definition
D	Data reported from a dilution
QC-02	The RPD is greater than the method acceptance criteria. At least one of the values used to calculate the RPD is less than PQL.
U	Analyte included in the analysis, but not detected

Method Reference Acronyms

Colilert	Colilert, IDEXX Laboratories, Inc.
EPA	Manual of Methods for Chemical Analysis of Water and Wastes, USEPA
GS	USGS Techniques of Water-Resources Investigations
HH	Hach Spectrophotometer Procedures Manual
SM	Standard Methods for the Examination of Water and Wastewater
SW	Test methods for Evaluating Solid Waste, SW-846

AE for Janet Finegán-Kelly
Water Quality Laboratory Manager

Stephen Quintero or Azubike Emenari
QA/QC Coordinator

Ada County Highway District

Attn: Monica Lowe
3775 Adams Street
Garden City, Idaho 83714–6418
Tel. (208) 387–6255
Fax (208) 387–6391

Purchase Order: 63046445
Project: Stormwater-PI
Sampler(s): Andy Carlson
Tammy Lichtle
Andy Weigel
Andrea Leonard

							Matrix	Type																	
Lab#	**Begin Date**	**End Date**	**Begin Time**	**End Time**	**Sample Identification**	**Sampler Initials**	Water	Grab	Composite	BOD_5 - SM 5210 B	COD - Hach 8000	TSS - SM 2540 D	TDS - SM 2540 C	TKN - Perstorp PAI-DK01	TP - EPA 200.7	Orthophosphate - EPA 365.1	Total As, Cd, Pb - EPA 200.7	Diss. Cd Cu, Pb, Zn - EPA 200.7	Total Hg - EPA 245.2	E. Coli - IDEXX Colilert	Turbidity - EPA 180.1	Hardness - SM2340 B	NO_3+NO_2 - EPA 353.2	NH_3 - SM 4500 NH_3 - D	Total Containers
C0083-01	2/2/19	2/2/19	1941	2358	190202 - 03 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	3
-02	2/2/19	2/3/19	2000	0024	190202 - 11 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	3
-03	2/2/19	2/2/19	1932	2119	190202 - 12 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	2
-04	2/2/19	2/3/19	1139	~~2037~~ 0145	190202 - 14 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	3
				per bottle label per Andy Carlson																					

Relinquished by (sign)	Date & Time Transferred	Received by (sign)	Comments/Special Instructions:
	2/3/19 0948	BDM 2-3-19 1000	

9AC0003

Report Date: 04/19/2019 10:54

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Samples in this Report

Lab ID	Sample	Sample Description	Matrix	Qualifiers	Date Sampled	Date Received
9AC0015-01	ACST1B	190414-03-WG	Water		04/14/2019	04/14/2019
9AC0015-02	ACST1B	190414-11-WG	Water		04/14/2019	04/14/2019
9AC0015-03	ACST1B	190414-12-WG	Water		04/14/2019	04/14/2019
9AC0015-04	ACST1B	190414-14-WG	Water		04/14/2019	04/14/2019
9AC0015-05	ACST1B	190414-14-001	Water		04/14/2019	04/14/2019
9AC0015-06	ACST1B	190414-14-101	Water		04/14/2019	04/14/2019

Report Date: 04/19/2019 10:54

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location:	ACST1B	Location Description:	190414-03-WG
Date/Time Collected:	04/14/2019 00:13		
Lab Number:	9AC0015-01	Sample Collector:	AML
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9D1507	156.5	MPN/100 mL	1.0	1.0	Colilert	04/14/19 07:00	4/15/19 7:15	JJR	
Wet Chemistry										
Chlorine Screen	B9D1514	Absent				SM 4500-CL G-2000 mod	04/14/19	4/14/19 6:18	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location: ACST1B
Date/Time Collected: 04/14/2019 00:42
Lab Number: 9AC0015-02
Sample Type: Grab

Location Description: 190414-11-WG
Sample Collector: AML
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9D1507	179.3	MPN/100 mL	1.0	1.0	Colilert	04/14/19 07:10	4/15/19 7:15	JJR	
Wet Chemistry										
Chlorine Screen	B9D1514	Absent				SM 4500-CL G-2000 mod	04/14/19	4/14/19 6:23	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
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Analysis Report

Location:	ACST1B	Location Description:	190414-12-WG
Date/Time Collected:	04/14/2019 00:09		
Lab Number:	9AC0015-03	Sample Collector:	ABC
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9D1507	186.0	MPN/100 mL	1.0	1.0	Colilert	04/14/19 07:10	4/15/19 7:15	JJR	
Wet Chemistry										
Chlorine Screen	B9D1514	Absent				SM 4500-CL G-2000 mod	04/14/19	4/14/19 6:23	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 04/19/2019 10:54

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location: ACST1B
Date/Time Collected: 04/14/2019 00:25
Lab Number: 9AC0015-04
Sample Type: Grab

Location Description: 190414-14-WG
Sample Collector: ABC
Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9D1507	325.5	MPN/100 mL	1.0	1.0	Colilert	04/14/19 07:10	4/15/19 7:15	JJR	
Wet Chemistry										
Chlorine Screen	B9D1514	Absent				SM 4500-CL G-2000 mod	04/14/19	4/14/19 6:23	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location: ACST1B

Location Description: 190414-14-001

Date/Time Collected: 04/14/2019 12:00

Lab Number: 9AC0015-05

Sample Collector: ABC

Sample Type: Grab

Sample Matrix: Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9D1507	<1.0	MPN/100 mL	1.0	1.0	Colilert	04/14/19 07:00	4/15/19 7:15	JJR	U
Wet Chemistry										
Chlorine Screen	B9D1514	Absent				SM 4500-CL G-2000 mod	04/14/19	4/14/19 6:18	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location:	ACST1B	Location Description:	190414-14-101
Date/Time Collected:	04/14/2019 12:00		
Lab Number:	9AC0015-06	Sample Collector:	ABC
Sample Type:	Grab	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Microbiology										
E. Coli	B9D1507	328.2	MPN/100 mL	1.0	1.0	Colilert	04/14/19 07:00	4/15/19 7:15	JJR	
Wet Chemistry										
Chlorine Screen	B9D1514	Absent				SM 4500-CL G-2000 mod	04/14/19	4/14/19 6:18	JJR	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Quality Control Report

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Microbiology									
Batch: B9D1507									
Blank (B9D1507-BLK1)									
E. Coli	Absent						04/15/2019	JJR	
LCS (B9D1507-BS1)									
E. Coli				Present			04/15/2019	JJR	
Duplicate (B9D1507-DUP1)	Source ID: 9AC0016-01								
E. Coli					Pass	128	04/15/2019	JJR	

Notes and Definitions

Item	Definition
U	Analyte included in the analysis, but not detected

Method Reference Acronyms

Colilert	Colilert, IDEXX Laboratories, Inc.
EPA	Manual of Methods for Chemical Analysis of Water and Wastes, USEPA
GS	USGS Techniques of Water-Resources Investigations
HH	Hach Spectrophotometer Procedures Manual
SM	Standard Methods for the Examination of Water and Wastewater
SW	Test methods for Evaluating Solid Waste, SW-846

J Finegan-Kelly

Janet Finegan-Kelly
Water Quality Laboratory Manager

Stephen Quintero or Azubike Emenari
QA/QC Coordinator

Ada County Highway District

Attn: Monica Lowe
3775 Adams Street
Garden City, Idaho 83714–6418
Tel. (208) 387–6255
Fax (208) 387–6391

Purchase Order: 63046445
Project: Stormwater-PI
Sampler(s):

							Matrix	Type																	
Lab#	Begin Date	End Date	Begin Time	End Time	Sample Identification	Sampler Initials	Water	Grab	Composite	BOD$_5$ - SM 5210 B	COD - Hach 8000	TSS - SM 2540 D	TDS - SM 2540 C	TKN - Perstorp PAI-DK01	TP - EPA 200.7	Orthophosphate - EPA 365.1	Total As, Cd, Pb - EPA 200.7	Diss. Cd Cu, Pb, Zn - EPA 200.7	Total Hg - EPA 245.2	E. Coli - IDEXX Colilert	Turbidity - EPA 180.1	Hardness - SM2340 B	NO_3+NO_2 - EPA 353.2	NH_3 - SM 4500 NH_3 - D	Total Containers
9AC0015 -01	4/14/19	/	0013	/	190414-03-WG	AML	X	X												X					1
-02	4/14/19	/	0042	/	190414-11-WG	AML	X	X												X					1
-03	4/14/19	/	0009	/	190414 - 12 - WG	ABC	X	X												X					1
-04	4/14/19	/	0025	/	190414 - 14 - WG	ABC	X	X												X					1
-05	4/14/19	/	~~0025~~ ABC 1200	/	190414 - 14 - 001	ABC	X	X												X					1
-06	4/14/19	/	1200	/	190414 - 14 - 101	ABC	X	X												X					1

Relinquished by (sign)	Date & Time Transferred	Received by (sign)
	4/14/19 0127	4/14/19 0600

Comments/Special Instructions:

9AC0015

9AC0015

Report Date: 04/26/2019 10:51

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Samples in this Report

Lab ID	Sample	Sample Description	Matrix	Qualifiers	Date Sampled	Date Received
9AC0014-01	ACST1C	190414-03-WC	Water		04/14/2019	04/14/2019
9AC0014-02	ACST1C	190414-11-WC	Water		04/14/2019	04/14/2019

Report Date: 04/26/2019 10:51

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location:	ACST1C	Location Description:	190414-03-WC
Date/Time Collected:	04/13/2019 23:37 - 04/14/2019 10:33		
Lab Number:	9AC0014-01	Sample Collector:	ABC
Sample Type:	Composite	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B9D2001	0.483	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	04/20/19	4/20/19 14:25	BAK	
BOD5	B9D1511	11.8	mg/L	2.00	2.00	SM 5210 B-2001	04/15/19	4/20/19 9:44	ALG	
COD	B9D1503	66.0	mg/L	7.00	7.00	SM 5220 D-2017	04/15/19	4/15/19 9:30	ASM	
Nitrate-Nitrite, as N	B9D2501	0.157	mg/L	0.0250	0.0250	EPA 353.2	04/25/19	4/25/19 8:38	JAL	
TKN	B9D1604	2.00	mg/L	0.130	0.130	EPA 351.2	04/16/19	4/17/19 9:33	LRF	
Total Dissolved Solids	B9D1516	30.3	mg/L	20.0	20.0	SM 2540 C-1997	04/15/19	4/15/19 13:13	ALD	
Total Suspended Solids	B9D1513	37.5	mg/L	0.900	0.900	SM 2540 D-1997	04/15/19	4/15/19 10:43	CPC	
Turbidity	B9D1504	12.7	NTU	0.3	0.3	EPA180.1 R2.0 (1993)	04/15/19	4/15/19 8:45	ALG	
Dissolved Wet Chemistry										
Orthophosphate, as P	B9D1505	0.132	mg/L	2.00E-3	2.00E-3	EPA 365.1	04/15/19	4/15/19 9:20	ALN	
Total Metals										
Mercury	B9D1712	8.51E-3	ug/L	4.71E-3	4.71E-3	EPA 245.2	04/18/19	4/19/19 8:50	SAS	
Arsenic	B9D1519	<5.72	ug/L	5.72	5.72	EPA 200.7	04/15/19	4/16/19 10:28	AMO	U
Cadmium	B9D1519	<1.00	ug/L	1.00	1.00	EPA 200.7	04/15/19	4/16/19 10:28	AMO	U
Calcium	B9D1519	4.44	mg/L	0.0500	0.0500	EPA 200.7	04/15/19	4/16/19 10:28	AMO	
Lead	B9D1519	<6.94	ug/L	6.94	6.94	EPA 200.7	04/15/19	4/16/19 10:28	AMO	U
Magnesium	B9D1519	601	ug/L	50.0	50.0	EPA 200.7	04/15/19	4/16/19 10:28	AMO	
Phosphorus as P	B9D1519	0.303	mg/L	6.00E-3	6.00E-3	EPA 200.7	04/15/19	4/16/19 10:28	AMO	
Hardness	B9D1519	13.6	mg/L			EPA 200.7	04/15/19	4/16/19 10:28	AMO	
Dissolved Metals										
Cadmium	B9D1617	<1.00	ug/L	1.00	1.00	EPA 200.7	04/16/19	4/16/19 15:21	EDM	U
Copper	B9D1617	<10.0	ug/L	10.0	10.0	EPA 200.7	04/16/19	4/16/19 15:21	EDM	U
Lead	B9D1617	<6.94	ug/L	6.94	6.94	EPA 200.7	04/16/19	4/16/19 15:21	EDM	U
Zinc	B9D1617	20.2	ug/L	10.0	10.0	EPA 200.7	04/16/19	4/16/19 15:21	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Report Date: 04/26/2019 10:51

Boise City Public Works
Water Quality Laboratory
11818 Joplin Road
Boise, Idaho 83714-1076
Telephone (208) 608-7240
Fax (208) 608-7319

Analysis Report

Location:	ACST1C	Location Description:	190414-11-WC
Date/Time Collected:	04/13/2019 23:51 - 04/14/2019 07:41		
Lab Number:	9AC0014-02	Sample Collector:	ABC
Sample Type:	Composite	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B9D2001	0.642	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	04/20/19	4/20/19 15:10	BAK	
BOD5	B9D1511	10.7	mg/L	2.00	2.00	SM 5210 B-2001	04/15/19	4/20/19 9:38	ALG	Chlor-01
COD	B9D1503	125	mg/L	7.00	7.00	SM 5220 D-2017	04/15/19	4/15/19 9:30	ASM	
Nitrate-Nitrite, as N	B9D2501	0.177	mg/L	0.0250	0.0250	EPA 353.2	04/25/19	4/25/19 8:43	JAL	
TKN	B9D1604	2.64	mg/L	0.130	0.130	EPA 351.2	04/16/19	4/17/19 9:34	LRF	
Total Dissolved Solids	B9D1516	49.8	mg/L	20.0	20.0	SM 2540 C-1997	04/15/19	4/15/19 13:13	ALD	
Total Suspended Solids	B9D1513	128	mg/L	0.900	0.900	SM 2540 D-1997	04/15/19	4/15/19 10:43	CPC	
Turbidity	B9D1504	46.1	NTU	0.6	0.3	EPA180.1 R2.0 (1993)	04/15/19	4/15/19 8:59	ALG	D
Dissolved Wet Chemistry										
Orthophosphate, as P	B9D1505	0.143	mg/L	2.00E-3	2.00E-3	EPA 365.1	04/15/19	4/15/19 9:21	ALN	
Total Metals										
Mercury	B9D1712	0.0160	ug/L	4.71E-3	4.71E-3	EPA 245.2	04/18/19	4/19/19 9:25	SAS	
Arsenic	B9D1519	<5.72	ug/L	5.72	5.72	EPA 200.7	04/15/19	4/16/19 10:53	AMO	U
Cadmium	B9D1519	<1.00	ug/L	1.00	1.00	EPA 200.7	04/15/19	4/16/19 10:53	AMO	U
Calcium	B9D1519	6.62	mg/L	0.0500	0.0500	EPA 200.7	04/15/19	4/16/19 10:53	AMO	
Lead	B9D1519	9.64	ug/L	6.94	6.94	EPA 200.7	04/15/19	4/16/19 10:53	AMO	
Magnesium	B9D1519	1790	ug/L	50.0	50.0	EPA 200.7	04/15/19	4/16/19 10:53	AMO	
Phosphorus as P	B9D1519	0.420	mg/L	6.00E-3	6.00E-3	EPA 200.7	04/15/19	4/16/19 10:53	AMO	
Hardness	B9D1519	23.9	mg/L			EPA 200.7	04/15/19	4/16/19 10:53	AMO	
Dissolved Metals										
Cadmium	B9D1617	<1.00	ug/L	1.00	1.00	EPA 200.7	04/16/19	4/16/19 16:37	EDM	U
Copper	B9D1617	<10.0	ug/L	10.0	10.0	EPA 200.7	04/16/19	4/16/19 16:37	EDM	U
Lead	B9D1617	<6.94	ug/L	6.94	6.94	EPA 200.7	04/16/19	4/16/19 16:37	EDM	U
Zinc	B9D1617	12.6	ug/L	10.0	10.0	EPA 200.7	04/16/19	4/16/19 16:37	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Quality Control Report

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry									
Batch: B9D1503									
Blank (B9D1503-BLK1)									
COD	< 7	mg/L					04/15/2019	ASM	U
LCS (B9D1503-BS1)									
COD			98.3	90-110			04/15/2019	ASM	
Duplicate (B9D1503-DUP1) Source ID: 9AC0014-01									
COD					2.99	10	04/15/2019	ASM	
Batch: B9D1504									
Blank (B9D1504-BLK1)									
Turbidity	< 0.3	NTU					04/15/2019	ALG	U
LCS (B9D1504-BS1)									
Turbidity			101	90-110			04/15/2019	ALG	
Duplicate (B9D1504-DUP1) Source ID: 9AC0014-01									
Turbidity					5.10	25	04/15/2019	ALG	
Batch: B9D1511									
Blank (B9D1511-BLK1)									
BOD5	< 2	mg/L					04/20/2019	ALG	U
LCS (B9D1511-BS1)									
BOD5			103	84.6-115.4			04/20/2019	ALG	
LCS (B9D1511-BS2)									
BOD5			102	84.6-115.4			04/20/2019	ALG	
Duplicate (B9D1511-DUP1) Source ID: 9EP0036-01									
BOD5					1.05	30	04/20/2019	ALG	D
Batch: B9D1513									
Blank (B9D1513-BLK1)									
Total Suspended Solids	< 0.9	mg/L					04/15/2019	CPC	U
LCS (B9D1513-BS1)									
Total Suspended Solids			99.8	90-110			04/15/2019	CPC	
Duplicate (B9D1513-DUP1) Source ID: 9LS0143-01									
Total Suspended Solids					1.27	20	04/15/2019	CPC	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry (Continued)									
Batch: B9D1516									
Blank (B9D1516-BLK1)									
Total Dissolved Solids	< 20	mg/L					04/15/2019	ALD	U
LCS (B9D1516-BS1)									
Total Dissolved Solids			97.3	90-110			04/15/2019	ALD	
Duplicate (B9D1516-DUP1) Source ID: 9AC0014-01									
Total Dissolved Solids					20.7	10	04/15/2019	ALD	QC-02
Batch: B9D1604									
Blank (B9D1604-BLK1)									
TKN	< 0.13	mg/L					04/17/2019	LRF	U
LCS (B9D1604-BS1)									
TKN			108	80-120			04/17/2019	LRF	
LCS (B9D1604-BS2)									
TKN			102	80-120			04/17/2019	LRF	
Duplicate (B9D1604-DUP1) Source ID: 9LS0130-01									
TKN					0.0177	20	04/17/2019	LRF	D
Duplicate (B9D1604-DUP2) Source ID: 9WB0253-08									
TKN					7.81	20	04/17/2019	LRF	D
Duplicate (B9D1604-DUP3) Source ID: 9PK0007-01									
TKN					0.0747	20	04/17/2019	LRF	
Matrix Spike (B9D1604-MS1) Source ID: 9LS0130-01									
TKN			95.9	80-120			04/17/2019	LRF	D
Matrix Spike (B9D1604-MS2) Source ID: 9WB0253-08									
TKN			99.6	80-120			04/17/2019	LRF	D
Matrix Spike (B9D1604-MS3) Source ID: 9PK0007-01									
TKN			103	80-120			04/17/2019	LRF	
Matrix Spike Dup (B9D1604-MSD1) Source ID: 9LS0130-01									
TKN			97.7	80-120	1.43	20	04/17/2019	LRF	D
Matrix Spike Dup (B9D1604-MSD2) Source ID: 9WB0253-08									
TKN			90.6	80-120	7.96	20	04/17/2019	LRF	D
Matrix Spike Dup (B9D1604-MSD3) Source ID: 9PK0007-01									
TKN			99.0	80-120	3.93	20	04/17/2019	LRF	

