TETRA TECH

TECHNICAL MEMORANDUM

To:	Nevada Environmental Response Trust
Cc:	Dan Pastor, Tetra Tech, Inc.
From:	April Hussey
Date:	June 22, 2018
Subject:	Operation and Maintenance Summary – May 2018 Weir Dewatering Treatment Plant Nevada Environmental Response Trust; Henderson, Nevada

The Southern Nevada Water Authority (SNWA) is completing two weir construction projects in the Las Vegas Wash, the Sunrise Mountain Weir and Historic Lateral Weir. SNWA has hired a construction company, Las Vegas Paving (LVP) to perform weir construction activities. This includes constructing diversion channels to divert the Las Vegas Wash and perform construction dewatering activities. The Nevada Environmental Response Trust (NERT or Trust) has been ordered by the Nevada Division of Environmental Protection (NDEP) to treat the groundwater from the construction dewatering activities to remove perchlorate before discharging the treated water to the Las Vegas Wash.

To manage and treat groundwater from the construction activities, Tetra Tech, Inc. (Tetra Tech) designed and constructed two pump stations and a central water treatment plant (CWTP), collectively referred to as the SNWA Weir Dewatering Treatment Plant (Treatment Plant). The Treatment Plant will operate on a temporary basis, and operations will cease once groundwater dewatering associated with the SNWA weir construction projects is complete.

At the direction of NERT, Tetra Tech has prepared this summary of the operation and maintenance (O&M) activities performed during May 2018 for the Treatment Plant. The system was operated and maintained in accordance with the *NERT – SNWA Weir Dewatering Water Treatment Plant Operation and Maintenance Manual*.

SUMMARY OF O&M ACTIVITIES

During May 2018, the Treatment Plant continued to receive water from weir construction dewatering activities at both the Sunrise Mountain and Historic Lateral Weirs.

OPERATIONS

Operations in May 2018 were characterized by intervals of high influent total suspended solids (TSS) concentrations as a result of LVP construction activities disturbing soils in or near dewatering trenches and pits.

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Treatment Plant National Pollutant Discharge Elimination System (NPDES) water quality samples and influent flowrate monitoring confirmed the operations were in compliance with permit limits during the May 2018 reporting period.

Flow Rates

Flow rates for May 2018 are summarized in Table 1. This includes a summary of the flow rate into the Historic Lateral Pumps Station (HLPS), into the Sunrise Mountain Pump Station (SMPS), and out of the Treatment Plant.

Historic Lateral Pump Station

Flow rates into HLPS are variable based upon the number of dewatering pumps being used by LVP at the Historic Lateral Weir construction site. Each dewatering pump delivers up to approximately 800 gpm to 1,000 gpm to the HLPS. During May 2018, LVP used up to six pumps at Historic Lateral Weir construction site, but reduced the number of pumps to two at the end of the month.

Sunrise Mountain Pump Station

Flow rates into the SMPS were fairly consistent over the reporting period, reflecting consistent dewatering operations by LVP at the Sunrise Mountain Weir construction site using four dewatering pumps.

Influent Parameters

Influent water quality parameters are measured daily for the water coming into each pump station. Influent water quality parameters measured include:

- Perchlorate
- Chlorate
- Total Dissolved Solids (TDS)
- Sulfate
- Nitrate

Perchlorate, chlorate, and TDS are analyzed at a certified laboratory (Test America) in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. Sulfate and nitrate are also analyzed to capture a complete evaluation of these influent parameters. Beginning March 16, 2018, both nitrate and sulfate were analyzed exclusively by the in-house laboratory. Both nitrate and sulfate are analyzed according to EPA method 300.0. These in-house procedures meet the standards specified in the approved NERT project Quality Assurance Project Plan as described in previous monthly reports.

The range and average of perchlorate concentrations observed into each pump station during the reporting period were:

- HLPS: 2 to 225 µg/L, average: 123 µg/L
- SMPS: 878 to 1,510 µg/L, average: 1,116 µg/L

Table 2 contains the summary data from the daily influent parameter measurements.

