Final

Travis Air Force Base
Environmental Restoration Program
Restoration Program Manager's
Meeting Minutes
15 November 2017, 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 15 November at 0930 hours in Building 248 at Travis AFB, California. Attendees included:

Lonnie Duke	AFCEC/CZOW
Glenn Anderson	AFCEC/CZOW
Milton 'Gene' Clare	AFCEC/CZOW
Angel Santiago Jr.	AFCEC/CZOW
Merrie Schilter-Lowe	Travis AFB/PAO
Adriana Constantinescu (via telephone)	RWQCB
Ben Fries (via telephone)	DTSC
Nadia Hollan Burke (via telephone)	USEPA
Indira Balkissoon (via telephone)	Techlaw, Inc
Mike Riggle (via telephone)	USACE/Omaha
Jeff Gamlin (via telephone)	CH2M
Leslie Royer	CH2M
Mike Wray	CH2M

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 (October 2017)
Attachment 4	CGWTP Monthly Data Sheet (October 2017)
Attachment 5	LF007C GWTP Monthly Data Sheet (October 2017)
Attachment 6	ST018 Monthly Data Sheet (October 2017)
Attachment 7	Presentation: OSWER Site Closure Guidance
Attachment 8	Presentation: Site SS035 Site Closure

Attachment 9 Presentation: Program Update (November 2017)

1. ADMINISTRATIVE

A. Previous Meeting Minutes

The 19 October 2017 RPM meeting minutes were approved and finalized as written.

B. Action Item Review.

Action items from October 2017 were reviewed.

Action item 1 is ongoing: Ms. O'Sullivan to provide updates on perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). 15 November 2017 update: The last round of samples for the Site Inspection (SI) were collected on 23 October 2017. Sampling is now complete; the SI Report is expected to be ready for review in late January 2018.

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

The next RPM meeting will be a teleconference held on Wednesday 17 January 2018, at 0930 hours.

Lonnie is scheduled to be in Alabama during the scheduled RPM teleconference in September 2018. This meeting date (09-19-2018) may need to be re-scheduled.

Travis AFB Master Document Schedule

— Community Relations Plan (CRP): No change was made to the schedule. The draft document has been sent to AFCEC Public Affairs. A schedule update is expected at the next RPM meeting.

— Work Plan for the Fourth Five-year Review: The Response to Comments Due date was changed to 18 October 2017 to reflect actual submittal date of RTCs to EPA; the remainder

of the schedule was changed accordingly. This document will be moved to the history in January.

- Amendment to the WABOU Soil ROD for Travis AFB ERP Sites DP039, SD043, and SS046: No change was made to the schedule.
- Amendment to the NEWIOU Soil ROD for the Travis AFB ERP Sites SS016 and SD033: This is a new document/new schedule.
- Potrero Hills Annex (FS, PP, and ROD): No change was made to the schedule. Mr. Anderson said the contractor is completing the field work and he will ask for updates for the January meeting.
- Data Gap Investigation Results Technical Memorandum for Soil Sites SD033, SD043, and SS046: The Agency Comments Due date was changed to 20 November 2017 to accommodate requested additional review time; the remainder of the schedule was changed accordingly. Ms. Burke noted that she and her staff have started the review process, but she is unsure if EPA will be able to meet the requested date due to recent wildfire deployments. She may request an additional 30 days; if needed, she will submit a formal request.
- Data Gap Investigation Results Technical Memorandum for Soil Site SS016: Draft to Agencies date changed to 21 November 2017 to accommodate additional preparation time, the rest of the dates were changed accordingly. Mr. Anderson noted the upcoming holidays and requested regulators let him know if additional review time will be necessary.
- Quarterly Newsletters (January 2018): The schedule was updated to reflect the January 2018 newsletter.
- 2016 Annual GRISR: The Response to Comments date has been changed to 15 December 2017; the remainder of the schedule was changed accordingly.
- Site TS060 Removal Action Completion Report: The Predraft to AF/Service Center date was changed to 8 November 2017 to account for additional internal review time. The rest of the schedule was changed accordingly. Mr. Anderson noted the upcoming holidays and requested regulators let him know if additional review time will be necessary.
- Site SS035 Site Closure Report: This is a new document and a new schedule.
- POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW052, OW050, OW052, OW055, OW056, and OW057. Draft to Agencies Due date was changed to 29 November 2017; the rest of the dates were changed accordingly.
- The following documents were moved to History:
  - Site ST032 POCO Well Decommissioning and Site Closeout Technical Memorandum
  - POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW052, OW050, OW052, OW055, OW056, and OW057

— 2016 Annual CAMU Monitoring Report

2. CURRENT PROJECTS

Treatment Plant Operation and Maintenance Update

South Base Boundary Groundwater Treatment Plant, October 2017 (see Attachment 3)

The South Base Boundary Groundwater Treatment Plant (SBBGWTP) performed at 99.9% uptime, and 4.1 million gallons of groundwater were extracted and treated in October 2017. All treated water was discharged to Union Creek. The average flow rate for the SBBGWTP was 94.4 gallons per minute (gpm). Electrical power usage was 9,261 kWh, and approximately 7,653 pounds of CO_2 were created (based on DOE calculation). Approximately 1.68 pounds of volatile organic compounds (VOCs) were removed in October. The total mass of VOCs removed since startup of the system is 492.6 pounds.

Optimization Activities for SBBGWTP: Based on two aquifer tests conducted in June 2017, it was determined that five (5) new extraction wells would be needed to optimize removal of residual 1,2-DCA at Site FT005. The well installations were completed in October 2017, and the wells will be connected to the SBBGWTP in November 2017.

Central Groundwater Treatment Plant, October 2017 (see Attachment 4)

The Central Groundwater Treatment Plant (CGWTP) performed at 99.3% uptime with approximately 1,135,193 gallons of groundwater extracted and treated in October 2017. All treated water was discharged to the storm sewer system which discharges to Union Creek. The average flow rate for the CGWTP was 25.6 gpm. Electrical power usage was 1,761 kWh for all equipment connected to the Central Plant, and approximately 2,191 pounds of CO_2 were generated. Approximately 1.93 pounds of VOCs were removed from groundwater by the treatment plant in October. The total mass of VOCs removed since the startup of the system is 11,475 pounds.

Optimization Activities for CGWTP: No optimization activities are reported for the month of October 2017.

LF007C Groundwater Treatment Plant, October 2017 (see Attachment 5)

The Subarea LF007C Groundwater Treatment Plant (LF007C GWTP) performed at 89.7% uptime with approximately 188,368 gallons of groundwater extracted and treated in October 2017. All treated water was discharged to the Duck Pond for

beneficial reuse. The average flow rate was 4.9 gpm. This plant operates on solar power only. Approximately 1.95 x 10^{-3} pound of VOCs was removed from groundwater by the treatment plant in October. The total mass of VOCs removed since the startup of the system is 174.38 pounds.

Optimization Activities for LF007C GWTP: No optimization activities are reported for the month of September 2017.

Note: On 6 September, the LF007C GWTP was shut down because of high pressures; the shutdown was not identified until 13 September when the system was planned to be shut down because of the potentially false-positive TPH exceedances. On 14 September, the system was restarted for 2 hours prior to collecting the additional confirmation samples. The system was shut down after the samples were collected, and remained off line for the remainder of the reporting period. The system was restarted on 4 October 2017.

Mr. Wray followed up regarding the TPH exceedances and confirmation sampling, stating that the exceedances were not related to site contamination. The source of the TPH in these samples will be investigated in November 2017 as part of the periodic basewide sampling effort.

Mr. Wray also noted that the seasonal rains have begun, adding that we will inspect this GWTP after any rain event, and if standing water is observed, the system will be shut down.