Quality Control Report
(Continued)

Wet Chemistry (Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Batch: B9D2001									
Blank (B9D2001-BLK1)									
Ammonia, as N	< 0.035	mg/L					04/20/2019	BAK	U
LCS (B9D2001-BS1)									
Ammonia, as N			101	90-110			04/20/2019	BAK	
Duplicate (B9D2001-DUP1) Source ID: 9BB0247-01									
Ammonia, as N					1.22	10	04/20/2019	BAK	
Matrix Spike (B9D2001-MS1) Source ID: 9BB0247-01									
Ammonia, as N			103	80-120			04/20/2019	BAK	
Matrix Spike Dup (B9D2001-MSD1) Source ID: 9BB0247-01									
Ammonia, as N			103	80-120	0.203	10	04/20/2019	BAK	
Batch: B9D2501									
Blank (B9D2501-BLK1)									
Nitrate-Nitrite, as N	< 0.025	mg/L					04/25/2019	JAL	U
Blank (B9D2501-BLK2)									
Nitrate-Nitrite, as N	< 0.025	mg/L					04/25/2019	JAL	U
LCS (B9D2501-BS1)									
Nitrate-Nitrite, as N			103	90-110			04/25/2019	JAL	
LCS (B9D2501-BS2)									
Nitrate-Nitrite, as N			107	90-110			04/25/2019	JAL	
Duplicate (B9D2501-DUP1) Source ID: 9AC0014-01									
Nitrate-Nitrite, as N					5.36	10	04/25/2019	JAL	
Duplicate (B9D2501-DUP2) Source ID: 9PK0007-01									
Nitrate-Nitrite, as N					1.79	10	04/25/2019	JAL	
Duplicate (B9D2501-DUP3) Source ID: 9PK0007-11									
Nitrate-Nitrite, as N					4.94	10	04/25/2019	JAL	
Matrix Spike (B9D2501-MS1) Source ID: 9AC0014-01									
Nitrate-Nitrite, as N			104	90-110			04/25/2019	JAL	
Matrix Spike (B9D2501-MS2) Source ID: 9PK0007-01									
Nitrate-Nitrite, as N			102	90-110			04/25/2019	JAL	
Matrix Spike (B9D2501-MS3) Source ID: 9PK0007-11									
Nitrate-Nitrite, as N			107	90-110			04/25/2019	JAL	
Matrix Spike Dup (B9D2501-MSD1) Source ID: 9AC0014-01									
Nitrate-Nitrite, as N			102	90-110	1.76	10	04/25/2019	JAL	
Matrix Spike Dup (B9D2501-MSD2) Source ID: 9PK0007-01									
Nitrate-Nitrite, as N			105	90-110	2.19	10	04/25/2019	JAL	
Matrix Spike Dup (B9D2501-MSD3) Source ID: 9PK0007-11									
Nitrate-Nitrite, as N			105	90-110	1.38	10	04/25/2019	JAL	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Dissolved Wet Chemistry									
Batch: B9D1505									
Blank (B9D1505-BLK1)									
Orthophosphate, as P	< 0.002	mg/L					04/15/2019	ALN	U
LCS (B9D1505-BS1)									
Orthophosphate, as P			102	90-110			04/15/2019	ALN	
Duplicate (B9D1505-DUP1) Source ID: 9WB0321-01									
Orthophosphate, as P					0.990	10	04/15/2019	ALN	
Matrix Spike (B9D1505-MS1) Source ID: 9WB0321-01									
Orthophosphate, as P			105	90-110			04/15/2019	ALN	
Matrix Spike Dup (B9D1505-MSD1) Source ID: 9WB0321-01									
Orthophosphate, as P			104	90-110	0.347	10	04/15/2019	ALN	

Quality Control Report

(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Total Metals									
Batch: B9D1519									
Blank (B9D1519-BLK1)									
Arsenic	< 5.72	ug/L					04/16/2019	AMO	U
Cadmium	< 1	ug/L					04/16/2019	AMO	U
Calcium	< 0.05	mg/L					04/16/2019	AMO	U
Lead	< 6.94	ug/L					04/16/2019	AMO	U
Magnesium	< 50	ug/L					04/16/2019	AMO	U
Phosphorus as P	< 0.006	mg/L					04/16/2019	AMO	U
LCS (B9D1519-BS1)									
Arsenic			99.5	85-115			04/16/2019	AMO	
Cadmium			104	85-115			04/16/2019	AMO	
Calcium			96.7	85-115			04/16/2019	AMO	
Lead			103	85-115			04/16/2019	AMO	
Magnesium			99.5	85-115			04/16/2019	AMO	
Phosphorus as P			106	85-115			04/16/2019	AMO	
Duplicate (B9D1519-DUP1) Source ID: 9AC0014-01									
Arsenic					NR	20	04/16/2019	AMO	U
Cadmium					NR	20	04/16/2019	AMO	U
Calcium					0.205	20	04/16/2019	AMO	
Lead					NR	20	04/16/2019	AMO	U
Magnesium					0.153	20	04/16/2019	AMO	
Phosphorus as P					0.175	20	04/16/2019	AMO	
Matrix Spike (B9D1519-MS1) Source ID: 9AC0014-01									
Arsenic			106	70-130			04/16/2019	AMO	
Cadmium			105	70-130			04/16/2019	AMO	
Calcium			97.9	70-130			04/16/2019	AMO	
Lead			111	70-130			04/16/2019	AMO	
Magnesium			102	70-130			04/16/2019	AMO	
Phosphorus as P			116	70-130			04/16/2019	AMO	
Matrix Spike Dup (B9D1519-MSD1) Source ID: 9AC0014-01									
Arsenic			106	70-130	0.0878	20	04/16/2019	AMO	
Cadmium			106	70-130	0.137	20	04/16/2019	AMO	
Calcium			97.8	70-130	0.118	20	04/16/2019	AMO	
Lead			108	70-130	2.49	20	04/16/2019	AMO	
Magnesium			103	70-130	1.15	20	04/16/2019	AMO	
Phosphorus as P			113	70-130	1.88	20	04/16/2019	AMO	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Total Metals (Continued)									
Batch: B9D1712									
Blank (B9D1712-BLK1)									
Mercury	< 0.00471	ug/L					04/19/2019	SAS	U
LCS (B9D1712-BS1)									
Mercury			100	85-115			04/19/2019	SAS	
Duplicate (B9D1712-DUP1) Source ID: 9AC0014-01									
Mercury					6.39	20	04/19/2019	SAS	
Duplicate (B9D1712-DUP2) Source ID: 9EP0032-01									
Mercury					NR	20	04/19/2019	SAS	U
Matrix Spike (B9D1712-MS1) Source ID: 9AC0014-01									
Mercury			101	70-130			04/19/2019	SAS	
Matrix Spike (B9D1712-MS2) Source ID: 9EP0032-01									
Mercury			97.8	70-130			04/19/2019	SAS	
Matrix Spike Dup (B9D1712-MSD1) Source ID: 9AC0014-01									
Mercury			104	70-130	2.94	20	04/19/2019	SAS	
Matrix Spike Dup (B9D1712-MSD2) Source ID: 9EP0032-01									
Mercury			95.4	70-130	2.44	20	04/19/2019	SAS	

Quality Control Report
(Continued)

Dissolved Metals

Batch: B9D1617

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B9D1617-BLK1)									
Cadmium	< 1	ug/L					04/16/2019	EDM	U
Copper	< 10	ug/L					04/16/2019	EDM	U
Lead	< 6.94	ug/L					04/16/2019	EDM	U
Zinc	< 10	ug/L					04/16/2019	EDM	U
LCS (B9D1617-BS1)									
Cadmium			99.4	85-115			04/16/2019	EDM	
Copper			96.0	85-115			04/16/2019	EDM	
Lead			102	85-115			04/16/2019	EDM	
Zinc			98.6	85-115			04/16/2019	EDM	
Duplicate (B9D1617-DUP1) Source ID: 9AC0014-01									
Cadmium					NR	10	04/16/2019	EDM	U
Copper					NR	10	04/16/2019	EDM	U
Lead					NR	10	04/16/2019	EDM	U
Zinc					0.0788	10	04/16/2019	EDM	
Duplicate (B9D1617-DUP2) Source ID: 9AC0014-02									
Cadmium					NR	10	04/16/2019	EDM	U
Copper					NR	10	04/16/2019	EDM	U
Lead					NR	10	04/16/2019	EDM	U
Zinc					6.18	10	04/16/2019	EDM	
Matrix Spike (B9D1617-MS1) Source ID: 9AC0014-01									
Cadmium			102	70-130			04/16/2019	EDM	
Copper			107	70-130			04/16/2019	EDM	
Lead			106	70-130			04/16/2019	EDM	
Zinc			99.8	70-130			04/16/2019	EDM	
Matrix Spike (B9D1617-MS2) Source ID: 9AC0014-02									
Cadmium			102	70-130			04/16/2019	EDM	
Copper			106	70-130			04/16/2019	EDM	
Lead			105	70-130			04/16/2019	EDM	
Zinc			102	70-130			04/16/2019	EDM	
Matrix Spike Dup (B9D1617-MSD1) Source ID: 9AC0014-01									
Cadmium			102	70-130	0.288	10	04/16/2019	EDM	
Copper			99.0	70-130	7.54	10	04/16/2019	EDM	
Lead			104	70-130	1.74	10	04/16/2019	EDM	
Zinc			98.8	70-130	0.723	10	04/16/2019	EDM	
Matrix Spike Dup (B9D1617-MSD2) Source ID: 9AC0014-02									
Cadmium			102	70-130	0.0601	10	04/16/2019	EDM	
Copper			105	70-130	0.772	10	04/16/2019	EDM	
Lead			106	70-130	0.627	10	04/16/2019	EDM	
Zinc			101	70-130	0.541	10	04/16/2019	EDM	

Notes and Definitions

Item	Definition
Chlor-01	The sample exhibited a false positive for the chlorine screen.
D	Data reported from a dilution
QC-02	The RPD is greater than the method acceptance criteria. At least one of the values used to calculate the RPD is less than PQL.
U	Analyte included in the analysis, but not detected

Method Reference Acronyms

Colilert	Colilert, IDEXX Laboratories, Inc.
EPA	Manual of Methods for Chemical Analysis of Water and Wastes, USEPA
GS	USGS Techniques of Water-Resources Investigations
HH	Hach Spectrophotometer Procedures Manual
SM	Standard Methods for the Examination of Water and Wastewater
SW	Test methods for Evaluating Solid Waste, SW-846

J Finegan-Kelly

Janet Finegan-Kelly
Water Quality Laboratory Manager

Stephen Quintero or Azubike Emenari
QA/QC Coordinator

Ada County Highway District

Attn: Monica Lowe
3775 Adams Street
Garden City, Idaho 83714–6418
Tel. (208) 387–6255
Fax (208) 387–6391

Purchase Order: 63046445
Project: Stormwater-PI
Sampler(s): Andy Carlson
Andrea Leonard

Lab#	Begin Date	End Date	Begin Time	End Time	Sample Identification	Sampler Initials	Matrix	Type																	
							Water	Grab	Composite	BOD$_5$ - SM 5210 B	COD - Hach 8000	TSS - SM 2540 D	TDS - SM 2540 C	TKN - Perstorp PAI-DK01	TP - EPA 200.7	Orthophosphate - EPA 365.1	Total As, Cd, Pb - EPA 200.7	Diss. Cd Cu, Pb, Zn - EPA 200.7	Total Hg - EPA 245.2	E. Coli - IDEXX Colilert	Turbidity - EPA 180.1	Hardness - SM2340 B	NO$_3$+NO$_2$ - EPA 353.2	NH$_3$ - SM 4500 NH$_3$ - D	Total Containers
9AC0014-01	4/13/19	4/14/19	2337	1033	190414 - 03 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	3
-02	4/13/19	4/14/19	2351	ABC ~~0641~~ 0741	190414 - 11 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	3

Relinquished by (sign)	Date & Time Transferred	Received by (sign)
	4/14/19 1135	Denise K 4-14-19 @ 1140

Comments/Special Instructions:

9AC0014

9AC0014

Report Date: 06/05/2019 15:07

Boise City Public Works
Water Quality Laboratory
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Samples in this Report

Lab ID	Sample	Sample Description	Matrix	Qualifiers	Date Sampled	Date Received
9AC0024-01	ACST1C	190516-03-WC	Water		05/16/2019	05/17/2019
Comments:	No dissolved parameters. Low sample volume.					
9AC0024-02	ACST1C	190516-11-WC	Water		05/16/2019	05/17/2019

Analysis Report

Location:	ACST1C	Location Description:	190516-03-WC
Date/Time Collected:	05/16/2019 17:39 - 05/16/2019 20:22		
Lab Number:	9AC0024-01	Sample Collector:	ABC
Sample Type:	Composite	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B9E2905	2.67	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	05/29/19	5/29/19 9:10	ASM	
BOD5	B9E1805	>185	mg/L	2.00	2.00	SM 5210 B-2001	05/18/19	5/23/19 8:45	ALD	BOD-01
COD	B9E1801	543	mg/L	7.00	7.00	SM 5220 D-2017	05/18/19	5/18/19 10:45	CJP	
TKN	B9E2901	10.8	mg/L	0.130	0.130	EPA 351.2	05/29/19	5/30/19 9:59	LRF	
Total Dissolved Solids	B9E1634	282	mg/L	20.0	20.0	SM 2540 C-1997	05/17/19	5/18/19 8:30	ASM	
Total Suspended Solids	B9E1806	111	mg/L	0.900	0.900	SM 2540 D-1997	05/18/19	5/18/19 11:16	LRF	
Turbidity	B9E1710	20.3	NTU	0.3	0.3	EPA180.1 R2.0 (1993)	05/17/19	5/17/19 13:22	ALD	
Total Metals										
Mercury	B9E2215	0.0152	ug/L	4.71E-3	4.71E-3	EPA 245.2	05/23/19	5/24/19 9:09	SAS	
Arsenic	B9E2009	5.80	ug/L	5.72	5.72	EPA 200.7	05/20/19	5/22/19 17:57	EDM	
Cadmium	B9E2009	<1.00	ug/L	1.00	1.00	EPA 200.7	05/20/19	5/22/19 17:57	EDM	U
Calcium	B9E2009	14.1	mg/L	0.0500	0.0500	EPA 200.7	05/20/19	5/22/19 17:57	EDM	
Lead	B9E2009	<6.94	ug/L	6.94	6.94	EPA 200.7	05/20/19	5/22/19 17:57	EDM	U
Magnesium	B9E2009	2550	ug/L	50.0	50.0	EPA 200.7	05/20/19	5/22/19 17:57	EDM	
Phosphorus as P	B9E2009	2.19	mg/L	6.00E-3	6.00E-3	EPA 200.7	05/20/19	5/22/19 17:57	EDM	
Hardness	B9E2009	45.6	mg/L	0.125	0.125	EPA 200.7	05/20/19	5/22/19 17:57	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Analysis Report

Location:	ACST1C	Location Description:	190516-11-WC
Date/Time Collected:	05/16/2019 16:51 - 05/16/2019 20:31		
Lab Number:	9AC0024-02	Sample Collector:	ABC
Sample Type:	Composite	Sample Matrix:	Water

Analyte Name	Batch	Result	Units	Adjusted MDL *	Method MDL	Analysis Method Reference	Prepared Time	Analysis Time	Analyst Initials	Qual
Wet Chemistry										
Ammonia, as N	B9E2905	1.64	mg/L	0.0350	0.0350	SM 4500-NH3 D-1997	05/29/19	5/29/19 9:20	ASM	
BOD5	B9E1805	158	mg/L	2.00	2.00	SM 5210 B-2001	05/18/19	5/23/19 8:52	ALD	
COD	B9E1801	368	mg/L	7.00	7.00	SM 5220 D-2017	05/18/19	5/18/19 10:45	CJP	
Nitrate-Nitrite, as N	B9E3103	0.747	mg/L	0.0250	0.0250	EPA 353.2	05/31/19	5/31/19 12:16	SMC	
TKN	B9E2901	7.22	mg/L	0.130	0.130	EPA 351.2	05/29/19	5/30/19 10:04	LRF	
Total Dissolved Solids	B9E1634	238	mg/L	20.0	20.0	SM 2540 C-1997	05/17/19	5/18/19 8:30	ASM	
Total Suspended Solids	B9E1707	110	mg/L	0.900	0.900	SM 2540 D-1997	05/17/19	5/17/19 14:23	CPC	
Turbidity	B9E1710	18.9	NTU	0.3	0.3	EPA180.1 R2.0 (1993)	05/17/19	5/17/19 13:43	ALD	
Dissolved Wet Chemistry										
Orthophosphate, as P	B9E1709	0.863	mg/L	0.0100	2.00E-3	EPA 365.1	05/17/19	5/17/19 12:55	ALN	D
Total Metals										
Mercury	B9E2215	0.0196	ug/L	4.71E-3	4.71E-3	EPA 245.2	05/23/19	5/24/19 9:12	SAS	
Arsenic	B9E2009	6.72	ug/L	5.72	5.72	EPA 200.7	05/20/19	5/22/19 17:42	EDM	
Cadmium	B9E2009	<1.00	ug/L	1.00	1.00	EPA 200.7	05/20/19	5/22/19 17:42	EDM	U
Calcium	B9E2009	18.3	mg/L	0.0500	0.0500	EPA 200.7	05/20/19	5/22/19 17:42	EDM	
Lead	B9E2009	10.1	ug/L	6.94	6.94	EPA 200.7	05/20/19	5/22/19 17:42	EDM	
Magnesium	B9E2009	3920	ug/L	50.0	50.0	EPA 200.7	05/20/19	5/22/19 17:42	EDM	
Phosphorus as P	B9E2009	1.49	mg/L	6.00E-3	6.00E-3	EPA 200.7	05/20/19	5/22/19 17:42	EDM	
Hardness	B9E2009	61.8	mg/L	0.125	0.125	EPA 200.7	05/20/19	5/22/19 17:42	EDM	
Dissolved Metals										
Cadmium	B9F0312	<1.00	ug/L	1.00	1.00	EPA 200.7	06/03/19	6/3/19 15:44	EDM	U
Copper	B9F0312	19.5	ug/L	10.0	10.0	EPA 200.7	06/03/19	6/3/19 15:44	EDM	
Lead	B9F0312	<6.94	ug/L	6.94	6.94	EPA 200.7	06/03/19	6/3/19 15:44	EDM	U
Zinc	B9F0312	74.3	ug/L	10.0	10.0	EPA 200.7	06/03/19	6/3/19 15:44	EDM	

* The reported adjusted "MDL" is sample-specific. The analysis MDL as defined by 40 CFR pt 136 App.B. was corrected for dilution, dry weight, or method-defined ML.