Perchlorate Mass Removal Estimates

Daily perchlorate mass removal estimates were calculated from the recorded total influent flow to the SMPS and HLPS and daily measurements of perchlorate (analyzed at Test America by Method 314.0). The mass removed was calculated based on an effluent perchlorate concentration of zero (0) µg/L. The estimated mass of perchlorate removed during May 2018 is:

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- HLPS: 59 pounds
- SMPS: 873 pounds
- Total: 932 pounds

Perchlorate removal estimates have been tabulated since the startup period ended January 17, 2018. The estimated total perchlorate mass removed from January 18, 2018 through May 31, 2018 is:

- HLPS: 381 pounds
- SMPS: 3,748 pounds
- Total: 4,129 pounds

A graph showing the estimated removal of perchlorate from January 18 through May 31, 2018 is presented in the attached Figure 1.

Suspended Solids Removal and Management

The Treatment Plant was designed to remove the majority of suspended solids from the influent waters via hydrocyclones and multimedia filters (MMF). High TSS waste from the hydrocyclones are stored in the 20,000-gallon cyclone waste tank. High TSS waste from the MMFs is generated during the MMF backwash process and is stored in two 20,000-gallon backwash waste tanks. The system is designed to slowly blend in backwash waste and cyclone waste water into the treated effluent stream in small quantities to ensure the concentrations do not exceed the NPDES permit discharge limits for perchlorate (18 µg/L) and TSS (135 mg/L).

To address the ongoing significant solids loading in the waters produced from weir construction, continued use of external tanks for cyclone and backwash waste surge and storage capacity and associated decanting system occurred in May 2018. These external surge tanks are connected to the permanent cyclone and backwash waste tanks with a semi-permanent hard-pipe system to reduce the potential for releases outside of containment. The piping system maintains all pumps and connections within secondary containment, and includes a pumping circuit to decant the water overlying settled solids from these tanks back into the SMPS influent tanks. In the month of May:

- 27 tanker truckloads of solids slurry were sent to the landfill, or 117,000 gallons of tanker capacity; and
- 849,500 gallons of water overlying settled solids were decanted from the surge tanks and routed back through the Treatment Plant (4,023,100 total gallons since start of decanting process).

MAINTENANCE

Maintenance performed at the Treatment Plant during the reporting period included both routine maintenance activities and non-routine maintenance activities as described in the following sections.

Routine Maintenance

Routine maintenance activities included the following:

- Generators supplying power to the SMPS, HLPS, and CWTP require service approximately every 250 hours of generator run time. Generators were serviced during the reporting period as follows:
    - XQ350 – Unit 14-161 (at HLPS), service conducted on May 8 and May 19, 2018
    - XQ350 – Unit 14-162 (at HLPS), service conducted on May 8 and May 19, 2018
    - XQ500 – Unit 14-165 (at CWTP), service conducted on May 2, May 15, and May 25, 2018
    - XQ350 – Unit 17-248 (at SMPS), service conducted on May 5, May 16, and May 25, 2018
    - XQ350 – Unit 17-249 (at HLPS), service conducted on May 8 and May 22, 2018

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  - XQ350 – Unit 17-250 (at SMPS), service conducted on May 5 and May 16, 2018
  - XQ350 – Unit 17-251 (at SMPS), service conducted on May 5, May 16, and May 25, 2018
- Wye strainer was flushed periodically to clear solids accumulation.
- Cyclone underflow lines were flushed periodically to clear solids accumulation.
- Cyclone valves were greased.
- Pump oil was changed on Pump 1C.
- Tank level sensors were cleaned.
- Polymer injection system was cleaned.

Non-Routine Maintenance

Non-routine maintenance was performed during May 2018 to improve Treatment Plant operation, including:

- Installed new gasket on Ion Exchange Vessel 2A on May 2, 2018.
- Installed new 2" pump from sump to Sunrise Mountain Influent Tank on May 10, 2018.
- Installed new flange and fittings on decant line on May 10, 2018.
- Conducted maintenance on cyclone valve XV505 on May 10, 2018.
- Conducted maintenance on Backwash Waste Tank Mixers on May 11 and May 12, 2018.
- Conducted maintenance on MMF blowers on May 11, 2018.
- Changed ion exchange resin in vessels 1C on May 19, 2018.
- Changed ion exchange resin in vessels 2A on May 26, 2018.
- Installed new valve actuator on Multi Media Filter Valve 2B on May 22, 2018.
- Installed new pressure gauges on Pump 7A on May 23, 2018.

O&M Costs

At the direction of the Trust, Tetra Tech has summarized cost data for the reporting period. The following table summarizes project charges in accordance with the Operations and Maintenance Agreement, executed December 31, 2017. This section only captures project charges consistent with the O&M agreement or agreed upon charges for items supplied by/through Tetra Tech and billed to the Trust.

