

**Travis Air Force Base  
Environmental Restoration Program  
Restoration Program Manager's  
Meeting Minutes  
13 February 2019, 0930 Hours**

Mr. Lonnie Duke of the Air Force Civil Engineer Center (AFCEC) Restoration Installation Support Section (ISS) conducted the Restoration Program Manager's (RPM) meeting on 13 February 2019 at 0930 hours in Building 248 at Travis AFB, California. Attendees included:

Lonnie Duke	AFCEC/CZOW
Glenn Anderson	AFCEC/CZOW
Gene Clare	AFCEC/CZOW
Angel Santiago Jr.	AFCEC/CZOW
Haekyung Kim	AFCEC/CZRW
(via telephone)	
Sarah Miller	USACE
(via telephone)	
Merrie Schilter-Lowe	Travis AFB/PA
Dominique Forrester	DTSC
(via telephone)	
Ben Fries	DTSC
Adriana Constantinescu	RWQCB
Nadia Hollan-Burke	EPA
(via telephone)	
Indira Balkissoon	TechLaw, Inc.
Mike Wray	CH2M/JACOBS
Leslie Royer	CH2M/JACOBS
Jeannette Cumberland	CH2M/JACOBS
Jill Dunphy	CH2M/JACOBS
(via telephone)	

Handouts distributed prior to or at the meeting, discussions, and presentations included:

Attachment 1	Meeting Agenda
Attachment 2	Master Meeting and Document Schedule
Attachment 3	SBBGWTP Monthly Data Sheet (January 2019)
Attachment 4	CGWTP Monthly Data Sheet (January 2019)
Attachment 5	LF007C Monthly Data Sheet (January 2019)
Attachment 6	ST018 Monthly Data Sheet (January 2019)

Attachment 7	Presentation: Site System Enhancements Planned for 2019
Attachment 8	Presentation: Program Update

## 1. **ADMINISTRATIVE**

### **A. Previous Meeting Minutes**

There were no Water Board, DTSC, or EPA comments on the January 2019 RPM Teleconference Summary. EPA clarified that during the partial federal government shutdown, EPA was able to receive mail and it was being distributed, and that EPA contractors were not shut down. Ms. Burke noted that, should there be another federal government shutdown, their contractors can continue to work on EPA projects if given appropriate direction from EPA beforehand.

### **B. Action Item Review**

Action items from January 2019 were reviewed.

Action item 1 is ongoing: Ms. O'Sullivan to provide updates on perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). February 2019 update: Mr. Duke had no updates. Regarding the Site Inspection Report, Ms. Constantinescu said that the Water Board still intends to send a letter to the Air Force requesting that the Air Force issue a work plan by April 12 for additional PFOS/PFOA investigation; however, the Air Force still has not received it. The Air Force stated that they will have to work with AFCEC to resolve the issue. Ms. Constantinescu said the Water Board can accept the work plan, and proposed work may be phased based on findings. Mr. Duke said that they can't write a work plan until the contract for additional investigation is awarded, which will likely be awarded to the contractor who conducted the Site Inspection. DTSC and the Water Board noted that the SI Report was finalized without agency input; however, Mr. Duke stated that the finalized document was provided to the regulators in accordance with the Travis AFB Federal Facilities Agreement.

Action Item 2 is ongoing: Mr. Duke will continue to provide design and construction information for the new KC-46 Hangar construction project. February 2019 update: EPA, DTSC, and the Water Board position is that ongoing, routine vapor intrusion sampling is necessary to ensure that the vapor barrier is working and/or there are no vapor intrusion issues, citing earthquakes as a potential issue. Mr. Duke stated that this is not included in the scope of the current contract, so the Air Force cannot support additional sampling. The Air Force will discuss with AFCEC including routine sampling in the 5-year reviews in the next contract, since those reviews evaluate the ongoing protectiveness of the remedies in place. The contract will not be awarded until 2021, but the next 5-year review is scheduled for 2023 and could potentially be included in that contract.

Action Item 3: Once the partial government shutdown is over and the EPA returns to work, the Air Force will discuss the document schedule with the EPA and revise the Master Meeting and Document Schedule accordingly. Mr. Duke will send the revised MMDS to the regulators ahead of the meeting or teleconference following the reopening of the federal government. February 2019 update: Mr. Duke noted that the updated schedule will be discussed during the Master Meeting and Document discussion. This action item is now closed.

Action Item 4: Mr. Anderson will send a summary email to DTSC regarding acceptable ecological risk at Site SS015 due to a thick overlying concrete pavement, justifying that there is no need for DTSC's ecological risk assessor to review the documents. February 2019 Update: Mr. Anderson sent the summary as requested. The concrete will be left in place and land use controls (LUCs) will remain at the site, and the Air Force will provide additional information regarding the location of contamination at DTSC's request. This action item is now closed.

Action Item 5: Mr. Duke will upload the Environmental Assessment from the Concrete Batch Plant for Water Board review of the stormwater management section. February 2019 Update: Mr. Anderson stated that the Air Force sent the Environmental Analysis (EA) to the Water Board. Ms. Constantinescu stated that the Water Board received, and is reviewing the EA, and she will check with the Watershed division regarding acceptability of the stormwater BMPs. This action item is now closed.

Action Item 6: Mr. Anderson will send an Outlook invitation to the regulators for the annual LUC inspection, tentatively planned for 29 January 2019. February 2019 Update: Mr. Anderson sent invitations to DTSC and the Water Board; DTSC attended. Mr. Anderson stated that he did not send an outlook invite to EPA or their contractor due to the partial federal government shutdown. 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).

The progress of several documents was affected by the 35-day partial federal government shutdown, and resulting furlough of EPA staff. Delays related to legal review and comments pose a potential issue since the Air Force is still waiting for EPA Legal responses to Air Force Legal comments on the Amendment to the NEWIOU Record of Decision (ROD) dating back to September 2018. This delay affects many projects, including the KC-46 hangar. Mr. Duke noted that he may need to elevate this to management in order to

resolve in a timely manner. As a result, the schedule for many documents remains “TBD”.

### **Travis AFB Annual Meeting and Teleconference Schedule**

The next RPM meeting will be a teleconference held on Wednesday, 20 March 2019.

### **Travis AFB Master Document Schedule**

- Community Relations Plan Update (CRP): There was no change to the schedule.
- Amendment to the NEWIOU Soil ROD for the Travis AFB ERP Sites SS016 and SD033: There was no change to the schedule. Air Force Legal delays are related to staff turnover, and EPA Legal delays are related to the partial federal government shutdown. **This is a super-critical document** due to site work supporting planned KC-46 hangar construction.
- No Further Action ROD for Old Skeet Range (TS060 MRA): There is no change in the schedule. Responses to comments were sent to the acting Air Force Legal staff. **This is an important but not critical document.**
- Site SS016 Remedial Design/Remedial Action Work Plan: There was no change in the schedule. This document won’t go final until the final Amendment to the NEWIOU Soil ROD is submitted, which is also delayed due to the shutdown. This excavation project is located within the footprint of the future new KC-46 hangar, so **this document is critical.**
- Site SD031 Soil Remedial Investigation/Feasibility Study: No change was made to the schedule. **This document is important but not time-critical.**
- Fourth Five-Year Review Report for Multiple Groundwater, Soil, and Sediment Sites: No change was made to the schedule. **This document is very important but not critical.**
- Addendum to the Site SS016 Groundwater Remedial Design/Remedial Action Work Plan: The Draft to Agencies and Draft to RAB due dates were changed to 28 February 2019, and the Agency Comments due date was changed to 1 April 2019. The rest of the schedule was changed to TBD due to delays resulting from the shutdown.
- Potrero Hills Annex (FS, PP, and ROD): No change was made to the schedule.
- Quarterly Newsletters (April 2019): The PreDraft to AF/Service Center was changed to 26 February 2019. The rest of the schedule was changed accordingly. This newsletter announces the April RAB Meeting so must be delivered a few weeks prior to that.
- 2017 Annual GRISR: The Agency Comments Due date was changed to 31 January 2019. The Air Force is preparing responses to EPA and Water Board comments. An email with the DTSC comments was submitted on 12 February 2019; and Mr.

Fries indicated a letter providing the final comments will be sent. Responses to DTSC comments cannot be prepared until the official letter is received (note, agency comments were due for this document on 19 November 2018).

- Site SS015 Soil Sampling Results Technical Memorandum. No change was made to the schedule. The Water Board is reviewing Air Force responses to their comments and will confirm if the responses are adequate and accepted by 22 February. Ms. Burke and Mr. Fries indicated that the Air Force responses to their comments were adequate, therefore accepted.
- Site LF006 Technology Demonstration Construction Completion Report: The Draft to Agencies due date was changed to 20 February 2019. EPA noted they do not need to review this document because it is a secondary document.
- Subarea LF007C Total Petroleum Hydrocarbon Chromatogram Review Technical Memorandum: The Response to Comment due date was changed to 22 February 2019. The Water Board is reviewing. Ms. Constantinescu has a meeting scheduled with the Waste Water Discharge permitting specialist to see if he agrees with dropping the TPH analysis. Ms. Burke requested she be copied on the submittal when the document is finalized.
- AOC TA500 POCO Well Decommissioning and Site Closeout Technical Memorandum: Moved to History.

## **2. CURRENT PROJECTS**

### **Treatment Plant Operation and Maintenance Update**

#### **South Base Boundary Groundwater Treatment Plant, January 2019 (see Attachment 3)**

The South Base Boundary Groundwater Treatment Plant (SBBGWTP) performed at 100% uptime, and 6.2 million gallons of groundwater were extracted and treated in January 2019. All treated water was discharged to Union Creek. The average flow rate for the SBBGWTP was 142.9 gallons per minute (gpm). Electrical power usage was 15,645 kilowatt hours (kWh), and approximately 12,377 pounds of CO<sub>2</sub> were created (based on DOE calculation). Approximately 1.3 pounds of volatile organic compounds (VOCs) were removed in January. The total mass of volatile organic compounds (VOCs) removed since startup of the system is 512.1 pounds.