Quality Control Report

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry									
Batch: B9E1634									
Blank (B9E1634-BLK1)									
Total Dissolved Solids	< 20	mg/L					05/16/2019	ASM	U
LCS (B9E1634-BS1)									
Total Dissolved Solids			106	90-110			05/16/2019	ASM	
Duplicate (B9E1634-DUP1) Source ID: 9EN0006-02									
Total Dissolved Solids					1.98	10	05/16/2019	ASM	
Batch: B9E1707									
Blank (B9E1707-BLK1)									
Total Suspended Solids	< 0.9	mg/L					05/17/2019	CPC	U
LCS (B9E1707-BS1)									
Total Suspended Solids			98.0	90-110			05/17/2019	CPC	
Duplicate (B9E1707-DUP1) Source ID: 9BB0293-01									
Total Suspended Solids					1.03	20	05/17/2019	CPC	
Batch: B9E1710									
Blank (B9E1710-BLK1)									
Turbidity	< 0.3	NTU					05/17/2019	ALD	U
LCS (B9E1710-BS1)									
Turbidity			99.3	90-110			05/17/2019	ALD	
Duplicate (B9E1710-DUP1) Source ID: 9AC0024-01									
Turbidity					15.8	25	05/17/2019	ALD	
Batch: B9E1801									
Blank (B9E1801-BLK1)									
COD	< 7	mg/L					05/18/2019	CJP	U
LCS (B9E1801-BS1)									
COD			98.3	90-110			05/18/2019	CJP	
Duplicate (B9E1801-DUP1) Source ID: 9AC0024-01									
COD					1.86	10	05/18/2019	CJP	

Quality Control Report

(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Wet Chemistry (Continued)									
Batch: B9E1805									
Blank (B9E1805-BLK1)									
BOD5	< 2	mg/L					05/23/2019	ALD	U
LCS (B9E1805-BS1)									
BOD5			105	84.6-115.4			05/23/2019	ALD	
LCS (B9E1805-BS2)									
BOD5			108	84.6-115.4			05/23/2019	ALD	
Duplicate (B9E1805-DUP1) Source ID: 9BB0301-01									
BOD5					6.35	30	05/23/2019	ALD	D
Batch: B9E1806									
Blank (B9E1806-BLK1)									
Total Suspended Solids	< 0.9	mg/L					05/18/2019	LRF	U
LCS (B9E1806-BS1)									
Total Suspended Solids			98.2	90-110			05/18/2019	LRF	
Duplicate (B9E1806-DUP1) Source ID: 9BB0300-01									
Total Suspended Solids					8.70	20	05/18/2019	LRF	
Batch: B9E2901									
Blank (B9E2901-BLK1)									
TKN	< 0.13	mg/L					05/30/2019	LRF	U
Blank (B9E2901-BLK2)									
TKN	< 0.13	mg/L					05/30/2019	LRF	U
Blank (B9E2901-BLK3)									
TKN	< 0.13	mg/L					05/30/2019	LRF	U
LCS (B9E2901-BS1)									
TKN			99.1	80-120			05/30/2019	LRF	
LCS (B9E2901-BS2)									
TKN			101	80-120			05/30/2019	LRF	
Duplicate (B9E2901-DUP1) Source ID: 9AC0024-01									
TKN					1.33	20	05/30/2019	LRF	
Duplicate (B9E2901-DUP2) Source ID: 9PK0014-03									
TKN					9.95	20	05/30/2019	LRF	
Duplicate (B9E2901-DUP3) Source ID: 9BB0286-01									
TKN					4.80	20	05/30/2019	LRF	D
Matrix Spike (B9E2901-MS1) Source ID: 9AC0024-01									
TKN			102	80-120			05/30/2019	LRF	
Matrix Spike (B9E2901-MS2) Source ID: 9PK0014-03									
TKN			101	80-120			05/30/2019	LRF	
Matrix Spike (B9E2901-MS4) Source ID: 9WQ0023-01									
TKN			95.9	80-120			05/30/2019	LRF	D

Quality Control Report
(Continued)

Wet Chemistry (Continued)

Batch: B9E2901 (Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Matrix Spike (B9E2901-MS5) Source ID: 9BB0271-04RE1									
TKN			103	80-120			05/30/2019	LRF	D
[Spk] 50mL->100mL; 5mL->25mL; Spiked 25mL									
Matrix Spike Dup (B9E2901-MSD1) Source ID: 9AC0024-01									
TKN			91.2	80-120	3.44	20	05/30/2019	LRF	
Matrix Spike Dup (B9E2901-MSD2) Source ID: 9PK0014-03									
TKN			101	80-120	8.91E-3	20	05/30/2019	LRF	

Batch: B9E2905

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B9E2905-BLK1)									
Ammonia, as N	< 0.035	mg/L					05/29/2019	ASM	U
Blank (B9E2905-BLK2)									
Ammonia, as N	< 0.035	mg/L					05/29/2019	ASM	U
LCS (B9E2905-BS1)									
Ammonia, as N			104	90-110			05/29/2019	ASM	
LCS (B9E2905-BS2)									
Ammonia, as N			110	90-110			05/29/2019	ASM	
Duplicate (B9E2905-DUP1) Source ID: 9WQ0023-08									
Ammonia, as N					1.45	10	05/29/2019	ASM	
Duplicate (B9E2905-DUP2) Source ID: 9BB0314-01									
Ammonia, as N					0.443	10	05/29/2019	ASM	
Duplicate (B9E2905-DUP3) Source ID: 9BB0317-01									
Ammonia, as N					0.252	10	05/29/2019	ASM	
Matrix Spike (B9E2905-MS1) Source ID: 9WQ0023-08									
Ammonia, as N			105	80-120			05/29/2019	ASM	
Matrix Spike (B9E2905-MS2) Source ID: 9BB0314-01									
Ammonia, as N			108	80-120			05/29/2019	ASM	
Matrix Spike (B9E2905-MS3) Source ID: 9BB0317-01									
Ammonia, as N			115	80-120			05/29/2019	ASM	
Matrix Spike Dup (B9E2905-MSD1) Source ID: 9WQ0023-08									
Ammonia, as N			101	80-120	2.46	10	05/29/2019	ASM	
Matrix Spike Dup (B9E2905-MSD2) Source ID: 9BB0314-01									
Ammonia, as N			110	80-120	1.48	10	05/29/2019	ASM	
Matrix Spike Dup (B9E2905-MSD3) Source ID: 9BB0317-01									
Ammonia, as N			114	80-120	0.525	10	05/29/2019	ASM	

Quality Control Report
(Continued)

Wet Chemistry (Continued)

Batch: B9E3103

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Blank (B9E3103-BLK1)									
Nitrate-Nitrite, as N	< 0.025	mg/L					05/31/2019	SMC	U
Blank (B9E3103-BLK2)									
Nitrate-Nitrite, as N	< 0.025	mg/L					05/31/2019	SMC	U
LCS (B9E3103-BS1)									
Nitrate-Nitrite, as N			96.8	90-110			05/31/2019	SMC	
LCS (B9E3103-BS2)									
Nitrate-Nitrite, as N			95.6	90-110			05/31/2019	SMC	
Duplicate (B9E3103-DUP1) Source ID: 9AC0025-02									
Nitrate-Nitrite, as N					0.648	10	05/31/2019	SMC	
Duplicate (B9E3103-DUP2) Source ID: 9BB0286-01									
Nitrate-Nitrite, as N					2.23	10	05/31/2019	SMC	
Duplicate (B9E3103-DUP3) Source ID: 9PK0014-03									
Nitrate-Nitrite, as N					6.72	10	05/31/2019	SMC	
Matrix Spike (B9E3103-MS1) Source ID: 9AC0025-02									
Nitrate-Nitrite, as N			99.2	90-110			05/31/2019	SMC	
Matrix Spike (B9E3103-MS2) Source ID: 9BB0286-01									
Nitrate-Nitrite, as N			97.7	90-110			05/31/2019	SMC	
Matrix Spike (B9E3103-MS3) Source ID: 9PK0014-03									
Nitrate-Nitrite, as N			97.1	90-110			05/31/2019	SMC	
Matrix Spike (B9E3103-MS4) Source ID: 9AC0030-01									
Nitrate-Nitrite, as N			96.6	90-110			05/31/2019	SMC	
Matrix Spike Dup (B9E3103-MSD1) Source ID: 9AC0025-02									
Nitrate-Nitrite, as N			97.2	90-110	0.834	10	05/31/2019	SMC	
Matrix Spike Dup (B9E3103-MSD2) Source ID: 9BB0286-01									
Nitrate-Nitrite, as N			96.6	90-110	0.912	10	05/31/2019	SMC	
Matrix Spike Dup (B9E3103-MSD3) Source ID: 9PK0014-03									
Nitrate-Nitrite, as N			95.6	90-110	1.34	10	05/31/2019	SMC	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Dissolved Wet Chemistry									
Batch: B9E1709									
Blank (B9E1709-BLK1)									
Orthophosphate, as P	< 0.002	mg/L					05/17/2019	ALN	U
LCS (B9E1709-BS1)									
Orthophosphate, as P			97.1	90-110			05/17/2019	ALN	
Duplicate (B9E1709-DUP1) Source ID: 9BB0294-01									
Orthophosphate, as P					2.56	10	05/17/2019	ALN	D
Duplicate (B9E1709-DUP2) Source ID: 9BB0293-01									
Orthophosphate, as P					0.0278	10	05/17/2019	ALN	D
Matrix Spike (B9E1709-MS1) Source ID: 9BB0294-01									
Orthophosphate, as P			99.7	90-110			05/17/2019	ALN	D
Matrix Spike (B9E1709-MS2) Source ID: 9BB0293-01									
Orthophosphate, as P			103	90-110			05/17/2019	ALN	D
Matrix Spike Dup (B9E1709-MSD1) Source ID: 9BB0294-01									
Orthophosphate, as P			104	90-110	0.837	10	05/17/2019	ALN	D
Matrix Spike Dup (B9E1709-MSD2) Source ID: 9BB0293-01									
Orthophosphate, as P			104	90-110	0.438	10	05/17/2019	ALN	D

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Total Metals									
Batch: B9E2009									
Blank (B9E2009-BLK1)									
Arsenic	< 5.72	ug/L					05/22/2019	EDM	U
Cadmium	< 1	ug/L					05/22/2019	EDM	U
Calcium	< 0.05	mg/L					05/22/2019	EDM	U
Lead	< 6.94	ug/L					05/22/2019	EDM	U
Magnesium	< 50	ug/L					05/22/2019	EDM	U
Phosphorus as P	< 0.006	mg/L					05/22/2019	EDM	U
LCS (B9E2009-BS1)									
Arsenic			105	85-115			05/22/2019	EDM	
Cadmium			102	85-115			05/22/2019	EDM	
Calcium			102	85-115			05/22/2019	EDM	
Lead			102	85-115			05/22/2019	EDM	
Magnesium			104	85-115			05/22/2019	EDM	
Phosphorus as P			106	85-115			05/22/2019	EDM	
Duplicate (B9E2009-DUP1) Source ID: 9AC0024-01									
Arsenic					8.26	20	05/22/2019	EDM	
Cadmium					NR	20	05/22/2019	EDM	U
Calcium					0.264	20	05/22/2019	EDM	
Lead					NR	20	05/22/2019	EDM	U
Magnesium					0.255	20	05/22/2019	EDM	
Phosphorus as P					0.228	20	05/22/2019	EDM	
Matrix Spike (B9E2009-MS1) Source ID: 9AC0024-01									
Arsenic			107	70-130			05/22/2019	EDM	
Cadmium			103	70-130			05/22/2019	EDM	
Calcium			103	70-130			05/22/2019	EDM	
Lead			105	70-130			05/22/2019	EDM	
Magnesium			105	70-130			05/22/2019	EDM	
Phosphorus as P			97.9	70-130			05/22/2019	EDM	
Matrix Spike Dup (B9E2009-MSD1) Source ID: 9AC0024-01									
Arsenic			107	70-130	0.452	20	05/22/2019	EDM	
Cadmium			103	70-130	0.208	20	05/22/2019	EDM	
Calcium			102	70-130	0.319	20	05/22/2019	EDM	
Lead			106	70-130	0.772	20	05/22/2019	EDM	
Magnesium			105	70-130	0.403	20	05/22/2019	EDM	
Phosphorus as P			96.0	70-130	0.357	20	05/22/2019	EDM	

Quality Control Report
(Continued)

Analyte Name	Method Blank	Units	% Recovery	Recovery Limits	RPD	RPD Limit	Date Analyzed	Analyst Initials	Qualifier
Total Metals (Continued)									
Batch: B9E2215									
Blank (B9E2215-BLK1)									
Mercury	< 0.00471	ug/L					05/24/2019	SAS	U
LCS (B9E2215-BS1)									
Mercury			101	85-115			05/24/2019	SAS	
Duplicate (B9E2215-DUP1) Source ID: 9AC0025-01									
Mercury					10.3	20	05/24/2019	SAS	
Duplicate (B9E2215-DUP2) Source ID: 9BB0287-01									
Mercury					4.08	20	05/24/2019	SAS	D
Matrix Spike (B9E2215-MS1) Source ID: 9AC0025-01									
Mercury			99.8	70-130			05/24/2019	SAS	
Matrix Spike (B9E2215-MS2) Source ID: 9BB0287-01									
Mercury			99.4	70-130			05/24/2019	SAS	D
Matrix Spike Dup (B9E2215-MSD1) Source ID: 9AC0025-01									
Mercury			103	70-130	2.03	20	05/24/2019	SAS	
Matrix Spike Dup (B9E2215-MSD2) Source ID: 9BB0287-01									
Mercury			99.1	70-130	0.281	20	05/24/2019	SAS	D
Dissolved Metals									
Batch: B9F0312									
Blank (B9F0312-BLK1)									
Cadmium	< 1	ug/L					06/03/2019	EDM	U
Copper	< 10	ug/L					06/03/2019	EDM	U
Lead	< 6.94	ug/L					06/03/2019	EDM	U
Zinc	< 10	ug/L					06/03/2019	EDM	U
LCS (B9F0312-BS1)									
Cadmium			101	85-115			06/03/2019	EDM	
Copper			99.8	85-115			06/03/2019	EDM	
Lead			101	85-115			06/03/2019	EDM	
Zinc			98.0	85-115			06/03/2019	EDM	
Duplicate (B9F0312-DUP1) Source ID: 9AC0025-02									
Cadmium					NR	10	06/03/2019	EDM	U
Copper					3.69	10	06/03/2019	EDM	
Lead					NR	10	06/03/2019	EDM	U
Zinc					0.943	10	06/03/2019	EDM	
Matrix Spike (B9F0312-MS1) Source ID: 9AC0025-02									
Cadmium			99.6	70-130			06/03/2019	EDM	
Copper			98.8	70-130			06/03/2019	EDM	
Lead			97.9	70-130			06/03/2019	EDM	
Zinc			94.5	70-130			06/03/2019	EDM	
Matrix Spike Dup (B9F0312-MSD1) Source ID: 9AC0025-02									
Cadmium			99.9	70-130	0.325	10	06/03/2019	EDM	
Copper			91.5	70-130	5.50	10	06/03/2019	EDM	
Lead			99.5	70-130	1.69	10	06/03/2019	EDM	
Zinc			95.6	70-130	0.517	10	06/03/2019	EDM	

Notes and Definitions

Item	Definition
BOD-01	Dilution scheme was not sufficient to meet method defined oxygen depletion criteria.
D	Data reported from a dilution
U	Analyte included in the analysis, but not detected

Method Reference Acronyms

Colilert	Colilert, IDEXX Laboratories, Inc.
EPA	Manual of Methods for Chemical Analysis of Water and Wastes, USEPA
GS	USGS Techniques of Water-Resources Investigations
HH	Hach Spectrophotometer Procedures Manual
SM	Standard Methods for the Examination of Water and Wastewater
SW	Test methods for Evaluating Solid Waste, SW-846

J Finegan-Kelly

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Purchase Order: 63046445
Project: Stormwater-PI
Sampler(s): Andy Carlson

							Matrix	Type																		
Lab#	Begin Date	End Date	Begin Time	End Time	Sample Identification	Sampler Initials	Water	Grab	Composite	✓ BOD_5 - SM 5210 B	✓ COD - Hach 8000	✓ TSS - SM 2540 D	✓ TDS - SM 2540 C	✓ TKN - Perstorp PAI-DK01	✓ TP - EPA 200.7	✓ Orthophosphate - EPA 365.1	✓ Total As, Cd, Pb - EPA 200.7	✓ Diss. Cd Cu, Pb, Zn - EPA 200.7	✓ Total Hg - EPA 245.2	E. Coli - IDEXX Colilert	✓ Turbidity - EPA 180.1	✓✓✓ Hardness - SM2340 B	✓ NO_3+NO_2 - EPA 353.2	✓ NH_3 - SM 4500 NH_3 - D	Total Containers
9C0024-01	5/16/19	5/16/19	1739	2022	190516 - 03 - WC	ABC	X		X	X	X	X	X	X	X	~~X~~	X	~~X~~	X		X	X	~~X~~	X	1
↓ -02	5/16/19	5/16/19	1651	2031	190516 - 11 - WC	ABC	X		X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	1

Relinquished by (sign)	Date & Time Transferred	Received by (sign)
	1110 5/17/19	05/17/19 1110

Comments/Special Instructions:

If not enough volume for all analytes, please do Totals instead of dissolved parameters.