ST018 Groundwater (MTBE) Treatment Plant, October 2017 (see Attachment 6)

Site ST018 (MTBE) Treatment Plant (ST018 GWTP) performed at 100% uptime with approximately 146,380 gallons of groundwater extracted and treated in October 2017. All treated water was discharged to the Fairfield – Suisun Sewer District. The average flow rate for the ST018 GWTP was 3.4 gpm. Electrical power usage for the month was 81 kWh for all equipment connected to the ST018 GWTP. The total CO_2 equivalent, including an estimate for the carbon change-out, equates to approximately 60 pounds. Approximately 0.07 pound of BTEX, VOCs, and TPH was removed in October by the treatment plant, and approximately 0.00 pound of MTBE was removed from groundwater. The total BTEX, MTBE and TPH mass removed since the startup of the system is 42.7 pounds, and the total MTBE mass removed since startup of the system is 10.6 pounds.

Note: Electrical power use at the ST018 GWTP is only for the alarm system and a pump that pushes water through the GAC vessels for treatment. The four groundwater extraction pumps in the system are all solar powered.

Optimization Activities for ST018 GWTP: Beginning in October 2017, three of the four extraction wells (EW2014x18, EW2016x18, and EW2333x18) began operating in a two-week “pulse-mode” (two weeks off, two weeks on, two weeks off, and so forth).

The furthest downgradient extraction well EW2019x18 will not be turned off during the pulsed mode operation.

3. Presentations:

A) OSWER Site Closure Process (See Attachment 7)

Mr. Gamlin provided an overview of the OSWER guidance and data considerations related to the site closure process. Highlights of the presentation include:

The purpose of the presentation is proactive planning, to open dialogue for advanced planning for forthcoming site closures. The Air Force will draft a white paper with recommended data collection and evaluation procedures for review.

A high level summary of the approach we will follow includes consideration of active vs. passive remediation (i.e., monitored natural attenuation versus pump and treat) and how concentration trends may be affected, site closure monitoring requirements dictated in the groundwater Record of Decision, considerations of recommendations set forth in OSWER 9283.1-44 (guidance in OSWER 2011 9320.2-22 will also be considered, but this presentation focuses on groundwater; therefore it discusses the 2014 recommended approach for evaluating completion of groundwater restoration remedial action at groundwater monitoring wells), consideration of groundwater data trends relative to the conceptual site model, and use of appropriate statistical methods and tools as recommended in the 2014 OSWER guidance.

There are two phases of monitoring according to OSWER: remediation monitoring and attainment monitoring. Remediation monitoring is complete when all the RAOs for all site COCs have been achieved as set forth in the groundwater ROD. Attainment monitoring is complete when the contaminant cleanup level for all site COCs has been met and continues to be at or below the 95% Upper Confidence Limit (UCL) for 2 years to support closure.

OSWER recommends semiannual sampling for two years for attainment monitoring; however, there is flexibility in how many sampling events must be completed within the attainment monitoring timeframe.

The site CSM dictates what is done for monitoring at each site, considering factors such as groundwater velocity and active vs. passive remediation. The guidance recommends evaluating only what is related to the site release history in the CSM. Mr. Gamlin noted that comingled plumes exist as do trespass plumes, but these need to be considered and tied to the site identifier with which they are associated.

The OSWER guidance allows use of data across both phases of monitoring and does not specify a number of samples to be collected; it must be enough to calculate a 95% UCL. Passive remedies may require fewer data points; active remedies may require more due to system shutdown and rebound effects. Many sites will have long monitoring periods to evaluate trends.

It is appropriate to look at the entire trend for an MNA or other passive remedy and for each phase separately for active remedies due to rebound periods and other site condition changes. Outliers in data happen, that's why the 95% UCL is important.

If a site COC concentration from a specific well is below the MCL throughout all monitoring events, then there is no need to complete a statistical evaluation of the data from that well because concentrations have not exceeded the MCL.

A technical memorandum outlining the Air Force's proposed rationale for site closure monitoring and data evaluation is forthcoming. Additional information is required for addressing comingled and trespass plumes; however, infrastructure can be transferred to other sites if it has served its purpose on its original site but can assist in monitoring comingled or trespass plumes from upgradient or crossgradient sources.

B) Site SS035 Site Closure (See Attachment 8)

Ms. Royer provided an overview of the Site SS035 Site Closure Report, expected to be submitted in December. Please refer to Attachment 8 for details. Highlights of the presentation include the following:

By the time the groundwater ROD for this site was signed, contaminant concentrations at the site had dropped below selected cleanup levels.

Site closure monitoring was performed in seven monitoring events conducted from 2Q2014 through 2Q2017; results indicate that site related COCs have remained below cleanup levels, and all requirements specified in the Groundwater ROD have been met.

The infrastructure (monitoring wells) will be retained to support West Industrial Operable Unit (WIOU) and Site SS014 monitoring.

The site is on the periphery of the large WIOU TCE plume, bordered on the northwestern, western, and southern sides by the much larger Site SD037, and overlapped by petroleum-only contaminated Site SS014 Subsite 2 on the northeastern side.

Site features include facilities used for aircraft maintenance, two oil water separators (both of which were cleaned and closed in place in 2016), and a hydraulic lift.

Two contaminant sources were identified utilizing soil gas and groundwater data during the 1994-1995 remedial investigation – the former oil water separator located at the southwestern corner of Facility 818 and the hydraulic lift storage area are in the same vicinity.

The maximum TCE concentration detected in groundwater during the RI was 21 ug/L near well MW818x35.

Remedial actions taken at the site include no action for soil (PCBs and metals found to pose acceptable present and future risk), OWSs were certified clean and closed in 2016, an interim remedy of MNA was selected to address TCE and TPH-D in groundwater over the period leading to the groundwater ROD (1997 – 2014), as well as the final groundwater remedy. The Groundwater ROD specified that site closure monitoring should begin because cleanup levels had been attained.

The depth to groundwater is approximately 10 feet bgs. Approximately 30 feet of alluvium overlies the weathered bedrock. Groundwater flows primarily through the low permeability alluvium. Groundwater flow is generally to the southwest, the presence of a southwest trending groundwater trough results in more southerly flow in the northern portion of the site, and more westerly flow in the eastern portion of the site. The trough continues into the WIOU, so contamination from multiple sites flows towards the trough and comingles.

Cleanup levels at the site are 5 ug/L for TCE, and the environmental screening level of 100 ug/L for TPH-D. These cleanup levels have been attained through attenuation over the interim period leading up to the groundwater ROD. Per the ROD, closure monitoring was initiated in 2014 to verify the maintenance of these levels.

Seven closure monitoring events were conducted between 2Q2014 and 2Q2107 at the required 4 Site SS035 monitoring wells. Two of these wells are located upgradient of the historical Site SS035 source area: one in the historical source area for Site SS014, and one that is impacted by the adjacent WIOU groundwater plume. Both of these wells are impacted by contamination from other sites. Data from downgradient wells was evaluated to confirm COC concentrations downgradient of the site remained below the cleanup level and ESL.

In 2Q 2017, TCE concentrations did not exceed the cleanup level at any well, and TPH-D concentrations did not exceed the ESL, with the exception of one upgradient well impacted by nearby Site SS014. The TCE cleanup level has been maintained at the Site SS035 historical source area wells, as well as at the downgradient well, over the closure monitoring period. TCE concentrations in excess of the cleanup level have been observed at an upgradient well which is impacted by adjacent WIOU groundwater plume.

TPH-D remains below the ESL in the former source area wells; aside from well MWRW1x35, which is impacted by Site SS014. TPH-D concentrations downgradient of the site are below the ESL.

The two years of closure monitoring required by the groundwater ROD have been completed, and demonstrate that groundwater contamination resulting from site related activities has naturally attenuated and has remained below cleanup levels. Groundwater site closure requirements specified in the ROD have been met and closure is appropriate for Site SS035.

Site monitoring wells will be retained to support the GRISR and for monitoring of the adjacent WIOU plume and Site SS014, subsite 2.

During the presentation, a discussion was held regarding the fact that the former source area wells for SS035 are shown on the figures as being outside of the site boundaries. The regulators requested that the Air Force look into moving the site boundaries slightly to the west to include the former source area wells. Moving the Site SS014 boundaries to better capture this site was also discussed. The Air Force agreed to check on the possibility of moving these boundaries.