1,2-DCA was detected in the effluent sample at concentrations greater than the instantaneous maximum effluent discharge limit. TPH-D was also detected in the effluent, but did not exceed the discharge limit. The agencies were notified of the exceedance. Confirmation samples were collected, as well as samples from Union Creek upstream and downstream of the outfall; results will be included in the next monthly data sheet. A carbon changeout is planned for February 2019.

Troubleshooting activities were performed on several extraction wells in January 2019. Details can be found in Attachment 3.

No optimization activities are reported for the month of January 2019.

#### **Central Groundwater Treatment Plant, January 2019 (see Attachment 4)**

The Central Groundwater Treatment Plant (CGWTP) performed at 100% uptime with approximately 1,158,130 gallons of groundwater extracted and treated in January 2019. All treated water was discharged to the storm sewer system which discharges to Union Creek. The average flow rate for the CGWTP was 27.7 gpm. Electrical power usage was 1,979 kWh for all equipment connected to the Central Plant, and approximately 2,353 pounds of CO<sub>2</sub> were generated. Approximately 1.8 pounds of VOCs were removed from groundwater by the treatment plant in January. The total mass of VOCs removed since the startup of the system is 11,510 pounds.

Optimization Activities for CGWTP: The DP039 bioreactor continues to operate in a four-week “pulsed mode.” No other optimization activities are reported for the month of January 2019.

#### **LF007C Groundwater Treatment Plant, January 2019 (See Attachment 5)**

The Subarea LF007C Groundwater Treatment Plant (LF007C GWTP) performed at 100% uptime with approximately 17,867 gallons of groundwater extracted and treated in January 2019. All treated water was discharged to the Duck Pond for beneficial reuse. The average flow rate was 2.6 gpm. Approximately  $2.1 \times 10^{-4}$  pound of VOCs was removed from groundwater by the treatment plant in January. 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.

The LF007C GWTP was taken off line on 7 January 2019 when vernal pools formed at Subarea LF007C. The system will be restarted once the vernal pools have dissipated. Monthly groundwater samples were not collected at the LF007C GWTP in January 2019 because the system was shut down before monthly samples were collected. Samples will be collected once the treatment plant resumes operation.

No optimization activities are reported for the month of January 2019.

#### **ST018 Groundwater (MTBE) Treatment Plant, January 2019 (see Attachment 6)**

Site ST018 (MTBE) Treatment Plant (ST018 GWTP) performed at 100% uptime with approximately 180,430 gallons of groundwater extracted in January 2019. All groundwater was discharged to the Fairfield – Suisun Sewer District. The average flow rate for the ST018 GWTP was 4.2 gpm. Electrical power usage for the month was 98

kWh for all equipment connected to the ST018 GWTP. The total CO<sub>2</sub> equivalent, including an estimate for the carbon change-out, equates to approximately 73 pounds. Approximately 0.49 pound of MTBE, BTEX, VOCs, and TPH was removed in January by the treatment plant, and approximately 0.02 pound of MTBE-only was removed from groundwater. The total BTEX, MTBE and TPH mass removed since the startup of the system is 46.6 pounds, and the total MTBE mass removed since startup of the system is 11.3 pounds.

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

There were no shutdowns of the ST018 GWTP in January 2019; however, because of consecutive cloudy, foggy, and/or rainy days, the extraction wells experienced decreased production throughout the monitoring period. In addition, extraction well EW2333x18 experienced shutdowns during the reporting period because of high pressures in the extraction piping. This well has its flow restricted to reduce frequent well cycling, and this can lead to occasional shutdowns. This alarm set point will be adjusted if continued shutdowns are experienced going forward.

No optimization activities are reported for the month of January 2019.

### **3. Presentations:**

#### **A) Site System Enhancements Planned for 2019(see Attachment 7)**

Ms. Royer discussed the sites and systems where ongoing remedial actions will be enhanced in 2019. Full details of the presentation can be found in Attachment 7. Highlights include:

- Minor adjustments are necessary at a few sites to enhance remedial efforts or the ongoing technology demonstrations (TDs).
- These enhancements result from observations in the 2018 Groundwater Remediation Implementation Program (GRIP) data. They will be recommended in the forthcoming 2018 Groundwater Remediation Implementation Status Report (GRISR), implemented during the 2019 field season, and reported on in the 2019 GRISR. There will not be any work plans submitted relating to these enhancements.
- Site SD034 Oxygen Enhancement:
  - Original remedy was monitored natural attenuation (MNA) with passive skimming

- The current system is pulling in a lot more contamination than was initially evident from baseline concentrations, and it is using more oxygen than the system can continue to provide
- Oxygen distribution in the washboard bioreactor system has slowed; more oxygen is needed in the subgrade biogeochemical reactor (SBGR) trenches to continue degradation
- This potential need for additional oxygen was anticipated during the TD design, so the slotted pipes and risers, which would allow for introduction of oxygen, are already installed in the trenches
- In addition to increasing oxygen delivery, low-yielding extraction well EW01x34 will be decommissioned and replaced in close proximity, and one additional extraction well will be installed near MW02x34. The improvement in extraction will allow more product to be removed and delivered to the trenches.
- Utilities and location of proposed enhancements have been assessed
- ST027B Reinjection:
  - Slight rebound observed a few wells, need to reinject in order for degradation to continue.
  - Emulsified vegetable oil (EVO) is likely being used up faster than expected, and injections were also a challenge due to fractured bedrock
  - The same mix of EVO and EVO and bioaugmentation used in 2016 will be used again, and at the same locations.
- Site DP039 Extraction and SBGR recirculation enhancement:
  - Two of the components of the DP039 RA (the bioreactor and SBGR trench) will be modified to increase effectiveness of the remedy.
  - The SBGR along the upgradient edge of the phytoremediation system is receiving more water than it can effectively handle, but don't want to decrease the rate of extraction at the two wells that provide groundwater to the SBGR.
  - The bioreactor has the capacity to handle additional water
  - A flow control valve will be installed in order to direct excess flow to the bioreactor using the existing pipeline
  - The goal would be to maximize flow from all extraction wells and split it between the infiltration trench and bioreactor
  - In the event of a drought, extraction water could be diverted away from the bioreactor and back to the infiltration trench
  - There will be a fence around the flow controller for security
- Site SS015 Reinjection Study:
  - EVO Injection is the final remedy; two injections have been completed already
  - Progress in remediation was slower than desired



- Samples from 4 wells at the site have been collected, and will be analyzed to determine the types of bacteria present
- Use of amendments will be evaluated based on the types of bacteria present; different nutrients are needed for aerobic vs. anaerobic decomposition.
- If an amendment is identified that has the potential to better support the site-specific bacterial population, the effectiveness of the amendment will be tested in a small area of the site prior to implementing at the entire site.
- Sites SD036 and SD037 Aquifer Testing:
  - Certain wells at each site have shown increasing VOC concentrations; at SD036, this well is outside of the treatment area
  - 72-hour aquifer tests will be conducted to refine hydrogeologic parameters in the area and evaluate TCE concentrations as the aquifer is stressed in the immediate vicinity of the pumped wells.
- Extraction Well Redevelopment:
  - There are ongoing sedimentation issues at some extraction wells, so these wells will be redeveloped to enhance performance
- Because the enhancements will likely occur before the 2018 GRISR is ready for review, Ms. Burke noted that EPA will provide comments on this presentation rather than wait until review of the 2018 GRISR
- There is no operation and maintenance plan for the technology demonstrations because the technology and resulting data are too dynamic. EVO reinjections for RA remedies involving ERD are part of routine maintenance of the remedy and will continue, as needed, until the remedial action objectives are met. The Air Force will continue to follow procedures outlined in existing, approved work plans to conduct this work.

## **B) Program Update: Activities Completed, In Progress, and Upcoming (see Attachment 8)**

Mr. Wray reported on the status of fieldwork and documents which are completed, in progress, and upcoming. Please refer to Attachment 8 for the full briefing.

### **4. New Action Item Review**

1. Ms. Royer will let EPA know which of the Site ST027B wells showed rebound and led to planned reinjections.

### **5. PROGRAM ISSUES/UPDATE**

None

## 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 design and construction information for the KC-46 Hangar for agency input ahead of the Air Force/Civil Engineering awarding the construction contract.	Ongoing	Open
3.	Leslie Royer	Ms. Royer will let EPA know which of the Site ST027B wells showed rebound and led to planned reinjections.	February 28, 2019	Open

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

The RPM face-to-face meeting is scheduled for 09:30 AM PST on 13 February, 2019.  
**The call-in number is 1-866-203-7023. Enter the Participation code 5978-75-9736 then enter #.**

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. SITE AND SYSTEM ENHANCEMENTS PLANNED FOR 2019
- B. PROGRAM UPDATE: DOCUMENTS & ACTIVITIES COMPLETED, IN PROGRESS AND PLANNED

4. NEW ACTION ITEM REVIEW

5. PROGRAM/ISSUES/UPDATE

MEETING SCHEDULE

NOTES: AFTER THE RPM MEETING, BASED ON THE DISCUSSION DURING THE REVIEW OF THE MASTER MEETING AND DOCUMENT SCHEDULE, WE 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.

**(2019)**  
**Annual Meeting and Teleconference Schedule**

Monthly RPM Meeting <sup>1</sup> (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.)
—	01-16-19	—
02-13-19	—	—
—	03-20-19	—
04-18-19 (Thursday 2:00 PM)	—	04-18-19
—	05-15-19	—
06-19-19	—	—
—	07-17-19	—
08-21-19	—	—
—	09-18-19	—
10-16-19	—	May through October <sup>2</sup>
—	11-20-19	—
—	—	—

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

<sup>2</sup> 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	Amendment to the NEWIOU Soil ROD for the Travis AFB ERP Sites SS016 and SD033 Travis AFB, Glenn Anderson CH2M, Latonya Coleman	No Further Action ROD for Old Skeet Range (TS060 MRA) Travis AFB, Glenn Anderson
<b>Scoping Meeting</b>	NA	NA	NA
Predraft to AF/Service Center	08-23-16	02-28-18	05-18-18
AF/Service Center Comments Due	09-07-16	03-30-18	06-01-18
Draft to Agencies	09-28-16 (03-22-18)	06-22-18	6-25-18
Draft to RAB	09-28-16 (03-22-18)	06-22-18	6-25-18
Agency Comments Due	10-28-16 (04-27-18)	08-22-18	11-30-18
<b>Response to Comments Meeting</b>	<b>TBD</b>	<b>09-06-18</b>	<b>01-16-19</b>
Agency Concurrence with Remedy	NA	NA	NA
Public Comment Period	NA	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>	<b>NA</b>
Response to Comments Due	TBD	TBD*	TBD*
Draft Final Due	TBD	TBD*	TBD*
Final Due	TBD	TBD*	TBD*

\* = TBD due to government shutdown.

## Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS		
Life Cycle	Site SS016 Remedial Design/Remedial Action Work Plan Travis AFB, Glenn Anderson CH2M, Doug Berwick CAPE, Meg Greenwald	Site SD031 Soil Remedial Investigation/Feasibility Study Travis AFB, Glenn Anderson CH2M, Nikki Carlton
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	06-04-18	TBD
AF/Service Center Comments Due	06-18-18	TBD
Draft to Agencies	07-31-18	TBD
Draft to RAB	07-31-18	TBD
Agency Comments Due	08-30-18	TBD
<b>Response to Comments Meeting</b>	<b>09-19-18</b>	<b>TBD</b>
Agency Concurrence with Remedy	NA	NA
Public Comment Period	NA	NA
<b>Public Meeting</b>	<b>NA</b>	<b>NA</b>
Response to Comments Due	10-24-18	TBD
Draft Final Due	10-24-18	TBD
Final Due	TBD	TBD

## Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS		
Life Cycle	Fourth Five-Year Review Report for Multiple Groundwater, Soil, and Sediment Sites Travis AFB, Glenn Anderson Tetra Tech, Joachim Eberharter	Addendum to the Site SS016 Groundwater Remedial Design/Remedial Action Work Plan Travis AFB, Lonnie Duke CH2M, Levi Pratt
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	03-14-18	12-12-18
AF/Service Center Comments Due	05-22-18	01-02-19
Draft to Agencies	06-05-18	02-28-19**
Draft to RAB	06-05-18	02-28-19**
Agency Comments Due	07-20-18	04-01-19**
<b>Response to Comments Meeting</b>	TBD	TBD*
Agency Concurrence with Remedy	NA	NA
Public Comment Period	NA	NA
<b>Public Meeting</b>	NA	NA
Response to Comments Due	TBD	TBD*
Draft Final Due	TBD	TBD*
Final Due	TBD	TBD*

\* = TBD due to government shutdown.

\* \* = Submit to Water Board and DTSC, but hold for EPA, until they return from the government shutdown.

## Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS			
Life Cycle	Potrero Hills Annex Travis, Glenn Anderson		
	FS	Proposed Plan	ROD
<b>Scoping Meeting</b>	<b>180 days after Water Board Order Rescinded</b>	<b>+470 days</b>	<b>+735 days</b>
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
<b>Response to Comments Meeting</b>	<b>+ 405 days</b>	<b>+665 days</b>	<b>+ 1110 days</b>
Agency Concurrence with Remedy	NA	NA	+ 1130 days
Public Comment Period	NA	+735 to 765 days	NA
<b>Public Meeting</b>	<b>NA</b>	<b>+745 days</b>	<b>NA</b>
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

INFORMATIONAL DOCUMENTS		
Life Cycle	Quarterly Newsletter (April 2019) Travis, Glenn Anderson	2017 Annual GRISR Travis AFB, Glenn Anderson CH2M, Leslie Royer
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	02-26-19	05-09-18
AF/Service Center Comments Due	NA	06-11-18
Draft to Agencies	03-05-19	07-19-18
Draft to RAB	NA	07-19-18
Agency Comments Due	03-19-19	11-19-18 (01-31-19) (02-08-19)
<b>Response to Comments Meeting</b>	03-20-19	01-16-19 (02-13-19)
Response to Comments Due	4-03-19	TBD*
Draft Final Due	NA	NA
Final Due	4-04-19	TBD*
Public Comment Period	NA	NA
<b>Public Meeting</b>	NA	NA

\* = TBD due to government shutdown.

## Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS		
Life Cycle	Site SS015 Soil Sampling Results Technical Memorandum Travis AFB, Glenn Anderson CH2M HILL, Levi Pratt	Site LF006 Technology Demonstration Construction Completion Report Travis AFB, Glenn Anderson CH2M HILL, Levi Pratt
<b>Scoping Meeting</b>	NA	NA
Predraft to AF/Service Center	10-17-18	12-19-18
AF/Service Center Comments Due	10-31-18	01-09-19
Draft to Agencies	11-20-18	02-20-19**
Draft to RAB	11-20-18	02-20-19**
Agency Comments Due	12-21-18	03-21-19**
<b>Response to Comments Meeting</b>	TBD*	TBD*
Response to Comments Due	TBD*	TBD*
Draft Final Due	NA	NA
Final Due	TBD*	TBD*
Public Comment Period	NA	NA
<b>Public Meeting</b>	NA	NA

\* = TBD due to government shutdown.

\* \* = Submit to Water Board and DTSC, but hold for EPA, until they return from the government shutdown.

## Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS	
Life Cycle	Subarea LF007C Total Petroleum Hydrocarbon Chromatogram Review Technical Memorandum Travis AFB, Glenn Anderson CH2M HILL, Leslie Royer
<b>Scoping Meeting</b>	NA
Predraft to AF/Service Center	09-05-18
AF/Service Center Comments Due	09-19-18
Draft to Agencies	09-24-18
Draft to RAB	09-24-18
Agency Comments Due	10-24-18 (12-19-18)
<b>Response to Comments Meeting</b>	<b>01-16-19</b>
Response to Comments Due	02-22-19
Draft Final Due	NA
Final Due	02-22-19
Public Comment Period	NA
<b>Public Meeting</b>	NA

## Travis AFB Master Meeting and Document Schedule

HISTORY	
Life Cycle	AOC TA500 Well Decommissioning and Site Closeout Technical Memorandum Travis AFB, Glenn Anderson CH2M HILL, Tony Chakurian
<b>Scoping Meeting</b>	NA
Predraft to AF/Service Center	10-15-18
AF/Service Center Comments Due	10-29-18
Draft to Agencies	11-12-18
Draft to RAB	11-12-18
Agency Comments Due	12-14-18
<b>Response to Comments Meeting</b>	<b>01-16-19</b>
Response to Comments Due	02-01-19 (01-08-19)
Draft Final Due	NA
Final Due	02-01-19 (01-08-19)
Public Comment Period	NA
<b>Public Meeting</b>	<b>NA</b>

# South Base Boundary Groundwater Treatment Plant

## Monthly Data Sheet

Report Number: 219

Reporting Period: 2 January 2019 – 1 February 2019

Date Submitted: 7 February 2019

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 January 2019 reporting period.

Table 1 – Operations Summary – January 2019				
Initial Data Collection:		1/2/2019 11:00	Final Data Collection:	2/1/2019 12:00
Operating Time:		Percent Uptime:	Electrical Power Usage:	
SBBGWTP:	721 hours	SBBGWTP:	100%	SBBGWTP: 15,645 kWh (12,377 lbs CO <sub>2</sub> generated <sup>a</sup> )
Gallons Treated: <b>6.2 million gallons</b>			Gallons Treated Since July 1998: <b>1,094 million gallons</b>	
Volume Discharged to Union Creek: <b>6.2 million gallons</b>			Gallons Treated from Other Sources: <b>0 gallons</b>	
VOC Mass Removed: <b>1.3 lbs<sup>b</sup></b>			VOC Mass Removed Since July 1998: <b>512.1 lbs</b>	
Rolling 12-Month Cost per Pound of Mass Removed: \$11,907 <sup>c</sup>				
Monthly Cost per Pound of Mass Removed: \$16,738 <sup>c</sup>				
lbs = pounds				
<sup>a</sup> SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG. Value also includes approximately 800 pounds of GHG from GAC change out services averaged to a per month basis.				
<sup>b</sup> Calculated using January 2019 EPA Method SW8260C analytical results.				
<sup>c</sup> 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) <sup>a</sup> – January 2019							
FT005 <sup>b</sup>				SS029		SS030	
EW01x05	Offline	EW743x05	Offline	EW01x29	Offline <sup>c</sup>	EW01x30	15.4
EW02x05	Offline	EW744x05	4.3	EW02x29	Offline <sup>c</sup>	EW02x30	3.5
EW03x05	Offline	EW745x05	9.5	EW03x29	2.8	EW03x30	15.9
EW731x05	7.7	EW746x05	Offline	EW04x29	8.1	EW04x30	24.8
EW732x05	Offline	EW2291x05	4.9	EW05x29	8.2	EW05x30	3.3
EW733x05	Offline	EW2782x05	4.6	EW06x29	7.9	EW2174x30	8.5
EW734x05	4.0	EW2783x05	7.6	EW07x29	13.8	EW711x30	3.9
EW735x05	0.7	EW2784x05	11.4			MW269x30	Offline <sup>d</sup>
EW736x05	Offline	EW2785x05	4.4				
EW737x05	Offline	EW2786x05	4.0				
EW742x05	Offline						
FT005 Total: 63.1				SS029 Total: 40.8		SS030 Total: 75.3	
SBBGWTP Average Monthly Flow <sup>e</sup> : 142.9 gpm							
<sup>a</sup> Flow rates presented are instantaneous measurements taken at the end of the reporting period.							
<sup>b</sup> 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.							
<sup>c</sup> Extraction wells taken off line because of persistent fouling of the well pumps and associated discharge piping.							
<sup>d</sup> Well is dry. If water recharges, the extraction well will be restarted.							
<sup>e</sup> 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 <sup>a</sup>		Restart <sup>a</sup>		Cause
	Date	Time	Date	Time	
SBBGWTP	None.	--		--	
-- = Time not recorded <sup>a</sup> 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 9 January 2019. Sample results are presented in Table 4. The total VOC concentration (26.00 µg/L) in the influent sample increased from the December 2018 sample results (22.96 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 24 µg/L. TCE, cis-1,2-DCE, chloroform, and 1,2-DCA were detected in the midpoint sampling location at low concentrations. Cis-1,2-DCE, chloroform, and 1,2-DCA were detected in the effluent sample. The cis-1,2-DCE (0.16 J µg/L) and chloroform (0.17 J µg/L) concentrations were less than the instantaneous maximum effluent discharge limit of 5.0 µg/L. The 1,2-DCA concentration (0.63 J µg/L), however, exceeded the instantaneous maximum effluent discharge limit of 0.50 µg/L.