9AC 0024-01 → No Dissolved parameters; low sample volume - SMC

9AC0024

Appendix C: Americana Subwatershed Monitoring Summary

Americana Subwatershed Monitoring Summary Report

Prepared for
Ada County Highway District
January 6, 2020

Table of Contents

List of Figures

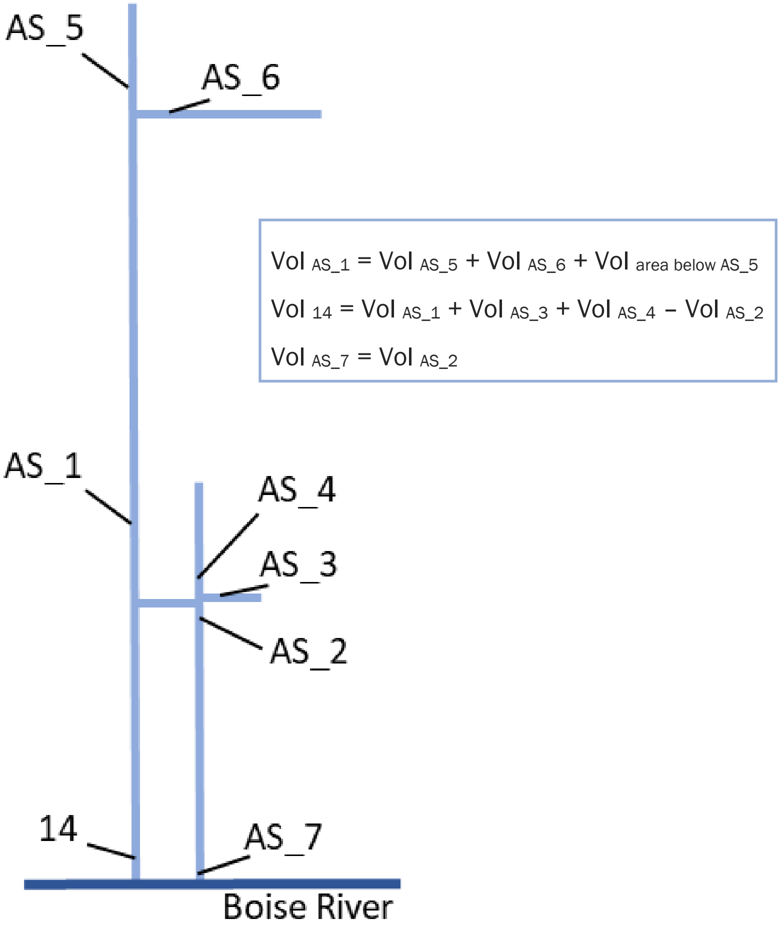
Executive Summary

The Americana subwatershed is the largest urban subwatersheds on the lower Boise River and drains a significant portion of downtown Boise and the north end and foothills residential areas. Connections with natural surface waters, irrigation canals, dewatering from construction activities, utility vaults, and dewatering wells further complicate the profile of stormwater runoff and background non-stormwater flows. Development in downtown Boise and the residential area north of downtown, as well as increasing awareness and concern in the community for water quality, presents an opportunity to change behaviors and implement targeted pollutant reduction activities in the Americana subwatershed.

To capitalize on this opportunity and build upon the stormwater runoff and dry weather, non-stormwater monitoring (flow measurement and analytical sample collection) that have been conducted at the Americana outfall since 2013, Ada County Highway District (ACHD) developed the Americana subwatershed monitoring plan in water year (WY) 2018 with the following objectives:

- Validate assumptions about stormwater flows from individual subcatchments and identify situations where monitoring data does not align with expectations based on the results of the Connectivity Evaluation (Brown and Caldwell, 2015) or the Subwatershed Planning document for the Americana and Main Street subwatersheds (Ecosystem Sciences, 2016).
- Identify sources of wet weather flows as well as non-stormwater dry weather flows that contribute to the flows discharging from the Americana outfall.
- Identify specific areas of the subwatershed where additional controls or changes in management approach are needed.

At the beginning of WY 2019 ACHD began conducting systematic flow monitoring at major nodes within the Americana subwatershed storm drain system. These monitoring sites are represented below in Figure ES-1.



$$Vol_{AS\_1} = Vol_{AS\_5} + Vol_{AS\_6} + Vol_{\text{area below } AS\_5}$$

$$Vol_{14} = Vol_{AS\_1} + Vol_{AS\_3} + Vol_{AS\_4} - Vol_{AS\_2}$$

$$Vol_{AS\_7} = Vol_{AS\_2}$$

Figure ES-1. Conceptual layout of monitoring sites

Continuous flow monitoring data collected during WY 2019 were used to analyze 19 representative wet weather events and 10 representative dry weather events. The analysis of measured flows together with modeled flows, calculation of flow total correlations between sites, and development of a water balance for the Americana subwatershed led to several conclusions about flows in the subwatershed and provide additional direction for monitoring activities in WY 2020. These conclusions help ACHD better understand how to use the Americana subwatershed model as a predictive tool to inform management decisions by assessing limitations in light of actual observations to describe how they impact model results. Additionally, monitoring results from year one have narrowed down the areas within the subwatershed that contribute most significantly to dry weather flows and have helped to identify and document the timing and nature of dry weather flows.

Activities for WY 2020 include water quality monitoring at a subcatchment monitoring location within the Americana subwatershed and continued flow monitoring. Flow monitoring is planned to continue at some of the WY 2019 locations, and some new locations may be brought online as well to acquire additional data in support of program objectives.

Section 1: Introduction and Background

The Americana subwatershed is one of the largest urban subwatersheds on the lower Boise River and drains a significant portion of downtown Boise and the north end and foothills residential areas, which results in a complex drainage area. Connections with natural surface waters, irrigation canals, dewatering from construction activities, utility vaults, and dewatering wells further complicate the profile of stormwater runoff and background non-stormwater flows. Stormwater runoff and dry weather, non-stormwater monitoring (flow measurement and analytical sample collection) have been conducted at the Americana outfall since 2013.

The subwatershed drains almost 900 acres of residential and commercial land uses, resulting in stormwater runoff pollutant loads that are often higher than the smaller subwatersheds. Development in downtown Boise and the residential area north of downtown, as well as increasing awareness and concern in the community for water quality, presents an opportunity to change behaviors and implement targeted pollutant reduction activities in the Americana subwatershed. Ada County Highway District (ACHD) has undertaken additional studies and investigations to support decision-making for stormwater management activities that reduce pollutant loads from sources and improve runoff quality in this subwatershed.

In addition to stormwater quality and flow monitoring at the Americana outfall, ACHD developed a subwatershed plan for the Americana subwatershed to prioritize subareas for future green stormwater infrastructure. The subwatershed plan used modeled flow and water quality information to identify and prioritize subareas for future green stormwater infrastructure implementation. ACHD has also analyzed dry weather, non-stormwater flows at the outfall, which has led to documenting a variety of dry weather flow sources that have varying water quality implications.

ACHD developed the Americana subwatershed monitoring plan in water year (WY) 2018 with the following objectives:

- Validate assumptions about stormwater flows from individual subcatchments and identify situations where monitoring data does not align with expectations based on the results of the Connectivity Evaluation (Brown and Caldwell [BC], 2015) or the Subwatershed Planning document for the Americana and Main Street subwatersheds (Ecosystem Sciences, 2016).
- Identify sources of wet weather flows as well as non-stormwater dry weather flows that contribute to the flows discharging from the Americana outfall.
- Identify specific areas of the subwatershed where additional controls or changes in management approach are needed.

At the beginning of WY 2019 ACHD began conducting systematic flow and water quality monitoring at major nodes within the Americana subwatershed storm drain system. This report summarizes data collection efforts and monitoring equipment used during WY 2019, describes monitoring site information and results, and provides conclusions in line with each monitoring objective. A discussion of potential monitoring activities for WY 2020 is also included.

Section 2: Year One Data Collection

Continuous rain data was recorded at two rain gauge sites, and flow data was collected and analyzed from seven individual monitoring sites in the Americana subwatershed, in addition to continued flow and water quality monitoring at the Americana outfall monitoring station. Monitoring data and information from the Americana subwatershed model developed in PCSWWM for the subwatershed plan were used to create a water balance for the Americana drainage area. The water balance and inter-site data comparison were used to check monitored and modeled results against expectations, draw preliminary conclusions about sources of wet weather and dry weather flow, and start documenting specific areas of the subwatershed where additional controls or changes in management approach might be needed.

2.1 Monitoring Equipment

Data acquisition in WY 2019 was accomplished using pressure transducer water level loggers, flowmeters, and rain gauges. Monitoring equipment is described in detail below.

2.1.1 Pressure Transducer Water Level Loggers

Pressure Transducer Water Level Loggers (loggers) are the primary monitoring instrument used to gather data about flows in the Americana subwatershed storm drain system. ACHD has selected HOBO U20L Water Level Loggers for in-pipe monitoring. The loggers record water depth as absolute pressure (in pounds per square inch) exerted on the sensor as well as temperature. When combined with barometric pressure data in the HOBOware Pro software, the system generates a corresponding water level reading for each temperature and pressure reading.

From the start of data collection in August 2018 through January 2019, barometric pressure data from the National Weather Service Boise Airport was used, but beginning in January 2019 barometric pressure data was collected from another HOBO U20L logger mounted in a protected open-air location at ACHD headquarters, approximately 1.25 miles from the logger sites, to minimize calculation errors. Level data from AS_1 through AS_6 were imported into Flowlink Pro software and converted to flow measurements using Manning's equations and each site's individual characteristics (pipe size, material, and slope). The flow data was then imported into DataSight.

The loggers are installed in the storm drain pipes inside a 2-inch diameter steel-lined flexible conduit. The submerged end of the conduit is pinched to a narrow opening that holds the logger back from passing through the end of the conduit while still allowing free movement of water into the conduit for measurement. At each site the conduit is mounted to pipe and vault walls, starting at the bottom of the manhole cover to the measured pipe floor. The logger is secured to a piece of flexible fiberglass rod that is the same length as the conduit. This setup allows the logger to be removed from the conduit and reinserted without confined space entry, as well as ensuring that it is back in position at the bottom of the pipe and is shown in Figure 1.

Figure 1. Installation of level loggers. Pictured left to right: conduit installation for loggers within stormdrain pipe with pinched end located at bottom of pipe; conduit installation with fiberglass rod extending from conduit for easy removal/replacement of level logger for download.

Calibration and Maintenance

Loggers are gently cleaned during each download to remove any debris or biological growth. Battery life is expected to last 5 years and has not yet become an issue.

2.1.2 Flowmeters

Hach and ISCO flowmeters have been used at some Americana subwatershed monitoring sites on a case-by-case basis. The flowmeters are used to record level, velocity, flow, and, in the case of ISCO flowmeters, also temperature and diagnostic information. The flowmeter consists of a probe that is mounted to the invert of the pipe by means of a mounting band. The instrument includes both a bubbler depth sensor (Hach) or pressure transducer (ISCO) and an acoustic Doppler velocity sensor. The sensors work together to measure the depth and velocity, respectively, in order to estimate the flow of water through the pipe using the pipe geometry via the area-velocity calculation.

A Hach flowmeter is permanently installed at Site 14 as part of the stormwater outfall monitoring program. Other locations of flowmeter installations to date have been AS_1 and AS_7, with the purpose of level/flow validation of level logger data.

Calibration and Maintenance

Routine calibration and maintenance of flowmeters has been performed as described in the Stormwater Outfall Monitoring Plan.

2.1.3 Rain Gauges

ACHD currently maintains two rain gauge sites representative of the Americana subwatershed. The rain gauges are deployed to collect continuous precipitation data throughout the water year. The program uses tipping-bucket style rain gauges that measure rainfall depths to 0.01-inch increments. Both rain gauge sites are equipped with HOBO event data loggers. Both a primary and a backup data logger were used to record tip measurements.

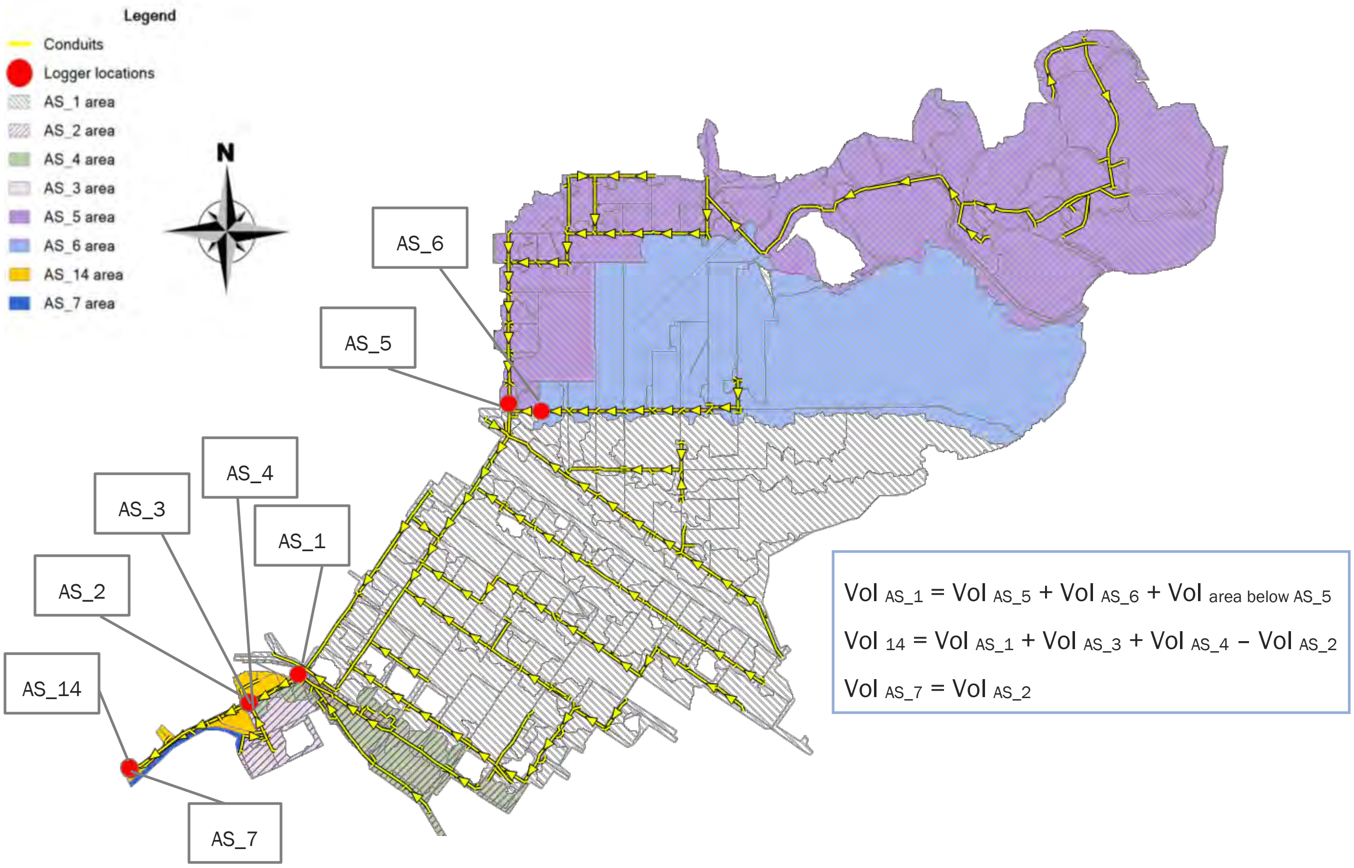
The data collected on the rain gauge data loggers were downloaded to a portable laptop computer on a regular monthly basis by ACHD personnel. The data was compared to the National Weather Service rainfall data and used to identify geographic variations, revise estimates of runoff coefficients, and analyze and evaluate the stormwater quality data.

Calibration and Maintenance

ACHD has inspected, maintained, and downloaded the rain gauges on a monthly basis. Any conditions requiring troubleshooting have been performed by ACHD, and any data gaps or periods of questionable data were identified by ACHD.

2.2 Monitoring Sites

Eight level/flow monitoring sites were used during WY 2019, including the Americana outfall monitoring station. Figure 2 is a map of the Americana subwatershed showing locations and subcatchments for each monitoring site. The figure also explains the contributing areas, in terms of flow volume, monitored at sites AS_1, AS_7, and Site 14. Detailed figures showing the specific subcatchment represented by each monitoring site are included in Attachment B.



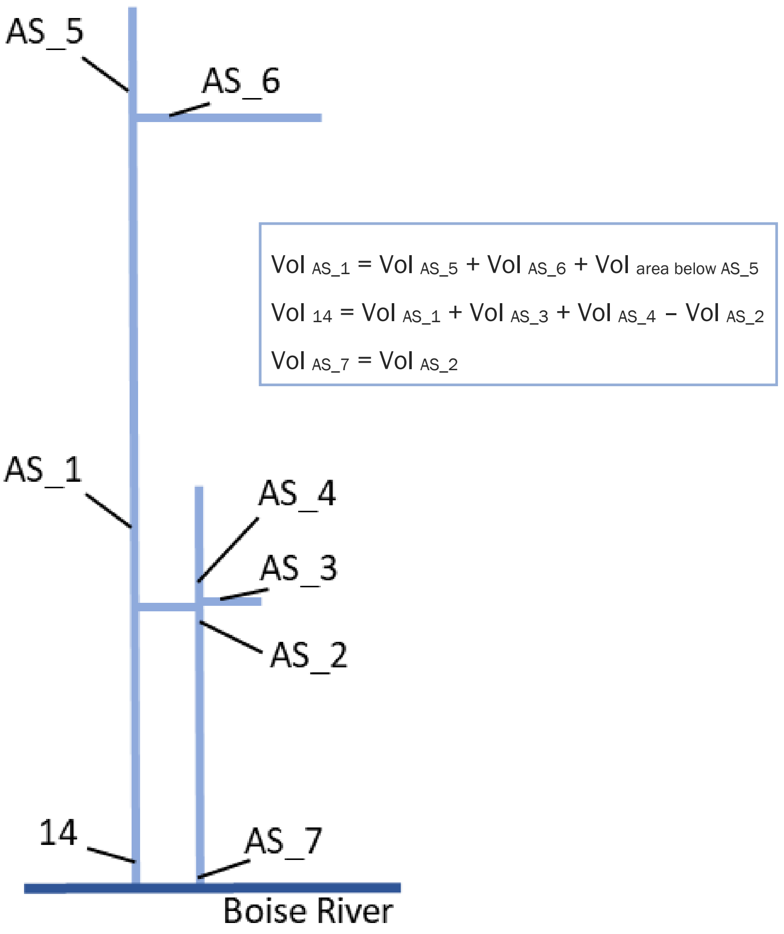
$$\mathrm{Vol}_{\mathrm{AS\_1}} = \mathrm{Vol}_{\mathrm{AS\_5}} + \mathrm{Vol}_{\mathrm{AS\_6}} + \mathrm{Vol}_{\text{area below AS\_5}}$$

$$\mathrm{Vol}_{14} = \mathrm{Vol}_{\mathrm{AS\_1}} + \mathrm{Vol}_{\mathrm{AS\_3}} + \mathrm{Vol}_{\mathrm{AS\_4}} - \mathrm{Vol}_{\mathrm{AS\_2}}$$

$$\mathrm{Vol}_{\mathrm{AS\_7}} = \mathrm{Vol}_{\mathrm{AS\_2}}$$

Figure 2. Monitoring site locations

Figure 2 shows the locations of the monitoring sites in relation to each other using a conceptual layout of the storm drain system in the Americana subwatershed.



$$\mathrm{Vol}_{AS\_1} = \mathrm{Vol}_{AS\_5} + \mathrm{Vol}_{AS\_6} + \mathrm{Vol}_{\text{area below } AS\_5}$$

$$\mathrm{Vol}_{14} = \mathrm{Vol}_{AS\_1} + \mathrm{Vol}_{AS\_3} + \mathrm{Vol}_{AS\_4} - \mathrm{Vol}_{AS\_2}$$

$$\mathrm{Vol}_{AS\_7} = \mathrm{Vol}_{AS\_2}$$

Figure 3. Conceptual layout of monitoring sites

Table 1 provides pertinent information for each of the monitoring locations within the subwatershed including monitoring equipment information, land use information, and construction details necessary for measuring and calculating in-pipe level and flow. Brief descriptions of each site are given below to outline the instrumentation, site-to-site relationships, and any unique flow conditions present.