C) Program Update: Activities Completed, In Progress, and Upcoming (see Attachment 9)

Mr. Wray reported on the status of fieldwork and documents which are completed, in progress, and upcoming. Please refer to Attachment 9 for the full briefing.

4. New Action Item Review

The Air Force will determine if site boundaries can be changed.

5. PROGRAM/ISSUES/UPDATE

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

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

The RPM Teleconference is scheduled for 9:30 AM PST on 15 November 2017. **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

   A. TREATMENT PLANT OPERATION AND MAINTENANCE UPDATE

3. PRESENTATIONS

   A. OSWER SITE CLOSURE PROCESS
   B. SITE SS035 SITE CLOSURE
   C. PROGRAM UPDATE:
      DOCUMENTS & ACTIVITIES COMPLETED, IN PROGRESS AND PLANNED

4. NEW ACTION ITEM REVIEW

5. PROGRAM/ISSUES/UPDATE

   A. MEETING SCHEDULE

NOTES: AFTER THE RPM TELECONFERENCE, 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.

(2017)

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.)
—	01-18-17	—
02-15-17	—	—
—	03-15-17	—
04-20-17 (Thursday 2:00 PM)	—	04-20-17
—	05-17-17	—
06-21-17	—	—
—	07-19-17	—
08-16-17	—	—
—	09-20-17	—
10-19-17 (Thursday 2:00 PM)	—	10-19-17[2]
—	11-15-17	—
—	—	—

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

[2] Note: RAB tour will start at 10:00 AM in front of the Delta Breeze Club.

(2018)
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.)
—	01-17-18	—
02-21-18	—	—
—	03-21-18	—
04-19-18 (Thursday 2:00 PM)	—	04-19-18
—	05-16-18	—
06-20-18	—	—
—	07-18-18	—
08-15-18	—	—
—	09-19-18	—
10-18-18 (Thursday 2:00 PM)	—	10-18-18[2]
—	11-21-18	—
—	—	—

[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 date in lieu of RAB meeting.

Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS		
Life Cycle	**Community Relations Plan Travis AFB, Glenn Anderson CH2M, Jill Dunphy**	**Work Plan for the Fourth Five-year Review Travis AFB, Glenn Anderson Tetratech, Joachim Eberharter**
Scoping Meeting	**NA**	**06-02-17**
Predraft to AF/Service Center	08-23-16	08-01-17
AF/Service Center Comments Due	09-07-16	08-15-17
Draft to Agencies	09-28-16	08-23-17
Draft to RAB	09-28-16	08-23-17
Agency Comments Due	10-28-16 (11-28-16)	09-28-17
Response to Comments Meeting	**TBD**	**10-18-17**
Agency Concurrence with Remedy	NA	NA
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**
Response to Comments Due	TBD	10-18-17
Draft Final Due	TBD	10-18-17
Final Due	TBD	11-03-17

Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS		
Life Cycle	Amendment to the WABOU Soil ROD for the Travis AFB ERP Sites DP039, SD043, and SS046 Travis AFB, Glenn Anderson CH2M, Latonya Coleman	Amendment to the NEWIOU Soil ROD for the Travis AFB ERP Sites SS016 and SD033 Travis AFB, Glenn Anderson CH2M, Latonya Coleman
Scoping Meeting	**NA**	**NA**
Predraft to AF/Service Center	10-09-17	01-16-18
AF/Service Center Comments Due	11-08-17	02-15-18
Draft to Agencies	11-22-17	03-08-18
Draft to RAB	11-22-17	03-08-18
Agency Comments Due	01-26-18	05-07-18
Response to Comments Meeting	**02-21-18**	05-16-18
Agency Concurrence with Remedy	NA	NA
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**
Response to Comments Due	03-07-18	05-30-18
Draft Final Due	03-07-18	05-30-18
Final Due	04-06-18	06-29-18

Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS			
	Potrero Hills Annex Travis, Glenn Anderson		
Life Cycle	**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	**Data Gap Investigation Results Technical Memorandum for Soil Sites SD033, SD043, and SS046** **Travis AFB, Glenn Anderson** **CH2M, Leslie Royer**	**Data Gap Investigation Results Technical Memorandum for Soil Site SS016** **Travis AFB, Glenn Anderson** **CH2M, Doug Berwick** **CAPE, Meg Greenwald**
Scoping Meeting	**NA**	**NA**
Predraft to AF/Service Center	07-26-17	10-04-17
AF/Service Center Comments Due	08-09-17	10-18-17
Draft to Agencies	09-19-17	11-21-17
Draft to RAB	09-19-17	11-21-17
Agency Comments Due	10-19-17 (11-20-17)	12-27-17
Response to Comments Meeting	**(11-15-17) 01-17-18**	**01-17-18**
Response to Comments Due	(12-05-17) 02-01-18	02-02-18
Draft Final Due	NA	NA
Final Due	(12-05-17) 02-01-18	02-02-18
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS		
Life Cycle	**Quarterly Newsletters (January 2018) Travis, Glenn Anderson**	**2016 Annual GRISR Travis AFB, Glenn Anderson CH2M, Leslie Royer**
Scoping Meeting	**NA**	**NA**
Predraft to AF/Service Center	NA	04-21-17
AF/Service Center Comments Due	NA	05-22-17
Draft to Agencies	01-04-18	06-07-17
Draft to RAB	NA	06-07-17
Agency Comments Due	01-18-18	08-10-17 (08-24-17)
Response to Comments Meeting	**TBD**	**08-16-17 (09-20-17)**
Response to Comments Due	01-19-18	09-01-17 (12-15-17)
Draft Final Due	NA	NA
Final Due	01-19-18	09-01-17 (12-15-17)
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS		
Life Cycle	**Site TS060 Removal Action Completion Report Travis AFB, Glenn Anderson CH2M, Doug Berwick CAPE, Meg Greenwald**	**Site SS035 Site Closure Report Travis AFB, Glenn Anderson CH2M, Leslie Royer**
Scoping Meeting	**NA**	**NA**
Predraft to AF/Service Center	11-08-17	11-07-17
AF/Service Center Comments Due	11-22-17	11-21-17
Draft to Agencies	12-07-17	12-06-17
Draft to RAB	12-07-17	12-06-17
Agency Comments Due	01-09-18	01-08-18
Response to Comments Meeting	**01-17-18**	**01-17-18**
Response to Comments Due	02-05-18	02-07-18
Draft Final Due	NA	NA
Final Due	02-05-18	02-07-18
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL POCO DOCUMENTS	
Life Cycle	**POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW050, OW052, OW055, OW056, and OW057** **Travis AFB, Glenn Anderson** **CH2M, Doug Berwick**
Scoping Meeting	**NA**
Predraft to AF/Service Center	02-01-17
AF/Service Center Comments Due	02-15-17
Draft to Agencies	11-29-17
Draft to RAB	11-29-17
Agency Comments Due	01-03-18
Response to Comments Meeting	**01-17-18**
Response to Comments Due	01-31-18
Draft Final Due	NA
Final Due	01-31-18
Public Comment Period	NA
Public Meeting	**NA**

Travis AFB Master Meeting and Document Schedule

HISTORY			
Life Cycle	**Site ST032 POCO Well Decommissioning and Site Closeout Technical Memorandum** **Travis AFB, Glenn Anderson** **CH2M, Doug Berwick** **CAPE, Meg Greenwald**	**POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW051, OW053, and OW054** **Travis AFB, Glenn Anderson** **CH2M, Doug Berwick**	**2016 Annual CAMU Monitoring Report** **Travis AFB, Glenn Anderson** **CH2M, Levi Pratt**
Scoping Meeting	**NA**	**NA**	**NA**
Predraft to AF/Service Center	04-25-17	11-07-16	02-09-17
AF/Service Center Comments Due	05-09-17	11-21-16	02-24-17
Draft to Agencies	08-30-17	01-19-17	06-30-17
Draft to RAB	08-30-17	01-19-17	06-30-17
Agency Comments Due	10-02-17	02-21-17	07-31-17
Response to Comments Meeting	**10-19-17**	**03-15-17**	**08-16-17**
Response to Comments Due	11-08-17 (09-27-17)	09-29-17 (10-03-17)	09-20-17 (10-06-17)
Draft Final Due	NA	NA	NA
Final Due	11-08-17 (09-27-17)	09-29-17 (10-03-17)	09-20-17 (10-06-17)
Public Comment Period	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**

South Base Boundary Groundwater Treatment Plant Monthly Data Sheet

Report Number: 205 **Reporting Period: 1 November 2017 – 5 December 2017** **Date Submitted: 12 December 2017**

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 November 2017 reporting period.