The Water Board was notified by telephone of the exceedance on 1 February 2019, and via email (along with EPA and DTSC) on 1 February 2019 in accordance with the NPDES permit. In addition on 1 February 2019, a confirmation effluent sample was collected. In addition, water samples from Union Creek upstream and downstream of the SBBGWTP outfall were collected. These results will be presented in the February 2019 monthly data sheet. A carbon change out is being coordinated for early February 2019.

In January 2019, troubleshooting was performed on several extraction wells. The following list presents the maintenance activities and status of several extraction wells:

- EW735x05 – Replaced flow totalizer; however, the well has repeated flow meter fouling. Well is currently operating.
- EW2784x05 – Replaced flowmeter. Well is currently operating.
- EW01x30 – Lowered transducer 4 to 5 feet. Well is currently operating.
- EW04x30 – Installed a new transducer; however, the pressure transducer wiring needs to be replaced. Well is currently operating in hand mode.
- EW05x30 – Replaced pump motor. Well is currently off line.
- EW2174x30 – Replaced pump motor. Adjusted the pump depth to approximately five (5) feet higher than its original position. Well is currently operating.

Figure 1 presents the influent 1,2-DCA and TCE concentrations since January 2017. Between July and October 2018, TCE influent concentrations have increased, while the 1,2-DCA influent concentrations have decreased to non-detect. In November 2018, TCE concentrations began to decrease, and in December 2018 and January 2019, 1,2-DCA reappeared in the influent sample.

Figure 2 presents a plot of influent VOC concentrations and average flow at the SBBGWTP over the past twelve (12) months. An overall increasing 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.

## Optimization Activities

No optimization activities occurred at the SBBGWTP in January 2019.

## 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 3 presents the historical GHG production from the SBBGWTP. In January 2019, the SBBGWTP produced approximately 12,377 pounds of GHG, which includes approximately 800 pounds of GHG generated from GAC change out services averaged to a per month basis.



TABLE 4

Summary of Groundwater Analytical Data for January 2019 – South Base Boundary Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	9 January 2019 (µg/L)		
				Influent	Midpoint	Effluent
Halogenated Volatile Organics						
Acetone	NA	2.1	0	ND	ND	ND
Bromodichloromethane	NA	0.29	0	ND	ND	ND
Carbon Tetrachloride	0.5	0.15	0	ND	ND	ND
Chloroform	5.0	0.12	0	ND	0.18 J	0.17 J
Chloromethane	NA	0.25	0	ND	ND	ND
1,1-Dichloroethane	5.0	0.15	0	ND	ND	ND
1,2-Dichloroethane	0.5	0.22	1	0.40 J	0.57 J	0.63 J
1,1-Dichloroethene	5.0	0.14	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.10	0	1.6	1.6	0.16 J
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	24	4.4	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	16	0	NM	NM	19 J
Total Petroleum Hydrocarbons – Motor Oil	50	160	0	NM	NM	ND