Site 14

Site 14 is the Americana outfall monitoring station used in the stormwater outfall monitoring program. It is equipped with a Hach Sigma 950 flowmeter. The Site 14 subcatchment (Figure 4, attached) includes the entirety of subcatchments AS_1, AS_5, and AS_6 and accepts a portion of the flow from AS_3 and AS_4.

AS_7

Site AS_7 (Figure 5, attached) is a secondary outfall to Site 14, with a connection between storm drain pipes at the junction of AS_2, AS_3, and AS_4. The subcatchment includes the entirety of AS_3 and AS_4; however, a portion of flow from those subcatchments flows through the pipe connection and continues to Site 14. AS_7 is equipped with an ISCO 2150 Flowmeter that was installed on January 11, 2019 to measure level, velocity, flow, temperature, and velocity signal diagnostic information.

AS_1

AS_1 (Figure 6, attached) includes the entirety of AS_5 and AS_6 along with most of the downtown area of the Americana subwatershed. AS_1 is outfitted with a HOBO level logger and an ISCO 2150 Flowmeter installed October 25, 2019.

AS_2

AS_2 (Figure 7, attached) contains the subcatchments AS_3 and AS_4 and is downstream of the pipe connection with the Site 14 storm drain pipe. It is outfitted with a HOBO level logger that measures level and temperature.

AS_3

The AS_3 subcatchment (Figure 8, attached) accounts for a small subcatchment piped in just above the pipe connection between AS_7 and Site 14. It is outfitted with a HOBO logger that measures level and temperature.

AS_4

The AS_4 subcatchment (Figure 9, attached) includes a small subcatchment located just upstream of the conduit connection between AS_7 and Site 14. A HOBO logger is installed at this location and measures level and temperature.

AS_5

AS_5 is the farthest north subcatchment (Figure 10, attached) and is contained within the subcatchments AS_1 and Site 14. A HOBO level logger is installed to measure level and temperature.

AS_6

The AS_6 subcatchment (Figure 11, attached) includes a large portion of the north end residential area. A HOBO level logger is installed to measure level and temperature.

Section 3: Monitoring and Modeling Results

From the continuous monitoring conducted during WY 2019, 19 representative wet weather events with rainfall totals over 0.1 inch were selected for analysis. Figure 12 is a hydrograph of WY 2019, that identifies the wet weather events used for analysis. Analysis included comparing measured flows with modeled flows, calculating flow value correlations between sites, and developing a water balance for the Americana subwatershed as a whole. Dry weather analysis was conducted on 10 representative events during WY 2019. Figure 13 is a hydrograph of WY 2019, that identifies the dry weather events used for analysis.

Representativeness for wet weather events was judged as those events with precipitation that fell as rain only (no snow) and were separated from the previous wet weather event by at least 6 hours with no precipitation. Representativeness criteria applied to both wet and dry flow events included absence of data gaps during the event, absence of surcharge conditions at the outfall monitoring sites, and lack of any obviously wrong measurements. This section describes monitoring results and analysis. Section 4 provides a discussion of implications of monitoring results in the context of the monitoring program objectives.

Flow totals from measured and modeled wet weather and measured dry weather events are summarized in Tables 2 and 3, respectively. These values were used to calculate percentage of the total flow from each site during each wet and dry weather event and are included in Tables 4 and 5. Table 4 also contains the modeled percentage of total flow for each site for wet weather events.

Representing measured volumes as percent of total flow measured at each site is helpful for understanding the water balance for the Americana subwatershed. The water balance is an important tool for efficiently validating flow measurements (using known flow volumes to calculate a related unknown flow volume) and informing management decisions (magnitude of flow or pollutant load in comparison to other subcatchments). Using the calculated flow percentages, the total flow leaving the Americana subwatershed is represented as the sum of flows at Site 14 and AS_7.

In theory, measured flow from AS_1, AS_3, and AS_4 should add up to nearly 100 percent because they are so near the outfalls. Tables 2 and 3 show that the sum of both wet and dry weather flows measured at AS_1, AS_3, and AS_4 consistently add up to far less than 100 percent. This is indicative of a problem with measurements or calculations at one or more monitoring site described in more detail in Section 3.3.

3.1 Correlations

Using a second degree Line of Best Fit, correlations are calculated between sites help to identify whether the data discrepancies are likely due to equipment malfunction or to errors in flow calculation variables, such as pipe slope, in-pipe level offset, or barometric pressure correction. Correlations of flow values between sites are listed below. Values above 0.8 are considered to have strong correlation. When strong correlations exist and flow percentages do not balance out, results are indicative of an issue with flow calculation variables rather than measurement accuracy of the monitoring equipment.

Correlation to Site 14:

- AS_1: 0.992 Wet; 0.836 Dry
- AS_3: 0.990 Wet; 0.929 Dry
- AS_4: 0.968 Wet; 0.921 Dry
- AS_5: 0.935 Wet; 0.873 Dry
- AS_6: 0.867 Wet; 0.558 Dry
- AS_7: 0.949 Wet; 0.883 Dry

Correlation to AS_1:

- AS_5: 0.939 Wet; 0.856 Dry
- AS_6: 0.857 Wet; 0.995 Dry

Correlation to Site 7:

- AS_3: 0.964 Wet; 0.870 Dry
- AS_4: 0.960 Wet; 0.970 Dry

3.2 Modeled Flows

PCSWMM was used to model flows during wet weather events, using the model design generated for the Americana Subwatershed Plan with rain data only. For most events modeled, total flows were significantly lower than measured total flows over the 19 analyzed wet events. This difference is likely attributable to three primary sources of error:

- Lack of dry weather flow influence adjustment (for those sites with consistent dry weather flow).
- Additional unmapped drainage area associated with Hulls Gulch storm flow.
- Hydrograph generation methods (source of total runoff for each storm event) in the model do not always line up well with effects of rainfall intensities on runoff volumes for individual subcatchments. Effects of canopy cover and changes in impervious area connectivity with varying intensity rainfall are examples of complicating factors in runoff prediction.

While flow totals are lower, the hydrograph shape, timing, and proportions of total flow are still similar, meaning the model is still useful for evaluating and estimating conditions within the subwatershed. It also means that the model could provide even more utility in the future with calibration, enabling its application in estimating stormwater discharges to other areas within the National Pollutant Discharge Elimination

System Permit area. Table 4 demonstrates the proportionality of modeled flows versus measured flows in that the flow percentage for each subcatchment is similar.

Results from flow data processing and analysis after the end of WY 2019 indicates that sites AS_1, AS_5, AS_6, AS_7, and Site 14 are producing high accuracy data. Sites AS_2, AS_3, and AS_4 have recorded level data, but as explained below within the results of each site, there are currently errors in flow calculations.

3.3 Monitoring Results by Site

A site-by-site discussion of measured and modeled values is included below. Flow totals refer to the total flow from all 19 representative wet weather events or all 10 dry weather events used in this analysis. Water balance relationships are discussed in several site result summaries below. Tables 6 and 7 include water balance calculations for wet weather and dry weather flows, respectively. The water balance relationships are based on current understanding of the storm drain system in the Americana subwatershed, and the results are based on the data collected during WY 2019, with the limitations described below. Implications of results are discussed in Section 4.

Site 14 (Outfall)

The mean percentage of measured wet weather flow that Site 14 discharges for the entire Americana subwatershed is 82 percent (5.1 million cubic feet [cf]). The mean percentage of dry weather flow discharging from Site 14 is 95 percent (6.7 million cf). Flow measurements at Site 14 do not take into consideration level measurement error due to a faulty bubbler unit, which affected all flow measurements during WY 2019. Flow rates recorded by the flowmeter during this time were likely between 20 and 40 percent lower than the actual flow values. However, due to the long record of flow measurement at this location, historical flows may be used to generate and apply a velocity-level rating curve to correct measurements.

Modeled results are significantly less than measured results (2.7 million cf). Modeled results do not take into account the non-stormwater background flow that is still present during measured wet weather events, which contributes to the discrepancy between measured and modeled flow totals.

AS_7 (Outfall)

The mean percentage of wet weather flow that the AS_7 outfall discharges for the entirety of Americana subwatershed is 18 percent, which totals 1.13 million cf. The mean percentage of dry weather flow discharging from AS_7 is 5 percent, totaling 286,173 cf.

When comparing wet event flow totals from AS_7 to AS_14, the correlation between the two has an R^2 of 0.949. Dry weather total flows correlated with an R^2 of 0.883 and instantaneous dry flow values correlated with an R^2 of 0.973.

Modeled flows for this location are consistent when compared to measured flows, with the exception of the February 20, 2019, event, which had a lower modeled flow volume caused by the large difference of rain measured at the two rain gauge locations and how those measurements are spatially associated to subcatchments.

AS_1

Flow measurements at AS_1 account for a mean percentage of wet event flow totals of 40 percent, or 2.39 million cf, and a mean dry event flow total of 63 percent, or 4.04 million cf.

When comparing wet event flow totals from AS_1 to Site 14, the correlation between the two has an R^2 of 0.992. Dry weather total flows correlated with an R^2 of 0.836. This latter correlation, along with the flow totals for these sites during dry events later in the year, indicates that there is variability in dry weather flows introduced below the AS_1 area that are likely related to human activities.

Dry weather flow at this site has been confirmed to include flows from Hulls Gulch, Boise City Canal overflow, and a discharge from the geothermal system in downtown Boise.

Modeled results at this location make up the majority of flow modeled for Site 14, as expected. Modeled flow totals from AS_1 often exceed measured flows, which usually occurs during longer or more intense rain events.

AS_1 level and subsequent flow measurements for WY 2019 were corrected at the end of the water year based on measurements from a flowmeter temporarily installed at the site. The results reported for all WY 2019 events represent these corrected values.

AS_2

Measured flows at AS_2 were consistently lower than expected given the close proximity to the AS_7 outfall. This error is most likely due to the complicated geometry of the AS_2 pipe junction as well as turbulent conditions in the connected vault upstream. For analytical purposes, AS_2 flows are presumed to equal those of AS_7, and so results from AS_2 are not included in tables.

AS_3

Turbulent flow conditions caused by the pipe geometry and larger flows from AS_4 into the vault below AS_3 resulted in low quality and unreliable level data collection at this site. However, since AS_3 and AS_4 are the only contributing areas to this junction, the flow from AS_3 can be calculated from a water balance equation.

The water balance for the Americana subwatershed dictates the following flow volume relationship to AS_3:

AS_3 volume = Site 14 volume + AS_7 volume – AS_1 volume – AS_4 volume

AS_3, as measured, contributes an average total flow of 4 percent during wet events, totaling 235,253 cf. Dry weather contributions averaged 2 percent, or 129,293 cf.

When comparing wet event flow totals from AS_3 to Site 14, the correlation between the two has an R^2 of 0.990, and the dry event correlation has an R^2 of 0.925. Compared to AS_7, wet event flows correlate with an R^2 of 0.964, and dry event flows correlate with an R^2 of 0.87. The strength of these correlations, particularly the stronger dry weather correlation with Site 14, indicate a strong tie between AS_3 and Site 14 during lower flow rates through the connecting pipe. However, as explained above, flows from AS_4 interfere with accurate measurement of flows from AS_3, so while the correlations between both outfalls are strong, they may not be accurate, as flow totals for AS_3 are likely lower than measured.

Modeled flows attribute a lower volume of flow from the AS_3 subcatchment and show it contributing a smaller portion to the flow modeled at AS_7.

AS_4

AS_4, as measured, contributed a mean percentage of wet event total flow of 7 percent totaling 421,132 million cf, and dry flow event totals averaged 2 percent, or 125,824.

When comparing wet event flow totals from AS_4 to Site 14, the correlation between the two has an R^2 of 0.968. Dry event flows correlate with an R^2 of 0.921. Compared to AS_7, AS_4 correlates during wet events with an R^2 of 0.960, and dry event flows correlate with an R^2 of 0.970. Although the strength of these correlations show a strong tie to both outfalls, and a stronger tie to AS_7, lower flows may not have been recorded, as explained below.

The water balance indicates that measured flows from AS_4 are most likely lower than actual conditions. While modeled flows for AS_4 were on average 26 percent smaller than measured flows, they make up a larger portion of modeled flows at AS_7 than measured flows. Given that there is a significant flow deficit in the water balance that originates from the AS_3 and AS_4 subcatchments, it is likely that a large portion of that flow comes from AS_4; however, the actual amount is unknown at this time.

AS_5

AS_5 makes up a portion of the AS_1 subcatchment. The subcatchment monitored by AS_5 contributes an average wet event flow of 5 percent, totaling 343,445 cf, and dry event flows contribute 7 percent of dry weather flows, totaling 268,863 cf.

Dry weather flow at this site has been confirmed to include flows from Hulls Gulch. With no other known sources of dry weather flow in this subcatchment, measurements at AS_5 are a good representation of the amount of flow entering the Americana subwatershed from Hulls Gulch.

Modeled results for AS_5 were significantly lower than measured flow, most likely due to the lack of dry weather flows in the model and the possible increased contributing area associated with Hulls Gulch. This supposition is supported by the fact that the largest discrepancies between modeled and measured flows occur during the longest duration events.

AS_5 level and subsequent flow measurements for WY 2019 were corrected at the end of the water year based on correlations with AS_1 and corrections made to values at that site. The results reported for all WY 2019 events represent these corrected values.

AS_6

Similar to AS_5, AS_6 represents another discrete portion of the AS_1 subcatchment. The mean percentage of wet weather flow that AS_6 discharges for the entirety of the Americana subwatershed is 1 percent, totaling 82,335 cf, and the mean percentage of dry weather flow discharging from AS_6 is 0.25 percent, or 21,906 cf.

Measured wet weather flow totals correlated with Site 14 with an R^2 of 0.873, and dry event flows correlated much weaker with an R^2 of 0.558. When compared to AS_1, the wet flow resulted in an R^2 of 0.857 and the dry flow had an R^2 of 0.995. This comparison indicates that AS_6 contributes almost no dry weather flow, and similar to AS_1, highlights that there is variability in dry weather flows originating below the AS_1 area that are likely related to human activities.

Modeled flows are consistently lower than measured flows at AS_6, which is likely due to the difference in hydrograph generation methods, including runoff coefficient accounting for storage in a subcatchment with a large amount of pervious area and canopy cover.

Section 4: Discussion and WY 2020 Activities

Flow analysis was performed on two separate types of flow events: wet weather and dry weather. This analysis allowed for the evaluation of the relationships between discrete subcatchments in the Americana subwatershed regarding stormwater runoff volumes and background, non-stormwater flow inputs. This section provides a summary of how results and conclusions from year one of this monitoring program align with the objectives of the Americana subwatershed monitoring program. This section also provides a list of potential activities for consideration in WY 2020.

4.1 Alignment with Monitoring Objectives

Conclusions related to each monitoring objective are described below.

Program Objective 1

Validate assumptions about stormwater flows from individual subcatchments and identify situations where monitoring data does not align with expectations based on the results of the Connectivity Evaluation (BC 2015) or the Subwatershed Planning document for the Americana and Main Street subwatersheds (Ecosystem Sciences 2016).

These conclusions help ACHD better understand how to use the model as a predictive tool to inform management decisions by assessing limitations in light of actual observations to describe how they impact model results.

- From measured results, the AS_3 and AS_4 areas combined contribute significantly less runoff than expected. When comparing measured flows to those calculated from a water balance, 34 percent of total flow is unaccounted for from AS_3 + AS_4. This deficiency is illustrated by Figure 14, which depicts the percentage of total monitored flow that each subcatchment contributes during wet weather events.
- Flow to the AS_7 outfall is also more significant than previously believed, yielding 18 percent of measured total flow during wet weather on average. Higher discharge from AS_7 is associated with more intense rainfall. This discharge is likely because less overall flow is diverted through the pipe connection between the AS_7 and Site 14 storm drain pipes.
- The discrepancy between modeled flows and measured flows is often high in the residential portions of the subwatershed, in which modeled flows are underestimated.

Program Objective 2

Identify sources of wet weather flows as well as non-stormwater dry weather flows that contribute to the flows discharging from the Americana outfall.

Monitoring results from year one have narrowed down the areas within the subwatershed that contribute most significantly to dry weather flows and have helped to identify and document the timing and nature of dry weather flows.

- Dry weather flows measured at AS_5 were confirmed to originate from a piped connection that allows a portion of flow from Hulls Gulch to enter the Americana subwatershed.
- A portion of dry weather flow measured at AS_1 was identified as a discharge from the geothermal system in downtown Boise.
- Elevated background flows contributing significant volume were identified following multiple wet weather events in April, May, and June at all sites except AS_5 and AS_6. Hydrograph geometry for the events (sudden rises and drop-offs) align with human activities such as turning on a pump or opening a headgate. Specific sources of these flows have not been identified.
- Significant elevated dry weather flow from August 20, 2019, to September 6, 2019, occurs in all subcatchments except for AS_5 and AS_6 and is attributed to human activities as indicated by a sudden rise and fall in the hydrographs.
- More dry weather contributions originate within the AS_3 and AS_4 subcatchments than originally presumed.
- Over half of the dry weather flows measured originate in the downtown area above AS_1 and below AS_5 and AS_6.

Program Objective 3

Identify specific areas of the subwatershed where additional controls or changes in management approach are needed.

Results from WY 2019 primarily contribute to the dry weather screening and illicit discharge detection and elimination programs. The addition of water quality monitoring and continued flow monitoring in WY 2020 is anticipated to provide more information in support of this objective.

- Data collected in WY 2019 has provided the foundation for identifying future monitoring locations most likely to yield usable and useful water quality data.
- WY 2019 has identified the timing, amount, and general source areas of non-stormwater flows that may be tracked, identified, documented, and mitigated if necessary.

4.2 Proposed WY 2020 Activities

WY 2020 presents the opportunity to potentially implement modifications to monitoring activities, as practicable, to acquire additional information to improve the quality of data already collected, additional data collected, and representativeness of the hydrologic/hydraulic model. Correlations between sites indicate the homogeneity of the data recorded between them, and the nature of their relationship in regard to dry and wet weather flows. As future data comes in to correct level/flow data calculations, the correlations can then be applied to correlated nodes to a certain degree and help remove error from the water balance in cases where direct flow validation has not yet or cannot be measured. These correlations have been used to identify flow discrepancies for AS_1 and AS_5 and aid in their error adjustments. Efforts to improve the quality of data and the representativeness of the model could include the following:

- Conduct a temporary installation of a flowmeter in the AS_4 monitoring location.
  - AS_4 is not currently producing reliable data. Data from a flowmeter installed at this location would provide data necessary to develop a rating curve for measured level data. A rating curve would allow for correcting all previous and future flow data. These corrected flow calculations allow AS_3 to be calculated using the water balance.
- Survey the inverts/pipe slopes for the AS_2, AS_3, AS_4 junction and the conduit connection to the Site 14 outfall pipe.
  - Correctly measured inverts/slopes for this location also allow another avenue for AS_4 flow calculation adjustment through Manning’s equation.
  - The PCSWMM model currently does not account for the connection between the AS_7 and Site 14 pipes and therefore cannot accurately be calibrated with measured outfall data. Survey information would allow the mapping and modeling of this connection and calibrate the model with the longest existing flow and analytical data set that exists for Site 14.
- Remove level loggers from AS_3 and AS_2.
  - These sites are currently not providing reliable measurements. These loggers could be moved to another area of the subwatershed.
- Replace the ISCO flowmeter at AS_7 with a level logger.
  - A significantly robust flow/level dataset now exists for AS_7, from which a rating curve could be applied to level measurements for reliable flow data collection with less effort.
- Begin water quality monitoring.
  - Flow data from WY 2019 can be used to inform decisions regarding suitable water quality monitoring locations within the Americana subwatershed.