Table 3: O&M Cost Summary

Item	Payment Details	Unit[1]	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Monthly Base Cost	Lump sum payable to Tetra Tech	$297,500 /month	$297,500	$1,487,500

[1] Unit rates do not include applicable taxes.

Item	Payment Details	Unit[1]	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Ion Exchange Resin	Lump sum direct pay from Trust to Evoqua for turn key resin delivery, replacement, transportation and disposal services	$135,755 /vessel which includes: $109,750 /vessel for resin $26,005 /vessel for changeout services and disposal	$356,413[2]	$356,413
Tankage	Actual usage charges direct pay from Trust to vendor	Baker Corp: $20,074 /month plus variable maintenance fees as necessary Rain for Rent: Variable costs H2O Environmental: Variable costs Logistical Solutions: Variable costs	$0[3] $26,632 $5,116 $8,063	$145,012
Generator Rental / Maintenance	Actual usage charges direct pay from Trust to Cashman	$625 every 250 run hours per XQ350 Generator $1,250 every 250 run hours per XQ500 plus Backup generator rental costs as required to support maintenance	$10,625[4]	$30,625
Generator Fuel	Actual usage charges direct pay from Trust to Cashman	$3.75 /gal delivered	$132,444	$443,725
Solids Disposal	Lump sum payable to Tetra Tech for off-site transportation and disposal	$4,150 /3,000-gallon tanker $6,917 /5,000-gallon tanker	$11,067	$1,312,838
Decanting	Daily charge	$10,000 /day	$100,000	$350,000
		TOTAL	$947,860	$4,126,113

No other items were supplied by/through Tetra Tech and billed to the Trust during this reporting period.

[2] The equivalent of 9 vessel changeouts were paid by the Trust as part of the construction contract. This credit has been exhausted. These charges reflect additional vessel changeouts payable directly by the Trust.

[3] The Trust pre-paid a sum during Treatment Plant Construction for project tankage to obtain a discount on long-term equipment cost. As of May 31, 2018, the remaining credit balance is $95,640.10. Additional payment by the Trust will not be required until this prepayment credit is exhausted.

[4] The Trust pre-paid a sum during Treatment Plant Construction for generator rental to obtain a discount on long-term equipment cost. As of May 31, 2018, the remaining rental credit balance is $76,140.72. Additional payment by the Trust for rental will not be required until this prepayment credit is exhausted. Maintenance costs are separate from the pre-paid sum for rental and are included in the table above.

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CERTIFICATION

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been prepared in a manner consistent with the current standards of the profession, and to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Description of Services Provided: Prepared Weir Dewatering Treatment Plant Operation and Maintenance Summary for May 2018.

June 22, 2018

Kyle Hansen, CEM
Field Operations Manager/Geologist
Tetra Tech, Inc.

Date

Nevada CEM Certificate Number: 2167
Nevada CEM Expiration Date: September 18, 2018