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

## 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

mg/L = milligrams per liter

NA = not applicable

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

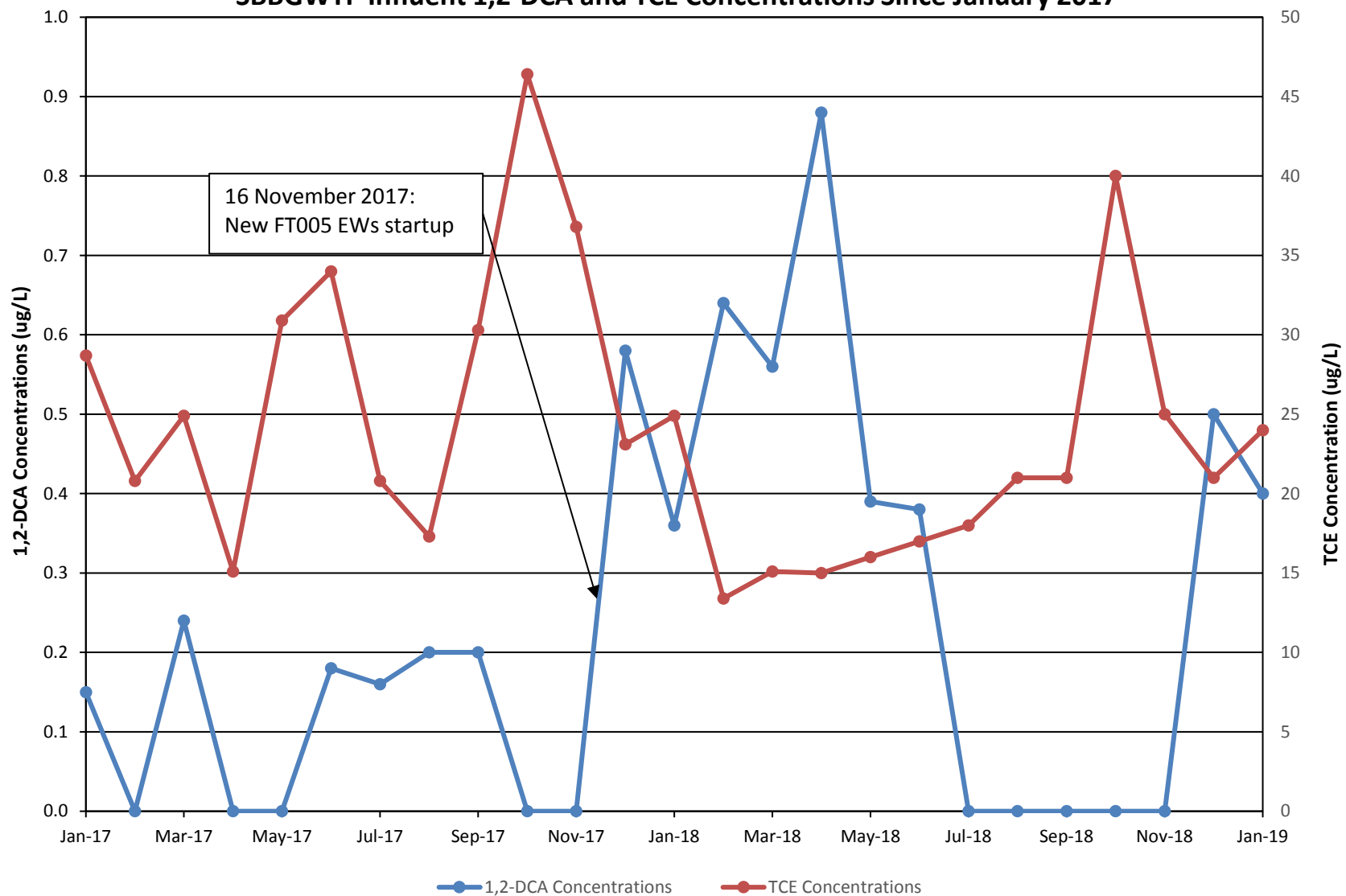
ND = not detected

NM = not measured

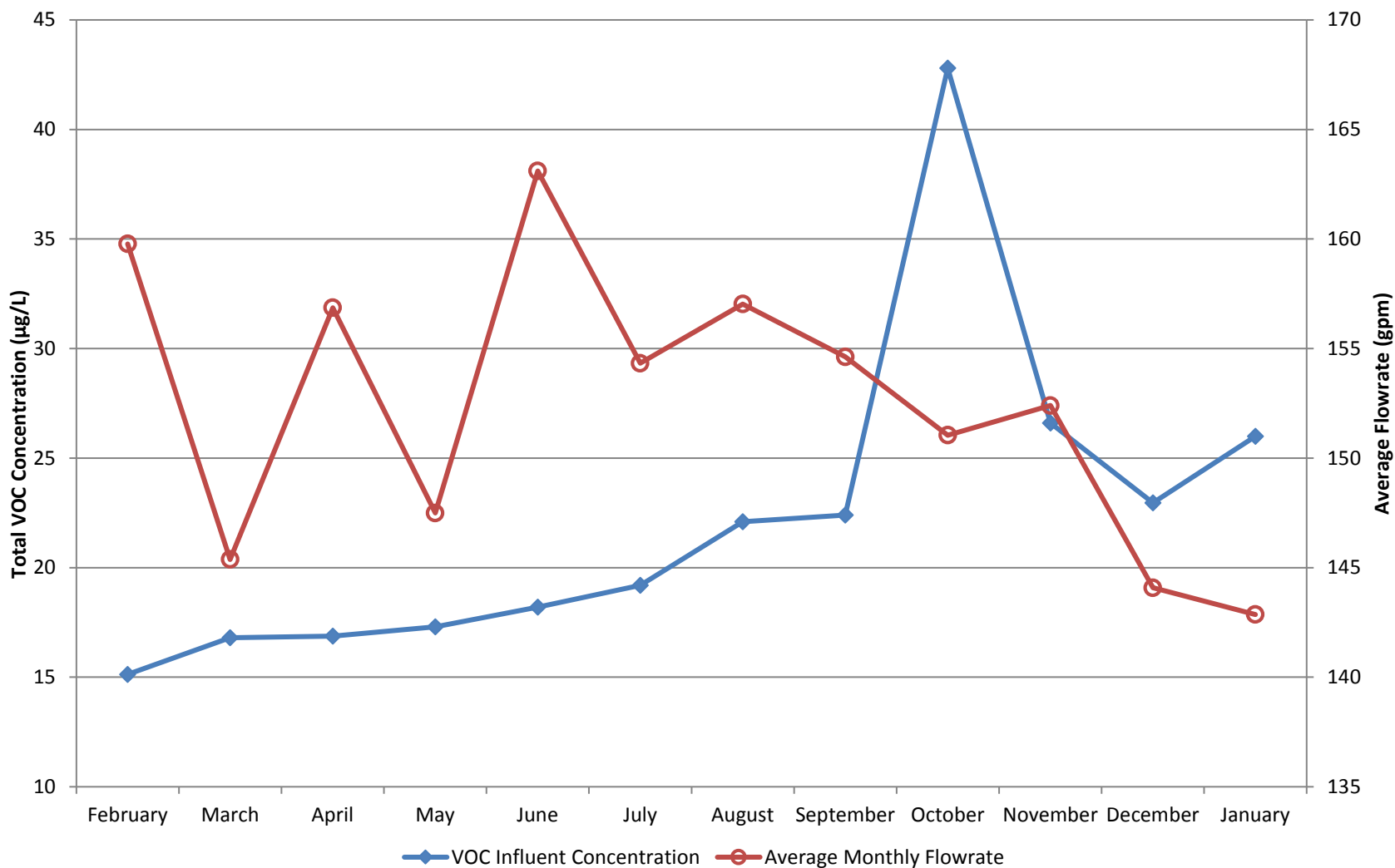
µg/L = micrograms per liter

# Figure 1

## SBBGWTP Influent 1,2-DCA and TCE Concentrations Since January 2017

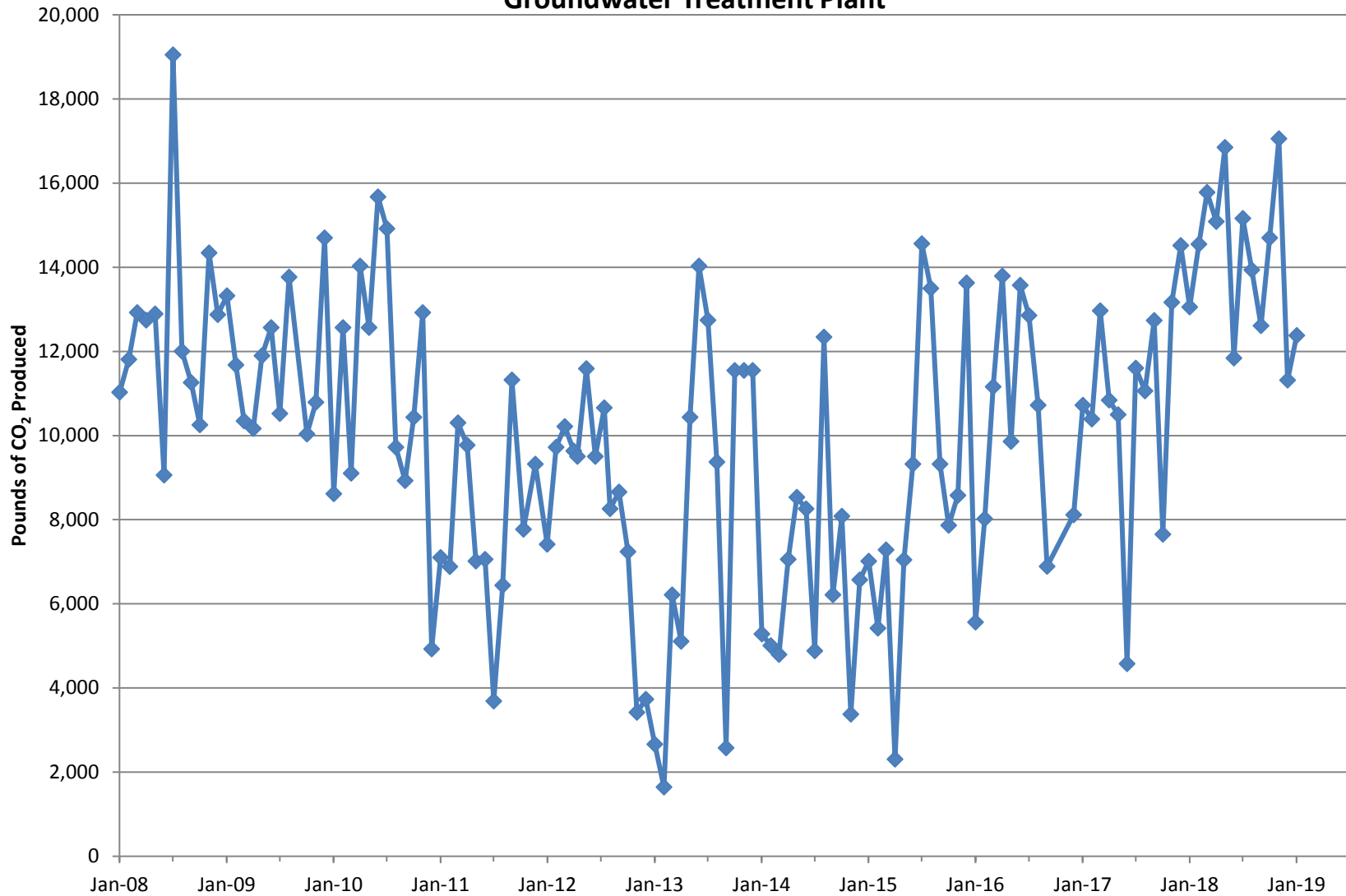


**Figure 2**  
**SBBGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History**



**Figure 3**

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



# Central Groundwater Treatment Plant Monthly Data Sheet

Report Number: 234

Reporting Period: 3 January 2019 – 1 February 2019

Date Submitted: 7 February 2019

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 January 2019 reporting period.

Table 1 – Operations Summary – January 2019			
Initial Data Collection:		1/3/2019 11:55	
Final Data Collection:		2/1/2019 12:00	
Operating Time:		Percent Uptime:	
CGWTP: 696 hours		CGWTP: 100%	
		Electrical Power Usage:	
		CGWTP: 1,979 kWh (2,353 lbs CO <sub>2</sub> generated <sup>a</sup> )	
Gallons Treated (discharge to storm sewer):		Gallons Treated Since January 1996:	
1,158,130 gallons <sup>b</sup>		565.0 million gallons	
VOC Mass Removed from groundwater:		VOC Mass Removed Since January 1996:	
1.8 lbs <sup>c</sup>		2,824 lbs from groundwater	
		8,686 lbs from vapor	
Rolling 12-Month Cost per Pound of Mass Removed: \$3,888 <sup>d</sup>			
Monthly Cost per Pound of Mass Removed: \$6,759 <sup>d</sup>			
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 Approximately 180 gallons of rainwater was pumped out of the Site SD043 excavation and treated at the CGWTP. Approximately 15 gallons of purged groundwater and decontamination water from the GRIP event was also treated at the CGWTP.			
c Calculated using January 2019 EPA Method SW8260C analytical results.			
d 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 <sup>a</sup> – January 2019	
Location	Average Flow Rate Groundwater (gpm)
EW001x16	12.3
EW002x16	7.2
EW003x16	0.2
EW605x16	5.8
EW610x16	2.6
CGWTP	27.7
<sup>a</sup> Flow rates calculated by dividing total gallons processed by system operating time for the month or the average of the instantaneous readings. gpm = gallons per minute	

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

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

Table 4 presents a twelve-month summary of the Site DP039 bioreactor recirculation well pulsing dates.

<b>Table 4 – Summary of DP039 Bioreactor “Pulsed Mode” Operations</b>		
<b>Location</b>	<b>Pulse-on Date</b>	<b>Pulse-off Date</b>
MW750x39	26 December 2017	22 January 2018
	19 February 2018	21 March 2018
	16 April 2018	14 May 2018
	12 June 2018	9 July 2018
	7 August 2018	6 September 2018
	1 October 2018	30 October 2018
	27 November 2018	24 December 2018
	23 January 2019	
MW = Monitoring Well		

## Summary of O&M Activities

Monthly groundwater treatment samples were collected at the CGWTP on 9 January 2019. Sample results are presented in Table 5. The total VOC concentration (183.68 µg/L) in the January 2019 influent sample has decreased from the December 2018 sample (223.30 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 140 µg/L. Vinyl chloride (0.19 µg/L) was detected in the sample after the first carbon vessel. No VOCs were detected in the sample collected after the second carbon vessel or in the effluent sample. Travis AFB will continue to monitor influent, midpoint, and effluent concentrations at the CGWTP for carbon breakthrough, though the carbon treatment remained effective in January 2019.

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 decreasing trend over the past 12 months along with a decreasing trend for the flow rate through the treatment plant.

The Site DP039 subgrade biogeochemical reactor (SBGR), also known as a bioreactor, continued to operate in a four-week “pulsed mode” to optimize distribution of total organic carbon (TOC). The bioreactor was brought back on line on 23 January 2019.

## Optimization Activities

No optimization activities occurred at the CGWTP in January 2019.

## 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 2,353 pounds of GHG during January 2019.

TABLE 5

Summary of Groundwater Analytical Data for January 2019 – Central Groundwater Treatment Plant

				9 January 2019 (µg/L)			
Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	Influent	After Carbon 1 Effluent	After Carbon 2 Effluent	System Effluent
Halogenated Volatile Organics							
Acetone	NA	2.1 – 11	0	ND	ND	ND	ND
Chloroform	5.0	0.12 – 0.60	0	ND	ND	ND	ND
Chloromethane	NA	0.25 – 1.3	0	ND	2.7	ND	ND
1,2-Dichlorobenzene	5.0	0.14 – 0.70	0	0.37 J	ND	ND	ND
1,3-Dichlorobenzene	5.0	0.11 – 0.55	0	0.37 J	ND	ND	ND
1,4-Dichlorobenzene	5.0	0.13 – 0.65	0	0.18 J	ND	ND	ND
1,1-Dichloroethane	5.0	0.15 – 0.75	0	ND	ND	ND	ND
1,2-Dichloroethane	0.5	0.22 – 1.1	0	ND	ND	ND	ND
1,1-Dichloroethene	5.0	0.14 – 0.70	0	0.52 J	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.15 – 0.50	0	39	ND	ND	ND
trans-1,2-Dichloroethene	5.0	0.15 – 0.55	0	2.5	ND	ND	ND
Methylene Chloride	5.0	0.35 – 1.8	0	ND	ND	ND	ND
Tetrachloroethene	5.0	0.15 – 0.75	0	0.53 J	ND	ND	ND
1,2,3-Trichlorobenzene	5.0	0.14 – 0.70	0	ND	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.19 – 0.95	0	ND	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.31 – 1.6	0	ND	ND	ND	ND
Trichloroethene	5.0	0.16 – 0.65	0	140	ND	ND	ND
Vinyl Chloride	0.5	0.22 – 1.1	0	0.21 J	0.19 J	ND	ND
Non-Halogenated Volatile Organics							
Benzene	1.0	0.13 – 0.65	0	ND	ND	ND	ND
Ethylbenzene	5.0	0.15 – 0.75	0	ND	ND	ND	ND
Toluene	5.0	0.25 – 1.3	0	ND	ND	ND	ND
Total Xylenes	5.0	0.18 – 0.90	0	ND	ND	ND	ND
Other							
Total Petroleum Hydrocarbons – Gasoline (C6 – C10)	50	10	0	NM	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel (C10 – C28)	50	15 – 17	0	NM	NM	NM	ND
Total Petroleum Hydrocarbons – Motor Oil (C28 – C40)	50 (trigger)	160 - 180	0	NM	NM	NM	ND