- Isolate non stormwater background flows for subtraction from wet weather event totals.
    - Measured wet weather flows also include non-stormwater background flow, which, especially during smaller storm events, skews measured wet weather flow data high. Analytical tools such as PCSWMM can be used to analyze trends in non-stormwater flows and subtract non-stormwater flows from wet weather event totals. This exercise would remove a significant source of error when comparing measured flows to modeled flows.
- Calibrate the model to known measured flows.
    - Models can be refined as more data are made available for the areas they are made to represent. Calibrating the model to measured flows at high-quality data sites allows for more accurate flow predictions and pollutant loading predictions within each subcatchment.

Attachment A: Tables

Table 1. Monitoring Site Information

Monitoring Program ID	Location Name	Total Area (acres)	Impervious Area (acres)	Primary Land Uses	Pipe Diameter (in)	Manning's Roughness Coefficient	Pipe Slope (%)	Instrument Type and ID	Deploy start date	Deploy End Date
Site 14	Americana	915	291	Commerical, Residential (Medium), Residential (Low)	48	0.015	0.0001	Hach Sigma 900 Flowmeter	10/1/2013	NA
AS_1	16th and Front St.	869	255	Residential (Medium), Residential (High), Commerical	42	0.015	0.0001	HOBO Logger 2150 ISCO Flowmeter	8/10/2018 10/25/2019	NA NA
AS_2	Americana and River South	39	28	Commercial, Public ROW	42	0.015	0.0001	HOBO Logger	8/10/2018	NA
AS_3	Americana and River East	10	5	Commercial, Residential (Medium) Residential (High)	16	0.015	0.0001	HOBO Logger	8/10/2018	NA
AS_4	Americana and River St.	29	23	Commerical, Public ROW	42	0.015	0.0001	HOBO Logger	8/10/2018	NA
AS_5	15th and Resseguie	289	49	Residential (Medium), Residential (Low), Public ROW	30	0.015	0.0001	HOBO Logger	8/10/2018	NA
AS_6	14th and Resseguie	206	23	Residential (Medium), Residential (Low), Residential (High)	22	0.024	0.0001	HOBO Logger	8/17/2018	NA
AS_7	Americana East	40	30	Commerical, Public ROW	42	0.015	0.0001	ISCO 2150 Flowmeter	1/11/2019	NA

Table 2. Total Flow: Wet Events

Date	Duration (hours)	Total Rain (in)	Mean Rain Intensity (in/hr)	Site 14 (ft^3)	Site 14 modeled (ft^3)	AS_1 (ft^3)	AS_1 modeled (ft^3)	AS_3 (ft^3)	AS_3 modeled (ft^3)	AS_4 (ft^3)	AS_4 modeled (ft^3)	AS_5 (ft^3)	AS_5 modeled (ft^3)	AS_6 (ft^3)	AS_6 modeled (ft^3)	AS_7 (ft^3)	AS_7 modeled (ft^3)	Total Flow (ft^3)	Total modeled flow (ft^3)
2/2/2019	16.4	0.89	0.05	452,900	450,000	204,900	436,500	22,630	11,930	47,240	51,950	37,990	12,750	14,280	2,147	141,500	65,950	594,400	516,000
2/4/2019	24.7	0.24	0.01	208,500	64,040	111,300	64,530	8,831	1,641	11,430	7,182	6,292	4,390	1,439	1,003	37,690	8,556	246,190	72,600
2/13/2019	43.4	0.92	0.02	715,600	372,500	326,500	362,100	32,860	9,878	53,170	42,670	38,810	12,750	11,760	3,454	165,800	54,310	881,400	426,800
2/20/2019	11.2	0.17	0.01	107,900	9,433	52,800	9,275	4,444	89	5,691	289	1,471	4,227	182	631	19,650	441	127,550	9,874
2/24/2019	17.7	0.22	0.01	208,500	49,920	102,200	49,610	9,073	1,323	13,160	5,588	6,990	2,817	1,882	899	41,680	6,979	250,180	56,890
2/25/2019	15.5	0.13	0.01	149,800	21,530	76,080	21,200	5,897	533	7,912	2,172	5,214	1,807	871	806	26,540	2,741	176,340	24,270
2/27/2019	11.3	0.65	0.06	371,300	355,400	166,300	340,700	17,440	10,630	36,080	45,950	33,280	8,754	10,940	977	111,700	59,190	483,000	414,600
3/12/2019	4.8	0.11	0.02	63,660	35,580	31,250	34,270	3,022	888	4,829	3,868	3,214	1,651	492	369	14,500	5,001	78,160	40,580
3/24/2019	14.1	0.51	0.04	326,000	251,800	148,600	241,500	15,140	6,634	31,870	28,770	28,430	7,267	7,164	1,344	90,280	36,990	416,280	288,700
3/27/2019	12.9	0.42	0.03	295,600	179,100	140,500	175,200	14,370	4,694	29,790	20,600	27,120	6,285	6,754	1,050	24,750	25,760	320,350	204,900
4/2/2019	8.6	0.11	0.01	94,580	26,950	48,960	26,110	4,575	651	6,388	2,896	5,956	1,836	364	501	16,600	3,673	111,180	30,620
4/5/2019	12.3	0.13	0.01	146,200	39,330	77,720	38,520	7,276	989	11,270	4,327	10,890	2,019	1,257	451	29,120	5,402	175,320	44,730
4/6/2019	9.3	0.09	0.01	110,100	15,980	54,340	17,530	4,956	462	6,958	2,011	7,315	1,228	522	395	18,030	2,236	128,130	18,220
4/7/2019	17.5	0.09	0.01	188,500	13,140	97,180	12,850	8,529	323	11,700	1,158	12,740	1,698	702	537	29,500	1,540	218,000	14,680
4/8/2019	37.3	0.58	0.02	667,300	202,900	325,600	200,500	33,430	5,339	57,820	23,050	54,020	9,325	9,535	1,889	154,400	28,690	821,700	231,600
4/13/2019	33.2	0.54	0.02	607,200	221,500	286,200	213,600	30,390	5,772	53,750	24,990	41,210	7,911	7,718	1,663	147,100	31,980	754,300	253,500
5/28/2019	5.0	0.24	0.05	101,400	76,340	49,010	72,350	4,572	1,792	15,400	8,058	13,430	4,128	4,271	294	30,950	10,370	132,350	86,710
8/9/2019	5.0	0.15	0.03	27,810	122,500	17,180	119,400	1,820	3,438	3,854	14,790	784	468	25	221	11,450	18,690	39,260	141,200
9/16/2019	13.9	0.40	0.03	245,400	190,300	69,420	184,500	5,998	5,542	12,820	23,230	8,289	5,730	2,177	954	23,280	31,440	268,680	221,800
Total	314	6.58	–	5,088,250	2,698,243	2,386,040	2,620,245	235,253	72,549	421,132	313,549	343,445	97,041	82,335	19,585	1,134,520	399,939	6,222,770	3,098,274
Total difference					2,390,007		(234,205)		162,704		107,583		246,403		62,750		734,582		3,124,496

Notes

[1] Rain values for events were calculated by spatially-weighting each rain gauge measurement for the subcatchment represented and generating an average total.

Table 3. Total Flow: Dry Events

Date	Duration (hours)	Site 14 (ft^3)	AS_1 (ft^3)	AS_3 (ft^3)	AS_4 (ft^3)	AS_5 (ft^3)	AS_6 (ft^3)	AS_7 (ft^3)	Total Flow (ft^3)
3/14/2019	192.3	1,112,000	661,700	36,270	35,340	53,660	1,495	79,340	1,191,340
3/24/2019	30.2	216,700	123,700	8,658	9,774	16,430	206	22,790	239,490
3/29/2019	103.4	910,200	501,100	40,130	50,630	67,070	1,076	141,600	1,051,800
4/3/2019	27.5	217,300	124,700	9,338	11,180	16,130	302	27,660	244,960
5/23/2019	21.7	64,930	50,550	2,014	1,502	9,096	171	3,557	68,487
5/24/2019	8.9	21,500	19,790	615	373	3,749	59	993	22,493
5/29/2019	20.2	62,120	41,570	1,138	920	5,268	162	1,150	63,270
6/7/2019	126.5	277,500	202,700	1,992	575	10,460	974	141	277,641
6/13/2019	1,348.8	1,827,000	1,735,000	25,010	14,550	70,520	17,460	4,024	1,831,024
9/21/2019	593.4	1,948,000	581,500	4,128	980	16,480	–	4,918	1,952,918
Total	**2,473**	**6,657,250**	**4,042,310**	**129,293**	**125,824**	**268,863**	**21,906**	**286,173**	**6,943,423**

Table 4. Percent of Total Flow: Wet Events

Date	Duration (hours)	Site 14	Site 14 Modeled	AS_1	AS_1 Modeled	AS_3	AS_3 Modeled	AS_4	AS_4 Modeled	AS_5	AS_5 Modeled	AS_6	AS_6 Modeled	AS_7	AS_7 Modeled
2/2/2019	16.4	76%	87%	34%	85%	4%	2%	8%	10%	6%	2%	2%	0%	24%	13%
2/4/2019	24.7	85%	88%	45%	89%	4%	2%	5%	10%	3%	6%	1%	1%	15%	12%
2/13/2019	43.4	81%	87%	37%	85%	4%	2%	6%	10%	4%	3%	1%	1%	19%	13%
2/20/2019	11.2	85%	96%	41%	94%	3%	1%	4%	3%	1%	43%	0%	6%	15%	4%
2/24/2019	17.7	83%	88%	41%	87%	4%	2%	5%	10%	3%	5%	1%	2%	17%	12%
2/25/2019	15.5	85%	89%	43%	87%	3%	2%	4%	9%	3%	7%	0%	3%	15%	11%
2/27/2019	11.3	77%	86%	34%	82%	4%	3%	7%	11%	7%	2%	2%	0%	23%	14%
3/12/2019	4.8	81%	88%	40%	84%	4%	2%	6%	10%	4%	4%	1%	1%	19%	12%
3/24/2019	14.1	78%	87%	36%	84%	4%	2%	8%	10%	7%	3%	2%	0%	22%	13%
3/27/2019	12.9	92%	87%	44%	86%	4%	2%	9%	10%	8%	3%	2%	1%	8%	13%
4/2/2019	8.6	85%	88%	44%	85%	4%	2%	6%	9%	5%	6%	0%	2%	15%	12%
4/5/2019	12.3	83%	88%	44%	86%	4%	2%	6%	10%	6%	5%	1%	1%	17%	12%
4/6/2019	9.3	86%	88%	42%	96%	4%	3%	5%	11%	6%	7%	0%	2%	14%	12%
4/7/2019	17.5	86%	90%	45%	88%	4%	2%	5%	8%	6%	12%	0%	4%	14%	10%
4/8/2019	37.3	81%	88%	40%	87%	4%	2%	7%	10%	7%	4%	1%	1%	19%	12%
4/13/2019	33.2	80%	87%	38%	84%	4%	2%	7%	10%	5%	3%	1%	1%	20%	13%
5/28/2019	5.0	77%	88%	37%	83%	3%	2%	12%	9%	10%	5%	3%	0%	23%	12%
8/9/2019	5.0	71%	87%	44%	85%	5%	2%	10%	10%	2%	0%	0%	0%	29%	13%
9/16/2019	13.9	91%	86%	26%	83%	2%	2%	5%	10%	3%	3%	1%	0%	9%	14%
Mean		**82%**	**88%**	**40%**	**86%**	**4%**	**2%**	**7%**	**9%**	**5%**	**6%**	**1%**	**1%**	**18%**	**12%**

Table 5. Percent of Total Flow: Dry Events

Date	Duration (hours)	Site 14	AS_1	AS_3	AS_4	AS_5	AS_6	AS_7
3/14/2019	192.3	93%	56%	3%	3%	5%	0%	7%
3/24/2019	30.2	90%	52%	4%	4%	7%	0%	10%
3/29/2019	103.4	87%	48%	4%	5%	6%	0%	13%
4/3/2019	27.5	89%	51%	4%	5%	7%	0%	11%
5/23/2019	21.7	95%	74%	3%	2%	13%	0%	5%
5/24/2019	8.9	96%	88%	3%	2%	17%	0%	4%
5/29/2019	20.2	98%	66%	2%	1%	8%	0%	2%
6/7/2019	126.5	100%	73%	1%	0%	4%	0%	0%
6/13/2019	1,348.8	100%	95%	1%	1%	4%	1%	0%
9/21/2019	593.4	100%	30%	0%	0%	1%	0%	0%
Mean	**247.3**	**95%**	**63%**	**2%**	**2%**	**7%**	**0.25%**	**5%**

Table 6. Wet Events Water Balance

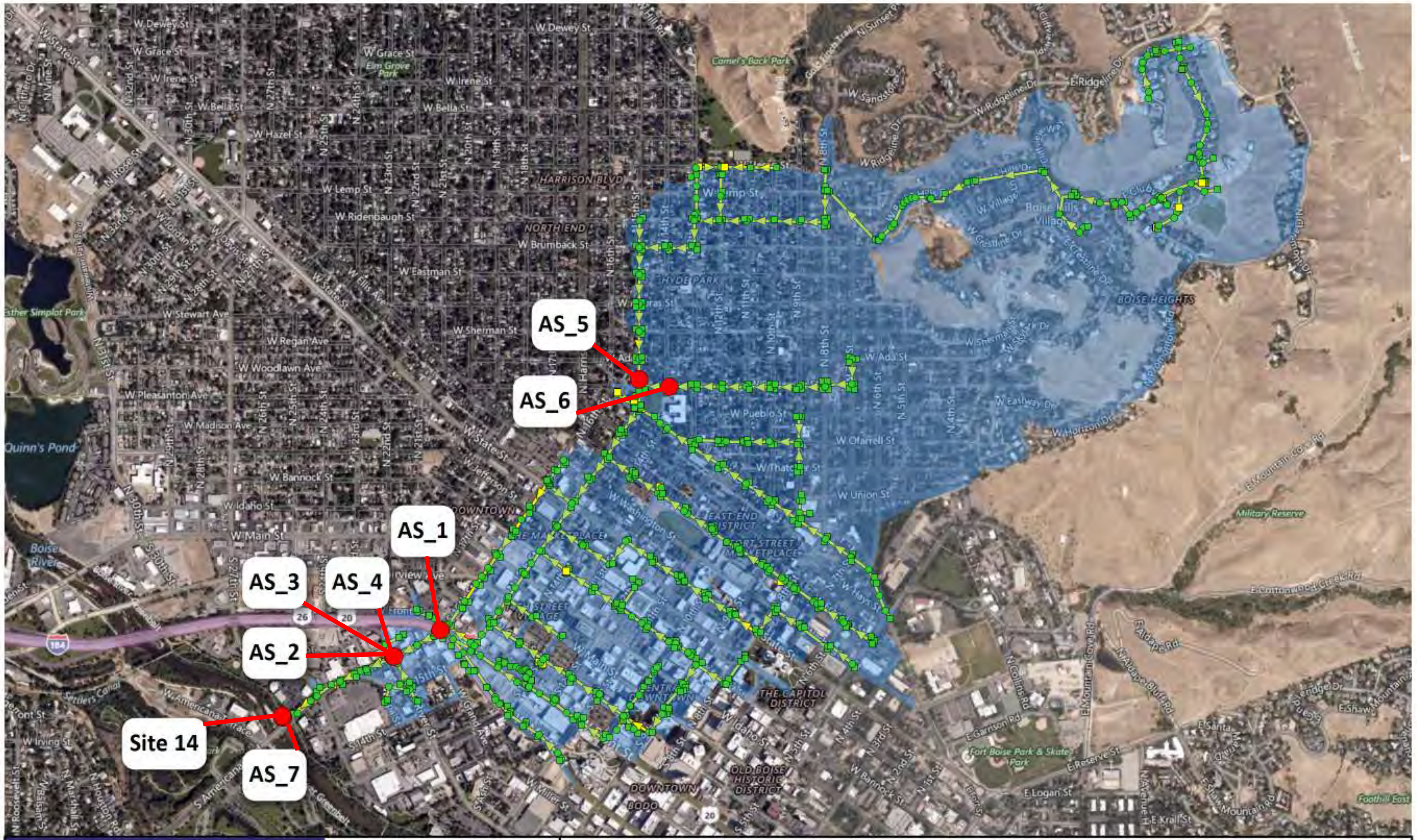
Date	Duration (hours)	Total Flow (ft^3)	Total Flow (ft^3) | Percent Total Flow						Percent of Site 14 - AS_1 Flow	Total Flow Deficit (ft^3) | Percent Total Flow	
			Site 14-AS_1		(Site 14-AS_1)-(AS-3+AS_4-AS_7)		AS_3+AS_4-AS_7		AS_3+AS_4-AS_7	AS_3 and AS_4	
2/2/2019	16.43	594,400	248,300	42%	36,990	6%	211,300	36%	85%	36,990	6%
2/4/2019	24.67	246,190	96,940	39%	38,990	16%	57,950	24%	60%	38,990	16%
2/13/2019	43.43	881,400	388,700	44%	136,900	16%	251,800	29%	65%	136,900	16%
2/20/2019	11.15	127,550	54,150	42%	24,360	19%	29,790	23%	55%	24,360	19%
2/24/2019	17.65	250,180	105,300	42%	41,360	17%	63,910	26%	61%	41,360	17%
2/25/2019	15.53	176,340	73,180	41%	32,830	19%	40,350	23%	55%	32,830	19%
2/27/2019	11.33	483,000	205,000	42%	39,840	8%	165,200	34%	81%	39,840	8%
3/12/2019	4.77	78,160	31,750	41%	9,406	12%	22,350	29%	70%	9,406	12%
3/24/2019	14.13	416,280	177,400	43%	40,080	10%	137,300	33%	77%	40,080	10%
3/27/2019	12.9	320,350	153,500	48%	86,050	27%	61,600	19%	40%	86,050	27%
4/2/2019	8.58	111,180	44,920	40%	17,360	16%	27,560	25%	61%	17,360	16%
4/5/2019	12.33	175,320	67,730	39%	20,070	11%	47,670	27%	70%	20,070	11%
4/6/2019	9.33	128,130	55,010	43%	25,070	20%	29,940	23%	54%	25,070	20%
4/7/2019	17.5	218,000	89,930	41%	40,200	18%	49,730	23%	55%	40,200	18%
4/8/2019	37.25	821,700	341,400	42%	95,720	12%	245,600	30%	72%	95,720	12%
4/13/2019	33.17	754,300	319,700	42%	88,510	12%	231,200	31%	72%	88,510	12%
5/28/2019	5	132,350	51,600	39%	683	1%	50,920	38%	99%	683	1%
8/9/2019	5	39,260	10,550	27%	-6,575	-17%	17,120	44%	162%	(6,575)	-17%
9/16/2019	13.92	268,680	175,500	65%	133,400	50%	42,100	16%	24%	133,400	50%
Mean	16.53	327,514	141,608	42%	47,434	14%	93,863	28%	69%	47,434	14%

