TETRA TECH

TECHNICAL MEMORANDUM

To:	Nevada Environmental Response Trust
Cc:	Dan Pastor, Tetra Tech, Inc.
From:	April Hussey
Date:	March 23, 2018
Subject:	Operation and Maintenance Summary – February 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 February 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 February 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 February 2018 were characterized by intervals of high influent total suspended solids (TSS) concentrations as a result of LVP excavating dewatering trenches and pits. 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 February 2018 reporting period.

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Flow Rates

Flow rates for February 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 approximately 800 gpm to the HLPS.

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 three 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. Currently, sulfate is analyzed at a certified laboratory until in-house laboratory methods are finalized. In addition, nitrate is analyzed at a certified laboratory except for samples collected on Saturdays, which are analyzed in-house due to the 48-hour hold time. In-house laboratory procedures follow EPA method 300.1 for nitrate. To confirm in-house procedures, 21 samples were split and analyzed for nitrate both in-house and by Test America. The average relative percent differences between the in-house and Test America results for the 21 samples was within 6%, which is within the 30% specified in the approved NERT project Quality Assurance Project Plan. Both sulfate and nitrate may be analyzed exclusively at the in-house lab in the future following confirmation of in-house laboratory procedures.

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

- HLPS: 103 to 289 µg/L, average: 210 µg/L
- SMPS: 870 to 1,390 µg/L, average: 1,176 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 February 2018 is:

- HLPS: 87 pounds
- SMPS: 762 pounds

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- Total: 849 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 February 28, 2018 is:

- HLPS: 107 pounds
- SMPS: 1,129 pounds
- Total: 1,236 pounds

A graph showing the estimated removal of perchlorate from January 18 through February 28 is presented in 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 MMF 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 National Pollutant Discharge Elimination System (NPDES) permit discharge limits for perchlorate (18 µg/L) and TSS (135 mg/L).

To address the significant solids loading in the waters produced from weir construction, additional surge and storage capacity was mobilized to the site in January 2018. In February 2018, eight of the 20,000 gallon cyclone and backwash waste tanks located in individual secondary containment outside the main containment area were equipped with a semi-permanent hard-pipe system to connect the tanks to the permanent backwash waste tanks reduce the potential for releases outside of containment, maintain all pumps and connections within secondary containment, and establish a pumping circuit to decant the supernatant water from these tanks back into the SMPS influent tanks. In the month of February:

- 89 tanker truckloads of solids slurry were sent to the landfill, or 403,000 gallons of tanker capacity; and
- 522,900 gallons of water overlying settled solids were decanted from the surge tanks and routed back through the Treatment Plant.

MAINTENANCE

Maintenance performed at the Treatment Plant during February 2018 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:
  - XQ500 – Unit 14-165, service conducted on February 3, 2018, February 16, 2018, and February 28, 2018
  - XQ350 – Unit 17-249 (at HLPS), service conducted on February 17, 2018
  - XQ350 – Unit 14-162 (at HLPS), service conducted on February 3, 2018 and February 24, 2018
  - XQ350 – Unit 17-248 (at SMPS), service conducted on February 6, 2018 and February 24, 2018
  - XQ350 – Unit 17-251 (at SMPS), service conducted on February 7, 2018
  - XQ350 – Unit 17-250 (at SMPS), service conducted on February 9, 2018
- Wye strainer was flushed periodically to clear solids accumulation

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- Cyclone underflow lines were flushed periodically to clear solids accumulation
- Pump oil was changed on Pumps 3A, 3B, 3C, 5B, 5C, 6A, and 6B
- Tank level sensors were cleaned

Non-Routine Maintenance

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

- Completed adjustments to wye strainer discharge flush line on February 9, 2018;
- Serviced polymer injection system on February 5, 2018;
- Added drainage gravel around equipment and entrance ramps on February 8, 2018;
- Removed solids accumulated in HLPS TK 2A on February 12, 2018;
- Conducted cyclone waste pump maintenance and cleared accumulated solids on February 14, 2018;
- Replaced ion exchange resin in IX Vessel 1A and 1B on February 17, 2018;
- Replaced gasket on MMF 1A hatch on February 19, 2018;
- Completed adjustments to MMF 1A blower for air scour on February 22, 2018;
- Installation of Line Reactors to SMPS XQ350 generators 20211, 20212 and 20213 on February 23-25, 2018;
- Completed adjustments to polymer injection system at multi-media filters including installing a poly tank to supply polymer dilution water, on February 26, 2018; and
- Repaired seized pump used for filling poly tank with Treated Effluent water for use at polymer injection system on February 26, 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	$595,000
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[2] $26,005 /vessel for changeout services and disposal	$0[2]	$0

[1] Unit rates do not include applicable taxes.