Table 1 – Operations Summary – November 2017

Initial Data Collection:	11/1/2017 12:40	**Final Data Collection:**	12/5/2017 12:00
Operating Time:	Percent Uptime:	Electrical Power Usage:	
SBBGWTP: 814 hours	**SBBGWTP:** 99.9%	**SBBGWTP:**	16,712 kWh (13,167 lbs CO_2 generated[a])
Gallons Treated: **6.3 million gallons**		Gallons Treated Since July 1998: **1,003 million gallons**	
Volume Discharged to Union Creek: **6.3 million gallons**		Gallons Treated From Other Sources: **0 gallons**	
VOC Mass Removed: **2.08 lbs**[b]		VOC Mass Removed Since July 1998: **494.7 lbs**	
Rolling 12-Month Cost per Pound of Mass Removed: $11,307[c]			
Monthly Cost per Pound of Mass Removed: $2,159[c]			

lbs = pounds

[a] 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.

[b] Calculated using November 2017 EPA Method SW8260C analytical results.

[c] Costs include operations and maintenance, 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] – November 2017

FT005[b]				SS029		SS030	
EW01x05	Offline	EW743x05	Offline	EW01x29	1.1	EW01x30	8.2
EW02x05	Offline	EW744x05	3.1	EW02x29	4.6	EW02x30	4.8
EW03x05	Offline	EW745x05	11.9	EW03x29	2.3	EW03x30	4.6
EW731x05	5.7	EW746x05	Offline	EW04x29	6.6	EW04x30	21.0
EW732x05	Offline	EW2291x05	Offline[c]	EW05x29	4.1	EW05x30	17.6
EW733x05	Offline	EW2782x05	4.0	EW06x29	5.9	EW2174x30	7.0
EW734x05	4.7	EW2783x05	7.7	EW07x29	9.3	EW711x30	6.9
EW735x05	11.7	EW2784x05	11.3				
EW736x05	Offline	EW2785x05	5.2				
EW737x05	Offline	EW2786x05	11.5				
EW742x05	Offline						
FT005 Total: 76.8				**SS029 Total: 33.9**		**SS030 Total: 70.1**	

SBBGWTP Average Monthly Flow[d]: 129.6 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] These extraction wells are offline due to pump or other malfunction.
[d] 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	20 November 2017	13:00	20 November 2017	14:00	Replaced bag filters.

-- = Time not recorded
[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 1 November 2017. Sample results are presented in Table 4. The total VOC concentration (39.47 µg/L) in the influent sample has decreased from the October 2017 sample results (49.71 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 36.8 µg/L. Several VOCs were detected in the midpoint sampling location, including TCE, cis-1,2-DCE, and chloroform. No VOCs were detected at the effluent sampling location. A carbon change out on the lead GAC vessel is being coordinated.

On 1 November, a system effluent sample was collected and analyzed for metals in accordance with the General Fuels NPDES Permit (Water Board, 2012). The metal detections were compared to background concentrations in the *Travis AFB West/Annexes/Basewide Operable Unit Remedial Investigation* (CH2M HILL, 1997) as well as the trigger values as defined in the General Fuels NPDES permit (Water Board, 2012). Sample results are presented in Table 5. Selenium was detected at a concentration (10.7 µg/L) exceeding the trigger value of 5 µg/L, but the detection is in line with the historical background concentrations as shown in Table 5. No other detections exceeded their respective trigger values. A trigger study for selenium will not be conducted at the SBBGWTP because this detection was below historical background levels. Hexavalent chromium and cyanide were not included in the metals analysis in November 2017; therefore, they will be collected in December 2017 and reported in the December 2017 Monthly Data Sheet.

In addition, on 2 November, a system effluent sample was collected for a bioassay test in accordance with the General Fuels NPDES Permit (Water Board, 2012). One hundred percent of the fish survived the 96-hour test; no statistically significant toxicity was observed.

In November 2017, troubleshooting was performed on several extraction wells. The following list presents the maintenance activities and status of several extraction wells:

- EW02x29 – Replaced a cracked fitting. Well is currently operating.
- EW02x30 – Replaced motor starter and fuse. Well is currently operating.
- EW05x30 – Motor starter malfunction. Starter was cleaned and lubricated. Well is currently operating.
- EW731x05 – Pressure transducer will need to be replaced. Well is currently operating.
- EW2291x05 – Low flow alarm. Additional troubleshooting will be conducted in December.

Figure 1 presents a plot of influent concentrations and average flow at the SBBGWTP over the past twelve (12) months. An overall increase in the VOC influent concentration has been observed in the past 12 months along with an increasing flow rate trend.

In October 2017, the FT005 extraction wells were off line for site construction; five (5) additional extraction wells were installed. In November, the wells were tied into the existing conveyance line. The FT005 extraction wells were restarted on 16 November 2017.

On 20 November, the SBBGWTP was shut down for approximately 1 hour to conduct routine maintenance on the system.

Optimization Activities

Based on two aquifer tests conducted in June 2017, five (5) new extraction wells (EW2782x05, EW2783x05, EW2784x05, EW2785x05, and EW2786x05) were installed to help extract and treat residual 1,2-DCA at Site FT005. On 16 November 2017, the Site FT005 extraction system was brought back on line without issue, and operated for the remainder of the reporting period. The addition of these five (5) new extraction wells, along with operation of six (6) existing wells (EW731x05, EW734x05, EW735x05, EW744x05, EW745x05, and

EW2291x05) has resulted in an increased flow rate of approximately 70 gpm, for an estimated total flow at the SBBGWTP of approximately 185 gpm. The December 2017 Monthly Data Sheet will present a full month of operation with the new Site FT005 extraction wells.

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 November 2017, the SBBGWTP produced approximately 13,167 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 November 2017 – South Base Boundary Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 November 2017 (µg/L)		
				Influent	Midpoint	Effluent
Halogenated Volatile Organics						
Acetone	NA	1.0	0	ND	ND	ND
Bromodichloromethane	NA	0.15	0	ND	ND	ND
Carbon Tetrachloride	0.5	0.15	0	ND	ND	ND
Chloroform	5.0	0.15	0	ND	**0.28 J**	ND
Chloromethane	NA	0.15	0	ND	ND	ND
1,1-Dichloroethane	5.0	0.15	0	ND	ND	ND
1,2-Dichloroethane	0.5	0.15	0	ND	ND	ND
1,1-Dichloroethene	5.0	0.15	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.15	0	**2.67**	**1.83**	ND
trans-1,2-Dichloroethene	5.0	0.15	0	ND	ND	ND
Methylene Chloride	5.0	0.15	0	ND	ND	ND
Tetrachloroethene	5.0	0.15	0	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.15	0	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.15	0	ND	ND	ND
Trichloroethene	5.0	0.15	0	**36.8**	**5.64**	ND
Vinyl Chloride	0.5	0.15	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	1.0	0.15	0	ND	ND	ND
Ethylbenzene	5.0	0.15	0	ND	ND	ND
Toluene	5.0	0.15	0	ND	ND	ND
Xylenes	5.0	0.15 – 0.30	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	35	0	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	24	0	NM	NM	ND
Total Petroleum Hydrocarbons – Motor Oil	50 (trigger)	24	0	NM	NM	ND

* In accordance with Appendix B of the Travis AFB South Base Boundary Groundwater Treatment Plant Operations and Maintenance Manual (CH2M HILL, 2004).