Table 7. Dry Events Water Balance

Date	Duration (hours)	Total Flow (ft^3)/Percent Total Flow							Percent of Site 14 - AS_1 Flow	Total Flow Deficit (ft^3)/Percent	
		Total Flow	Site 14-AS_1		(Site 14-AS_1)-(AS-3+AS_4-AS_7)		AS_3+AS_4-AS_7		AS_3+AS_4-AS_7	AS_3 and AS_4	
3/14/2019	192.25	1,191,340	449,800	42%	298,800	25%	151,000	13%	34%	298,800	25%
3/24/2019	30.17	239,490	92,950	39%	51,730	22%	41,220	17%	44%	51,730	22%
3/29/2019	103.42	1,051,800	409,200	44%	304,600	29%	276,600	26%	68%	304,600	29%
4/3/2019	27.5	244,960	92,350	42%	44,180	18%	48,170	20%	52%	44,180	18%
5/23/2019	21.67	68,487	14,030	42%	6,962	10%	7,073	10%	50%	6,962	10%
5/24/2019	8.92	22,493	1,443	41%	-537	-2%	1,980	9%	137%	-537	-2%
5/29/2019	20.17	63,270	20,130	42%	16,920	27%	3,209	5%	16%	16,920	27%
6/7/2019	126.5	277,641	72,260	41%	69,580	25%	2,705	1%	4%	69,580	25%
6/13/2019	1348.83	1,831,024	91,950	43%	48,380	3%	43,580	2%	47%	48,380	3%
9/21/2019	593.42	1,952,918	1,366,000	48%	1,356,000	69%	10,030	1%	1%	1,356,000	69%
Mean	**247.285**	**694,342**	**261,011**	**42%**	**219,661**	**23%**	**58,557**	**10%**	**45%**	**219,661**	**23%**

Attachment B: Figures

Figure 4. Site 14 Map



Brown AND Caldwell

Date: 12/2/2019

Project No.: 154166

Client: ACHD

Americana Subwatershed: Site 14 Area

● Logger locations

Junctions

● Manhole

■ Catch Basin

□ Sand/Grease Trap

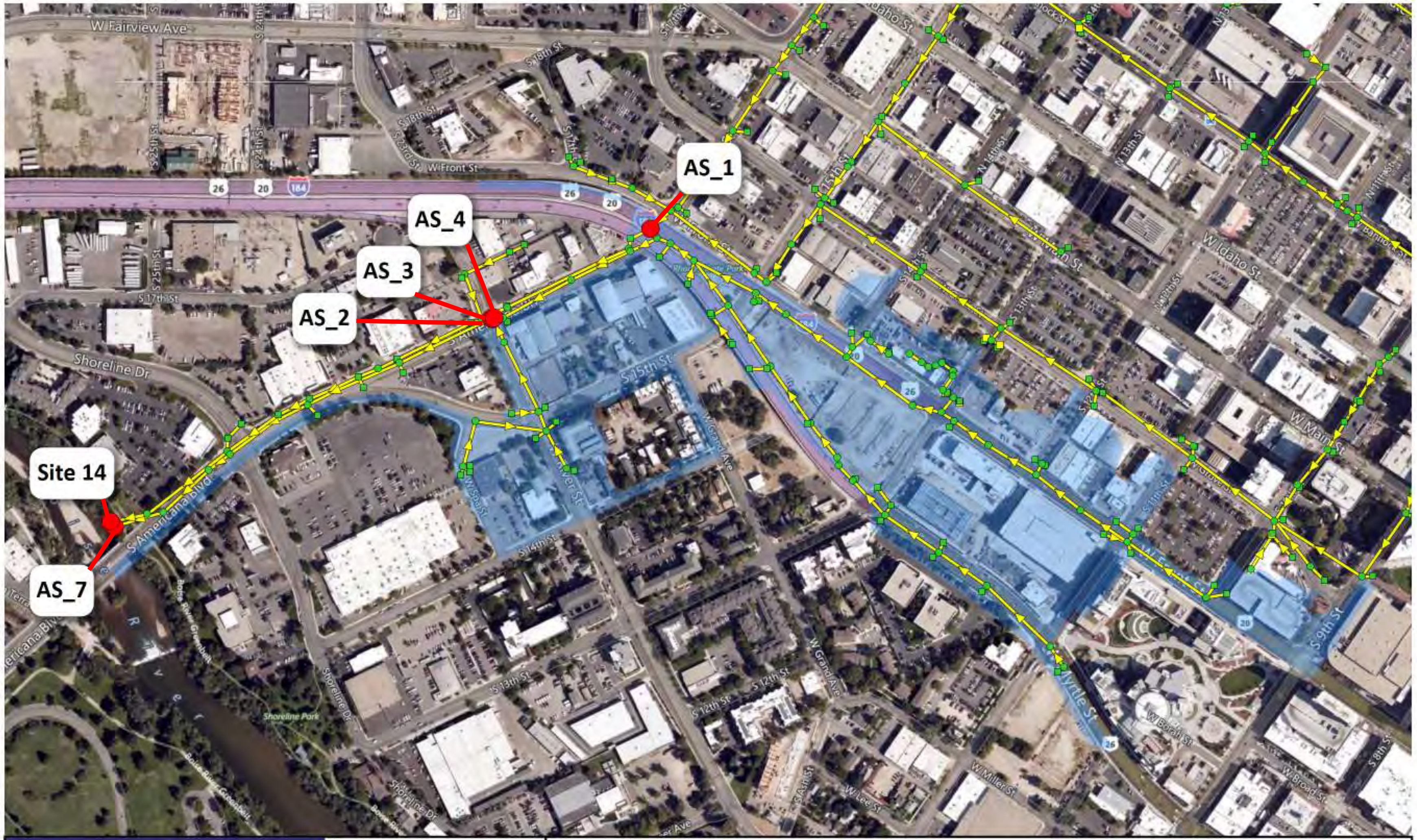
— Pipes

🟦 Site 14

N

1 Mile

Figure 5. AS_7 Map



Brown AND Caldwell

Date: 12/2/2019

Project No.: 154166

Client: ACHD

Americana Subwatershed: AS_7 Area

- ● Logger locations
- Junctions
  - ● Manhole
  - ■ Catch Basin
  - □ Sand/Grease Trap
- ━ Pipes
- ▨ AS_7 area

N

200 Yards

Figure 6. AS_1 Map

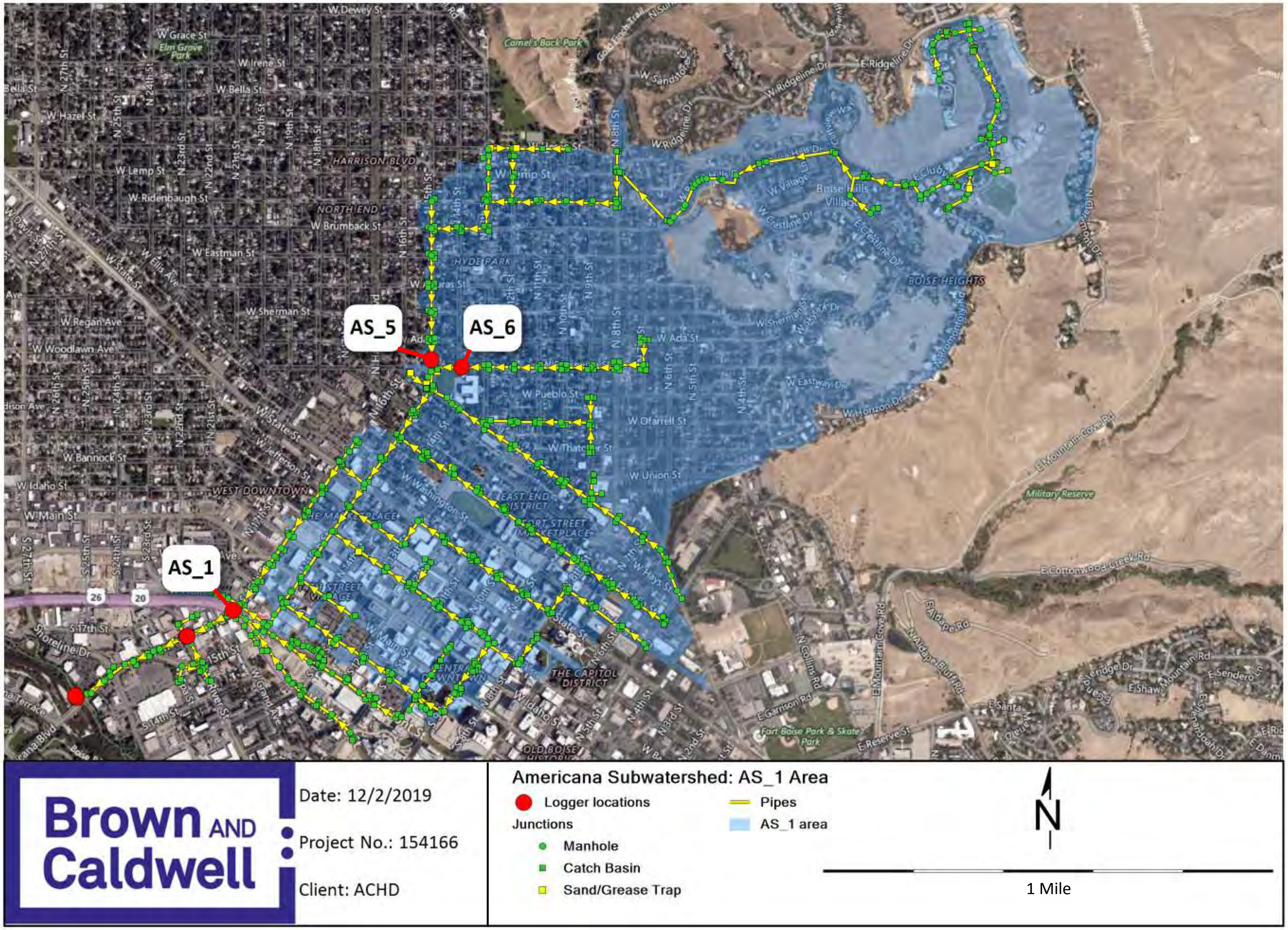
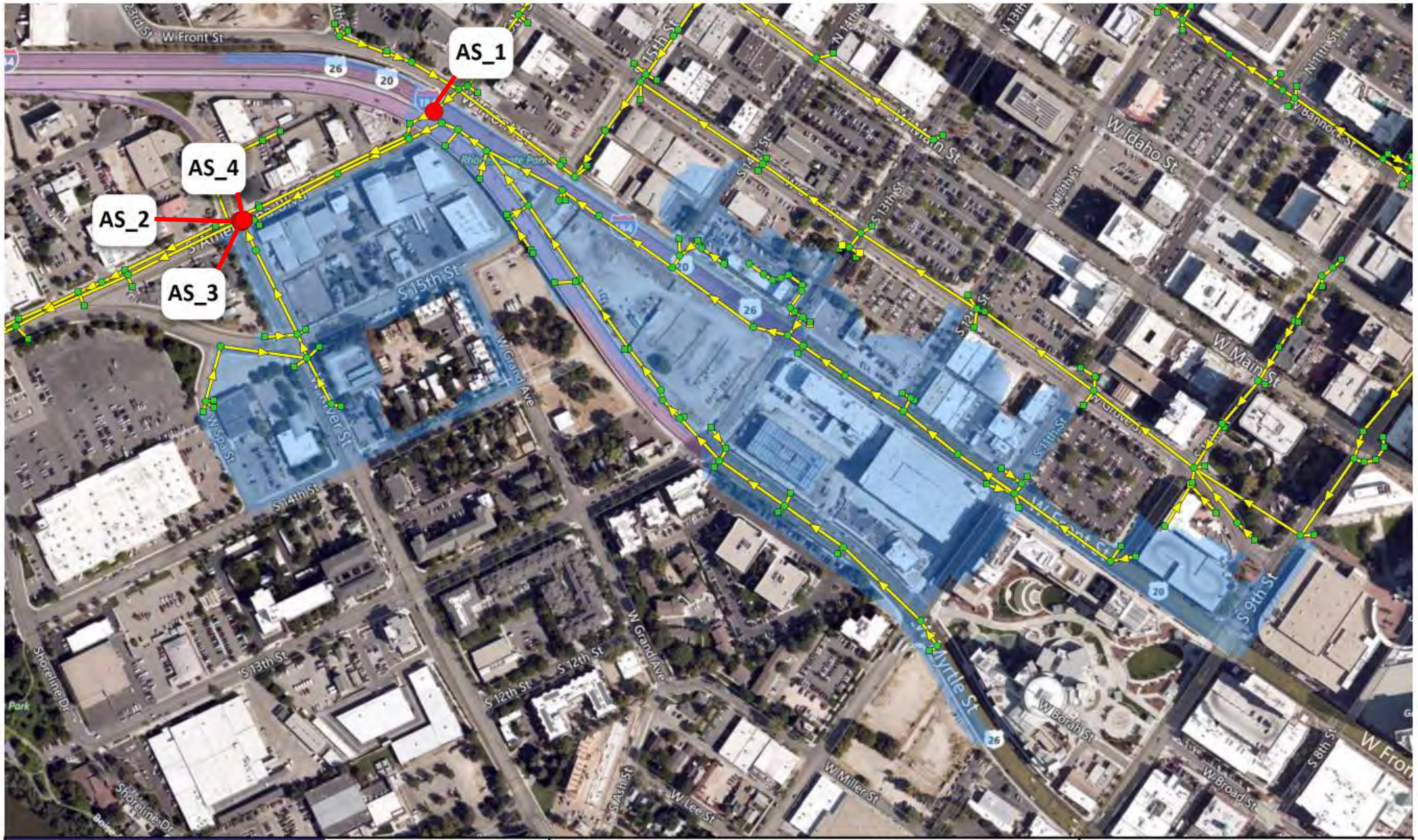


Figure 7. AS_2 Map



Brown AND Caldwell

Date: 12/2/2019

Project No.: 154166

Client: ACHD

Americana Subwatershed: AS_2 Area

- ● Logger locations
- Junctions
  - ● Manhole
  - ■ Catch Basin
  - □ Sand/Grease Trap
- ▬ Pipes
- ▨ AS_2 area

N

500 yards

Figure 8. AS_3 Map

Brown AND Caldwell

Date: 12/2/2019

Project No.: 154166

Client: ACHD

Americana Subwatershed: AS_3 Area

● Logger locations

Junctions

● Manhole

🟩 Catch Basin

🟨 Sand/Grease Trap

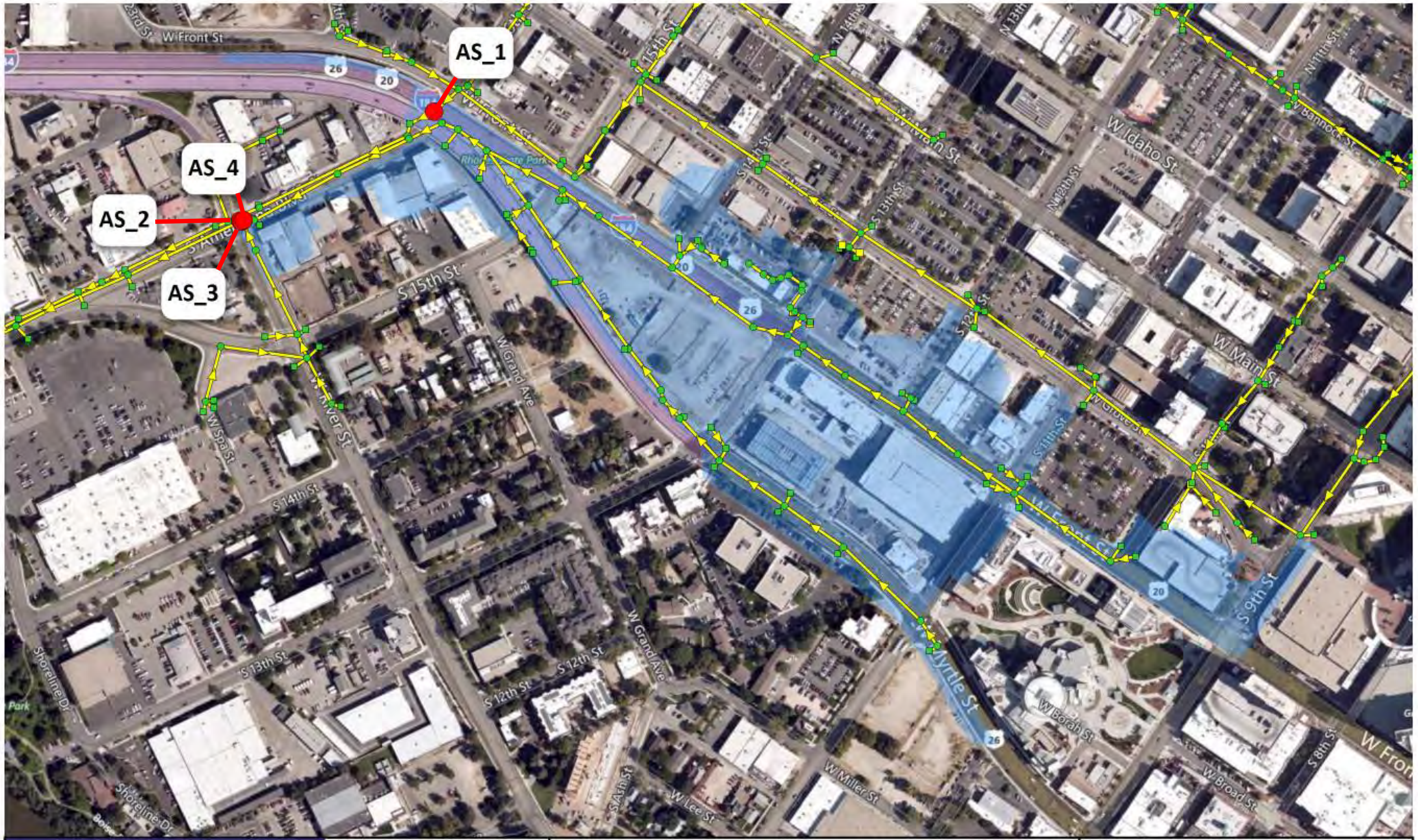
— Pipes

▨ AS_3 area

N

250 Yards

Figure 9. AS_4 Map



Brown AND Caldwell

Date: 12/2/2019

Project No.: 154166

Client: ACHD

Americana Subwatershed: AS_4 Area

● Logger locations	🟨 Pipes
Junctions	🟦 AS_4 area
● Manhole	
■ Catch Basin	
☐ Sand/Grease Trap	