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

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

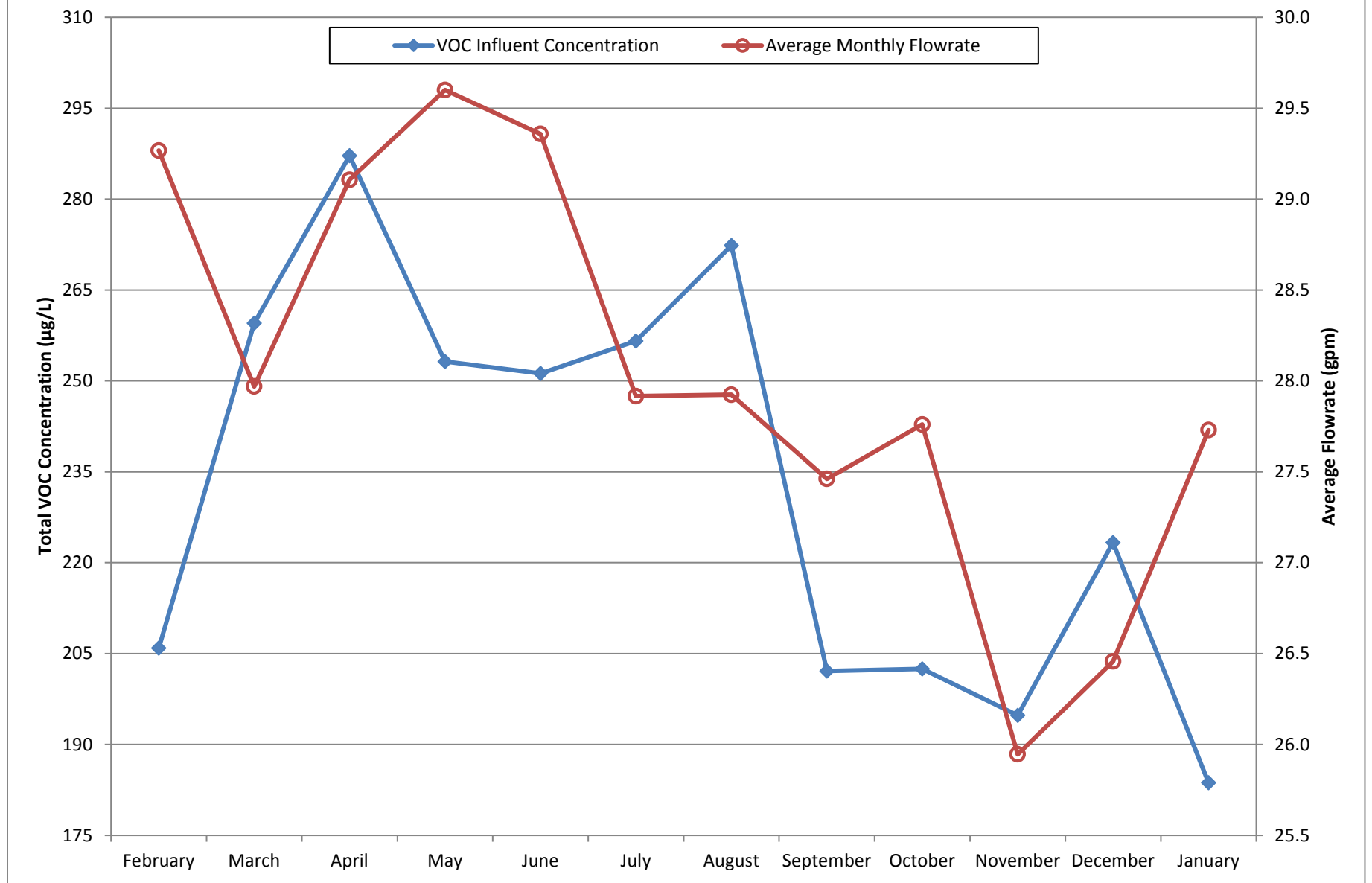
NM = not measured

µg/L = micrograms per liter

mg/L = milligrams per liter

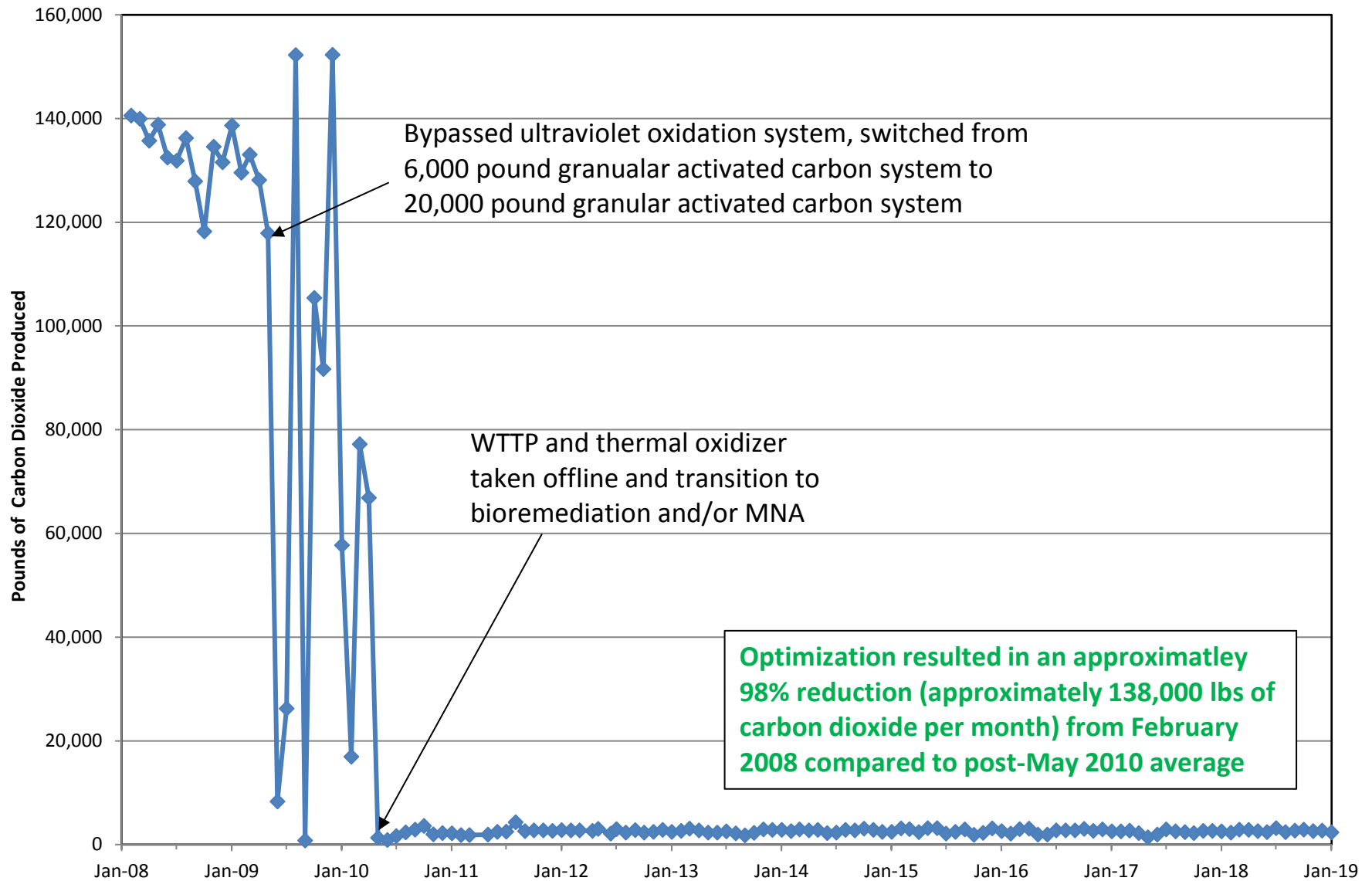


**Figure 1**  
**CGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History**



**Figure 2**

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



# Site ST018 Groundwater Treatment Plant

## Monthly Data Sheet

Report Number: 095

Reporting Period: 2 January 2019 – 1 February 2019

Date Submitted: 7 February 2019

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

### System Metrics

Table 1 presents operation data from the January 2019 reporting period.

Table 1 – Operations Summary – January 2019			
<b>Initial Data Collection:</b>	1/2/2019 14:20	<b>Final Data Collection:</b>	2/1/2019 13:45
Operating Time:		Percent Uptime:	Electrical Power Usage:
<b>ST018GWTP:</b> 719 hours		<b>ST018GWTP:</b> 100%	<b>ST018GWTP:</b> 98 kWh (73 lbs CO <sub>2</sub> generated <sup>a</sup> )
Gallons Extracted: <b>180,430 gallons</b>		Gallons Extracted Since March 2011: <b>16.4 million gallons</b>	
Volume Discharged to Sanitary Sewer: <b>180,430 gallons</b>		Final Totalizer Reading: <b>16,369,129 gallons</b>	
Cumulative Volume Discharged to Sanitary Sewer since 1 November 2014: <b>9,872,955 gallons</b>			
MTBE, BTEX, VOC, TPH Mass Removed: <b>0.49 lbs<sup>b</sup></b>		MTBE, BTEX, VOC, TPH Mass Removed Since March 2011: <b>46.6 lbs</b>	
MTBE (Only) Removed: <b>0.02 lbs<sup>b</sup></b>		MTBE (Only) Mass Removed Since March 2011: <b>11.3 lbs</b>	
Rolling 12-Month Cost per Total Pounds of Mass Removed: \$9,648 <sup>bc</sup>			
Monthly Cost per Pound of Mass Removed: \$7,258 <sup>bc</sup>			
<sup>a</sup> SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG. <sup>b</sup> Calculated using January 2019 EPA Method SW8260C and SW8015B analytical results. <sup>c</sup> 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.