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

TABLE 5
Summary of Groundwater Analytical Data For November 2017 – South Base Boundary Groundwater Treatment Plant

Constituent	Background Level[a] (µg/L)	Trigger Value[b] (µg/L)	Detection Limit (µg/L)	1 November 2017 (µg/L) Effluent
Dissolved Metals				
Antimony	76	6	0.031	**0.0696 J**
Arsenic	92.4	10	0.030	**0.806**
Beryllium	3.18	4	0.025	ND
Cadmium	8.63	1.1	0.030	ND
Chromium	2,820	NA	0.10	**3.11**
Copper	148	5.9	0.50	**2.61**
Lead	111	3.2	0.041	**0.105 J**
Nickel	734	30	0.025	**3.10**
Selenium	100	5	0.069	**10.7**
Silver	10.8	2.2	0.025	ND
Thallium	1.85	1.7	0.025	ND
Zinc	323	86	2.5	**12.0**
Mercury	0.96	0.025	0.045	ND

[a] In accordance with Appendix H1 of the T*ravis AFB West/Annexes/Basewide Operable Unit, Remedial Investigation* (CH2M HILL, 1997).

[b] In accordance with the General Fuels NPDES permit (Water Board, 2012).

Notes:

Concentrations in gray exceeded the trigger value

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

ND = not detected

NM = not measured

µg/L = micrograms per liter

Figure 1

SBBGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History

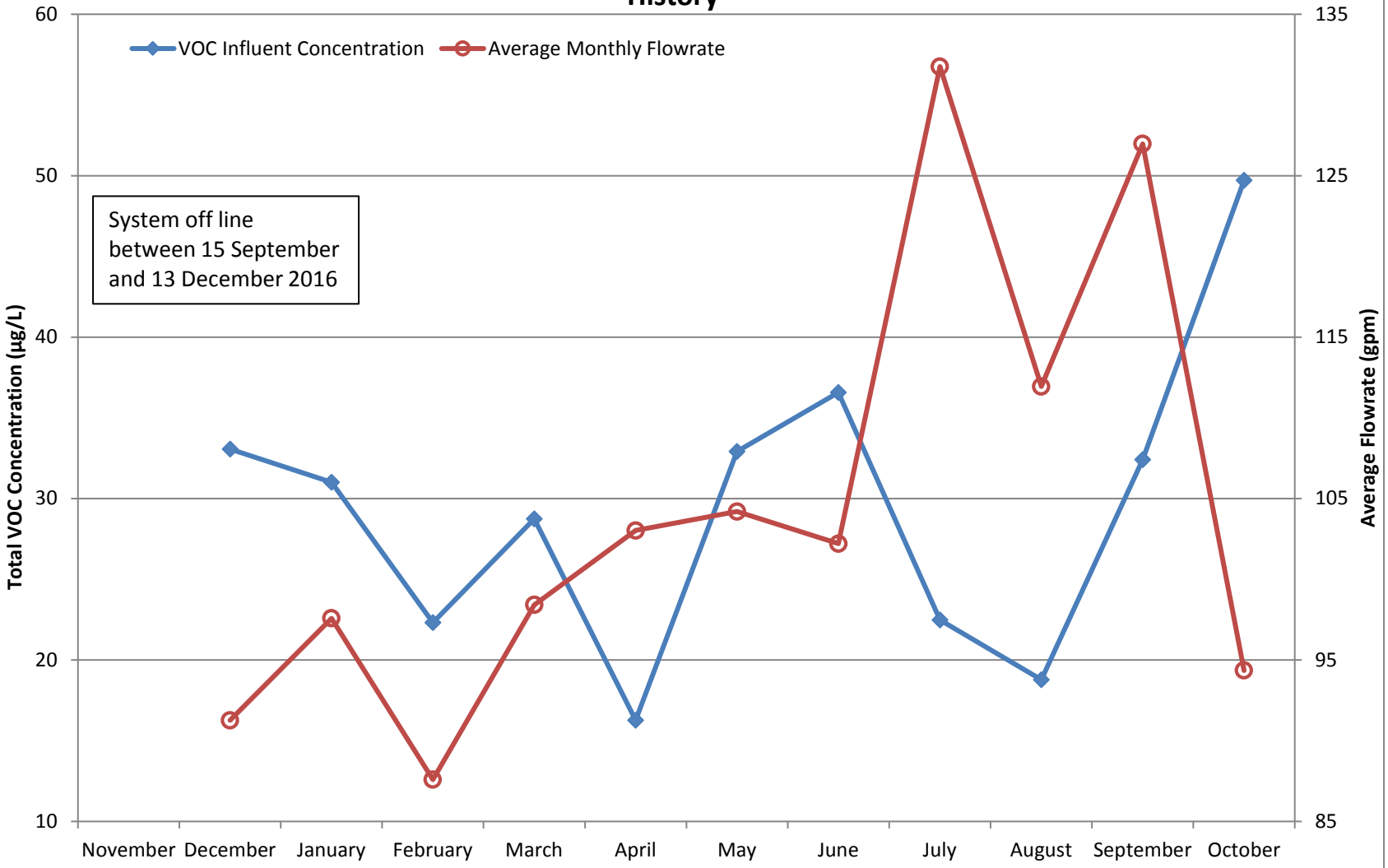
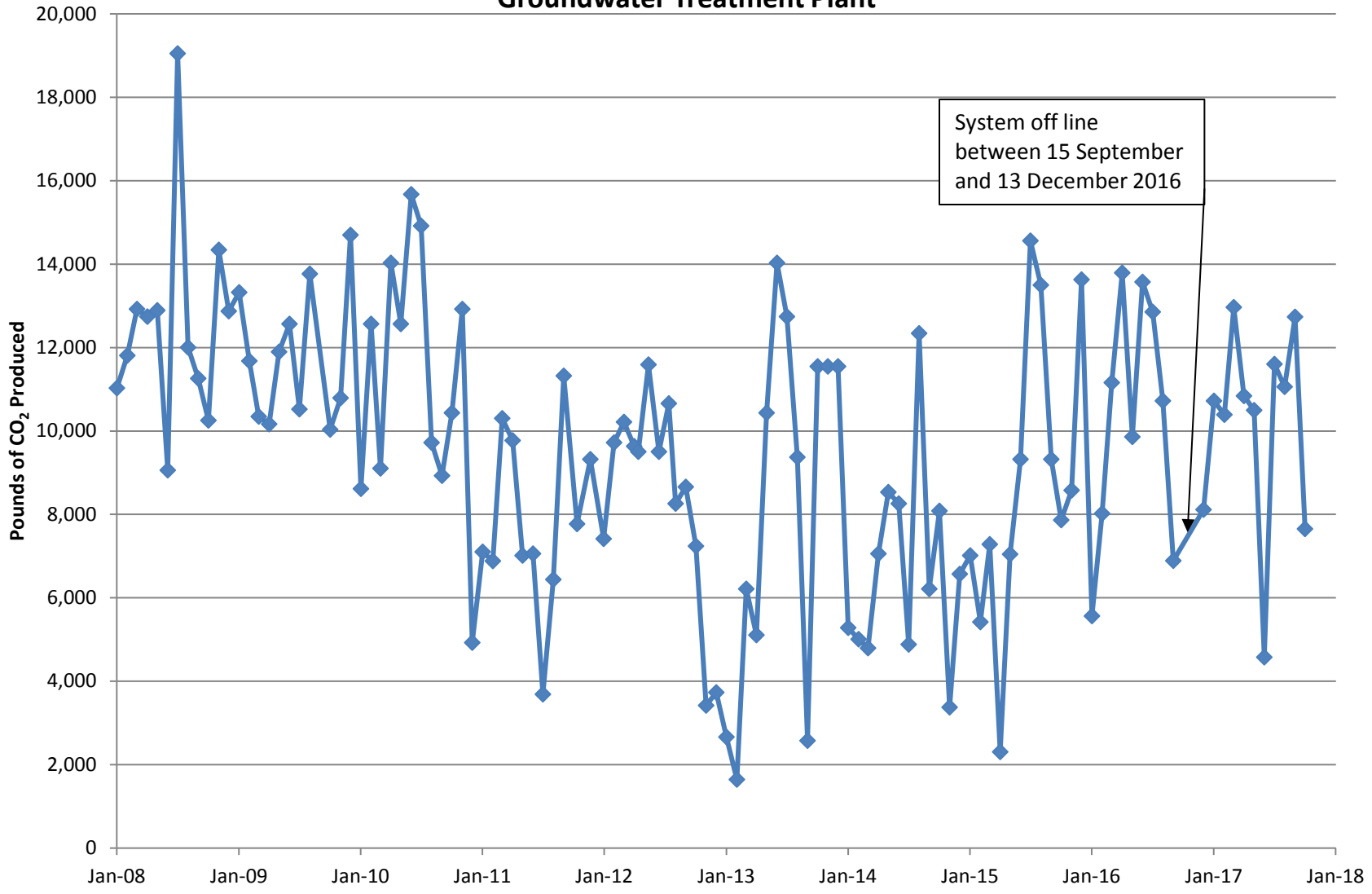


