

**Travis Air Force Base
Environmental Restoration Program
Restoration Program Manager's
Meeting Minutes
16 April 2020, 1300 Hours**

Mr. Lonnie Duke of the Air Force Civil Engineer Center (AFCEC) Restoration Installation Support Section (ISS) conducted the Restoration Program Manager's (RPM) teleconference on 16 April 2020 at 1300 hours. Effective 31 March 2020, the 60 AMW/CC at Travis AFB had directed Health Protection Condition (HPCON) CHARLIE in response to the evolving COVID-19 public health situation in the local area, meaning the Base is operating with a minimal manning posture to execute essential missions and operate the installation. **All attendees participated via telephone due to increased teleworking measures meant to reduce the number of employees on the base at one time. Attendees included:**

Lonnie Duke	AFCEC/CZOW
Glenn Anderson	AFCEC/CZOW
Monika O'Sullivan	AFCEC/CZOW
Angel Santiago	AFCEC/CZOW
Gene Clare	AFCEC/CZOW
Sarah Miller	USACE-Omaha
Paul Gedbaw	USACE-Omaha
Brian Boccellato	USACE-Omaha
Nadia Hollan Burke	EPA
Amanda Rohrbaugh	TechLaw, Inc.
Adriana Constantinescu	RWQCB
Kimiye Touchi	DTSC
Mike Wray	CH2M/Jacobs
Leslie Royer	CH2M/Jacobs
Jill Dunphy	CH2M/Jacobs

Handouts distributed prior to the meeting included:

Attachment 1	Meeting Agenda
Attachment 2	Master Meeting and Document Schedule
Attachment 3	SBBGWTP Monthly Data Sheet (March 2020)
Attachment 4	CGWTP Monthly Data Sheet (March 2020)

Attachment 5	LF007C Monthly Data Sheet (March 2020)
Attachment 6	ST018 Monthly Data Sheet (March 2020)
Attachment 7	Program Update
Attachment 8	DP039 Bioreactor Status

1. ADMINISTRATIVE

A. Previous Meeting Minutes

There were no comments on the March 2020 Draft Meeting Minutes; they will be finalized as is.

B. Action Item Review

Action items from March 2020 were reviewed.

Action Item 1 is ongoing: Ms. O’Sullivan to provide updates on perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). April 2020 update: Ms. O’Sullivan stated that the Air Force is waiting for guidance and direction regarding the sampling effort, given the COVID-19 shelter-in-place order and social distancing measures being followed. The letters requesting off-base property access are currently on hold, because additional language with respect to COVID-19 is being required. The Air Force asked everyone to continue to prioritize efforts related to this work.

Action Item 2 is ongoing: Mr. Duke will continue to provide design and construction information for the new KC-46 Hangar construction project. April 2020 update: Mr. Duke stated that construction of the hangar is no longer considered “essential” and has therefore been halted due to the COVID-19 restrictions in Solano County. The construction contractor and Air Force continue to prepare required paperwork, such as dig permits. Because no in-person communication is allowed at this time, a kickoff to discuss environmental issues will be the Air Force’s priority once project personnel are permitted back on-base.

Action Item 3 is ongoing: Include the progress of the optimized Emulsified Vegetable Oil (EVO) delivery via solar-powered organic carbon (SPOC) injection system pilot test at Site SS015 during future monthly program updates. April 2020 update: Ms. Royer said that the original well planned for SPOC injection wasn’t able to take any flow from the SPOC, and biological growth occurred in the second well after some injections, indicating that the injection solution was too strong, or that prior EVO injections are inhibiting flow into this well. A third well is being used, and the injection mixture has been scaled back from 4 drums of amendment

to 1 drum. It is definitely resulting in bacterial growth, which is the desired outcome. Samples are being collected today for volatile organic compounds and total organic carbon analysis, and will also be collected during the 2Q Groundwater Remediation Implementation Program (GRIP) sampling event (beginning in May).

Action Item 4: Ms. Constantinescu will confer with Water Board Subject Matter Experts on whether the Air Force should proceed with collecting total bacteria samples along with TPH samples on the LF007C system influent and effluent during O&M sampling of the groundwater extraction treatment system. April 2020 update: Ms. Constantinescu has not yet had a chance to have this conversation, and it is unlikely to happen in the near future due to the COVID-19 situation. This action item remains open.

Action Item 5: Mr. Duke to send an email to the RAB members announcing the rescheduled RAB meeting. April 2020 update: Mr. Duke sent the cancellation email to the RAB members. The venue has been reserved for the new date of 22 October 2020. This action item is now closed.

Action Item 6: Mr. Duke to update the MMDS with the new April RPM Meeting time (1300 PDT) and new RAB Meeting date (22 October 2020). April 2020 update: The calendar in the MMDS has been updated appropriately. This action item is now closed.

Action Item 7: Mr. Duke to send Site SD031B GoreSorber data and maps to Ms. Constantinescu to assist with Water Board review of the SD031B POCO Additional Investigation Work Plan. April 2020 update: Ms. Constantinescu has indicated that she has received the information. This action item is now closed.

C. Master Meeting and Document Schedule Review (see Attachment 2)

The Travis AFB Master Meeting and Document Schedule (MMDS) was discussed during this meeting (see Attachment 2).

Travis AFB Annual Meeting and Teleconference Schedule

Mr. Duke noted that the annual RAB meeting has been rescheduled for 22 October 2020.

The next RPM meeting is a teleconference scheduled for 20 May 2020 at 0930 PDT.

Travis AFB Master Document Schedule

Mr. Anderson noted that reviews are proceeding more slowly than usual due to the majority of folks working from home during the COVID-19 pandemic isolations, and requested everyone continue to do the best they can under current circumstances.

- Community Relations Plan Update (CRP): There was no change to the schedule. This document will be finished as soon as the other higher-priority documents are completed.
- Site SD031 Soil Remedial Investigation/Feasibility Study (RI/FS): The Response to Comments, Draft Final, and Final due dates remain TBD due to uncertainty with scheduling response-to-comments reviews.
- Potrero Hills Annex (FS, PP, and ROD): No change was made to the schedule. The Supplemental Nurse Slough property Soil and Groundwater Summary Results Technical Memorandum has been finalized. Responses to Water Board comments on the 2019 Annual Groundwater Monitoring Report have been submitted. Ms. Constantinescu had no additional updates.
- Site FT004 POCO Corrective Action Plan: There was no change to the schedule.
- Quarterly Newsletter (April 2020): The Response to Comments and Final due dates were changed to 2 April 2020 to reflect the date the newsletter was sent out to the stakeholders.
- Initial Passive Vent Systems Evaluation Work Plan Technical Memorandum: The Response to Comments and Final due dates were changed to 15 May 2020. Ms. Touchi noted that DTSC has not been able to submit comments yet, because the engineer is having technical difficulties during review. They will submit them as soon as possible. Ms. Constantinescu said that the Water Board comments should be provided by 24 April 2020.
- Optimization Activities Technical Memorandum for Sites SD034 and SD037: The Draft to Agencies due date was changed to 3 April 2020 to reflect actual submittal date; the Agency Comments due date was changed to 4 May 2020. There was no change to the remainder of the schedule.
- Site SD043 Well Decommissioning and Site Closeout Technical Memorandum: The PreDraft to AF Services Center due date was changed to 6 April 2020; the remainder of the schedule was updated accordingly.
- 2019 Annual Groundwater Remedy Implementation Status Report (GRISR): There was no change to the schedule.
- 2019 Annual Corrective Action Management Unit Monitoring Report: All dates are currently TBD; although Mr. Anderson noted that the Agencies will likely see a Draft in June 2020.

- Site SS016 Soil Remedial Action Completion Report: This is a new document. The Travis AFB document lead will be Mr. Anderson; the CH2M Jacobs document lead will be Doug Berwick, and the CAPE document lead will be Meg Greenwald. All dates are currently TBD. This document will allow for the KC-46 hangar construction to proceed once allowed to resume due to the COVID-19 situation.
- Site SD031B POCO Additional Site Work Plan: There was no change to the schedule. Ms. Constantinescu noted that the Water Board would provide responses by 22 April 2020.
- MOVED TO HISTORY:
None

2. CURRENT PROJECTS

Treatment Plant Operation and Maintenance Update

South Base Boundary Groundwater Treatment Plant, March 2020 (see Attachment 3)

The South Base Boundary Groundwater Treatment Plant (SBBGWTP) performed at 88.9% uptime, and 5.8 million gallons of groundwater were extracted and treated in March 2020. All treated water was discharged to Union Creek. The average flow rate for the SBBGWTP was 149.7 gallons per minute (gpm). Electrical power usage was 17,111 kilowatt hours (kWh), and approximately 14,262 pounds of CO₂ were created (based on DOE calculation). Approximately 0.68 of a pound of volatile organic compounds (VOCs) was removed in March. The total mass of VOCs removed since startup of the system is 525.4 pounds.

In March 2020, a carbon changeout was conducted for the lead granulated activated carbon (GAC) vessel. Both GAC vessels were subsequently backwashed. A power outage occurred, shutting down the SBBGWTP for three days. The system was restarted with no issue, and an uninterruptable power supply will be evaluated for installation to assist with future issues. Also in March, the extraction pump in well EW734x05 was replaced.

No optimization activities were conducted in March 2020.

Central Groundwater Treatment Plant, March 2020 (see Attachment 4)

The Central Groundwater Treatment Plant (CGWTP) performed at 100% uptime with approximately 1,120,790 gallons of groundwater extracted and treated in March 2020.

All treated water was discharged to the storm sewer system which discharges to Union Creek. The average flow rate for the CGWTP was 25.9 gpm. Electrical power usage was 2,380 kWh for all equipment connected to the Central Plant, and approximately 2,649 pounds of CO₂ were generated. Approximately 2.45 pounds of VOCs were removed from groundwater by the treatment plant in March. The total mass of VOCs removed since the startup of the system is 11,544 pounds.

The Site SS016 subgrade biogeochemical reactor (SBGR), also known as a bioreactor, and the Site DP039 bioreactor, continued operating in March 2020.

No optimization activities occurred at the CGWTP in March 2020.

LF007C Groundwater Treatment Plant, February 2020 (Attachment 5)

The Subarea LF007C Groundwater Treatment Plant (LF007C GWTP) performed at 100% uptime with approximately 165,583 gallons of groundwater extracted and treated in March 2020. All treated water was discharged to the Duck Pond for beneficial reuse. The average flow rate was 3.8 gpm. Approximately 1.2×10^{-3} of a pound of VOCs was removed from groundwater by the treatment plant in March 2020. The total mass of VOCs removed since the startup of the system is 174.4 pounds. There was no electrical power usage statistics, because this plant operates on solar power only.

No optimization activities are reported for the month of March 2020.

NOTE: While the LF007C GWTP and extraction systems are still accessible for O&M, the monitoring wells located offbase are not currently accessible, because the Air Force's LF007C off-base easement has expired. The Air Force is working on getting a new easement, which has been complicated by a change of land ownership. Ms. Burke and Ms. Constantinescu offered regulatory agency support for getting access to the sites for sampling and groundwater elevation measurements if the Air Force continues to encounter difficulties in obtaining an access agreement.

ST018 Groundwater (MTBE) Treatment Plant, March 2020 (see Attachment 6)

Site ST018 (MTBE) Treatment Plant (ST018 GWTP) performed at 100% uptime with approximately 139,760 gallons of groundwater extracted in March 2020. All groundwater was discharged to the Fairfield – Suisun Sewer District. The average flow rate for the ST018 GWTP was 3.3 gpm. Electrical power usage for the month was 76 kWh for all equipment connected to the ST018 GWTP. The total CO₂ discharge equivalent equates to approximately 56 pounds. Approximately 0.10 of a pound of MTBE, BTEX, VOCs, and TPH was removed in March by the treatment plant, and approximately 0.02 of a pound of MTBE-only was removed from groundwater. The

total BTEX, MTBE and TPH mass removed since the startup of the system is 49.1 pounds, and the total MTBE mass removed since startup of the system is 12.0 pounds.

Note: Electrical power use at the ST018 GWTP is only for the alarm system and a pump that pushes influent tank water to the Fairfield-Suisun Sanitary Sewer line. The four groundwater extraction pumps in the system are all solar powered.

No optimization activities are reported for the month of March 2020.

3. Presentations:

A) Program Update: Activities Completed, In Progress, and Upcoming (see Attachment 7)

Ms. Royer reported on the status of fieldwork and documents that have been completed, are in progress, or are upcoming. Please refer to Attachment 7 for the full briefing. Highlights include:

Documents in Progress - Initial Passive Vent Systems Sampling Work Plan Tech

Memo: Ms. Constantinescu noted that the Water Board comments will be sent to the Air Force by 24 April 2020.

Field Work Planned: Ms. Royer noted that much of the field work planned is contingent on obtaining approved dig permits. Mr. Clare is working on the documentation to facilitate the planned field work.

B) Site DP039 Bioreactor Status (see Attachment 8)

Mr. Wray reported on the status of the Site DP039 Bioreactor, as well as optimization measures planned for Summer 2020. If successful, optimization measures could be implemented to reinvigorate other bioreactors, allowing them to be reused. Please refer to Attachment 8 for the full briefing.

4. New Action Item Review

No new action items were noted.

5. PROGRAM ISSUES/UPDATE

1) Mr. Duke discussed the Travis AFB response to the COVID-19 pandemic. He stated that only essential personnel are allowed on-base until further notice; all other personnel are teleworking. Base personnel and field staff are required to wear masks while on-base; this can include homemade cloth masks. The Jacobs field team has N95 masks left over from last year's fire season.

2) The Triad Discussion on POCO Site SD031B was not held as there were no new data to report on; Ms. Constantinescu noted that the Air Force would receive Water Board comments on the Site SD031B POCO Additional Site Work Plan by 24 April 2020.

6. ACTION ITEMS

Item #	Responsible	Action Item Description	Due Date	Status
1.	Monika O'Sullivan	Ms. O'Sullivan to provide updates on PFOS and PFOA as she becomes aware of them.	Ongoing	Open
2.	Lonnie Duke	Mr. Duke will continue to provide construction updates for the KC-46 Hangar. This project was awarded to Walsh Construction and is being managed by an element of the Navy.	Ongoing	Open
3.	Mr. Wray and Ms. Royer	Mr. Wray or Ms. Royer to include the progress of the optimized EVO delivery via solar-powered organic carbon injection system pilot test at	Ongoing	Open

		Site SS015 during future monthly program updates.		
4.	Ms. Constantinescu	Ms. Constantinescu will confer with Water Board SMEs on whether the Air Force should proceed with collecting total bacteria samples along with TPH samples on the system influent and effluent during O&M sampling at LF007C groundwater extraction treatment system.	20 May 2020	Open

TRAVIS AIR FORCE BASE
ENVIRONMENTAL RESTORATION PROGRAM
RESTORATION PROGRAM MANAGER'S MEETING

The RPM Teleconference is scheduled for 1:00 PM PST on 16 April 2020. **The call-in number will be provided in the MS Teams meeting invite and also in the same email that the meeting materials are provided in. If you are able to participate via MS Teams meeting, you will see the shared documents that will be viewable by all participants.**

AGENDA

1. ADMINISTRATIVE

- A. INTRODUCTIONS
- B. PREVIOUS MEETING MINUTES
- C. ACTION ITEM REVIEW
- D. MASTER MEETING AND DOCUMENT SCHEDULE REVIEW

2. CURRENT PROJECTS

TREATMENT PLANT OPERATION AND MAINTENANCE UPDATE

3. PRESENTATIONS

- A. PROGRAM UPDATE:
 - DOCUMENTS & ACTIVITIES COMPLETED, IN PROGRESS & PLANNED
- B. DP039 BIOREACTOR UPDATE

4. NEW ACTION ITEM REVIEW

5. PROGRAM/ISSUES/UPDATE

TRIAD DISCUSSION ON POCO SITE SD031B

NOTES: AFTER THE RPM TELECONFERENCE, BASED ON THE DISCUSSION DURING THE REVIEW OF THE MASTER MEETING AND DOCUMENT SCHEDULE, WE WILL ALLOW TIME TO HOLD A SEPARATE SPLINTER MEETING TO DISCUSS RESPONSES TO AGENCY COMMENTS ON THOSE DOCUMENTS THAT ARE IN PROGRESS, OR OTHER ISSUES IF NEEDED. ALL PARTICIPANTS ARE WELCOME TO PARTICIPATE.