<b>Table 2 – ST018GWTP Average Flow Rates – January 2019</b>		
<b>Location</b>	<b>Average Flow Rate Groundwater (gpm)<sup>a</sup></b>	<b>Hours of Operation</b>
EW2014x18	1.0	719
EW2016x18	0.9	719
EW2019x18	1.2	719
EW2333x18	1.0	531
ST018GWTP	4.2	719
<sup>a</sup> Flow rates calculated by dividing total gallons processed by amount of operating time of the pump/system. gpm = gallons per minute ST018GWTP = Site ST018 Groundwater Treatment Plant		

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

<b>Table 3 – Summary of System Shutdowns</b>					
<b>Location</b>	<b>Shutdown<sup>a</sup></b>		<b>Restart<sup>a</sup></b>		<b>Cause</b>
	<b>Date</b>	<b>Time</b>	<b>Date</b>	<b>Time</b>	
ST018GWTP	None.	--		--	
-- = Time not recorded <sup>a</sup> 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 9 January 2019. Because the extracted groundwater is no longer treated with carbon prior to discharge to the sewer, only discharge samples are now collected, rather than influent and effluent samples. Results are presented in Table 4. The complete January 2019 laboratory data report is available upon request. The MTBE discharge concentration during the January 2019 sampling event was 16 µg/L, which is a decrease from the December 2018 sample result of 46 µg/L. TPH-g (270 J+ µg/L), TPH-d (35 J µg/L), benzene (3.0 µg/L), and ethylbenzene (0.96 J µg/L), were also detected in the system discharge sample along with several other VOCs.

There were no shutdowns of the ST018GWTP in January 2019; however, because of consecutive cloudy, foggy, and/or rainy days, the extraction wells experienced decreased production throughout the monitoring period. In addition, extraction well EW2333x18 experienced shutdowns during the reporting period because of high pressures in the extraction piping. This well has its flow restricted to reduce frequent well cycling, and this can lead to occasional shutdowns. This alarm set point will be adjusted if continued shutdowns are experienced going forward.

The Fairfield-Suisun Sewer District does not currently have a local 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 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. The extracted MTBE concentrations and extracted total concentrations have generally been fluctuating over the past 12 months with overall decreasing trends.

## Optimization Activities

No optimization activities occurred at the ST018GWTP in January 2019.

## 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 ST018GWTP system.

Figure 2 presents the historical GHG production from the ST018GWTP. The ST018GWTP produced 73 pounds of GHG during January 2019 and removed 180,430 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. Since the GAC vessels were bypassed, a slightly less amount of electricity is required.

TABLE 4

Summary of Groundwater Analytical Data for January 2019– Site ST018 Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	9 January 2019 (µg/L)
				System Discharge
Fuel Related Constituents				
Methyl tert-Butyl Ether	6,400	0.25	0	16
Benzene	25,000 <sup>a</sup>	0.16	0	3.0
Ethylbenzene	25,000 <sup>a</sup>	0.16	0	0.97 J
Toluene	25,000 <sup>a</sup>	0.17	0	ND
Total Xylenes	25,000 <sup>a</sup>	0.19 – 0.34	0	ND
Total Petroleum Hydrocarbons – Gasoline	50,000 <sup>b</sup>	10	0	270 J+
Total Petroleum Hydrocarbons – Diesel	50,000 <sup>b</sup>	15	0	35
Total Petroleum Hydrocarbons – Motor Oil	100,000	160	0	ND
Other				
1,2-Dichloroethane	20	0.13	0	ND
Carbon Tetrachloride	NA	0.19	0	ND
Methylene chloride	NA	0.32	0	0.49 J
Naphthalene	NA	0.22	0	0.39 J
N-Propylbenzene	NA	0.16	0	0.36 J

\* In accordance with the Fairfield-Suisun Sewer District Discharge Limitations  
Laboratory data available on request.

a – The limit of 25,000 µg/L is a combined limit for BTEX.

b – The limit of 50,000 µg/L is a combined limit for TPH-g and TPH-d

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

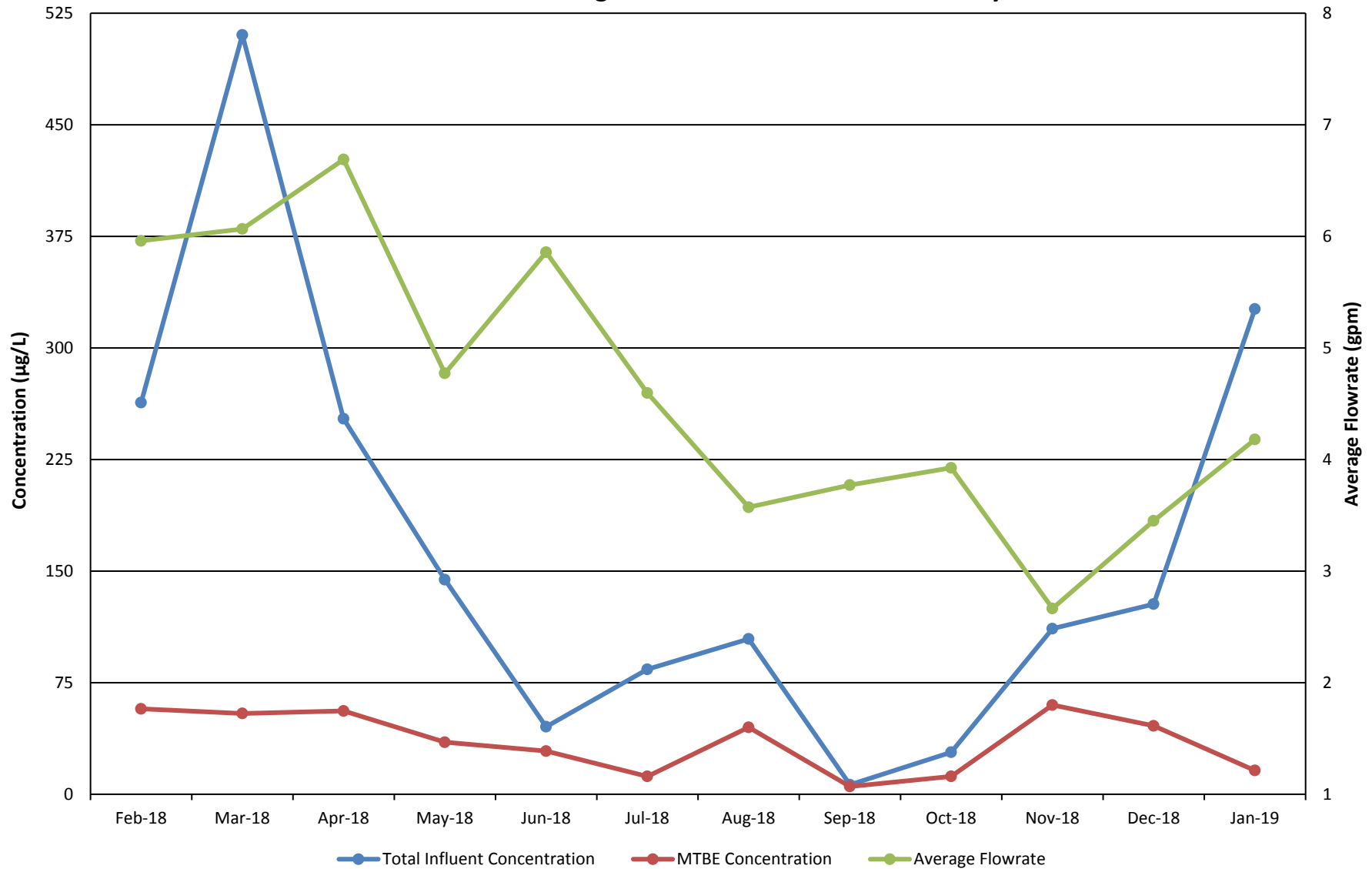
J+ = analyte concentration is considered an estimated value, biased high

NA = not applicable

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

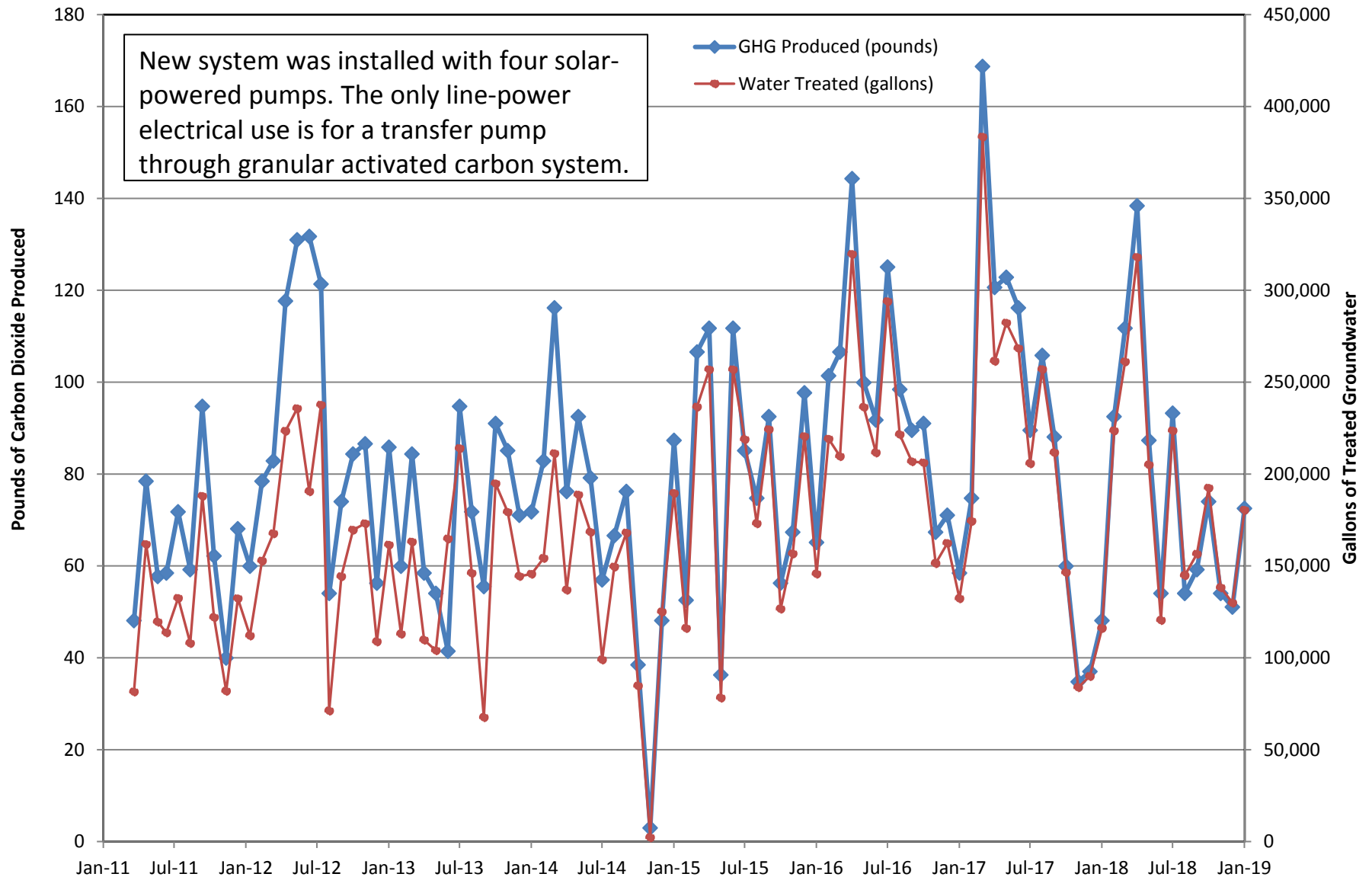
ND = not detected above method detection limit