Figure 2

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



Central Groundwater Treatment Plant Monthly Data Sheet

Report Number: 220 **Reporting Period: 2 November 2017 – 5 December 2017** **Date Submitted: 12 December 2017**

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 November 2017 reporting period.

Table 1 – Operations Summary – November 2017

Initial Data Collection:	11/2/2017 11:00		**Final Data Collection:**	12/5/2017 12:00	
Operating Time:		Percent Uptime:		Electrical Power Usage:	
CGWTP:	717 hours	**CGWTP:**	90.4%	**CGWTP:**	2,371 kWh (2,643 lbs CO_2 generated[a])

Gallons Treated (discharge to storm sewer): **1,260,656 gallons**

Gallons Treated Since January 1996: **548.0 million gallons**

VOC Mass Removed from groundwater: **2.13 lbs**[b]

VOC Mass Removed Since January 1996: **2,791 lbs from groundwater**; **8,686 lbs from vapor**

Rolling 12-Month Cost per Pound of Mass Removed: $2,224[c]

Monthly Cost per Pound of Mass Removed: $860[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 November 2017 EPA Method SW8260C analytical results.
[c] Costs include operations and maintenance, 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] – November 2017

Location	Average Flow Rate Groundwater (gpm)
EW001x16	13.2
EW002x16	11.1
EW003x16	0.3
EW605x16	6.1
EW610x16	2.6
CGWTP	29.3

[a] 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.

Table 3 – Summary of System Shutdowns

Location	Shutdown[a]		Restart		Cause
	Date	Time	Date	Time	
CGWTP	1 December 2017	09:40	4 December 2017	14:00	Replaced the starter and overload on the influent transfer pump. Installed a new variable frequency drive (VFD) for the pump motor.

-- = Date/Time not recorded
[a] 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.

Table 6 – Summary of DP039 Bioreactor "Pulsed Mode" Operations

Location	Pulse-on Date	Pulse-off Date
MW750x39	29 November 2016	13 December 2016
	27 December 2016	10 January 2017
	7 February 2017	7 March 2017
	5 April 2017	7 August 2017
	7 September 2017	2 October 2017
	6 November 2017	27 November 2017

MW = Monitoring Well

Summary of O&M Activities

Monthly groundwater treatment samples were collected at the CGWTP on 1 November 2017. Sample results are presented in Table 5. The total VOC concentration (202.53 µg/L) in the November 2017 influent sample has slightly decreased from the October 2017 sample (204.37 µg/L). TCE was the primary VOC detected in the influent sample at a concentration of 157 µg/L. Cis-1,2-DCE (16.5 µg/L) and vinyl chloride (0.22 J µg/L) were detected in the sample collected after the first carbon vessel, and vinyl chloride (0.21 J µg/L) was detected in the sample collected after the second carbon vessel. No VOC constituents were detected 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 November 2017. A carbon change out on the lead GAC vessel is being coordinated.

On 1 November, a system effluent sample was collected and analyzed for metals, in accordance with the General Fuels NPDES Permit (Water Board, 2012). The metal detections were compared to background concentrations in the *Travis AFB West/Annexes/Basewide Operable Unit Remedial Investigation* (CH2M HILL, 1997) as well as the trigger values as defined in the General Fuels NPDES permit (Water Board, 2012). Sample results are presented in Table 6. All metal concentrations were less than Travis AFB historical background levels and

trigger values. Hexavalent chromium and cyanide were not included in the metals analysis in November 2017; therefore, they will be collected in December 2017 and reported in the December 2017 Monthly Data Sheet.

In addition to metals analyses, the system effluent sample collected on 2 November was also subjected to a bioassay test in accordance with the General Fuels NPDES Permit (Water Board, 2012). One hundred percent of the fish survived the 96-hour test; hence, no statistically significant toxicity was observed.

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 an overall decreasing trend for the flow rate through the treatment plant.

Between 1 and 4 December, the CGWTP was shut down to perform maintenance on the influent transfer pump. After the starter and overload were replaced, the new VFD was installed and programmed. On 4 December, the system was restarted without issue.

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 6 November and was taken off line on 27 November.

Optimization Activities

No optimization activities occurred at the CGWTP in November 2017.

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 2,643 pounds of GHG during November 2017, which is an increase from the October 2017 amount of 2,191 pounds.

TABLE 5
Summary of Groundwater Analytical Data for November 2017 – Central Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 November 2017 (µg/L) Influent	After Carbon 1 Effluent	After Carbon 2 Effluent	System Effluent
Halogenated Volatile Organics							
Acetone	NA	1.0	0	ND	ND	ND	ND
Carbon Tetrachloride	0.5	0.15	0	ND	ND	ND	ND
Chloroform	5.0	0.15	0	ND	ND	ND	ND
Chloromethane	NA	0.15	0	ND	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.15	0	**39.6**	**16.5**	ND	ND
1,2-Dichlorobenzene	5.0	0.15	0	**0.62**	ND	ND	ND
1,3-Dichlorobenzene	5.0	0.15	0	**0.92**	ND	ND	ND
1,4-Dichlorobenzene	5.0	0.15	0	**0.47 J**	ND	ND	ND
1,1-Dichloroethane	5.0	0.15	0	ND	ND	ND	ND
1,2-Dichloroethane	0.5	0.15	0	ND	ND	ND	ND
1,1-Dichloroethene	5.0	0.15	0	**0.57**	ND	ND	ND
Methylene Chloride	5.0	0.15	0	ND	ND	ND	ND
Methyl tert-Butyl Ether	1.0	0.15	0	ND	ND	ND	ND
Tetrachloroethene	5.0	0.15	0	**0.55**	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.15	0	ND	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.15	0	ND	ND	ND	ND
trans-1,2-Dichloroethene	5.0	0.15	0	**2.49**	ND	ND	ND
Trichloroethene	5.0	0.15 – 1.5	0	**157**	ND	ND	ND
Vinyl Chloride	0.5	0.15	0	**0.31 J**	**0.22 J**	**0.21 J**	ND
Non-Halogenated Volatile Organics							
Benzene	1.0	0.15	0	ND	ND	ND	ND
Ethylbenzene	5.0	0.15	0	ND	ND	ND	ND
Toluene	5.0	0.15	0	ND	ND	ND	ND
Total Xylenes	5.0	0.15 – 0.30	0	ND	ND	ND	ND
Other							
Total Petroleum Hydrocarbons – Gasoline	50	35	0	NM	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	24	0	NM	NM	NM	ND
Total Petroleum Hydrocarbons – Motor Oil	50 (trigger)	24	0	NM	NM	NM	ND

* In accordance with Appendix G of the T*ravis AFB Central Groundwater Treatment Plant Operations and Maintenance Manual* (URS Group, Inc., 2002).