(2020)
Annual Meeting and Teleconference Schedule

Monthly RPM Meeting ¹ (Begins at time noted)	RPM Teleconference (Begins at time noted)	Restoration Advisory Board Meeting (Begins at 7:00 p.m.) (Poster Session at 6:30 p.m.)
—	01-15-20	—
02-19-20	—	—
—	03-18-20	—
04-16-20 (Thursday 1:00 PM)	—	04-16-20
—	05-20-20	—
06-17-20	—	—
—	07-15-20	—
08-26-20	—	—
—	09-16-20	—
10-22-20 (Thursday 2:00 PM)	—	10-22-20
—	11-18-20	—
—	—	—

¹ Note: Meetings and teleconferences will be held at 09:30 AM on the third Wednesday of each month unless otherwise noted.

² Note: Tentative RAB tour(s) during construction season.

Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS		
Life Cycle	Community Relations Plan Update Travis AFB, Glenn Anderson CH2M, Jill Dunphy	Site SD031 Soil Remedial Investigation/Feasibility Study Travis AFB, Glenn Anderson CH2M, Rick Sturm
Scoping Meeting	NA	NA
Predraft to AF/Service Center	08-23-16	05-24-19
AF/Service Center Comments Due	09-07-16	06-10-19
Draft to Agencies / RAB	09-28-16 (03-22-18)	09-12-19
Agency Comments Due	10-28-16 (04-27-18)	11-12-19 (01-14-20)
Response to Comments Meeting	TBD	TBD
Agency Concurrence with Remedy	NA	NA
Public Comment Period	NA	NA
Public Meeting	NA	NA
Response to Comments Due	TBD	TBD
Draft Final Due	TBD	TBD
Final Due	TBD	TBD

Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS			
Life Cycle	Potrero Hills Annex Travis, Glenn Anderson		
	FS	Proposed Plan	ROD
Scoping Meeting	180 days after Water Board Order Rescinded	+470 days	+735 days
Predraft to AF/Service Center	+ 270 days	+530 days	+ 915 days
AF/Service Center Comments Due	+ 300 days	+560 days	+ 975 days
Draft to Agencies	+330 days	+590 days	+ 1035 days
Draft to RAB	+ 330 days	+590 days	+ 1035 days
Agency Comments Due	+390 days	+650 days	+ 1095 days
Response to Comments Meeting	+ 405 days	+665 days	+ 1110 days
Agency Concurrence with Remedy	NA	NA	+ 1130 days
Public Comment Period	NA	+735 to 765 days	NA
Public Meeting	NA	+745 days	NA
Response to Comments Due	+430 days	+695days	+ 1190 days
Draft Final Due	+430 days	+695 days	+ 1190 days
Final Due	+460 days	+725 days	+ 1250 days

Travis AFB Master Meeting and Document Schedule

SECONDARY DOCUMENTS	
Life Cycle	Site FT004 POCO Corrective Action Plan Travis AFB, Glenn Anderson CH2M, Doug Berwick CAPE, Meg Greenwald
Scoping Meeting	NA
Predraft to AF/Service Center	03-20-20
AF/Service Center Comments Due	04-20-20
Draft to Agencies / RAB	05-07-20
Agency Comments Due	06-08-20
Response to Comments Meeting	06-17-20
Response to Comments Due	07-01-20
Draft Final Due	NA
Final Due	07-01-20
Public Comment Period	NA
Public Meeting	NA

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS			
Life Cycle	Quarterly Newsletter (April 2020) Travis, Glenn Anderson	Initial Passive Vent Systems Sampling Work Plan Tech Memo Travis AFB, Glenn Anderson CH2M, Leslie Royer	Optimization Activities Technical Memorandum for Sites SD034 and SD037 Travis AFB, Glenn Anderson CH2M, Levi Pratt
Scoping Meeting	NA	NA	NA
Predraft to AF/Service Center	03-05-20	12-16-19	01-20-20
AF/Service Center Comments Due	NA	12-31-19	02-20-20
Draft to Agencies / RAB	03-06-20	01-09-20	04-03-20
Agency Comments Due	03-20-20	02-10-20	05-04-20
Response to Comments Meeting	03-27-20	02-19-20	05-20-20
Response to Comments Due	04-02-20	03-04-20 (05-15-20)	06-01-20
Draft Final Due	NA	NA	NA
Final Due	04-02-20	03-04-20 (05-15-20)	06-01-20
Public Comment Period	NA	NA	NA
Public Meeting	NA	NA	NA

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS				
Life Cycle	Site SD043 Well Decommissioning and Site Closeout Technical Memorandum Travis AFB, Glenn Anderson CH2M, Levi Pratt	2019 Annual GRISR Travis AFB, Glenn Anderson CH2M, Levi Pratt	2019 Annual CAMU Monitoring Report Travis AFB, Gene Clare CH2M HILL, Levi Pratt	Site SS016 Soil Remedial Action Completion Report Travis AFB, Glenn Anderson CH2M, Doug Berwick CAPE, Meg Greenwald
Scoping Meeting	NA	NA	NA	NA
Predraft to AF/Service Center	04-06-20	05-04-20	TBD	TBD
AF/Service Center Comments Due	05-06-20	06-04-20	TBD	TBD
Draft to Agencies / RAB	05-21-20	06-22-20	TBD	TBD
Agency Comments Due	06-22-20	07-23-20	TBD	TBD
Response to Comments Meeting	07-15-20	08-05-20	TBD	TBD
Response to Comments Due	07-29-20	08-21-20	TBD	TBD
Draft Final Due	NA	NA	NA	NA
Final Due	07-29-20	08-21-20	TBD	TBD
Public Comment Period	NA	NA	NA	NA
Public Meeting	NA	NA	NA	NA

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS	
Life Cycle	Site SD031B POCO Additional Site Investigation Work Plan Travis, Glenn Anderson CH2M, Tony Chakurian
Scoping Meeting	NA
Predraft to AF/Service Center	12-18-19
AF/Service Center Comments Due	01-20-20
Draft to Agencies / RAB	03-02-20
Agency Comments Due	04-01-20
Response to Comments Meeting	04-16-20
Response to Comments Due	04-30-20
Draft Final Due	NA
Final Due	04-30-20
Public Comment Period	NA
Public Meeting	NA

South Base Boundary Groundwater Treatment Plant

Monthly Data Sheet

Report Number: 233

Reporting Period: 2 March 2020 – 1 April 2020

Date Submitted: 13 April 2020

This monthly data sheet presents information regarding the South Base Boundary Groundwater Treatment Plant (SBBGWTP) and associated remedial process optimization (RPO) activities.

System Metrics

Table 1 presents operational data from the March 2020 reporting period.

Table 1 – Operations Summary – March 2020				
Initial Data Collection:		3/2/2020 12:50	Final Data Collection:	4/1/2020 12:20
Operating Time:		Percent Uptime:	Electrical Power Usage:	
SBBGWTP:	647 hours	SBBGWTP:	88.9%	SBBGWTP: 17,111 kWh (14,262 lbs CO ₂ generated ^a)
Gallons Treated: 5.8 million gallons			Gallons Treated Since July 1998: 1.2 million gallons	
Volume Discharged to Union Creek: 5.8 million gallons			Gallons Treated from Other Sources: 0 gallons	
VOC Mass Removed: 0.68 lbs^b			VOC Mass Removed Since July 1998: 525.4 lbs	
Rolling 12-Month Cost per Pound of Mass Removed: \$22,335^c				
Monthly Cost per Pound of Mass Removed: \$34,041^c				
lbs = pounds				
^a SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG. Value also includes approximately 1,600 pounds of GHG from GAC change out services averaged to a per month basis.				
^b Calculated using March 2020 EPA Method SW8260C analytical results.				
^c Costs include operations and maintenance, carbon change out, reporting, analytical laboratory, project management, and utility costs related to operation of the system.				

Table 2 presents individual extraction well flow rates along with the average system flow during the monthly reporting period.

Table 2 – SBBGWTP Average Flow Rate (gpm) ^a – March 2020							
FT005 ^b				SS029		SS030	
EW01x05	Offline	EW743x05	Offline	EW01x29	Offline ^c	EW01x30	13.4
EW02x05	Offline	EW744x05	3.5	EW02x29	Offline ^c	EW02x30	Offline ^d
EW03x05	Offline	EW745x05	9.9	EW03x29	2.9	EW03x30	12.9
EW731x05	6.8	EW746x05	Offline	EW04x29	8.3	EW04x30	18.2
EW732x05	Offline	EW2291x05	3.1	EW05x29	8.2	EW05x30	6.6
EW733x05	Offline	EW2782x05	4.8	EW06x29	7.8	EW2174x30	8.0
EW734x05	4.6	EW2783x05	2.7	EW07x29	13.5	EW711x30	3.6
EW735x05	6.8	EW2784x05	10.6			MW269x30	0.5
EW736x05	Offline	EW2785x05	7.5				
EW737x05	Offline	EW2786x05	12.3				
EW742x05	Offline						
FT005 Total: 72.6				SS029 Total: 40.7		SS030 Total: 63.2	
SBBGWTP Average Monthly Flow ^e : 149.7 gpm							
^a Flow rates presented are instantaneous measurements taken at the end of the reporting period.							
^b Most extraction wells at FT005 were taken offline in accordance with the 2008 Annual Remedial Process Optimization Report for the Central Groundwater Treatment Plant, North Groundwater Treatment Plant, and South Base Boundary Groundwater Treatment Plant.							
^c Extraction wells taken off line because of persistent fouling of the well pumps and associated discharge piping.							
^d Extraction wells were operational; however, well was recharging.							
^e The average SBBGWTP groundwater flow rate was calculated using the Union Creek Discharge Totalizer and dividing it by the total time the system was operational.							
gpm – gallons per minute							
SBBGWTP – South Base Boundary Groundwater Treatment Plant							

Table 3 presents a summary of system shutdowns during the monthly reporting period.

Table 3 – Summary of System Shutdowns					
Location	Shutdown ^a		Restart ^a		Cause
	Date	Time	Date	Time	
SBBGWTP	March 14, 2020	15:00	March 17, 2020	09:00	Power outage.
SBBGWTP	March 25, 2020	7:30	March 25, 2020	14:00	Carbon change out of lead GAC vessel.
^a Shutdown and restart times estimated based on field notes SBBGWTP = South Base Boundary Groundwater Treatment Plant					

Summary of O&M Activities

Monthly groundwater treatment samples were collected at the SBBGWTP on 2 March 2020. Sample results are presented in Table 4. The total VOC concentration (14.0 µg/L) in the influent sample increased from the February 2020 sample results (13.33 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 13 µg/L. TCE, cis-1,2-DCE, chloroform, and 1,2-DCA were detected in the midpoint sampling location. In addition, chloroform and 1,2-DCA was detected in the effluent sample, and the 1,2-DCA concentration (0.73 J µg/L) exceeded the effluent limitation.

On 25 March, a carbon change out was conducted on the lead GAC vessels. Following the change out, both 6,000-pound GAC vessels were backwashed. The SBBGWTP was off line for approximately 7 hours and was restarted without issue.

On 27 March, confirmation samples were collected at the effluent sample location as well as upstream and downstream of the outfall at Union Creek. Sample results are presented in Table 5. 1,2-DCA was not detected in the effluent sample; however, chloroform (0.18 J µg/L) and cis-1,2-DCE (0.30 J µg/L) were detected at concentrations less than effluent limitations. TCE (0.21 J µg/L) was detected in the receiving water sample upstream of the SBBGWTP outfall. 1,2-DCA (0.50 J µg/L) and cis-1,2-DCE (0.18 J µg/L) was detected in the receiving water sample downstream of the SBBGWTP outfall.

Figure 1 presents a plot of influent VOC concentrations and average flow at the SBBGWTP over the past twelve (12) months. An overall decreasing trend was observed for the VOC influent concentrations in the past 12 months. An overall decreasing flow rate trend was observed in the past 12 months.

On 14 March, the SBBGWTP shut down because of a power outage. On 17 March, the system was restarted without issue. An uninterruptible power supply will be evaluated for the SBBGWTP to assist with temporary power outages. Also on 17 March, the EW734x05 pump was replaced. The well is currently on line.

Optimization Activities

No optimization activities occurred at the SBBGWTP in March 2020.

Sustainability

Travis AFB is committed to decreasing the amount of GHG produced directly (waste streams discharging GHG) or indirectly (GHG produced as related to electrical energy consumption) from all systems across Travis AFB. Travis AFB continues to optimize each treatment plant to reduce the amount of electrical energy consumed, and to implement sustainable treatment plant optimization programs, such as taking extraction pumps off line that are no longer necessary for contaminant plume capture.

Figure 2 presents the historical GHG production from the SBBGWTP. In March 2020, the SBBGWTP produced approximately 14,262 pounds of GHG, which includes approximately 1,600 pounds of GHG generated from GAC change out services averaged to a per month basis.

TABLE 4

Summary of Groundwater Analytical Data for March 2020 – South Base Boundary Groundwater Treatment Plant

Constituent	Instantaneous Maximum ^a (µg/L)	Detection Limit (µg/L)	N/C	2 March 2020 (µg/L)		
				Influent	Midpoint	Effluent ^b
Halogenated Volatile Organics						
Acetone	NA	1.9	0	ND	ND	ND
Bromodichloromethane	NA	0.17	0	ND	ND	ND
Chloroform	1.9	0.16	0	ND	0.17 J	0.17 J
Chloromethane	NA	0.30	0	ND	ND	ND
1,1-Dichloroethane	0.50	0.22	0	ND	ND	ND
1,2-Dichloroethane	0.50	0.13	1	ND	0.59 J	0.73 J
1,1-Dichloroethene	0.50	0.23	0	ND	ND	ND
cis-1,2-Dichloroethene	0.50	0.15	0	1.0	1.6	ND
trans-1,2-Dichloroethene	0.50	0.11	0	ND	ND	ND
Dichlorodifluoromethane	NA	0.31	0	ND	ND	ND
Tetrachloroethene	0.50	0.20	0	ND	ND	ND
1,1,1-Trichloroethane	0.50	0.16	0	ND	ND	ND
1,1,2-Trichloroethane	0.50	0.27	0	ND	ND	ND
Trichloroethene	0.65	0.16	0	13	6.8	ND
Vinyl Chloride	0.90	0.10	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	0.50	0.13	0	ND	ND	ND
Ethylbenzene	0.50	0.15	0	ND	ND	ND
Toluene	0.50	0.25	0	ND	ND	ND
Xylenes	0.50	0.10 – 0.18	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	10	0	ND	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	5.5	0	12 J	NM	ND
Total Petroleum Hydrocarbons – Motor Oil	100	32	0	ND	NM	ND

^a In accordance with current National Pollutant Discharge Elimination System permit number CAG912002, Order number R2-2017-0048.

^b Concentrations in **bold** exceeded discharge limits.

Notes:

J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant.

NA = not applicable

N/C = number of samples out of compliance with discharge limits.

ND = not detected

NM = not measured

µg/L = micrograms per liter

TABLE 5

Summary of Confirmation Groundwater Analytical Data for March 2020 – South Base Boundary Groundwater Treatment Plant

Constituent	Instantaneous Maximum ^a (µg/L)	Detection Limit (µg/L)	N/C	27 March 2020 (µg/L)		
				Effluent ^b	Upstream	Downstream
Halogenated Volatile Organics						
Acetone	NA	1.9	0	ND	6.8 J	ND
Bromodichloromethane	NA	0.17	0	ND	ND	ND
Chloroform	1.9	0.16	0	0.18 J	ND	ND
Chloromethane	NA	0.30	0	ND	ND	ND
1,1-Dichloroethane	0.50	0.22	0	ND	ND	ND
1,2-Dichloroethane	0.50	0.13	0	ND	ND	0.50 J
1,1-Dichloroethene	0.50	0.23	0	ND	ND	ND
cis-1,2-Dichloroethene	0.50	0.15	0	0.30 J	ND	0.18 J
trans-1,2-Dichloroethene	0.50	0.11	0	ND	ND	ND
Dichlorodifluoromethane	NA	0.31	0	ND	ND	ND
Tetrachloroethene	0.50	0.20	0	ND	ND	ND
1,1,1-Trichloroethane	0.50	0.16	0	ND	ND	ND
1,1,2-Trichloroethane	0.50	0.27	0	ND	ND	ND
Trichloroethene	0.65	0.16	0	ND	0.21 J	ND
Vinyl Chloride	0.90	0.10	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	0.50	0.13	0	ND	ND	ND
Ethylbenzene	0.50	0.15	0	ND	ND	ND
Toluene	0.50	0.25	0	ND	ND	ND
Xylenes	0.50	0.10 – 0.18	0	ND	ND	ND

^a In accordance with current National Pollutant Discharge Elimination System permit number CAG912002, Order number R2-2017-0048.