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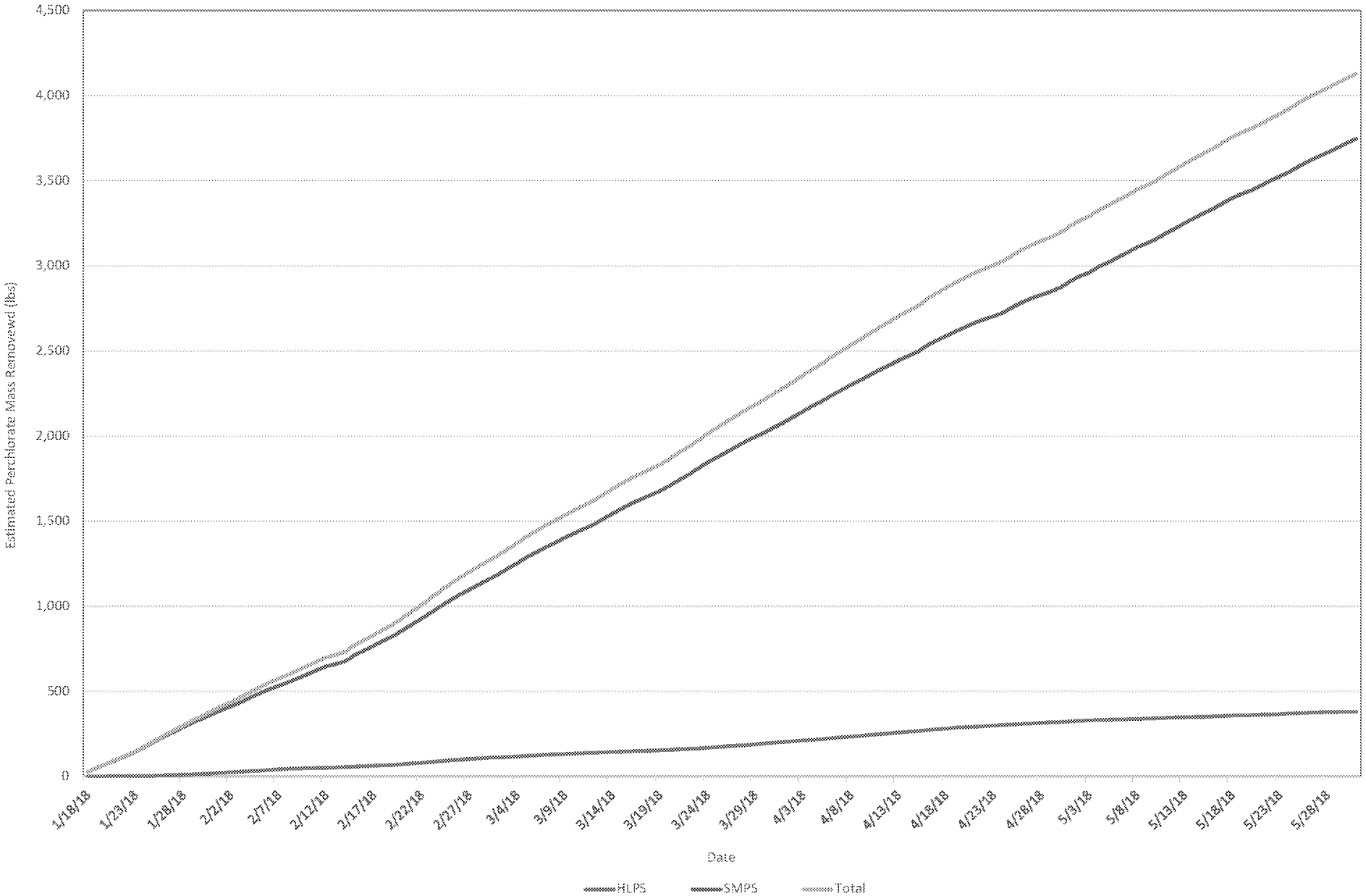
Figures