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

TABLE 6
Summary of Groundwater Analytical Data for November 2017 – Central Groundwater Treatment Plant

Constituent	Background Level[a] (µg/L)	Trigger Value[b] (µg/L)	Detection Limit (µg/L)	1 November 2017 (µg/L) System Effluent
Metals				
Antimony	76	6	0.031	**0.135 J**
Arsenic	92.4	10	0.030	**0.690**
Beryllium	3.18	4	0.025	ND
Cadmium	8.63	1.1	0.030	ND
Chromium	2,820	NA	0.10	**0.299 J**
Copper	148	5.9	0.50	**3.06**
Lead	111	3.2	0.041	**0.0585 J**
Nickel	734	30	0.025	**1.71**
Selenium	100	5	0.069	**1.78**
Silver	10.8	2.2	0.025	ND
Thallium	1.85	1.7	0.025	ND
Zinc	323	86	2.5	ND
Mercury	0.96	0.025	0.045	ND

[a] In accordance with Appendix H1 of the T*ravis AFB West/Annexes/Basewide Operable Unit, Remedial Investigation* (CH2M HILL, 1997).

[b] In accordance with the General Fuels NPDES permit (Water Board, 2012).

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

ND = not detected

NM = not measured

µg/L = micrograms per liter

Figure 1

CGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History

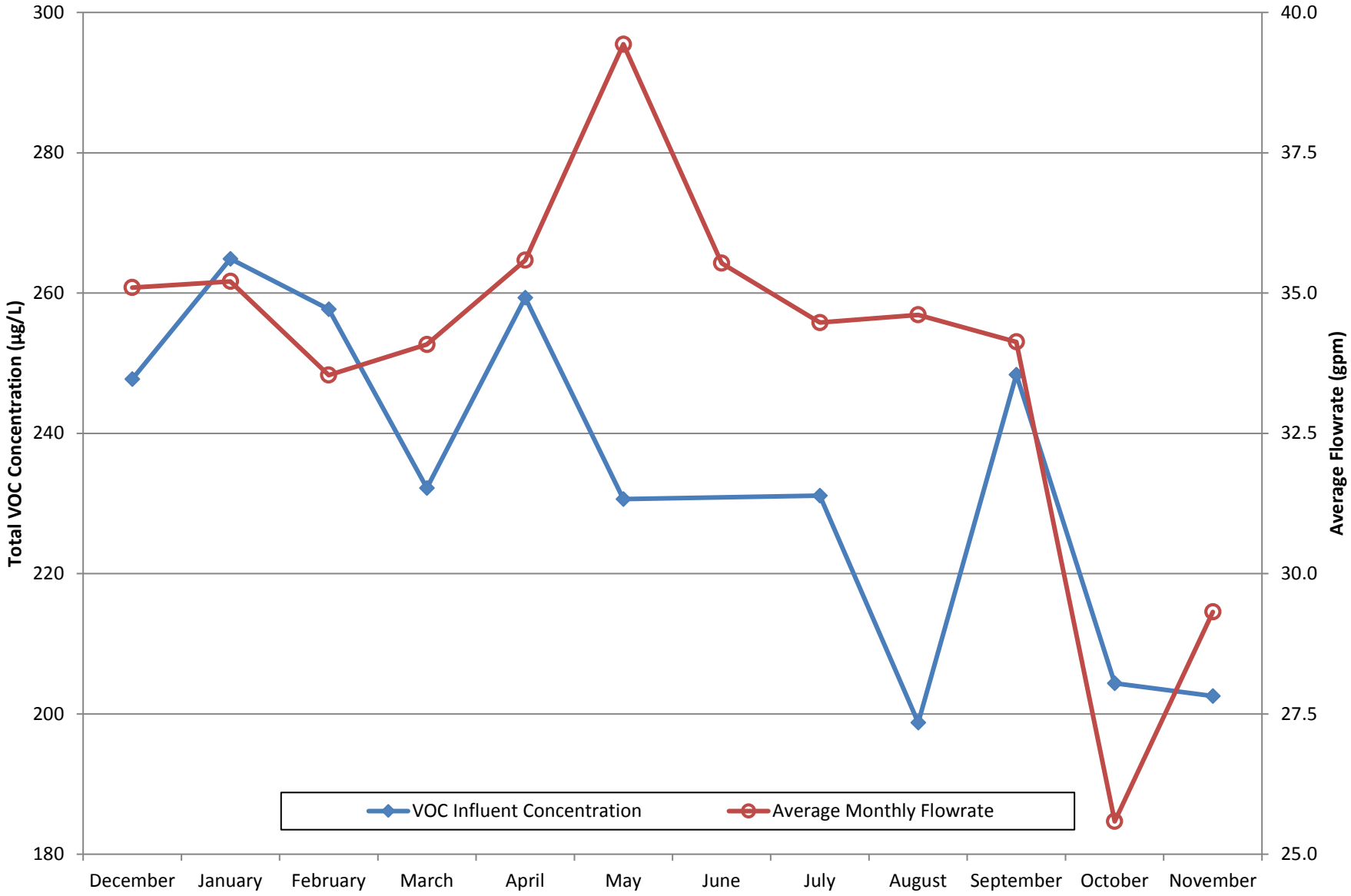
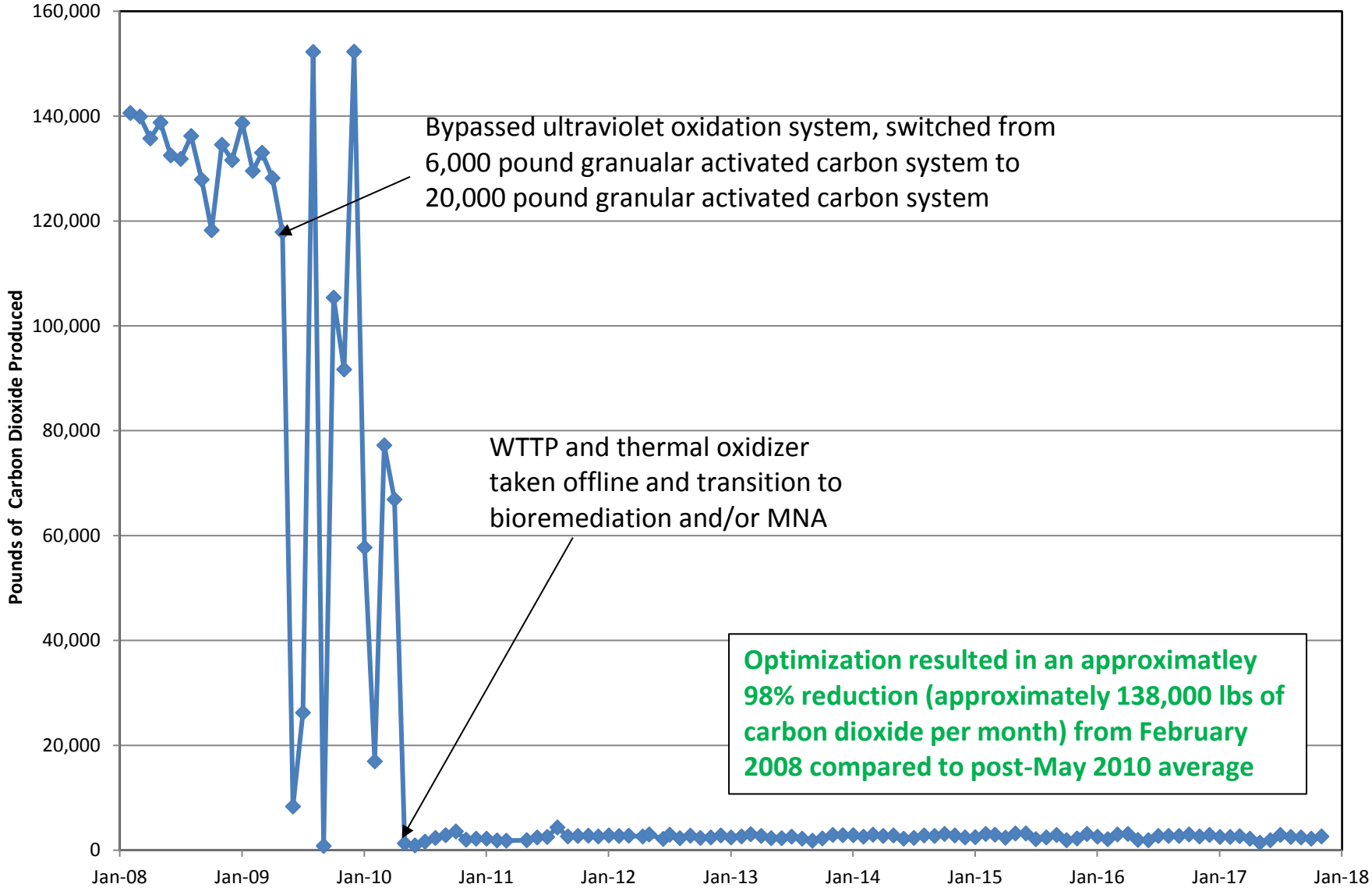