^b Concentrations in **bold** exceeded discharge limits.

Notes:

J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant.

NA = not applicable

N/C = number of samples out of compliance with discharge limits.

ND = not detected

µg/L = micrograms per liter

Figure 1
SBBGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History

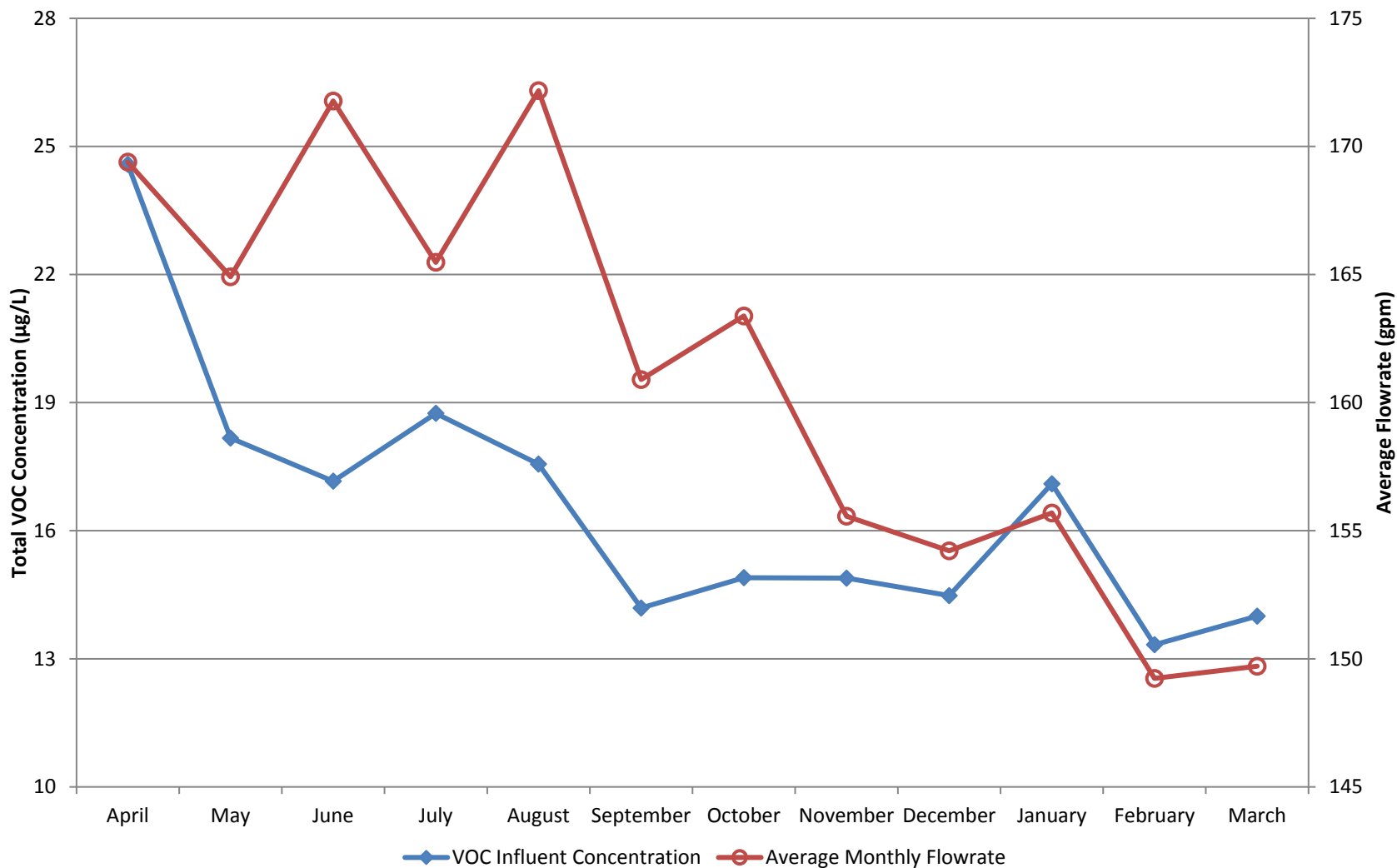
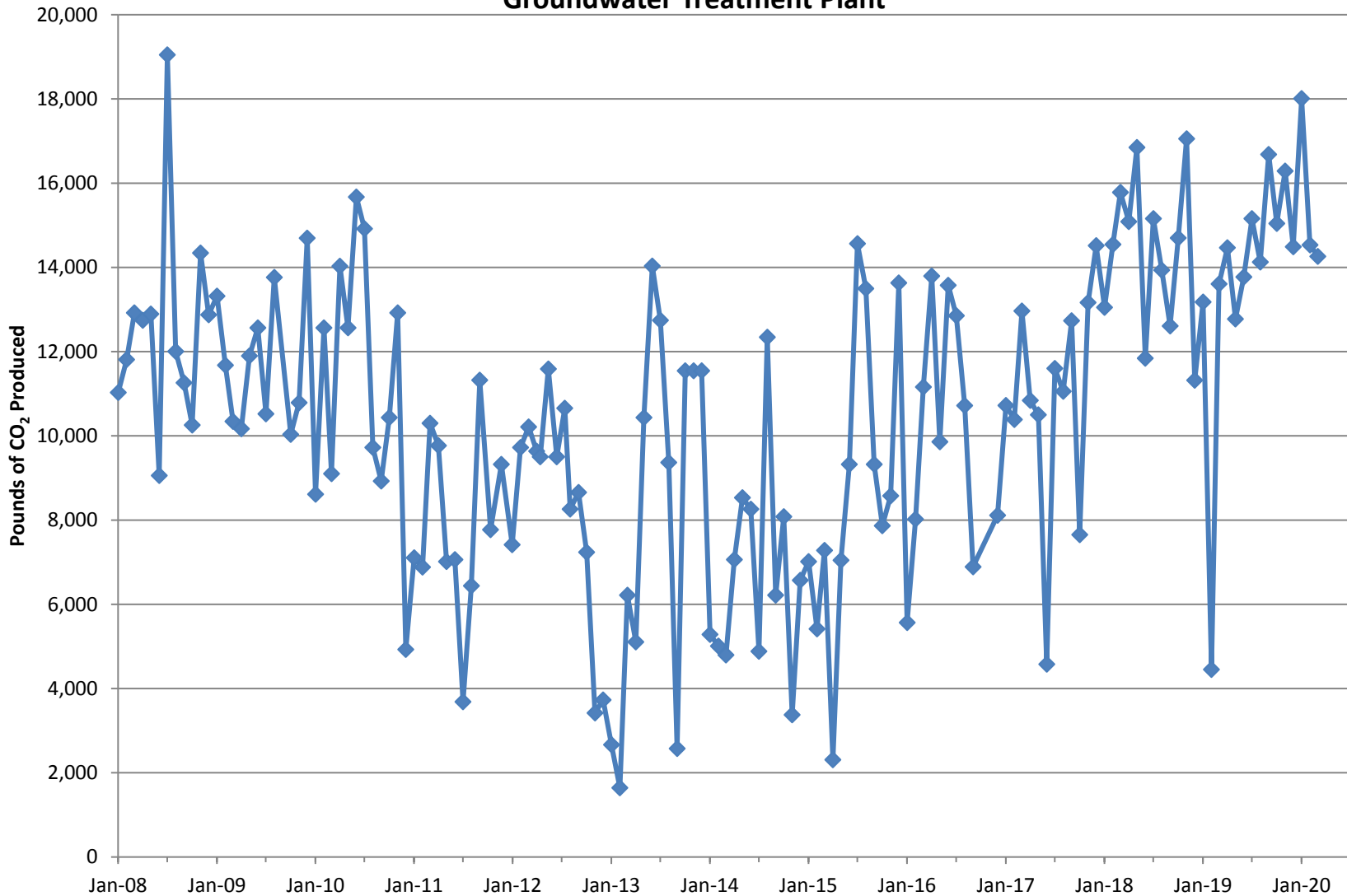


Figure 2

**Equivalent Pounds of Carbon Dioxide Produced by the South Base Boundary
Groundwater Treatment Plant**



Central Groundwater Treatment Plant Monthly Data Sheet

Report Number: 248

Reporting Period: 2 March 2020 – 1 April 2020

Date Submitted: 13 April 2020

This monthly data sheet presents information regarding the Central Groundwater Treatment Plant (CGWTP) and its associated technology demonstrations. The ongoing technology demonstrations related to the CGWTP include various emulsified vegetable oil (EVO) injections and two (2) bioreactor treatability studies.

System Metrics

Table 1 presents operational data from the March 2020 reporting period.

Table 1 – Operations Summary – March 2020			
Initial Data Collection:		3/2/2020 9:30	
Final Data Collection:		4/1/2020 9:30	
Operating Time:		Percent Uptime:	
CGWTP: 720 hours		CGWTP: 100%	
		Electrical Power Usage:	
		CGWTP: 2,380 kWh (2,649 lbs CO ₂ generated ^a)	
Gallons Treated (discharge to storm sewer):		Gallons Treated Since January 1996: 580.9 million gallons	
1,120,790 gallons			
VOC Mass Removed from groundwater:		VOC Mass Removed Since January 1996:	
2.45 lbs^b		2,858 lbs from groundwater	
		8,686 lbs from vapor	
Rolling 12-Month Cost per Pound of Mass Removed: \$2,655 ^c			
Monthly Cost per Pound of Mass Removed: \$2,750 ^c			
^a SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG. Value also includes approximately 888 pounds of GHG from GAC change out services averaged to a per month basis.			
^b Calculated using March 2020 EPA Method SW8260C analytical results.			
^c Costs include operations and maintenance, carbon change out, reporting, analytical laboratory, project management, and utility costs related to operation of the system.			

Table 2 presents individual extraction well flow rates during the monthly reporting period.

Table 2 – CGWTP Average Flow Rates ^a – March 2020	
Location	Average Flow Rate Groundwater (gpm)
EW001x16	11.8
EW002x16	7.0
EW003x16 ^b	0.5
EW605x16	5.3
EW610x16	1.7
CGWTP	25.9
^a Flow rates calculated by dividing total gallons processed by system operating time for the month or the average of the instantaneous readings.	
^b Extracted groundwater from EW003x16 is treated in Site SS016 bioreactor.	
gpm = gallons per minute	

Table 3 presents a summary of shutdowns during the monthly reporting period.

Table 3 – Summary of System Shutdowns					
Location	Shutdown^a		Restart		Cause
	Date	Time	Date	Time	
CGWTP	None.	--		--	
-- = Date/Time not recorded ^a Shutdown and restart times estimated based on field notes CGWTP = Central Groundwater Treatment Plant					

Summary of O&M Activities

Monthly groundwater treatment samples were collected at the CGWTP on 2 March 2020. Sample results are presented in Table 4. The total VOC concentration (262.07 µg/L) in the March 2020 influent sample has decreased from the February 2020 sample (279.69 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 210 µg/L. Carbon disulfide was detected at a trace concentration in the sample collected after the first carbon vessel. No VOCs were detected in the samples collected after the second carbon vessels or the effluent sample. TPH-d was detected in the effluent sample (12 J µg/L) at a concentration less than the effluent discharge limit of 50 µg/L. Travis AFB will continue to monitor influent, midpoint, and effluent concentrations at the CGWTP for carbon breakthrough, though the carbon treatment remained effective in March 2020.

Figure 1 presents a plot of influent concentrations (total VOCs) and the influent flow rate at the CGWTP versus time for the past twelve (12) months. The influent concentrations show a slightly increasing trend over the past 12 months along with a decreasing trend for the flow rate through the treatment plant.

The Site SS016 subgrade biogeochemical reactor (SBGR), also known as the bioreactor and the Site DP039 bioreactor, continued operating in March 2020.

Optimization Activities

No optimization activities occurred at the CGWTP in March 2020.

Sustainability

Travis AFB is committed to decreasing the amount of GHG produced directly (waste streams discharging GHG) or indirectly (GHG produced as related to electrical energy consumption) from all systems across Travis AFB. Travis AFB continues to optimize each treatment plant to reduce the amount of electrical energy consumed, and to implement sustainable treatment plant optimization programs, such as bioreactors and EVO injection well networks.

Figure 2 presents the historical GHG production from the systems associated with the CGWTP. The CGWTP produced approximately 2,649 pounds of GHG during March 2020.

TABLE 4
Summary of Groundwater Analytical Data for March 2020 – Central Groundwater Treatment Plant

				2 March 2020 (µg/L)			
Constituent	Instantaneous Maximum ^a (µg/L)	Detection Limit (µg/L)	N/C	Influent	After Carbon 1 Effluent	After Carbon 2 Effluent	System Effluent ^b
Halogenated Volatile Organics							
Acetone	NA	1.9 – 3.8	0	ND	ND	ND	ND
Bromomethane	NA	0.21 – 0.42	0	ND	ND	ND	ND
Carbon disulfide	NA	0.17	0	ND	0.23 J-	ND	ND
Chloroform	1.9	0.16 – 0.32	0	ND	ND	ND	ND
Chloromethane	NA	0.30 – 0.60	0	ND	ND	ND	ND
1,2-Dichlorobenzene	NA	0.15 – 0.30	0	0.37 J	ND	ND	ND
1,3-Dichlorobenzene	NA	0.13 – 0.26	0	0.46 J	ND	ND	ND
1,4-Dichlorobenzene	NA	0.16 – 0.32	0	0.21 J	ND	ND	ND
Bromodichloromethane	NA	0.17 – 0.34	0	ND	ND	ND	ND
1,1-Dichloroethane	0.50	0.22 – 0.44	0	ND	ND	ND	ND
1,2-Dichloroethane	0.50	0.13 – 0.26	0	ND	ND	ND	ND
1,1-Dichloroethene	0.50	0.23 – 0.46	0	0.57 J	ND	ND	ND
cis-1,2-Dichloroethene	0.50	0.15 – 0.30	0	47	ND	ND	ND
trans-1,2-Dichloroethene	0.50	0.15 – 0.30	0	2.9	ND	ND	ND
Tetrachloroethene	0.50	0.20 – 0.40	0	0.56 J	ND	ND	ND
1,1,1-Trichloroethane	0.50	0.16 – 0.32	0	ND	ND	ND	ND
1,1,2-Trichloroethane	0.50	0.27 – 0.54	0	ND	ND	ND	ND
Trichloroethene	0.65	0.16 – 0.32	0	210	ND	ND	ND
Vinyl Chloride	0.90	0.10 – 0.20	0	ND	ND	ND	ND
Non-Halogenated Volatile Organics							
Benzene	0.50	0.16 – 0.32	0	ND	ND	ND	ND
Ethylbenzene	0.50	0.16 – 0.32	0	ND	ND	ND	ND
Toluene	0.50	0.17 – 0.34	0	ND	ND	ND	ND
Total Xylenes	0.50	0.15 – 0.38	0	ND	ND	ND	ND
Other							
Total Petroleum Hydrocarbons – Gasoline (C6 – C10)	50	10	0	25 J+	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel (C10 – C28)	50	5.5	0	15 J	NM	NM	12 J
Total Petroleum Hydrocarbons – Motor Oil (C28 – C40)	100	32	0	ND	NM	NM	ND

^a In accordance with current National Pollutant Discharge Elimination System permit number CAG912002, Order number R2-2017-0048.