N

500 Yards

Figure 10. AS_5 Map

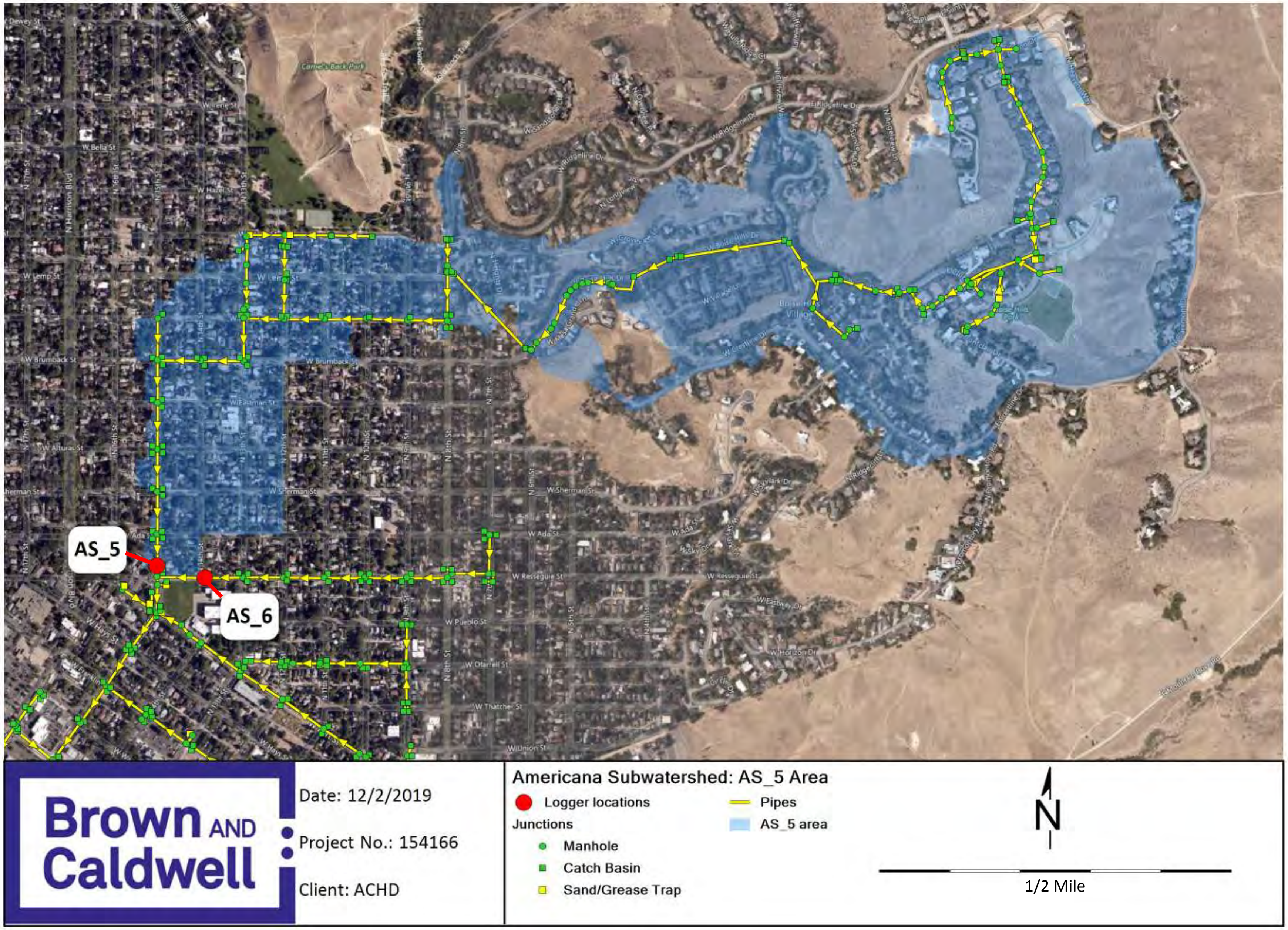


Figure 11. AS_6 Map

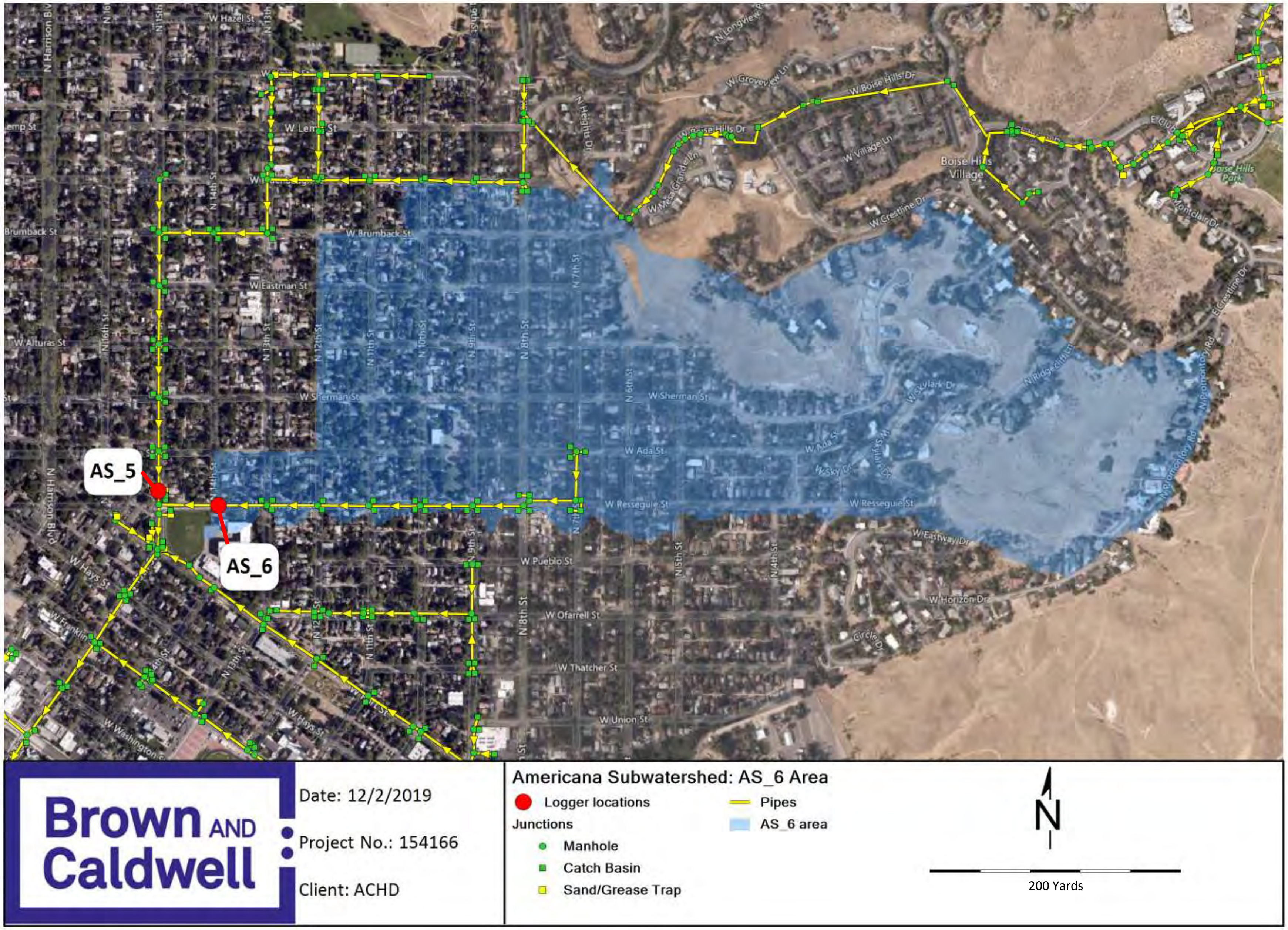


Figure 12: Wet Events Hydrograph

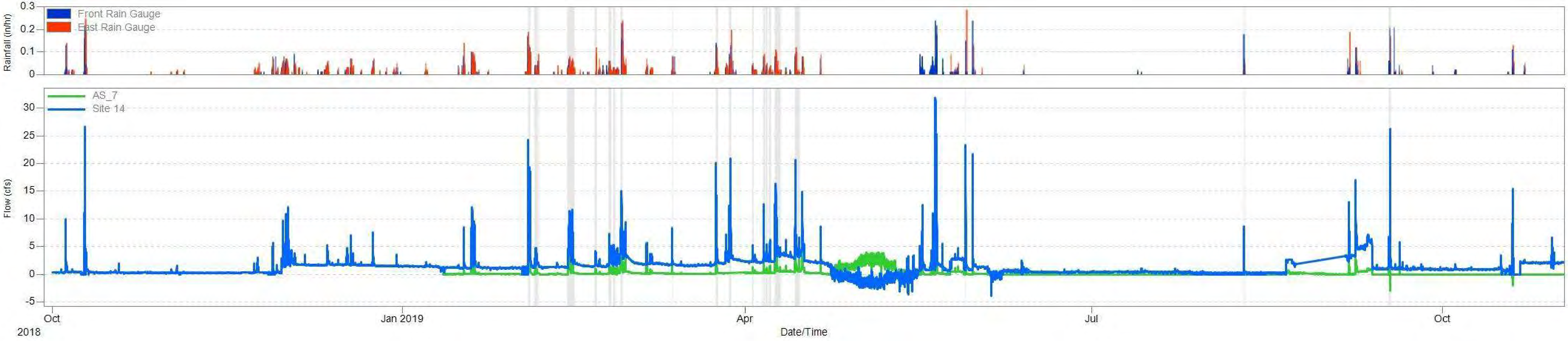


Figure 13: Dry Events Hydrograph

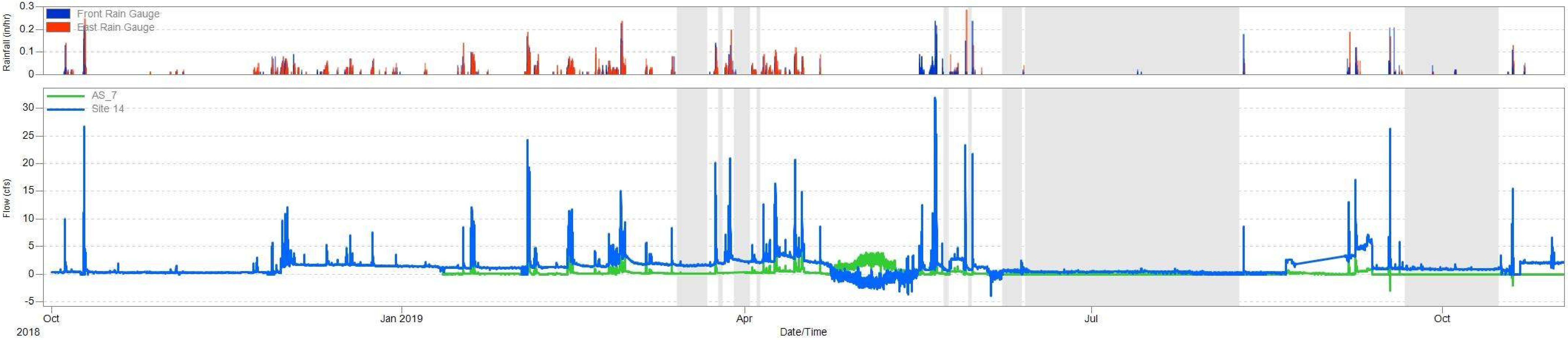
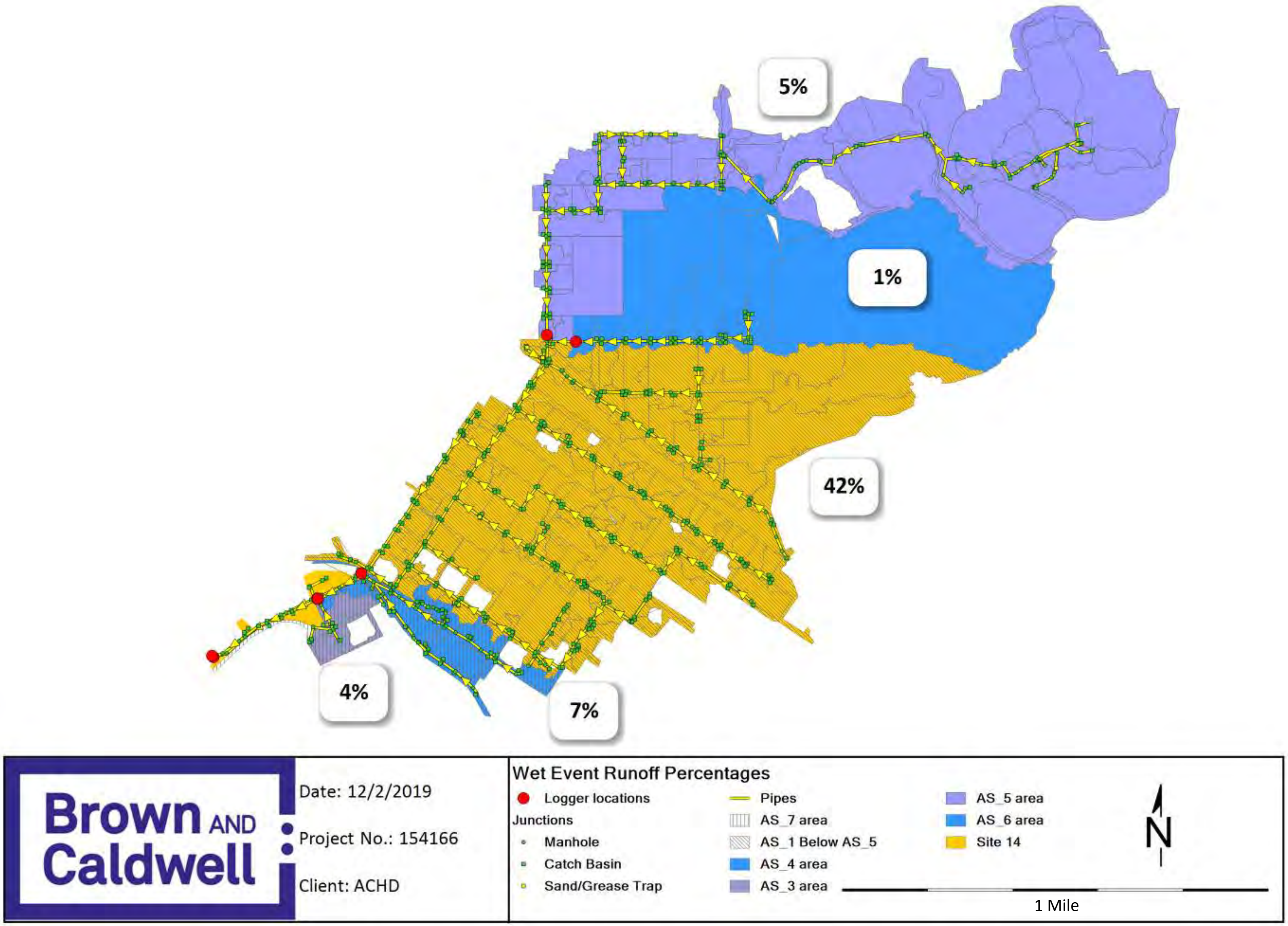


Figure 14. Percent Wet Event Flow Contribution



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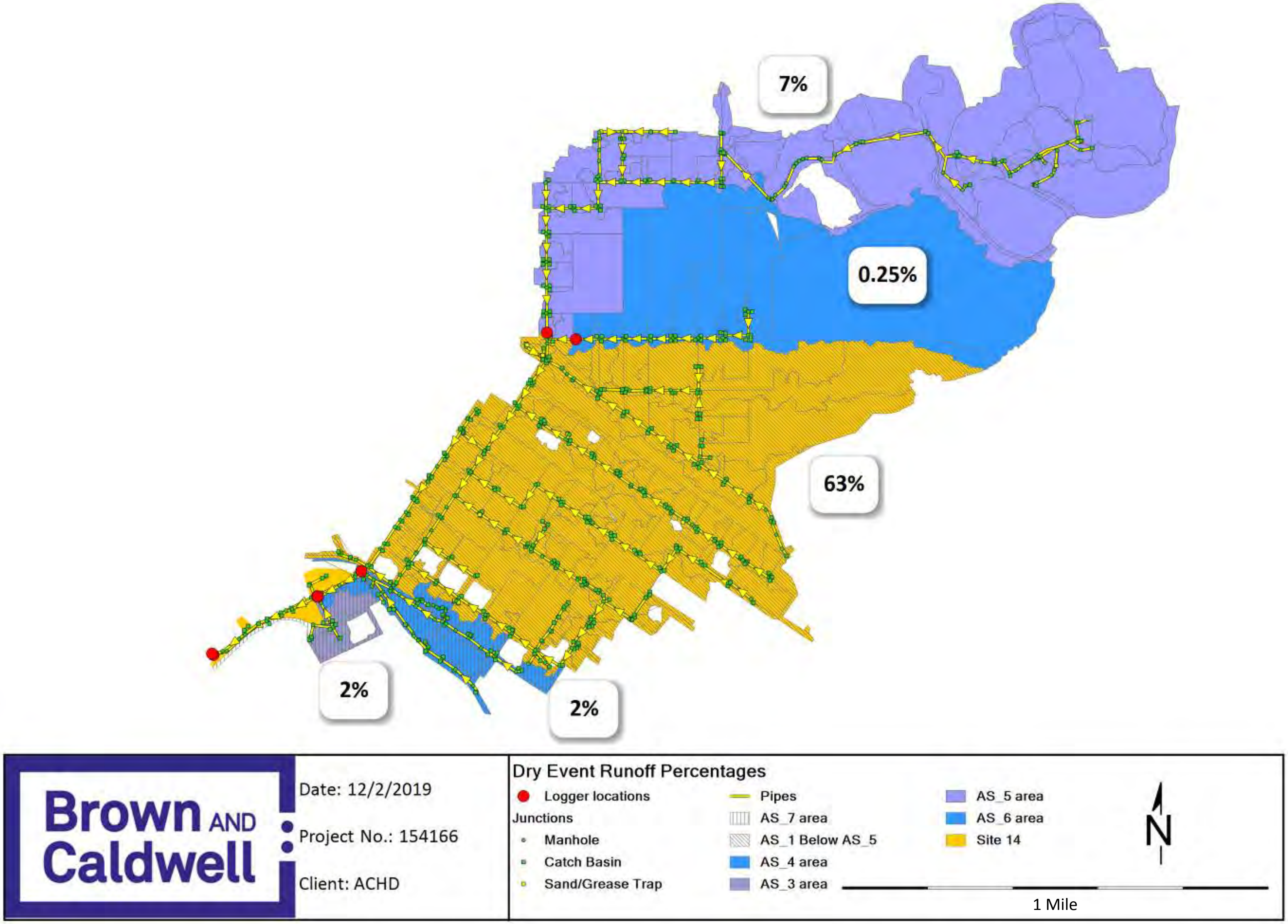
Date: 12/2/2019

Project No.: 154166

Client: ACHD

Figure 15. Percent Dry Event Flow Contribution



Date: 12/2/2019

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Client: ACHD