[2] The Trust pre-paid a sum during Treatment Plant Construction to pre-purchase the equivalent of 4.5 vessel changeouts of resin to ensure product availability and vendor readiness. As of February 28, 2018, 2.5 vessel changeouts of resin remain on credit with Evoqua. Additional payment by the Trust for resin will not be required until this credit is exhausted.

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Item	Payment Details	Unit[1]	Cost Invoiced During Reporting Period	Total Costs – Project Inception to Date
Tankage	Actual usage charges direct pay from Trust to Baker Corp and Rain for Rent	Baker Corp: $20,074 /month plus variable maintenance fees as necessary Rain for Rent: As used	$0[3] $0	$0
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	$0[4]	$0
Generator Fuel	Actual usage charges direct pay from Trust to Cashman	$3.65 /gal delivered	$5,466	$5,466
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	$0	$661,261
		TOTAL	$302,966	$1,261,727

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

[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 February 28, 2018, the remaining credit balance is $58,546.00. 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 February 28, 2018, the remaining credit balance is $267,366.10. Additional payment by the Trust will not be required until this prepayment credit is exhausted.

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CERTIFIED ENVIRONMENTAL MANAGER 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 February 2018.

Kyle L. Hansen

March 23, 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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Tables

Weir Dewatering Treatment Plant
Monthly Flow Summary
February 2018
Table 1

Date	Time	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
2/1/2018	23:59	1,222	1,760,000	1,618	2,330,000	2,750	3,960,000	3,125	4,500,000
2/2/2018	23:59	1,208	1,740,000	1,653	2,380,000	2,840	4,090,000	3,132	4,510,000
2/3/2018	23:59	1,222	1,760,000	1,674	2,410,000	2,896	4,170,000	3,222	4,640,000
2/4/2018	23:59	1,229	1,770,000	1,674	2,410,000	2,875	4,140,000	3,194	4,600,000
2/5/2018	23:59	1,208	1,740,000	1,660	2,390,000	2,882	4,150,000	3,160	4,550,000
2/6/2018	23:59	1,188	1,710,000	1,660	2,390,000	2,854	4,110,000	3,194	4,600,000
2/7/2018	23:59	1,188	1,710,000	1,653	2,380,000	2,833	4,080,000	3,188	4,590,000
2/8/2018	23:59	1,299	1,870,000	1,639	2,360,000	2,667	3,840,000	3,278	4,720,000
2/9/2018	23:59	986	1,420,000	1,646	2,370,000	2,618	3,770,000	2,993	4,310,000
2/10/2018	23:59	924	1,330,000	1,639	2,360,000	2,549	3,670,000	2,875	4,140,000
2/11/2018	23:59	382	550,000	1,625	2,340,000	1,993	2,870,000	2,319	3,340,000
2/12/2018	23:59	799	1,151,000	1,639	2,360,000	2,028	2,920,000	2,347	3,380,000
2/13/2018	23:59	1,188	1,710,000	889	1,280,000	1,694	2,440,000	2,361	3,400,000
2/14/2018	23:59	1,514	2,180,000	1,556	2,240,000	3,153	4,540,000	3,444	4,960,000
2/15/2018	23:59	1,340	1,930,000	2,556	3,680,000	4,000	5,760,000	4,299	6,190,000
2/16/2018	23:59	1,302	1,874,500	2,379	3,425,300	3,209	4,620,600	4,127	5,942,700
2/17/2018	23:59	1,388	1,998,100	2,400	3,456,000	3,816	5,494,400	4,116	5,927,000
2/18/2018	23:59	1,078	1,552,600	2,279	3,282,300	3,362	4,840,900	3,648	5,253,800
2/19/2018	23:59	987	1,421,700	2,245	3,233,200	3,265	4,701,700	3,535	5,089,700
2/20/2018	23:59	1,315	1,894,100	2,243	3,230,100	3,573	5,144,400	3,828	5,511,700
2/21/2018	23:59	1,440	2,074,200	2,224	3,202,700	3,775	5,436,700	4,014	5,780,300
2/22/2018	23:59	1,409	2,029,500	2,195	3,161,000	3,742	5,388,400	4,035	5,810,900
2/23/2018	23:59	1,543	2,221,300	2,205	3,175,400	3,758	5,411,200	4,091	5,891,000
2/24/2018	23:59	1,521	2,190,000	2,181	3,140,000	3,715	5,350,000	4,069	5,860,000
2/25/2018	23:59	1,479	2,130,000	2,188	3,150,000	3,667	5,280,000	4,007	5,770,000
2/26/2018	23:59	1,458	2,100,000	2,160	3,110,000	3,646	5,250,000	3,931	5,660,000
2/27/2018	23:59	1,444	2,079,900	2,158	3,107,700	3,626	5,221,700	3,920	5,644,700
2/28/2018	23:59	1,335	1,922,700	2,174	3,130,300	3,509	5,053,400	3,858	5,554,800