^b Concentrations in **bold** exceeded discharge limits

Notes:

J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant.

J+ = analyte concentration is considered a biased high estimated value.

J- = analyte concentration is considered a biased low estimated value.

NA = not applicable

NM = not measured

N/C = number of samples out of compliance with discharge limits.

µg/L = micrograms per liter

ND = not detected

Figure 1

CGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History

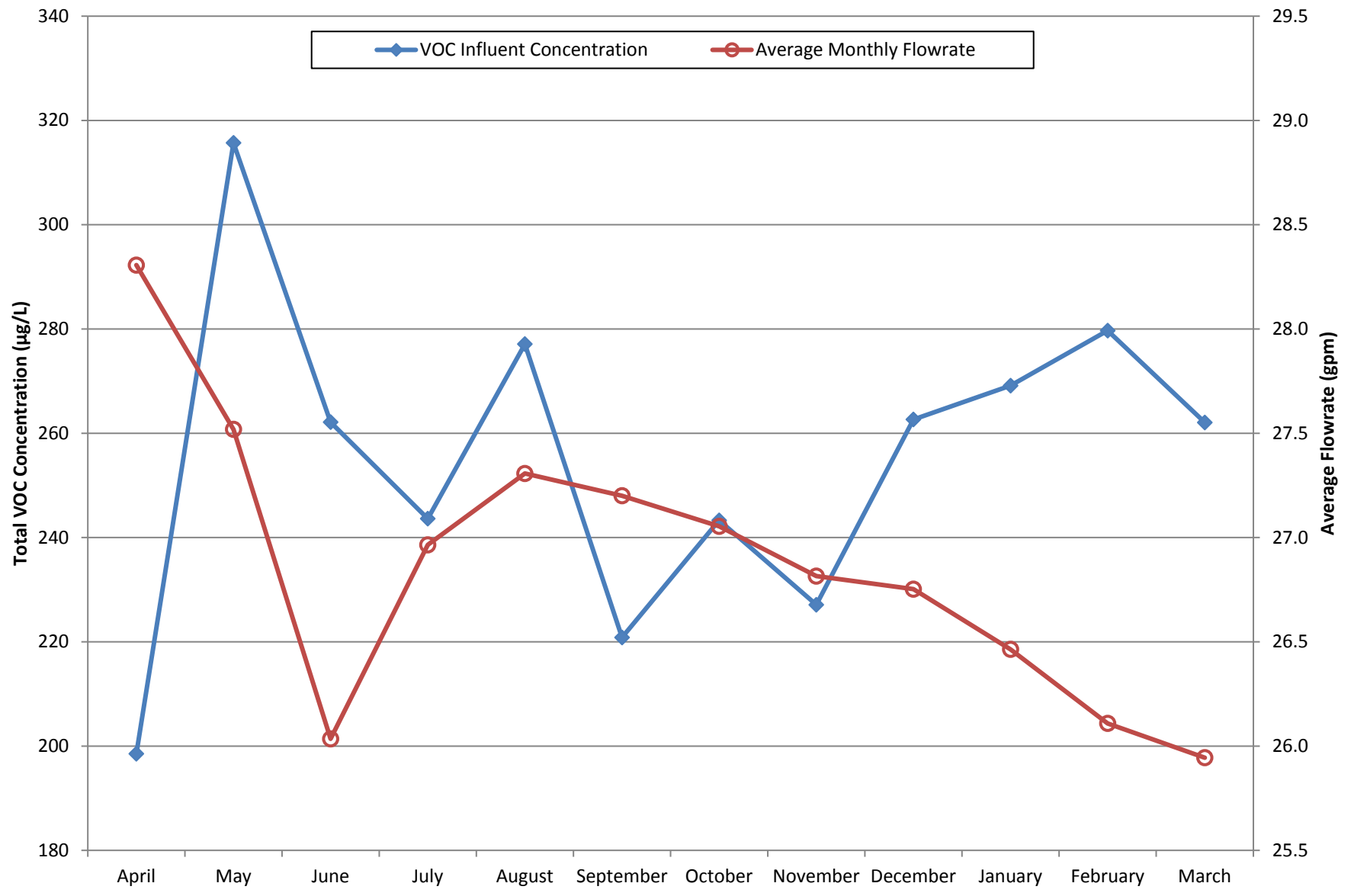
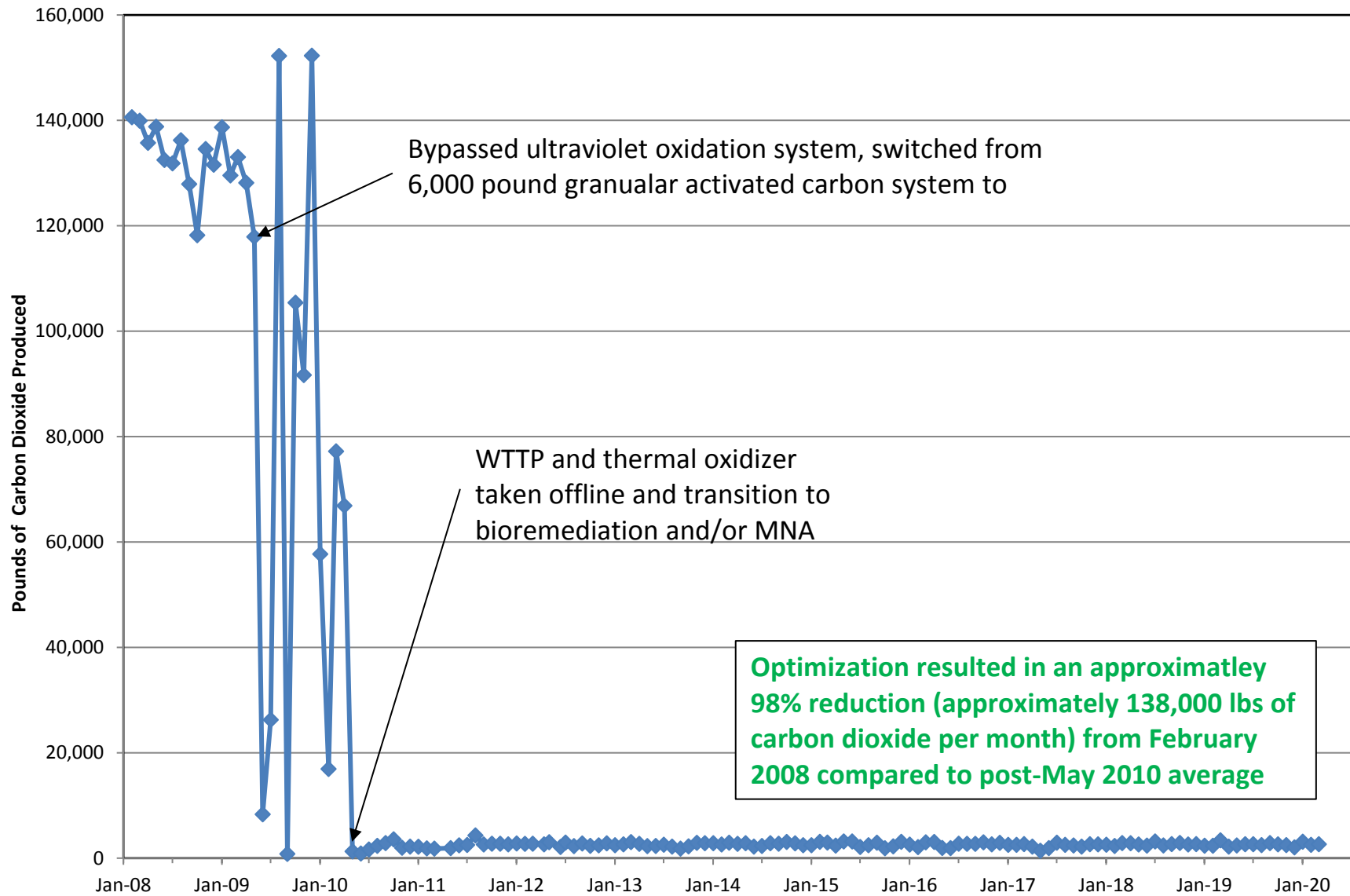


Figure 2

Equivalent Pounds of Carbon Dioxide Produced by the Central Groundwater Treatment Plant



Subarea LF007C Groundwater Treatment Plant

Monthly Data Sheet

Report Number: 187

Reporting Period: 2 March 2020 – 1 April 2020

Date Submitted: 13 April 2020

This monthly data sheet presents information regarding the Subarea LF007C Groundwater Treatment Plant (LF007C GWTP) and associated remedial process optimization (RPO) activities.

System Metrics

Table 1 presents operational data from the March 2020 reporting period:

Table 1 – Operations Summary – March 2020			
Initial Data Collection:		3/2/2020 10:45	Final Data Collection: 4/1/2020 10:30
Operating Time:		Percent Uptime:	Electrical Power Usage ^a :
LF007C GWTP:	720 hours	LF007C GWTP	100% LF007C GWTP: 0 kWh
Gallons Treated: 165,583 gallons		Gallons Treated Since March 2000: 90.0 million gallons	
Volume Discharged to Duck Pond: 165,583 gallons			
VOC Mass Removed: 1.2 x 10 ⁻³ pounds ^b		VOC Mass Removed Since March 2000: 174.4 pounds (Groundwater)	
Rolling 12-Month Cost per Pound of Mass Removed: Not Measured ^c			
Monthly Cost per Pound of Mass Removed: Not Measured ^c			
^a The LF007C GWTP operates on solar power only.			
^b VOCs from March 2020 influent sample detected by EPA Method SW8260C.			
^c Value not calculated since measurement does not accurately represent the cost effectiveness of the system.			

Table 2 presents individual extraction well flow rates during the monthly reporting period.

Table 2 – LF007C GWTP Average and Total Flow Rates – March 2020		
Location	Average Flow Rate (gpm) ^a	Total Gallons Processed (gallons)
EW614x07	3.6	156,212 ^b
EW615x07	0.3	13,896
LF007C GWTP	3.8	165,583
^a Flow rates calculated by dividing total gallons processed by system operating time for the month or the average of the instantaneous readings.		
^b The extraction pump takes in air from the subsurface, which alters the flow and totalizer. An air-release valve was installed on 12 November 2019 to help minimize the effects on the system.		
gpm = gallons per minute		

Table 3 presents a summary of shutdowns during the monthly reporting period.

Table 3 – Summary of System Shutdowns					
Location	Shutdown ^a		Restart ^a		Cause
	Date	Time	Date	Time	
LF007C GWTP	None.	--		--	
-- = Time not recorded ^a Shutdown and restart times estimated based on field notes LF007C GWTP = Subarea LF007C Groundwater Treatment Plant					

Summary of O&M Activities

Monthly groundwater samples were collected at the LF007C GWTP on 2 March 2020. Sample results are presented in Table 4. The total VOC concentration in the March 2020 influent sample was 0.84 J µg/L. TCE was the only VOC detected at the influent sample location. No other VOCs were detected in the midpoint and effluent sample locations. In addition, TPH-d was detected in the effluent sample location at a concentration of 24 µg/L, which is less than the effluent limitation.

Figure 1 presents a chart of influent concentrations (total VOCs) at the LF007C GWTP versus time for the past twelve (12) months. VOC concentrations, primarily TCE, have been seasonally variable; however, over the last 12 months the trend has been increasing. The average flow rate through the LF007C GWTP has decreased over the last 12 months.

Optimization Activities

No optimization activities occurred at the LF007C GWTP in March 2020.

Sustainability

Travis AFB is committed to decreasing the amount of GHG produced directly (waste streams discharging GHG) or indirectly (GHG produced as related to electrical energy consumption) from all systems across Travis AFB. Travis AFB continues to optimize each treatment plant to reduce the amount of electrical energy consumed, and to implement sustainable treatment plant optimization programs, such as the solar arrays employed to power the system.

Figure 2 presents the historical GHG production from the systems associated with the NGWTP and LF007C GWTP. The LF007C GWTP is a solar-only operated treatment system and does not generate GHG, with exception of a small amount of GHG generated from changing out the GAC averaged to a per month basis.

TABLE 4

Summary of Groundwater Analytical Data for March 2020 – Subarea LF007C Groundwater Treatment Plant

Constituent	Instantaneous Maximum ^a (µg/L)	Detection Limit (µg/L)	N/C	2 March 2020 (µg/L)		
				Influent	After Carbon 1	Effluent ^b
Halogenated Volatile Organics						
Acetone	NA	2.1	0	ND	ND	ND
Bromodichloromethane	5.0	0.29	0	ND	ND	ND
Bromoform	5.0	0.10	0	ND	ND	ND
2-Butanone	5.0	0.35	0	ND	ND	ND
Carbon Tetrachloride	0.5	0.15	0	ND	ND	ND
Chloroform	5.0	0.12	0	ND	ND	ND
Chloromethane	NA	0.30	0	ND	ND	ND
Dibromochloromethane	5.0	0.13	0	ND	ND	ND
Dichlorodifluoromethane	NA	0.31	0	ND	ND	ND
1,3-Dichlorobenzene	5.0	0.11	0	ND	ND	ND
1,4-Dichlorobenzene	5.0	0.13	0	ND	ND	ND
1,1-Dichloroethane	5.0	0.15	0	ND	ND	ND
1,2-Dichloroethane	0.5	0.22	0	ND	ND	ND
1,1-Dichloroethene	5.0	0.14	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.10	0	ND	ND	ND
trans-1,2-Dichloroethene	5.0	0.11	0	ND	ND	ND
Methylene Chloride	5.0	0.35	0	ND	ND	ND
Tetrachloroethene	5.0	0.15	0	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.19	0	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.31	0	ND	ND	ND
Trichloroethene	5.0	0.13	0	0.84 J	ND	ND
Vinyl Chloride	0.5	0.22	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	1.0	0.13	0	ND	ND	ND
Ethylbenzene	5.0	0.15	0	ND	ND	ND
Toluene	5.0	0.25	0	ND	ND	ND
Xylenes	5.0	0.10 – 0.18	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	10	0	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	5.5	0	60	NM	24
Total Petroleum Hydrocarbons – Motor Oil	100	32	0	48 J	NM	ND

^a In accordance with current National Pollutant Discharge Elimination System permit number CAG912002, Order number R2-2017-0048.^b Concentrations in **bold** exceeded discharge limits

Notes:

J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant.

NA = not applicable

N/C = number of samples out of compliance with discharge limits.