Figure 1
Estimated Perchlorate Mass Removed January 18 - May 31, 2018



Tables

Weir Dewatering Treatment Plant
Monthly Flow Summary
May 2018
Table 1

Date	Influent						Effluent[3]	
	HLPS		SMPS		Combined Flow[1]			
	Average[2] (FIT3010) gpm	Total (FIT3010) Gallons	Average[2] (FIT2010) gpm	Total (FIT2010) Gallons	Average[2] (FIT4010) gpm	Total (FIT4010) Gallons	Average[2] (FIT8060) gpm	Total (FIT8060) Gallons
5/1/2018	1,419	2,043,900	2,245	3,232,700	3,685	5,306,400	3,903	5,620,000
5/2/2018	1,344	1,934,900	2,197	3,164,300	3,529	5,081,600	3,685	5,306,000
5/3/2018	1,525	2,195,500	1,626	2,342,000	3,184	4,585,400	3,407	4,906,600
5/4/2018	1,013	1,459,300	1,867	2,688,900	2,903	4,179,800	3,174	4,570,000
5/5/2018	1,383	1,991,200	2,521	3,629,700	3,906	5,624,200	4,180	6,018,900
5/6/2018	1,243	1,789,200	2,177	3,135,000	3,399	4,894,000	3,519	5,067,800
5/7/2018	1,174	1,690,200	2,138	3,079,300	3,321	4,782,800	3,342	4,812,900
5/8/2018	1,476	2,125,500	2,140	3,081,700	3,618	5,209,200	3,785	5,450,100
5/9/2018	1,386	1,995,400	1,794	2,584,000	3,185	4,585,900	3,407	4,905,800
5/10/2018	1,373	1,977,100	2,182	3,141,800	3,567	5,136,900	3,697	5,323,200
5/11/2018	1,355	1,951,700	2,192	3,157,000	3,563	5,130,900	3,664	5,276,000
5/12/2018	1,305	1,879,700	2,131	3,068,900	3,455	4,975,400	3,613	5,203,000
5/13/2018	972	1,400,200	2,128	3,064,500	3,118	4,489,400	3,297	4,747,400
5/14/2018	1,121	1,614,100	2,133	3,072,000	3,298	4,749,400	3,383	4,872,100
5/15/2018	1,343	1,934,600	2,139	3,080,200	3,566	5,134,400	3,577	5,150,700
5/16/2018	1,358	1,956,100	2,134	3,072,800	3,553	5,115,800	3,760	5,413,700
5/17/2018	1,373	1,977,200	2,128	3,063,600	3,507	5,049,700	3,798	5,468,400
5/18/2018	1,424	2,050,100	2,135	3,074,100	3,573	5,145,400	3,785	5,451,100
5/19/2018	1,429	2,057,200	2,119	3,051,200	3,555	5,119,400	3,841	5,531,200
5/20/2018	1,205	1,735,200	1,788	2,574,700	3,012	4,337,900	3,310	4,766,700
5/21/2018	1,270	1,828,400	2,278	3,280,900	3,555	5,119,700	3,801	5,473,600
5/22/2018	1,218	1,754,000	2,149	3,094,100	3,419	4,922,800	3,694	5,319,500
5/23/2018	1,409	2,028,300	2,158	3,106,900	3,657	5,266,000	3,829	5,513,500
5/24/2018	1,397	2,011,700	2,056	2,960,000	3,603	5,188,000	3,679	5,297,300
5/25/2018	1,204	1,733,400	2,181	3,140,800	3,429	4,937,600	3,623	5,216,900
5/26/2018	1,210	1,742,500	2,070	2,980,700	3,299	4,750,600	3,649	5,254,900
5/27/2018	1,199	1,726,800	1,795	2,584,400	2,986	4,299,800	3,311	4,767,700
5/28/2018	1,186	1,708,500	2,036	2,931,500	3,224	4,642,000	3,542	5,100,400
5/29/2018	1,108	1,596,000	2,288	3,295,100	3,461	4,984,400	3,683	5,303,600
5/30/2018	1,235	1,778,600	2,186	3,148,500	3,468	4,994,400	3,757	5,409,800
5/31/2018	1,199	1,727,000	2,048	2,949,700	3,248	4,676,700	3,566	5,135,200

Notes:

HLPS = Historic Lateral Pump Station.

SMPS = Sunrise Mountain Pump Station.

FIT numbers presented in column headers correlate with Flow Instrument Transmitter tag numbers for particular flow meters.

Combined flow totals recorded on 5/12, 5/14 - 5/16, 5/19, 5/22 - 5/26 and 5/29 - 5/30 inclusive of bypass of flowmeter for maintenance or recirculated flow through plant decant process.

1 - The combined feed is measured by flow indicator FIT4010. This is not equal to the sum of flows from HLPS (FIT3010) and SMPS (FIT2010) due to fluctuating volumes in influent storage tanks.

2 - Average calculated by dividing total gallons by 1,440 (minutes per 24 hours).

3 - Effluent flow meter data is higher than the combined influent flows due to inherent flowmeter variability and is compounded by batch processing operations. Air drawn into piping (as designed for vacuum breaks) at the end of each pumping batch has been observed to result in transient, short duration high flow readings that are not representative of actual flows.