**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 Site & System Enhancements Planned for 2019

RPM Meeting  
February 13, 2019

# Enhancements – List of Sites/Systems

- SD034 O<sub>2</sub> Enhancement
- ST027B Reinjection
- DP039 Extraction and SBGR recirculation Enhancement
- SS015 Reinjection Study
- SD036/SD037 Aquifer Testing
- Well Redevelopment of targeted wells at sites ST018, SS030, SS029, and FT005.

# SD034 O<sub>2</sub> Enhancement

- O<sub>2</sub> distribution in the Washboard bioreactor system has slowed, and need to increase O<sub>2</sub> delivery into the SBGR trenches
- Each trench has a slotted pipe with a riser to the surface already installed
- Implement the following:
  - Abandon and replace the low-yielding well EW01x34
  - Add new extraction well in vicinity of MW02x34
  - Install low-flow blower to sparge O<sub>2</sub> into each of the SBGR trenches

# ST027B Reinjection

- VOCs rebounded slightly in 2018
- Will reinject the same as was done in 2016
- Implement the following:
  - Inject EVO solution in IW2253x27 and IW2254x27 in the EVO-only study area
  - Inject EVO solution and bioaugmentation solution in IW2255x27 and IW2256x27 in the bioaugmentation study area

# DP039 Extraction and SBGR recirculation Enhancement

- Maximize flow and recirculation from down-gradient extraction wells (EW2382x39 and EW2383x39)
- The infiltration trench is about at max capacity, and the source-area SBGR can take more recirculation water
- Implement the following:
  - Install flow control valve where flow from EW2382x39 and EW2383x39 enters the infiltration trench
  - Maximize flow from the extraction wells, and split flow between the infiltration trench and the SBGR

# SS015 Reinjection Study

- Biodegradation is progressing, although slowly
- Implement the following:
  - Collect samples from four wells at Site SS015 for analysis of qPCR and Next Generation Sequencing (DNA testing for bacterial populations)
  - Evaluate addition of amendments, based on mix of bacteria present
  - Reinject amended EVO solution in targeted area, to test effectiveness of amendments

# Aquifer Testing at SD036 and SD037

- SD036:
  - Well MW2032x36 has showed increasing VOC concentrations, and is outside of the EVO treatment area
  - Conduct 72-hour aquifer test to refine hydrogeologic parameters in this area and evaluate TCE concentrations throughout the test
- SD037
  - Well MW2121x37 has showed increasing VOC concentrations
  - Conduct 72-hour aquifer test to refine hydrogeologic parameters in this area and evaluate TCE concentrations throughout the test

# Re-develop Wells

- Several extraction wells at Travis have recurring sedimentation issues
- Plan to re-develop the following wells in 2019 to enhance performance:
  - EW2014x18
  - EW734x05
  - EW735x05
  - EW2174x30
  - EW02x29
  - EW03x29
  - EW04x29



# Travis AFB Restoration Program

## Program Update

*RPM Meeting*  
*February 13, 2019*

Note: Documents marked in yellow are delayed due to the  
government shutdown

# Completed Documents (1)

- Vapor Intrusion Assessment Update Technical Memorandum
- 2012 CAMU Annual Report
- Old Skeet Range Action Memorandum
- 3<sup>rd</sup> 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

# 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 (2<sup>nd</sup> 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 (3<sup>rd</sup> 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 (1<sup>st</sup> 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 (2<sup>nd</sup> 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**

# Documents In-Progress

## CERCLA

- Amendment to the NEWIOU Soil ROD for Sites SS016 and SD033
- Community Relations Plan Update (revised draft)
- 4<sup>th</sup> Five Year Review Report for Multiple Groundwater, Soil, and Sediment Sites
- SS016 RD/RA Work Plan
- 2017 Annual GRISR
- SS015 Soil Sampling Results Tech Memo

# Documents In-Progress

## MMRP

- NFA ROD for Old Skeet Range (TS060/TS060A MRA)

## POCO

- Subarea LF007C TPH Chromatogram Review TM

# Field Work In-Progress

CERCLA

- SS046 Soil excavation

POCO

- None

# Documents Planned

## CERCLA

- SD031 Soil RI/FS TBD
- Addendum to the Site SS016 Groundwater  
RD/RA Work Plan Feb
- LF006 Technology Demonstration Construction  
Completion Report Feb

## MMRP

- None

## POCO

- None

# Field Work Planned

## CERCLA

- SS016 Soil excavation (waiting on NEWIOU ROD amendment)
- ***2Q 2019 GRIP Sampling Event***

TBD  
***Apr***

## POCO

- None

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

# Petroleum Technology Demonstration Projects (1)

- SS014: Recycled Drywall SBGR (No new information)
  - Evaluate the effectiveness of sulfate (gypsum from crushed drywall) to enhance anaerobic biodegradation of petroleum in groundwater
  - Installation was completed November 2016
  - Results through first 15 months
    - TPH-G: 99% reduction in source area (1,900 to 15 J mg/L), 51% for remaining 6 site wells (was 34% after 9 months and 18% after 3 months)
    - TPH-D: 98% reduction in source area (5,500 to 92 mg/L), 38% for remaining 6 site wells (was 61% after 9 months and 33% after 3 months)
    - Benzene: 98% reduction in source area (22 to <0.4 mg/L), 87% for remaining 6 site wells (was 61% after 9 months and 49% after 3 months)

SBGR = Sulfate Biogeochemical Reactor

**Updates in Green Font**



## Petroleum Technology Demonstration Projects (2)

- SD034: Aerobic Washboard SBGR (No new information)
- 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) through first 20 months
  - TPH-D baseline 9,600 ug/L was reduced to 40 J ug/L after 15 months, with increase to 890 ug/L at 20 months (Was 98% reduction after 9 months. Concentration fluctuations are to be expected as higher concentration areas are flushed as part of the washboard effect)
  - TPH-MO baseline 2,300 ug/L was reduced to 89 J ug/L after 15 months, with increase to 760 ug/L at 20 months (Was 91% reduction after 9 months)
- Plume hot spot monitoring well (MW02x34) through first 20 months
  - TPH-D baseline 8,300 ug/L was reduced to 6,800 ug/L after 15 months, with increase to 13,000 ug/L at 20 months (Was 87% reduction after 9 months. Concentration fluctuations are to be expected as higher concentration areas are flushed as part of the washboard effect)
  - TPH-MO baseline 1,500 ug/L was reduced to 660 J ug/L after 15 months, with non-detect at elevated detection limit at 20 months (Was 72% reduction after 9 months, seeing some fluctuations)

\* SBGR = Subgrade Biogeochemical Reactor

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)
  - Limited TOC dispersal at SD036, so installed additional injection wells and reinjected with nanoEVO in 2017
  - Too early to evaluate degradation rates; however:
    - ~50-70% TCE reductions at ST027B, but still too early to evaluate if bioaugmentation was beneficial
    - 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 ug/L), and to the north (in MW2187x36, TCE reduced from 1,400 to 84 ug/L). Still too early to evaluate if bioaugmentation was beneficial
- 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

# CVOC Technology Demonstration Projects (4)

- FT004: Distribution of EVO via SBGR and/or Groundwater Extraction (No new information)
  - 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
  - COC concentrations declined through year 1
    - ~50% total molar reduction plume-wide through first year
    - Max monitoring well TCE concentration reduced from 560 to 140 µg/L
  - Limited TOC dispersal, additional EVO injection conducted with nanoEVO in 2017 to determine if this can enhance TOC dispersal (too early to evaluate results of reinjection)
    - Concentrations rebounded in 4Q17, but 2017 reinjection should support further reductions
  - TOC increase (and TCE decrease from 330 to 63 ug/L) in northern plume area following reinjection
  - 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 (so recirculation is working, but we are fighting additional TCE mass)

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
  - Early indications:
    - Recirculation through chimneys 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% (was 93%) (sum of key wells within TD area, excluding 2 wells to SW that increased)
    - Total molar concentration (sum of CVOCs) has reduced by 99% (was 84%) (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
    - While the demonstration has treated the originally defined groundwater plume area to below MCLs, we are waiting on 2Q19 data to evaluate effects of reinjections, since there is additional mass being pulled in from cross-gradient that we are continuing to evaluate

Updates in Green Font

# Completed Documents (Historical1)

- 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 Memorandum<sup>22</sup>

# Completed Field Work (Historical1)

- 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 (2<sup>nd</sup> 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 (4<sup>th</sup> 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