ND = not detected

NM = not measured

µg/L = micrograms per liter

Figure 1

LF007CGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History

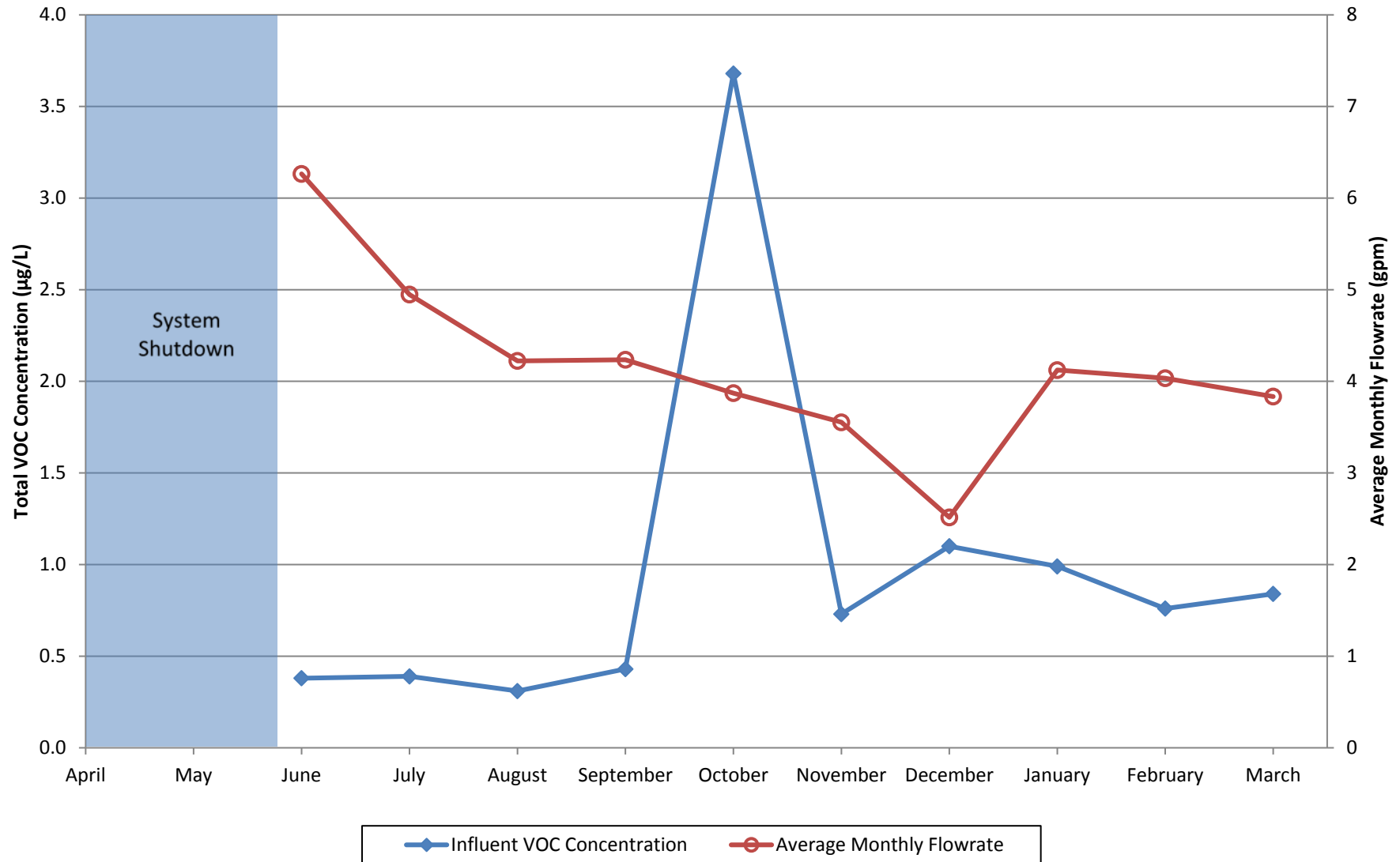
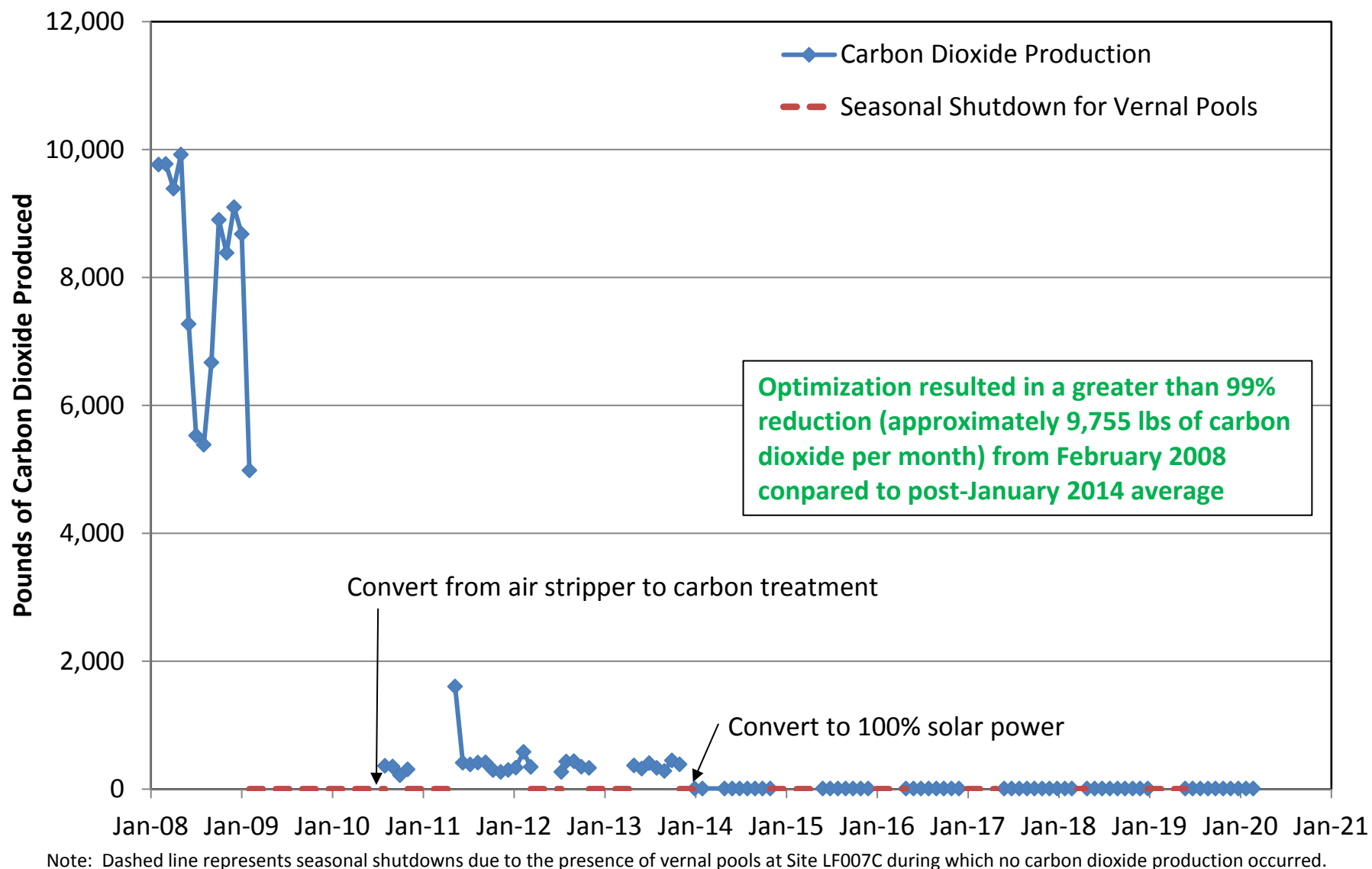


Figure 2
Equivalent Pounds of Carbon Dioxide Produced by the NGWTP/LF007C GWTP



Site ST018 Groundwater Treatment Plant

Monthly Data Sheet

Report Number: 109

Reporting Period: 2 March 2020 – 1 April 2020

Date Submitted: 13 April 2020

This monthly data sheet presents information regarding the Site ST018 Groundwater Treatment Plant (ST018GWTP).

System Metrics

Table 1 presents operation data from the March 2020 reporting period.

Table 1 – Operations Summary – March 2020			
Initial Data Collection: 3/2/2020 10:10		Final Data Collection: 4/1/2020 11:15	
Operating Time:		Percent Uptime:	
ST018GWTP: 721 hours		ST018GWTP: 100%	
		ST018GWTP: 76 kWh (56 lbs CO ₂ generated ^a)	
Gallons Extracted: 139,760 gallons		Gallons Extracted Since March 2011: 18.9 million gallons	
Volume Discharged to Sanitary Sewer: 139,760 gallons		Final Totalizer Reading: 18,887,789 gallons	
Cumulative Volume Discharged to Sanitary Sewer since 1 November 2014: 12.4 million gallons			
MTBE, BTEX, VOC, TPH Mass Removed: 0.10 lbs^b		MTBE, BTEX, VOC, TPH Mass Removed Since March 2011: 49.1 lbs	
MTBE (Only) Removed: 0.02 lbs^b		MTBE (Only) Mass Removed Since March 2011: 12.0 lbs	
Rolling 12-Month Cost per Total Pounds of Mass Removed: \$32,377 ^{bc}			
Monthly Cost per Pound of Mass Removed: \$68,571 ^{bc}			
^a SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG.			
^b Calculated using March 2020 EPA Method SW8260C and SW8015B analytical results.			
^c Costs include operations and maintenance, reporting, analytical laboratory, project management, and utility costs related to operation of the system.			
kWh = kilowatt hour			
lbs = pounds			

Table 2 presents individual extraction well flow rates along with the average system flow during the monthly reporting period.

Table 2 – ST018GWTP Average Flow Rates – March 2020		
Location	Average Flow Rate Groundwater (gpm)^a	Hours of Operation
EW2014x18	1.7	721
EW2016x18	0.3	721
EW2019x18	0.0	Offline ^b
EW2333x18	2.3	721
ST018GWTP	3.3	721
^a Flow rates calculated by dividing total gallons processed by amount of operating time of the pump/system. ^b Extraction well was turned off because of low MTBE concentrations with regulatory approval on 25 November 2019. gpm = gallons per minute ST018GWTP = Site ST018 Groundwater Treatment Plant		

Table 3 presents a summary of shutdowns during the monthly reporting period.

Table 3 – Summary of System Shutdowns					
Location	Shutdown^a		Restart^a		Cause
	Date	Time	Date	Time	
CGWTP	None.	--		--	
-- = Time not recorded ^a Shutdown and restart times estimated based on field notes ST018GWTP = Site ST018 Groundwater Treatment Plant					

Summary of O&M Activities

Monthly groundwater discharge samples were collected at the ST018GWTP on 2 and 27 March 2020. The second effluent sample was collected on 27 March 2020 because the original sample on 2 March was not received correctly by the laboratory. Its holding time had expired, so another sample was collected.

Because the extracted groundwater is no longer treated with carbon prior to discharge to the sanitary sewer, only discharge samples are now collected, rather than influent and effluent samples. Results are presented in Table 4. The complete March 2020 laboratory data report is available upon request. The MTBE discharge concentration during the March 2020 sampling event was 20 µg/L, which is an increase from the February 2020 sample result of 10 µg/L. A number of other fuel-related constituents were also detected in the system discharge sample and are listed in Table 4.

The Fairfield-Suisun Sewer District does not currently have a discharge limit for MTBE, but a limit of 6,400 µg/L is advised based on worker health and safety. Travis AFB will continue to monitor discharge contaminant concentrations to maintain compliance with the Fairfield-Suisun Sewer District discharge permit.

Figure 1 presents plots of the average flow rate and total extracted contaminant (MTBE, TPH-g, TPH-d, TPH-mo, BTEX, and VOCs) and extracted MTBE concentrations at the ST018GWTP over the past twelve (12) months. The average flow rate through the ST018GWTP has been cyclical with typical flow rates decreasing during the dry season (summer and fall) and increasing during the rainy season (winter and spring). The

overall average flow rates in the past 12 months show a decreasing trend, which is partially attributed to the shutdown of EW2019x18 in November 2019. The extracted MTBE concentrations and extracted total concentrations have generally been fluctuating over the past 12 months with an overall stable flat trend and slightly decreasing trend, respectively.

Optimization Activities

No optimization activities occurred at the ST018GWTP in March 2020.

Sustainability

Travis AFB is committed to decreasing the amount of GHG produced directly (waste streams discharging GHG) or indirectly (GHG produced as related to electrical energy consumption) from all systems across Travis AFB. Travis AFB continues to optimize each treatment plant to reduce the amount of electrical energy consumed, and to implement sustainable treatment plant optimization programs, such as the solar arrays employed to power a majority of the ST018GWTP system.

Figure 2 presents the historical GHG production from the ST018GWTP. The ST018GWTP produced 56 pounds of GHG during March 2020 and removed 139,760 gallons of water. The amount of GHG produced is directly attributed to the amount of water removed through the system because the only line-power electrical use is for a transfer pump to push the water from the system to the sanitary sewer.

TABLE 4

Summary of Groundwater Analytical Data for March 2020 – Site ST018 Groundwater Treatment Plant

Summary of Groundwater Analytical Data for March 2020				
Site 07019 Groundwater Treatment Plant			27 March 2020	
Constituent	Instantaneous Maximum ^a (µg/L)	Detection Limit (µg/L)	N/C	(µg/L)
				System Discharge ^b
Fuel Related Constituents				
Methyl tert-Butyl Ether	6,400	0.25	0	20
Benzene	25,000 ^c	0.16	0	0.54 J
Ethylbenzene	25,000 ^c	0.16	0	ND
Toluene	25,000 ^c	0.17	0	ND
Total Xylenes	25,000 ^c	0.19 – 0.34	0	ND
Total Petroleum Hydrocarbons – Gasoline	50,000 ^d	10	0	13 J
Total Petroleum Hydrocarbons – Diesel	50,000 ^d	15	0	48 ^e
Total Petroleum Hydrocarbons – Motor Oil	100,000	160	0	ND ^e
Other				
Acetone	NA	1.9	0	ND
1,2-Dichloroethane	20	0.13	0	0.73 J
Isopropylbenzene	NA	0.19	0	ND
Naphthalene	NA	0.22	0	ND
N-Propylbenzene	NA	0.16	0	ND

^a In accordance with the Fairfield-Suisun Sewer District Discharge Limitations^b Concentrations in **bold** exceeded discharge limits^c The limit of 25,000 µg/L is a combined limit for BTEX.^d The limit of 50,000 µg/L is a combined limit for TPH-g and TPH-d.^e Sample collected on 2 March 2020

µg/L = micrograms per liter

J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant.

NA = not applicable

N/C = number of samples out of compliance with discharge limits.

ND = not detected above method detection limit.

Figure 1
ST018GWTP Total VOC and MTBE Concentrations
and Average Flowrate Twelve Month History