Weir Dewatering Treatment Plant
Influent Parameter Summary
May 2018
Table 2

Parameter:	Parameter:	Parameter: Units:	Perchlorate ug/L		Chlorate ug/L		Total Dissolved Solids mg/L		Nitrate as NO3 mg/L		Sulfate mg/L		
Location	Collection Date	Lab Sample ID	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Comment
HLPS Influent	5/1/2018	440-210271-1	181		40.1		1580		43.3		578		
	5/2/2018	440-210442-1	177		44.0		1620		42.9		574		
	5/3/2018	440-210532-1	147		66.6		1630		39.1		590		
	5/4/2018	440-210611-1	150		94.5		1670		40.3		620		
	5/5/2018	440-210750-1	116		30.2	J	1550		39.0		556		
	5/6/2018	440-210752-1	106		43.2		1570		39.1		570		
	5/7/2018	440-210753-1	59.2		10	U	1410		40.3		503		
	5/8/2018	440-210866-1	123		35.3	J	1570		38.5		591		
	5/9/2018	440-210995-1	122		38.8	J	1480		39.1		559		
	5/10/2018	440-211183-1	121		41.0		1540		39.5		564		
	5/11/2018	440-211203-1	126		50.1		1550		40.1		551		
	5/12/2018	440-211352-1	143		57.7		1610		39.8		545		
	5/13/2018	440-211348-1	129		194		1620		39.5		548		
	5/14/2018	440-211347-1	125		21.1	J	1620		40.4		572		
	5/15/2018	440-211428-1	96.1		21.7	J	1700		41.3		569		
	5/16/2018	440-211524-1	117		84.1		1580		41.2		556		
	5/17/2018	440-211681-1	134		73.4		1630		42.4		571		
	5/18/2018	440-211711-1	136		73.0		1590		42.6		559		
	5/19/2018	440-211813-1	110		105		1630		41.0		545		
	5/20/2018	440-211811-1	107		61.1		1620		40.3		549		
	5/21/2018	440-211817-1	131		54.8		1610		41.0		550		
	5/22/2018	440-211928-1	95.8		23.2	J	1590		41.1		538		
	5/23/2018	440-212069-1	107		25.5	J	1560		40.6		544		
	5/24/2018	440-212178-1	225		199		1630		39.0		560		
	5/25/2018	440-212211-1	160		129		1490		40.8		547		
	5/26/2018	440-212366-1	152		86.7		1540		40.0		527		
	5/27/2018	440-212368-1	138		63.5		1480		40.2		522		
	5/28/2018	440-212355-1	137		57.3		1540		40.7		532		
	5/29/2018	440-212361-1	121		51.2		1530		40.9		535		
	5/30/2018	440-212426-1	1.87	J	59.7		1270		42.9		432		
	5/31/2018	440-212581-1	16.3		94.3		1610		43.7		592		
SMPS Influent	5/1/2018	440-210271-2	1300		167		2760		30.7		1230		
	5/2/2018	440-210442-2	1120		182		2760		30.5		1200		
	5/3/2018	440-210532-2	1100		131		2660		26.8		1200		
	5/4/2018	440-210611-2	1510		258		3320		27.5		1220		
	5/5/2018	440-210750-2	878		105		2550		26.6		1130		
	5/6/2018	440-210752-2	1090		184		2660		26.6		1160		
	5/7/2018	440-210753-2	1130		193		2700		27.2		1190		
	5/8/2018	440-210866-2	1170		164		2650		26.5		1190		
	5/9/2018	440-210995-2	1050		141		2570		27.5		1150		
	5/10/2018	440-211183-2	994		125		2580		27.5		1120		
	5/11/2018	440-211203-2	1220		172		2880		26.9		1230		
	5/12/2018	440-211352-2	1130		141		2640		26.1		1240		
	5/13/2018	440-211348-2	1240		184		2830		28.3		1110		
	5/14/2018	440-211347-2	1180		71.6		2850		29.4		1110		
	5/15/2018	440-211428-2	1120		72.3		2770		27.1		1230		
	5/16/2018	440-211524-2	1030		169		2660		28.2		1150		
	5/17/2018	440-211681-2	1250		172		2830		27.5		1150		
	5/18/2018	440-211711-2	1190		185		2620		27.8		1210		
	5/19/2018	440-211813-2	967		200		2860		27.9		1160		
	5/20/2018	440-211811-2	995		184		2790		27.4		1180		
	5/21/2018	440-211817-2	973		147		2760		28.8		1140		
	5/22/2018	440-211928-2	1130		142		2900		28.1		1140		
	5/23/2018	440-212069-2	976		141		2670		29.1		1120		
	5/24/2018	440-212178-2	1090		176		2820		27.9		1210		
	5/25/2018	440-212211-2	1220		175		2710		28.7		1120		
	5/26/2018	440-212366-2	1210		187		2710		28.9		1200		
	5/27/2018	440-212368-2	1190		119		2570		29.8		1020		
	5/28/2018	440-212355-2	1050		122		2620		28.9		1090		
	5/29/2018	440-212361-2	952		125		2600		28.4		1120		
	5/30/2018	440-212426-2	1080		179		2610		28.8		1200		
	5/31/2018	440-212581-2	1070		159		2620		28.4		1090		

Notes:

ug/L	micrograms per liter (parts per billion)
mg/L	milligrams per liter (parts per million)
U	Parameter analyzed for but not detected above the method detection limit shown.
J	Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
HLPS	Historic Lateral Pump Station
SMPS	Sunrise Mountain Pump Station
n/a	Not currently available.

Nitrate data presented as NO_3 consistent with terms of O&M agreement.

Nitrate and sulfate analyzed exclusively by In-House Laboratory beginning 3/16/18.