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 2/8, 2/12, 2/15, 2/16, 2/20, 2/21, 2/22, and 2/26 inclusive of 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
February 2018
Table 2

		Parameter:	Perchlorate		Chlorate		Total Dissolved Solids		Nitrate as NO3		Sulfate		
		Units:	ug/L		ug/L		mg/L		mg/L		mg/L		
Location	Collection Date	Lab Sample ID	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Result	LQ	Comment
HLPS Influent	2/1/2018	440-202452-1	223		130		1600		39.2		568		
	2/2/2018	440-202486-1	186		76.2		1530		40.4		598		
	2/3/2018	440-202632-1	215		112		1570		40.68		562		Nitrate analyzed by In-House Laboratory
	2/4/2018	440-202629-1	225		195		1590		41.6		567		
	2/5/2018	440-202631-1	230		193		1580		40.8		634		
	2/6/2018	440-202781-1	243		186		1580		40.8		570		
	2/7/2018	440-202848-1	241		210		1560		40.6		620		
	2/8/2018	440-202999-1	160		162		1600		42.3		553		
	2/9/2018	440-203118-1	200		47.4		1510		41.0		611		
	2/10/2018	440-203197-1	194		45.6		1440		40.52		551		Nitrate analyzed by In-House Laboratory
	2/11/2018	440-203198-1	272		322		1470		43.4		555		
	2/12/2018	440-203199-1	116		17.4	J	1480		41.8		608		
	2/13/2018	440-203323-1	103		46.6		1430		42.9		569		
	2/14/2018	440-203462-1	139		30.8		1460		41.5		552		
	2/16/2018	440-203657-1	122		37.1		1540		40.1		630		
	2/17/2018	440-203731-1	165		43.2		1450		40.23		610		Nitrate analyzed by In-House Laboratory
	2/18/2018	440-203729-1	171		56.2		1380		42.7		561		
	2/19/2018	440-203726-1	250		83.3		1550		40.3		619		
	2/20/2018	440-203822-1	289		129		1590		39.1		656		
	2/21/2018	440-203910-1	217		68.7		1570		44.6		632		
	2/22/2018	440-204008-1	236		90.1		1620		40.5		581		
	2/23/2018	440-204102-1	269		104		1560		40.7		585		
	2/24/2018	440-204182-1	260		98.5		1570		41.28		567		Nitrate analyzed by In-House Laboratory
	2/25/2018	440-204183-1	247		55.0		1670		45.7		591		
	2/26/2018	440-204187-1	262		128		1560		44.7		571		
	2/27/2018	440-204312-1	219		143		1670		40.9		582		
	2/28/2018	440-204429-1	210		141		1580		41.6		593		
SMPS Influent	2/1/2018	440-202452-2	1250		170		3090		29.8		1280		
	2/2/2018	440-202486-2	1070		185		2990		28.1		1350		
	2/3/2018	440-202632-2	1280		186		2930		30.00		1290		Nitrate analyzed by In-House Laboratory
	2/4/2018	440-202629-2	1280		195		2940		29.6		1280		
	2/5/2018	440-202631-2	1250		188		2950		29.2		1370		
	2/6/2018	440-202781-2	1210		176		2890		28.8		1260		
	2/7/2018	440-202848-2	1050		174		2740		28.8		1330		
	2/8/2018	440-202999-2	1020		179		3040		29.3		1230		
	2/9/2018	440-203118-2	1190		185		2850		28.8		1380		
	2/10/2018	440-203197-2	1210		191		3080		29.29		1240		Nitrate analyzed by In-House Laboratory
	2/11/2018	440-203198-2	1200		185		2950		29.9		1260		
	2/12/2018	440-203199-2	1200		176		2890		29.6		1390		
	2/13/2018	440-203323-2	1240		184		2870		29.0		1380		
	2/14/2018	440-203462-2	870		128		3230		26.3		1410		
	2/16/2018	440-203657-2	942		150		2890		27.1		1400		
	2/17/2018	440-203731-2	970		154		2760		28.36		1280		Nitrate analyzed by In-House Laboratory
	2/18/2018	440-203729-2	1030		170		2860		29.1		1270		
	2/19/2018	440-203726-2	1020		164		2810		28.1		1220		
	2/20/2018	440-203822-2	1250		173		2840		29.3		1320		
	2/21/2018	440-203910-2	1300		177		2870		28.9		1280		
	2/22/2018	440-204008-2	1300		206		2820		28.8		1200		
	2/23/2018	440-204102-2	1370		192		2830		30.5		1200		
	2/24/2018	440-204182-2	1390		196		2850		29.53		1160		Nitrate analyzed by In-House Laboratory
	2/25/2018	440-204183-2	1300		97.1		2870		29.8		1210		
	2/26/2018	440-204187-2	1290		199		2850		29.6		1160		
	2/27/2018	440-204312-2	1130		193		2920		29.9		1220		
	2/28/2018	440-204429-2	1150		203		2860		29.0		1240		