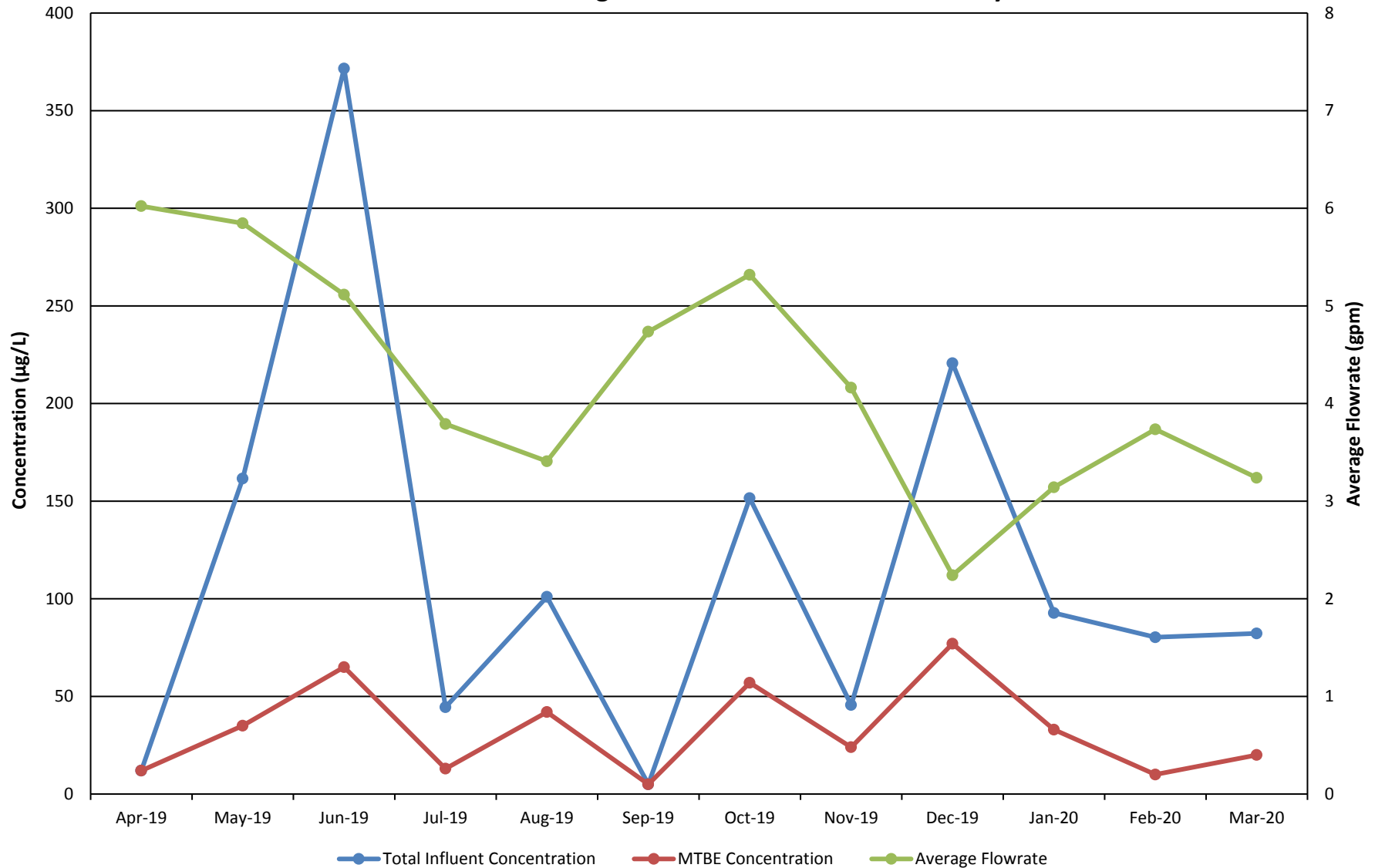
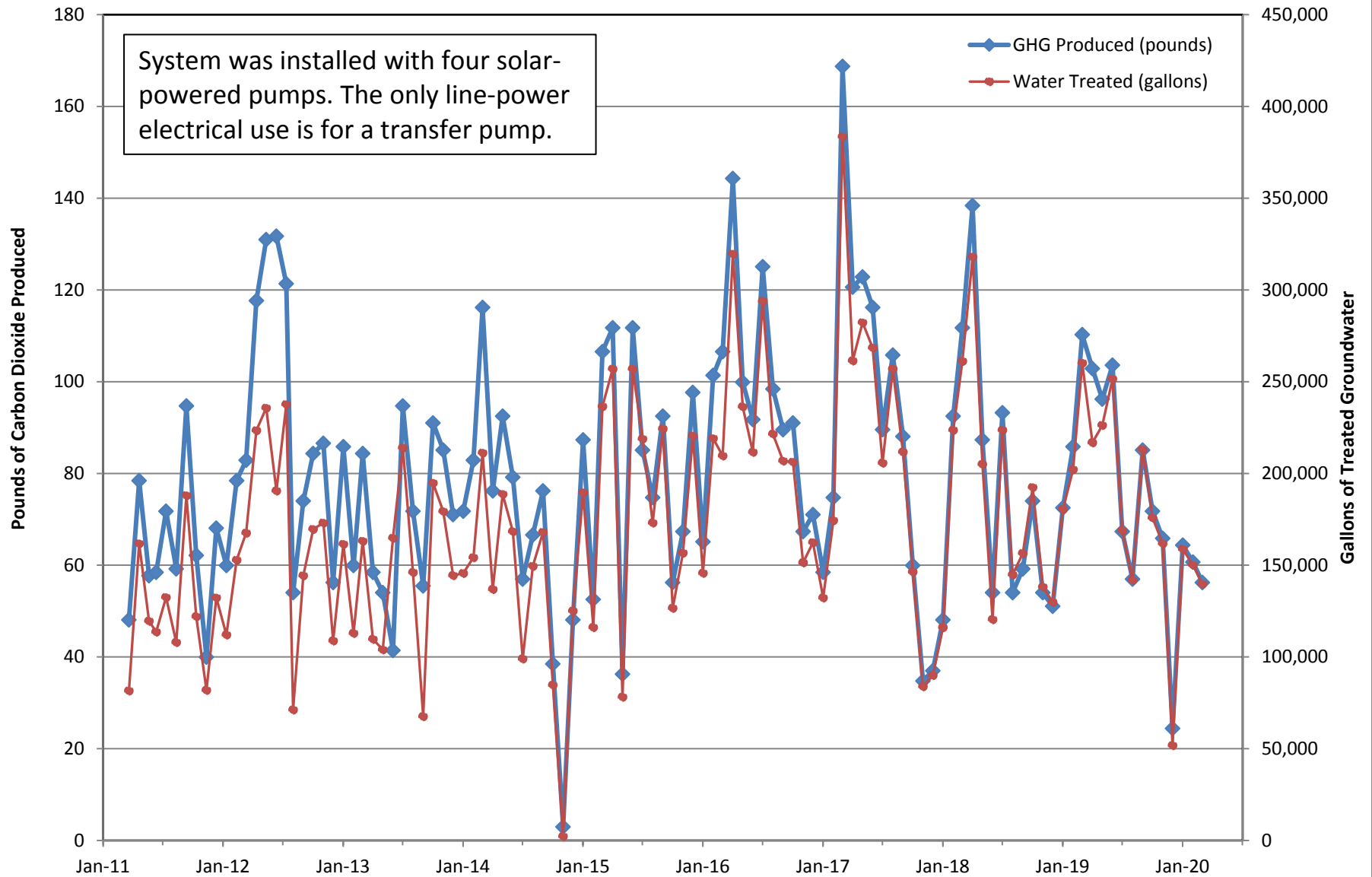


Figure 2

Equivalent Pounds of Carbon Dioxide Produced by the Site ST018 Groundwater Treatment Plant



Travis AFB Restoration Program

Program Update

RPM Meeting April 16, 2020

Completed Documents (1)

- Vapor Intrusion Assessment Update Technical Memorandum
- 2012 CAMU Annual Report
- Old Skeet Range Action Memorandum
- 3rd Five-Year Review
- 2012 Annual Groundwater Remediation Implementation Status Report (GRISR)
- Subarea LF007C and Site SS030 Remedial Process Optimization Work Plan
- Pre-Design Site Characterization of SS029 Report
- Old Skeet Range Removal Action Work Plan
- 2013 CAMU Inspection Annual Report
- Groundwater Record of Decision (ROD)
- CG508 POCO Work Plan
- 2013 Annual GRISR
- FT004 Technology Demonstration Work Plan
- Kinder Morgan LF044 Land Use Control Report
- SD031 Technology Demonstration Work Plan
- TA500 Data Gap Investigation Work Plan
- ST018 POCO Work Plan Addendum
- SD037 GW RD/RA Work Plan
- Travis AFB UFP-QAPP
- DP039 Lead Excavation Technical Memo

Completed Documents (2)

- Proposed Plan for ROD Amendment to WABOU Soil ROD
- Proposed Plan for ROD Amendment to NEWIOU Soil, Sediment, & Surface Water ROD
- SD034 Data Gap Investigation Work Plan
- POCO Investigation Work Plan for Oil-Water Separators
- ST032 POCO Soil Excavation Work Plan
- SD036 GW RD/RA Work Plan
- SS016 GW RD/RA Work Plan
- SS015 GW RD/RA Work Plan
- FT005 Technology Demonstration Work Plan
- 2014 Annual CAMU Monitoring Report
- Old Skeet Range PAH Delineation Report
- ST028 POCO Work Plan
- SS014 POCO TD Work Plan
- CG508 Site Investigation/Site Closure Request Report
- 2014 Annual CAMU Monitoring Report
- DP039 GW RD/RA Work Plan
- SD031 TDCCR
- ST018 POCO CCR
- Site SS030 Groundwater RA CCR
- Sites SD036 and SD037 Groundwater RACCR
- Site SS016 Groundwater RACCR
- Site SS015 Groundwater RACCR
- 2014 Annual GRISR
- Site CG508 Well Decommissioning Work Plan

Completed Documents (3)

- Data Gap Investigation TM for Soil Sites SD033, SD043, & SS046
- Site FT004 Technology Demonstration Construction Completion Report
- Site SD031 Soil Remedial Investigation Work Plan
- Corrective Action Plan for DERA-Funded Oil Water Separators
- Site ST032 POCO Completion Report
- Site ST028 POCO Completion Report
- 2015 Annual CAMU Monitoring Report
- Site SD031 Remedial Investigation Work Plan
- Site SD034 Technology Demonstration Work Plan
- Site SS016 Soil Data Gaps Investigation Work Plan
- Multi-Site Bioaugmentation Technology Demonstration Work Plan
- Sites ST028 and ST032 POCO Well Decommissioning Work Plan
- Site TS060 Action Memorandum
- 2015 Annual GRISR
- FT005 Technology Demonstration Construction Completion Report
- Site CG508 POCO Well Decommissioning and Site Closeout Technical Memorandum
- Site DP039 Remedial Action Construction Completion Report
- ST028 POCO Well Decommissioning/Site Closeout Technical Memorandum
- Site TS060 Removal Action Work Plan

Completed Documents (4)

- Multisite Technology Demonstration Construction Completion Report
- SS014 POCO Technology Demonstration Construction Completion Report
- Site LF044 Investigation Work Plan
- Site FT004 POCO Soil Data Gap Investigation Work Plan
- SD034 Technology Demonstration Construction Completion Report
- POCO Evaluation/Closeout Report for DERA-funded oil/water separators OW051, OW053, and OW054
- ST032 POCO Well Decommissioning and Site Closeout Technical Memorandum
- 2016 Annual CAMU Monitoring Report
- Work Plan for Fourth Five-year Review
- 2016 Annual GRISR
- Data Gap Investigation Results, Technical Memorandum for Soil, Sites SD033, SD043, SS046
- TS060 Removal Action Completion Report
- SS035 Site Closure Report
- AOC TA500 Data Gaps Investigation and Closure Report
- Site TS060 No Further Action Proposed Plan
- POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW050, OW052, OW055, OW056, and OW057

Completed Documents (5)

- Data Gap Investigation Results, Technical Memorandum for Soil Site SS016
- LF006, SS030, SD031 Aquifer Test Activities Technical Memorandum
- SS015 Soil Sampling Plan
- Monitoring Well Installation Tech Memo for Site DP039, Addendum to the RACCR
- FT005 Extraction System Optimization Tech Memo
- 2017 Annual CAMU Monitoring Report
- LF044 Sediment Sampling Report
- SD043 RD/RA Work Plan
- SS046 RD/RA Work Plan
- Amendment to the WABOU Soil ROD for sites DP039, SD043, and SS046
- EVO Sites FT004, SS015, SD031, & SD036 Optimization Injections Tech Memo
- LF006 Technology Demonstration Work Plan
- AOC TA500 Well Decommissioning and Site Closeout Tech Memo
- SS015 Soil Sampling Results Tech Memo
- LF006 Technology Demonstration Construction Completion Report
- Subarea LF007C TPH Chromatogram Review TM
- 2017 Annual GRISR
- SS014 POCO Subsites 2, 4, and 5 Closure Evaluation Report
- Addendum to the Site SS016 Groundwater RD/RA Work Plan

Completed Documents (6)

- SD043 Remedial Action Completion Report
- NFA ROD for Old Skeet Range (TS060/TS060A MRA)
- 2018 Annual GRISR
- SS046 Remedial Action Completion Report and Well Decommissioning Work Plan
- 2018 LF007 CAMU Inspection, Monitoring, and Maintenance Report
- Amendment to the NEWIOU Soil ROD for Sites SS016 and SD033
- SS016 RD/RA Work Plan
- 4th Five Year Review Report for Multiple Groundwater, Soil, and Sediment Sites
- SD043 Site Closure Report
- SS046 Well Decommissioning and Site Closeout Tech Memo
- LF008 Remedial Action Evaluation Report

Completed Field Work (1)

- Replace battery banks at ST018 Groundwater Treatment Plant
- Annual Groundwater Remediation Implementation Program (GRIP) Sampling event
- Well Decommissioning (9 Wells)
- Electrical repairs to FT005 extraction system (well EW01x05)
- Electrical repairs to Site SS029 extraction system
- Site ST018 carbon vessels upgrade
- 2014 GRIP Semiannual Sampling Event
- Pump repairs to Site SS016 well (EW610x16)
- Subsite LF007C optimization upgrades
- 2014 Annual GRIP Sampling Event
- Biological Resource Assessment
- Site CG508 Site Investigation
- Old Skeet Range Characterization Sampling
- 4Q Semiannual GRIP Sampling Event
- SD031 Technology Demonstration Well Installation
- SD037 Well Installation
- SD031 Trench/Conveyance/Power Installation
- SD031 EVO Injection
- ST018 Well Installation
- SS015 Well Installation
- SS016 Well Installation
- Well Development (SD036, SD037)
- ST018 Trench/Conveyance/Power Installation
- SD036 EVO Injection
- Well Development (SS015, SS016)
- Baseline Sampling (SS015, SS016)
- SS014 Data Gap Investigation
- SS016 EVO Injection
- TA500 Data Gaps Investigation

Completed Field Work (2)

- 2015 Annual GRIP Sampling
- SD037 EVO Injection
- SD034 Data Gaps Investigation
- SS015 EVO Injection
- FT005 Injection Well Installation
- OWS 47, 48, 49 Site Investigations
- SS030 Trench/Conveyance/Power Installation
- FT005 Trench Installation
- FT005 Well Development
- FT004 Well Installation, Well Development, Baseline Sampling
- FT005 Baseline Sampling
- DP039 Well Installation, Well Development, Baseline Sampling
- FT004 EVO Injection
- FT004 Trench/Conveyance/Power Installation
- DP039 Infiltration Trench Installation
- TA500 Groundwater Sampling
- FT005 EVO Injection
- 2016 Q2 GRIP Sampling
- Data Gap Inv. for Soil Sites (SD043, SS046)
- SD031 Remedial Investigation Step-out Sampling (2nd round)
- DP039 EVO Injection
- CG508 Well Decommissioning
- SD033 Soil Sampling
- Multi-site Bioaugmentation Well Installation
- SD034 Technology Demonstration Well Installation
- SS014 Bioreactor Installation
- ST028 & ST032 Well Decommissioning

Completed Field Work (3)

- SS016 Soil Data Gaps Investigation
- SD031 Remedial Investigation Soil Sampling (3rd round)
- Oil Water Separators Step-out Drilling
- OW055 Close-in-place
- Q4 2016 GRIP Sampling
- OW040 Soil Excavation/Surface Restoration
- OW057 Soil Excavation/Surface Restoration
- Multi-site Bioaugmentation & EVO Injection
- SD034 Technology Demonstration Bioreactor Installation
- OW050 Soil Sampling at Former Location of OWS
- OW055 Sidewalk Repairs
- SD031 Finish Soil Delineation (NE portion of site)
- Q2 2017 GRIP Sampling Event
- SS015 Optimization: Injection Well Installation
- DP039 Down-gradient Monitoring Well Installation (1st round)
- SD036 Optimization: Injection Well Installation
- SD031 Optimization: Injection Well Installation
- OW056 Site Excavation/Closure
- Well Re-development
- TS060 Removal Action

Completed Field Work (4)

- FT004 POCO Soil Data Gaps Investigation
- LF044 Sediment Sampling
- FT004 EVO Optimization
- DP039 Install downgradient monitoring wells (2nd round)
- FT005 – Install Extraction Wells
- DP039 Repair SBGR distribution headers
- Q4 2017 GRIP Sampling
- SD036 EVO Optimization
- SS015 EVO Optimization
- SD031 EVO Optimization
- FT005 Installation of Pumps and Controls in 5 New Extraction Wells
- Q1 2018 GRIP Sampling
- SD037 EVO reinjection
- Q2 2018 GRIP Sampling
- SS015 Soil sampling
- TA500 Well Decommissioning
- FT005 EVO injection
- FT004 POCO Soil Investigation
- 3Q 2018 GRIP Sampling
- LF006 Well Installations and Injections
- 4Q 2018 GRIP Sampling
- SD043 Soil excavation
- 1Q 2019 GRIP Sampling
- 2019 Annual LUC Inspections
- SS046 Soil excavation
- 2Q 2019 GRIP Sampling Event
- Well Re-development (11 wells)
- SD037 Injection Well Installation
- SS046 Well Decommissioning

Completed Field Work (5)

- 3rd Quarter 2019 GRIP Sampling
- SD034 O₂ Enhancement
- SS016 SBGR Repairs
- SD037 EVO Re-injection
- 4th Quarter 2019 GRIP Sampling
- SD031B POCO Additional Investigation (Gore Sorber Round 1)
- SD043 Well and GETS Decommissioning
- SS016 Soil excavation
- SS015 SPOC system installation
- SD031B POCO Additional Investigation (Gore Sorber Round 2)
- ***Annual CAMU Gas Monitoring***

Documents In-Progress

CERCLA

- Community Relations Plan Update (revised draft)
- SD031 Soil RI/FS
- Initial Passive Vent Systems Sampling Work Plan Tech Memo
- ***Optimization Activities Tech Memo for SD034 and SD037***

POCO

- SD031B POCO Additional Site Investigation Work Plan

Field Work In-Progress

CERCLA

None

POCO

None

Documents Planned

CERCLA

- SD043 Well Decommissioning and Site Closeout
Tech Memo May
- 2019 GRISR June
- ***SS016 RACR (Soil)*** ***TBD***
- ***2019 CAMU Monitoring Report*** ***TBD***

POCO

- FT004 POCO Corrective Action Plan May

Field Work Planned

CERCLA

- ***SS015 SPOC Sampling*** ***Apr***
- 2Q20 GRIP Sampling ***May***
- ***LF008 Well Decommissioning*** ***Jul***
- Passive Vent Systems Sampling ***Aug***
- ***SD036 MW Installation*** ***Aug***
- ***DP039 Bioreactor Rejuvenation*** ***Apr***
- ***DP039 Phytoremediation Trench extension*** ***Jul***

POCO

- ***FT004 Soil Excavation*** ***June***
- ***SD031B Phase 2 Soil, Vapor, & Groundwater Sampling*** ***June***

Note: Contact Lonnie Duke if you
would like to observe planned field
work events

Petroleum Technology Demonstration Projects (1)

- SS014: Recycled Drywall Subgrade Biogeochemical Reactor (SBGR)
 - Evaluate the effectiveness of sulfate (gypsum from crushed drywall) to enhance anaerobic biodegradation of petroleum in groundwater
 - Installation was completed November 2016
 - Results through ~2.5 years
 - TPH-G: 99% reduction in source area (1,900 to <25 mg/L [non-detect])
 - TPH-D: 99% reduction in source area (5,500 to 76 mg/L)
 - Benzene: 99% reduction in source area (90 to <0.4 mg/L [non-detect])
 - Plume as a whole continues to shrink, so this TD has been quite successful

No new data since the last update

SBGR = Subgrade Biogeochemical Reactor

Updates in Green Font

Petroleum Technology Demonstration Projects (2)

- SD034: Aerobic “Washboard” Subgrade Biogeochemical Reactor (SBGR)
 - Installed six (6) SBGR trenches in November 2016 to evaluate the effectiveness of an oxygen-enhanced aerobic SBGR on reducing TPH as diesel (TPH-D) in groundwater
 - Below SBGR trench (MW811x34/PZSSAx34)
 - TPH-D baseline of 9,600 ug/L decreased to 90 ug/L at 2.5 years in May 2019 and 77 ug/L by October 2019). Concentration fluctuations are to be expected as higher concentration areas are flushed as part of the washboard effect. Recently completed enhancements to the SBGR trenches to maintain treatment efficiency.)
 - TPH-MO baseline of 2,300 ug/L decreased to non-detect at 2 years and remained non-detect at through latest sampling event in October 2019
 - Plume hot spot monitoring well (MW02x34)
 - TPH-D baseline of 8,300 ug/L decreased to 5,500 ug/L at 2.5 years in May 2019, 430 ug/L in August 2019, and 4,300 ug/L in October 2019 (Concentration fluctuations are to be expected as higher concentration areas are flushed as part of the washboard effect. Recently completed enhancements to the extraction network to help reductions in this area.)
 - TPH-MO baseline of 1,500 ug/L decreased to 1,100 J ug/L at 2.5 years in May 2019, 210 J ug/L in August 2019, and 520 ug/L in October 2019
- Aerobic treatment process for this TD has been successful, but additional enhancements were recently completed to maintain treatment efficiency (replacement extraction well, new extraction well, and biosparging inside the SBGR trenches)

No new data since the last update

Updates in Green Font

CVOC Technology Demonstration Projects (3)

- **Multisite Bioaugmentation: EVO and KB-1 Plus (No new information)**
 - Evaluate if addition of bioaugmentation substrate to an EVO injection will increase the rate of CVOC degradation
 - Initial injections were completed (Nov 2016)
 - Summary:
 - It is inconclusive if bioaugmentation provided a noticeable increase in degradation rates compared to EVO only for Site ST027B.
 - TCE fluctuations at SD036 bioaugmentation area and 99% decrease in the EVO-only area, reinjections and additional injection wells have supported significant reductions to the east of the site (in MW2064Ax36, TCE reduced from 6,400 to 11 ug/L), northeast (in MW2063x36, TCE reduced from 1,000 to 1.8 J ug/L), and to the north (in MW2187x36, TCE reduced from 1,400 to 84 ug/L). Inconclusive if bioaugmentation was beneficial, ultimately performance was dictated by the additional injection wells installed to treat upgradient source mass.
- **FT005: Distribution of EVO and KB-1 Plus**
 - Evaluate total organic carbon (TOC) dispersion distances and rates for optimizing the remediation of 1,2-dichloroethane (DCA) in groundwater. TD installation completed May 2016. Optimized the GETs in 2017
 - FT005 north area: Slightly elevated TOC and reduced COC concentrations (below MCLs);
 - FT005 central area: Limited TOC increase observed to date in most areas, as injected EVO may be adsorbed to sediments or being consumed faster than spread can be observed. However, MW2292x05 (south of Base boundary) had TOC increase from 1.2 to 20 mg/L between May and October 2018, likely the result of the newly installed extraction wells and the 2018 reinjection in this area.
 - FT005 south area: No TOC increase observed in this control area: Newly installed extraction wells are effectively capturing the remaining 1,2-DCA hot spots, with concentrations now beginning to decrease in these areas
 - New extraction wells are decreasing 1,2-DCA (e.g., 3.6 to 0.81 J; 1.4 to <0.4; 5.9 to 4.2; 3.0 to 1.8 ug/L)
 - Distribution of TOC through the aquifer via extraction was not able to be demonstrated via sampling data, although it is still expected to have had a benefit to remediation as a whole

No new data since the last update

Updates in Green Font

CVOC Technology Demonstration Projects (4)

- **FT004: Distribution of EVO via SBGR and/or Groundwater Extraction**
 - Determine effectiveness of TOC distribution through two different enhanced reductive dechlorination (ERD) approaches: (1) groundwater TOC recirculation using a combination EVO injection, infiltration SBGR trenches, and groundwater extraction; and (2) EVO injection with groundwater extraction
 - Installation completed April 2016
 - Max monitoring well TCE concentration of 560 µg/L (baseline) was reduced to 63 ug/L in October 2018 and 94 ug/L in October 2019
 - Limited TOC dispersal, additional EVO injection conducted with nanoEVO in 2017 to determine if this can enhance TOC dispersal
 - Variable TOC increase and TCE decrease in main plume area monitoring wells
 - In some extraction wells, TCE concentrations are increasing. This indicates additional TCE mass below the vernal pools that is now being pulled to the extraction wells (recirculation is working, but we are fighting additional TCE mass present below the vernal pools, so it will take additional time to see concentration reductions)
 - MW2330x04 maxed out at 640 ug/L in April 2018, decreased to 49 ug/L in May 2019, and rebounded to 600 ug/L in October 2019. Need to further evaluate what is causing these fluctuations

No new data since the last update

Updates in Green Font

CVOC Technology Demonstration Projects (5)

- SD031: EVO distribution via Gravel Chimneys (No new information)
 - Determine if EVO injection and recirculation of groundwater through gravel chimneys can effectively distribute TOC horizontally in the subsurface to support ERD of 1,1-dichloroethene (DCE). Installation completed in April 2015
 - Summary:
 - TD has been successful relative to our design assumptions, TOC increased to >10 mg/L within majority of target area and COCs decreased to below MCLs (most wells ND, max 1,1-DCE reduced from 390 ug/L to ND)
 - 1,1-DCE (primary COC) concentrations have reduced by 99% (sum of key wells within TD area, excluding 2 wells to SW that increased expected to be caused by previously unknown downgradient mass)
 - Total molar concentration (sum of CVOCs) has reduced by 99% (sum of key wells within TD area, excluding 2 wells to SW that increased)
 - Four (4) new EVO wells installed to SW to enhance TOC in problem areas (plume being pulled back towards extraction well causing increasing concentrations in this cross-gradient area), conducted reinjection of EVO in 2017
 - 1,1-DCE in SW area where we reinjected: MW568x31 decreased from max of 48 ug/L to ND, MW572x31 decreased from max of 200 to 13 ug/L, and MW574x31 decreased from max of 33 to 8.9 ug/L

No new data since the last update

Updates in Green Font

Completed Documents (Historical 1)

- Basewide Health & Safety Plan (HSP)
- Action Plan
- 2007/2008 GSAP Annual Report
- LF007C RPO Work Plan
- LF008 Rebound Study Work Plan
- SS014 Tier 1 POCO Evaluation Work Plan
- ST027B Site Characterization Work Plan
- SS030 RPO Work Plan
- ST032 POCO Technical Memo
- DP039 Bioreactor Work Plan
- 2008 Annual GWTP RPO Report
- Passive Diffusion Bag (PDB) Technical Memo
- RD/RA QAPP Update
- ST032 Tier 1 POCO Evaluation Work Plan
- Phytostabilization Demonstration Technical Memo
- Model QAPP
- LF008 Rebound Test Technical Memo
- Comprehensive Site Evaluation Phase II Work Plan
- Field Sampling Plan (FSP)
- SS016 RPO Work Plan
- ST018 POCO RA Work Plan
- Vapor Intrusion Assessment Report
- GSAP 2008/2009 Annual Report
- FT005 Data Gap Work Plan
- First, Second, & Third Site DP039 Sustainable Bioreactor Demonstration Progress Reports
- DP039 RPO Work Plan
- SD036/SD037 RPO Work Plan
- ST027B Site Characterization Report
- 2009 GWTP RPO Annual Report
- Natural Attenuation Assessment Report (NAAR)
- Union Creek Sites SD001 & SD033 Remedial Action Report
- CAMU 2008-2009 Monitoring Annual Report

Completed Documents (Historical 2)

- Phytostabilization Study Report
- 2009/2010 Annual GSAP Report
- SS015 Remedy Optimization Field Implementation Plan
- Sites SS014 and ST032 Tier 1 POCO Evaluation Report
- SD036 Remedy Optimization Field Implementation Plan
- 2010 Annual CAMU Inspection Report
- Site ST018 POCO Baseline Implementation Report
- FT005 Data Gaps Investigation Report
- Comprehensive Site Evaluation Phase II Report
- 2010 Groundwater RPO Annual Report
- Focused Feasibility Study (FFS)
- Site ST027-Area B Human Health Risk Assessment
- Site ST027-Area B Ecological Risk Assessment
- Work Plan for Assessment of Aerobic Chlorinated Cometabolism Enzymes
- 2010/2011 Annual GSAP Report
- Baseline Implementation Report (Sites SS015, SS016, SD036, SD037, and DP039)
- 2011 CAMU Annual Report
- Technical and Economic Feasibility Analysis (TEFA)
- Work Plan for RPO of Sites SS016 and SS029
- Site LF007C Data Gaps Investigation Technical Memorandum
- Technical Memorandum for Assessment of Aerobic Chlorinated Cometabolism Enzymes
- Old Skeet Range Engineering Evaluation/Cost Analysis
- 2011 Groundwater Treatment RPO Annual Report
- Groundwater Proposed Plan (PP)
- FT005 Remedial Action Completion Report
- 2012 GSAP Technical Memorandum²³

Completed Field Work (Historical 1)

- ST027B Gore Sorber Survey–Phase 1
- ST027B Field Sampling – Phase 2
- GSAP 2008 Semi-annual Event
- ST027B Installation of Wells – Phase 3
- SS014 Site Characterization
- LF008 Rebound Study
- GSAP Annual Sampling Event - 2009
- SS030 Site Characterization–Phase 1
- ST027 Site Characterization -Phase 3
- ST014 Monitor Well Install - Subsite 3
- SD001/SD033 Sediment RA
- SS016 Site Characterization (OSA source area)
- ST018 Site Characterization
- SS030 Site Characterization (Off-base VOC Plume)
- DP039 Site Characterization (for Biobarrier Placement)
- SS014 & ST032 Q1 2010 MNA Sampling (2nd of 4 quarterly events)
- SD036 Additional Site Characterization (north & east)
- Therm/Ox System Removal
- SS016 Monitoring Well Installation
- SD037 EVO Injection Well Installation
- DP039 Monitoring Well & Injection Well Installation
- DP039 EVO Injection
- SD037 Monitoring Well Installation
- GSAP 2010 Annual Sampling Event
- SD037 EVO Injection
- SS015 Site Characterization
- South Plant GAC Change-out
- FT005 Data Gap Investigation
- SS016 Position Survey of EW03
- SS016 Bioreactor Installation
- SS016 Bioreactor Baseline Sampling
- DP039 Biobarrier Quarterly Performance Sampling

Completed Field Work (Historical 2)

- DP039 Bioreactor Quarterly Performance Sampling
- SD037 EVO Quarterly Performance Sampling
- SS015 EVO Baseline Sampling
- SD036 EVO Baseline Sampling
- SS016 Bioreactor Startup
- SD036 Injection Wells Installation
- SS015 Injection Wells Installation
- ST018 GETS Installation
- SD036 EVO Injection
- 2010 Semiannual GSAP
- SS015 EVO Injection
- Quarterly RPO Performance Monitoring (Feb 2011)
- ST018 GETS Startup
- Quarterly RPO Performance Monitoring (May 2011)
- 2011 Annual GSAP Sampling
- SS029 GET Shutdown Test (System Optimization analysis)
- Quarterly RPO Performance Monitoring (Aug 2011)
- Quarterly RPO Performance Monitoring (Nov 2011)
- 2011 Semiannual GSAP Sampling
- LF007C Site Characterization (Wetlands)
- FT005 Soil Remedial Action
- Performance Monitoring SS015 (4th Quarterly event)
- Sampling for Assessment of Aerobic Chlorinated Cometabolism Enzymes (Feb 21-22)
- 2012 Annual GSAP Sampling
- CAMU Lysimeter Removal
- LF007C GET System Optimization
- SS029/SS016 System Optimization Analysis
- GSAP Semiannual Sampling Event
- Replace electrical wiring for well field at Site SS030

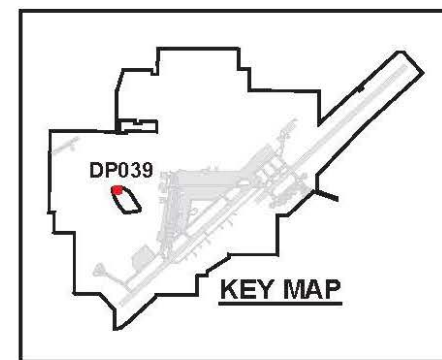
Site DP039 Bioreactor Status

RPM Meeting

April 16, 2020

Background

- The Site DP039 bioreactor was installed in 2008.
- This was the first bioreactor constructed at Travis AFB.
- The bioreactor was constructed to remediate the chlorinated volatile organic compounds (VOCs) from the source area.
- When the bioreactor was initiated, TCE concentrations as high as 8,000 µg/L were detected in the source area.
- The bioreactor has historically successfully treated influent TCE concentrations exceeding 1,000 µg/L.