Notes:

ug/L	micrograms per liter (parts per billion)
mg/L	milligrams per liter (parts per million)
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.
LQ	Laboratory qualifier
HLPS	Historic Lateral Pump Station
SMPS	Sunrise Mountain Pump Station

No sample collected 2/15/2018

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

Figures
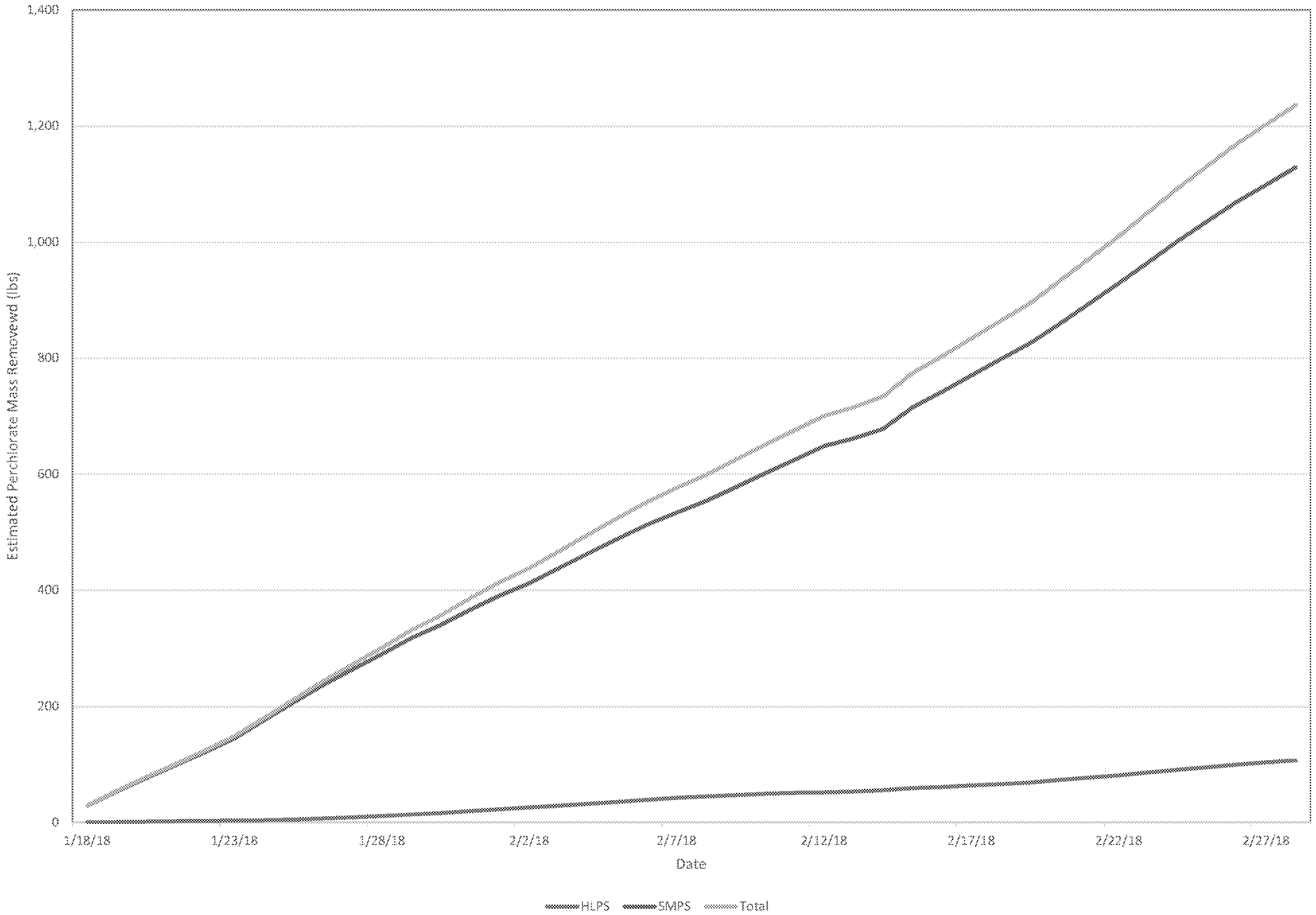
Figure 1
Estimated Perchlorate Mass Removed January 18 - February 28, 2018