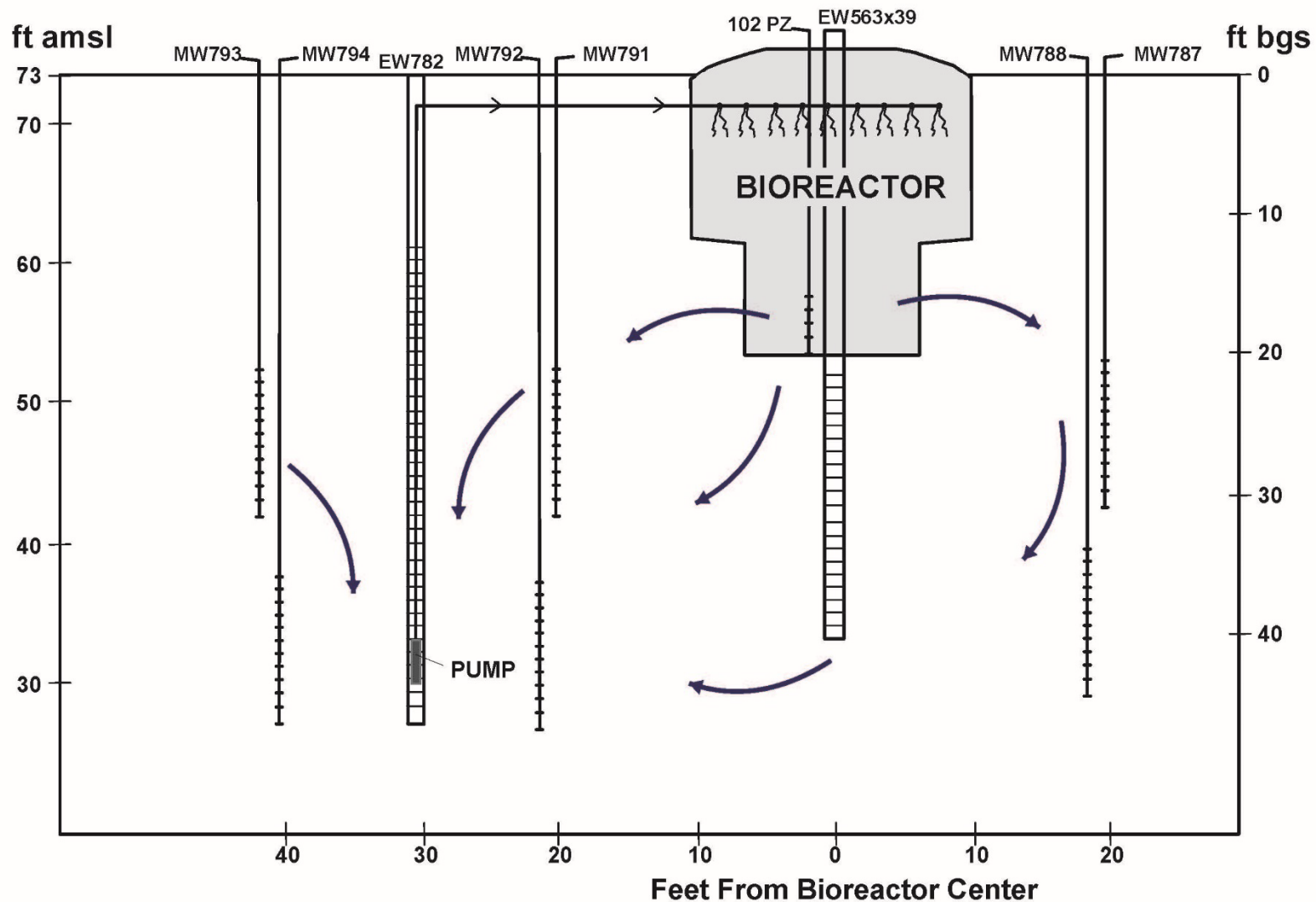


LEGEND

- GROUNDWATER MONITORING WELL
- PIEZOMETER
- ★ GROUNDWATER EXTRACTION WELL
- ➔ APPROXIMATE GROUNDWATER FLOW DIRECTION
- NEW BELOWGROUND ELECTRICAL
- EXISTING UNDERGROUND EXTRACTION WELL UTILITIES
- EXISTING UNDERGROUND EXTRACTION WELL UTILITIES (TO BE ABANDONED)
- EXISTING ABOVEGROUND ELECTRICAL
- EXISTING BELOWGROUND ELECTRICAL
- FENCE
- EXCAVATION AREA TO 6 INCHES
- EXCAVATION AREA TO 20 FEET



SITE DP039 SITE PLAN



Legend

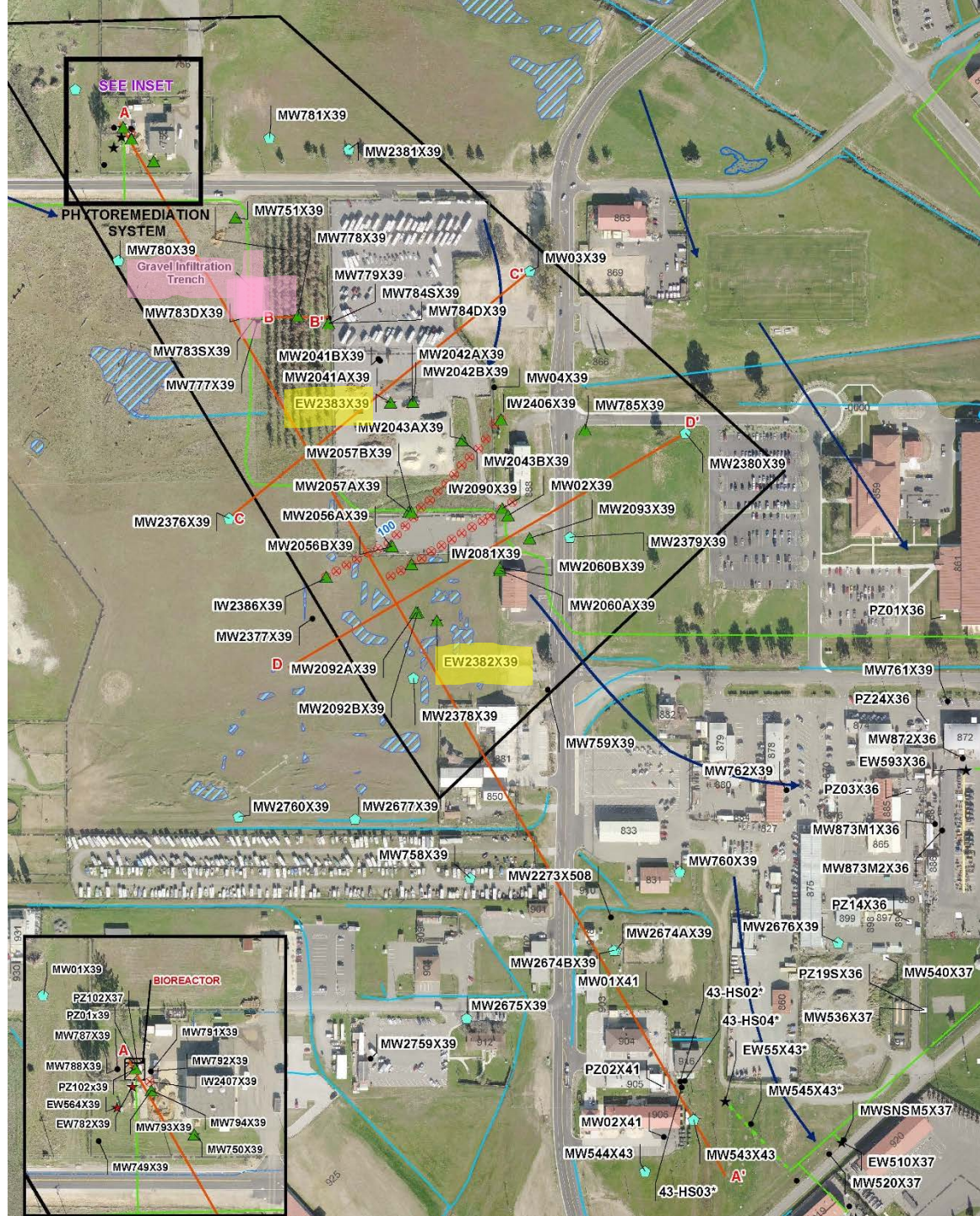


Groundwater Flow Direction

Bioreactor Demonstration Area Cross Section

Bioreactor Optimization

- Downgradient of the phytoremediation system in the middle of the Site DP039 groundwater plume, extraction wells EW2382x39 and EW2383x39 are used to extract and send groundwater to an infiltration trench upgradient of the phytoremediation system.
- The infiltration trench is unable to accommodate all of the groundwater from extraction wells EW2382x39 and EW2383x39 when they are pumping at full capacity.



Bioreactor Optimization, Cont.

- In order to continue to pump EW2382x39 and EW2383x39 at full capacity, the bioreactor was optimized in March 2019 to receive excess groundwater.
- Concentrations of chlorinated VOCs from EW2382x39 and EW2383x39 in October 2018 are lower than historically treated concentrations but higher than concentrations currently detected at MW750x39.
 - TCE at 220 µg/L in EW2382x39 and at 1,200 µg/L in EW2383x39
 - cis-1,2-DCE at 10 µg/L in EW2382x39 and at 15 µg/L in EW2383x39
 - vinyl chloride at <0.2 µg/L in EW2382x39 and at <0.2 µg/L in EW2383x39

Bioreactor Optimization, Cont.

- To monitor bioreactor performance following the optimization, groundwater samples were collected from PZ102x39 (screened in the bottom of the bioreactor).
- Results of the sampling from PZ102x39 indicated an increase in the concentration of vinyl chloride from 16 $\mu\text{g/L}$ in October 2018 to 250 $\mu\text{g/L}$ in June 2019.
- However, concentrations of TCE and cis-1,2-DCE in PZ102x39 were not detectable.
- The increased vinyl chloride is indicative of a more typical biodegradation pathway, versus the previous biogeochemical degradation pathway within the bioreactor that generates less vinyl chloride.

Bioreactor Optimization, Cont.

- As a result of the increased concentration of vinyl chloride in PZ102x39, monitoring well EW563x39 (screened below the bioreactor) was added to the sampling program and both wells were sampled monthly.
- Results of the sampling in PZ102x39 and EW563x39 confirmed the elevated concentrations of vinyl chloride, but also confirmed that TCE and cis-1,2-DCE continued to be completely degraded.
- In addition to monthly sampling of PZ102x39 and EW563x39, wells MW793x39/MW794x39 (immediately downgradient of the bioreactor) were sampled for VOCs in the 4Q19 GRIP.

Bioreactor Source Area

Vinyl Chloride Concentrations

Date	PZ102x39	EW563x39	MW793x39	MW794x39	MW750x39
10/16/2018	16 µg/L	N/A	N/A	N/A	<0.2 µg/L
5/8/2019	N/A	N/A	0.95 J µg/L	1.1 J µg/L	N/A
6/12/2019	250 µg/L	N/A	N/A	N/A	N/A
6/27/2019	190 µg/L	170 µg/L	N/A	N/A	N/A
8/15/2019	280 µg/L	300 µg/L	N/A	N/A	N/A
10/14/2019 10/15/2019	160 µg/L	140 µg/L	1.5 µg/L	110 µg/L	15 µg/L
11/12/2019	200 µg/L	180 µg/L	N/A	N/A	N/A
12/11/2019	200 µg/L	190 µg/L	N/A	N/A	N/A
1/15/2020	200 µg/L	180 µg/L	N/A	N/A	32 µg/L
2/20/2020	130 µg/L	170 µg/L	N/A	N/A	N/A
3/12/2020	84 µg/L	110 µg/L	N/A	N/A	N/A

Bioreactor Optimization, Cont.

- Vinyl chloride concentrations generally increased in all of the bioreactor wells following the March 2019 bioreactor optimization.
- Although vinyl chloride concentrations initially increased, concentrations have stabilized and detections exceeding cleanup levels are not migrating beyond the bioreactor treatment area.
- Well MW750x39 provides a recirculation loop for the bioreactor, helping contain elevated vinyl chloride concentrations in the bioreactor.
- Vinyl chloride quickly degrades in the aerobic conditions dominant outside of the bioreactor area.

Bioreactor Optimization, Cont.

- In October 2019, approximately 50 gallons of EVO were added to the bioreactor to increase total organic carbon (TOC) concentrations.
- However, monitoring results from EW563x39 and PZ102x39 in November and December 2019, indicated that the addition of EVO to the bioreactor had little impact on reducing vinyl chloride.
- Thus, insufficient TOC did not appear to be the limiting factor in vinyl chloride degradation.
- The bioreactor is 11 years old and may require additional amendments to improve performance.

Bioreactor Optimization, Cont.

- To reduce vinyl chloride in the bioreactor in the short term, extracted groundwater from EW2382x39 and EW2383x39 were routed only to the phytoremediation system in January 2020, and the extraction rates were reduced to levels that the infiltration trench could accommodate.
- As a result of the routing of the extracted groundwater to the phytoremediation system, concentrations of vinyl chloride in PZ102x39 and EW563x39 significantly decreased by March 2020.
- This summer, the infiltration trench will be expanded 100 feet to the south, which will double the capacity of the trench and allow for operating EW2382x39 and EW2383x39 at their maximum pumping rates.

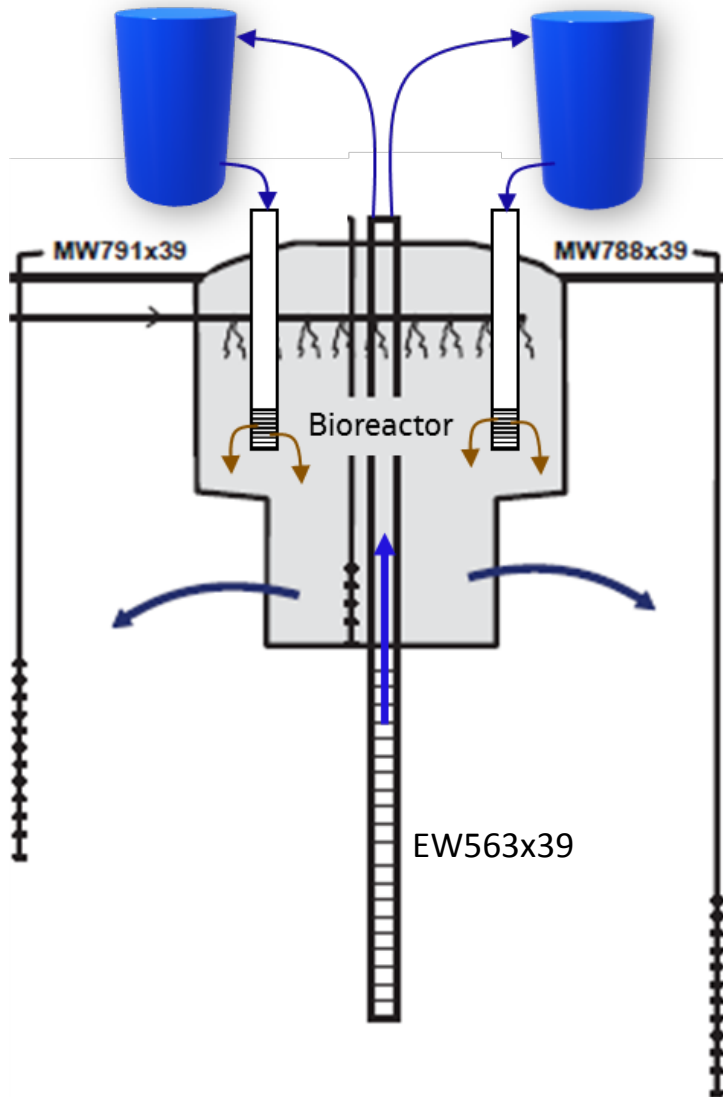
Planned Optimizations, Cont.

- To further diagnose the bioreactor performance, groundwater samples were collected from wells EW563x39, EW2382x39, EW2383x39, MW750x39, and PZ102x39 in January 2020 and analyzed for VOCs, dissolved gases, TOC, chloride, nitrate, sulfide, dissolved iron and manganese, total alkalinity, and bacteria by NGS and QuantArray Chlor to evaluate the bacteria populations that are present in the bioreactor and determine what amendments are needed to rejuvenate the bioreactor.
- Review of the analytical results from the Site DP039 bioreactor shows some of the key “community member” bacteria are starting to fade compared to our other reactors (the reactor is getting “long in the tooth”).

Planned Optimizations, Cont.

- We are going to implement O&M actions to inoculate the reactor with additional organic carbon and beneficial bacteria (similar to the SPOC system) to determine if this can accelerate vinyl chloride treatment by increasing bacteria that form iron sulfides (to support abiotic treatment of TCE and limits vinyl chloride production).
- The optimization is called “Passive Injectable Carbon Amendment Recirculation Device” (PICARD).

PICARD Concept



- Install drive point piezometers into mid-depth of bioreactor.
- Place drums containing mulch with vegetable oil amendments and connect to the drive points.
- Once per week drain and refill the amended water within the drums with groundwater from the extraction well (EW563x39) below the reactor, to increase bacterial activity within the bioreactor.

Questions