Figure 2

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



Subarea LF007C Groundwater Treatment Plant Monthly Data Sheet

Report Number: 164 **Reporting Period: 1 November 2017 – 5 December 2017** **Date Submitted: 12 December 2017**

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 November 2017 reporting period:

Table 1 – Operations Summary – November 2017

Initial Data Collection:	11/1/2017 11:30		**Final Data Collection:**	12/5/2017 8:45	
Operating Time:		Percent Uptime:	Electrical Power Usage[a]:		
LF007C GWTP:	541 hours	**LF007C GWTP**	66.6%	**LF007C GWTP:**	0 kWh
Gallons Treated: **139,990 gallons**			Gallons Treated Since March 2000: **86.7 million gallons**		
Volume Discharged to Duck Pond: **139,990 gallons**					
VOC Mass Removed: **1.45 x 10^{-3} pounds**[b]			VOC Mass Removed Since March 2000: **174.38 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 November 2017 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 – November 2017

Location	Average Flow Rate (gpm)[a]	Total Gallons Processed (gallons)
EW614x07	3.9	128,230
EW615x07	0.3	11,160
LF007C GWTP	**4.3**	**139,990**

[a] 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.

Table 3 – Summary of System Shutdowns

Location	Shutdown[a]		Restart[a]		Cause
	Date	Time	Date	Time	
LF007C GWTP	9 November 2017	01:00	20 November 2017	10:00	Treatment pad flooded with rainwater.

-- = Time not recorded

[a] Shutdown and restart times estimated based on field notes

LF007C GWTP = Subarea LF007C Groundwater Treatment Plant

TPH – total petroleum hydrocarbons

Summary of O&M Activities

Between August and November 2017, TPH-D and/or TPH-MO were detected at concentrations exceeding the effluent limitations or trigger values. The confirmation sampling results in September suggested that the TPH detections are not related to fuels contamination. The cause of the TPH-D and TPH-MO detections was investigated during basewide sampling in November 2017. These results will be evaluated in December 2017.

Monthly groundwater samples were collected at the LF007C GWTP on 1 November 2017. Sample results are presented in Table 4. TCE (1.24 µg/L) was detected at the influent sample location. Cis-1,2-DCE (0.16 J µg/L) was detected at the midpoint sampling location. No VOC contaminants were detected at the effluent sampling location. However, the effluent sample identified TPH-D at a concentration (111 µg/L) in excess of the effluent limitation of 50 µg/L, the TPH-MO concentration (69.1 J µg/L) exceeded its trigger value of 50 µg/L.

On 1 November, a system effluent sample was collected and analyzed for metals in accordance with General Fuels NPDES Permit (Water Board, 2012). The metal detections were compared to background concentrations in the *Travis AFB Remedial Investigation Report, East Industrial Operable Unit* (Weston, 1995) as well as the trigger values as defined in the General Fuels NPDES permit (Water Board, 2012). Sample results are presented in Table 5. Copper was detected at a concentration (7.64 µg/L) in excess of the trigger value of 5.9 µg/L. This detection, however, is well within the historical background concentration range of 3.81 µg/L to 148 µg/L. A trigger study will not be conducted because background concentrations of copper are in excess of the detected historical range at Travis AFB. Hexavalent chromium and cyanide were not included in the metals analysis in November 2017; therefore, they will be collected in December 2017 and reported in the December 2017 Monthly Data Sheet.

In addition on 2 November, a system effluent sample was collected for a bioassay test. One hundred percent of the fish survived the 96-hour test; no statistically significant toxicity was observed.

In November 2017, the LF007C GWTP system was shut down for approximately 11 days because the treatment pad sump flooded with rainwater. On 20 November, the rainwater was pumped out of the pad and sump, and the system was restarted without issue.

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 decreasing slightly. The average flow rate through the LF007C GWTP has increased over the last 12 months.

Optimization Activities

No optimization activities occurred at the LF007C GWTP in November 2017.

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 now a solar-only operated treatment system and no longer generates 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 November 2017 – Subarea LF007C Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 November 2017 (µg/L)		
				Influent	After Carbon 1	Effluent
Halogenated Volatile Organics						
Acetone	NA	0.50	0	ND	ND	ND
Bromodichloromethane	5.0	0.15	0	ND	ND	ND
Bromoform	5.0	0.15	0	ND	ND	ND
2-Butanone	5.0	2.0	0	ND	ND	ND
Carbon Tetrachloride	0.5	0.15	0	ND	ND	ND
Chloroform	5.0	0.15	0	ND	ND	ND
Dibromochloromethane	5.0	0.15	0	ND	ND	ND
1,3-Dichlorobenzene	5.0	0.15	0	ND	ND	ND
1,4-Dichlorobenzene	5.0	0.15	0	ND	ND	ND
1,1-Dichloroethane	5.0	0.15	0	ND	ND	ND
1,2-Dichloroethane	0.5	0.15	0	ND	ND	ND
1,1-Dichloroethene	5.0	0.15	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.15	0	ND	**0.16 J**	ND
trans-1,2-Dichloroethene	5.0	0.15	0	ND	ND	ND
Methylene Chloride	5.0	0.15	0	ND	ND	ND
Tetrachloroethene	5.0	0.15	0	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.15	0	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.15	0	ND	ND	ND
Trichloroethene	5.0	0.15	0	**1.24**	ND	ND
Vinyl Chloride	0.5	0.15	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	1.0	0.15	0	ND	ND	ND
Ethylbenzene	5.0	0.15	0	ND	ND	ND
Toluene	5.0	0.15	0	ND	ND	ND
Xylenes	5.0	0.15 – 0.30	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	35	0	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	24	1	NM	NM	**111**
Total Petroleum Hydrocarbons – Motor Oil	50	24	1	NM	NM	**69.1 J**

* In accordance with Appendix G of the *Travis AFB North Groundwater Treatment Plant Operations and Maintenance Manual*, Sites FT004, SD031, and LF007 Area C (URS Group, Inc., 2005).

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 Groundwater Analytical Data For November 2017 – Subarea LF007C Groundwater Treatment Plant

Constituent	Background Level[a] (µg/L)	Trigger Value[b] (µg/L)	Detection Limit (µg/L)	1 November 2017 (µg/L)
				Effluent
Dissolved Metals				
Antimony	24.1 – 76	6	0.031	**0.0707 J**
Arsenic	0.984 – 92.4	10	0.030	**0.977**
Beryllium	0.51 – 3.18	4	0.025	ND
Cadmium	1.72 – 5.42	1.1	0.030	ND
Chromium	5.24 – 2,820	NA	0.10	**1.46**
Copper	3.81 – 148	5.9	0.50	**7.64**
Lead	1.1 – 59.5	3.2	0.041	**0.438 J**
Nickel	9.86 – 734	30	0.025	**3.35**
Selenium	0.843 – 100	5.0	0.069	**3.24**
Silver	4.92 – 10.8	2.2	0.025	ND
Thallium	0.874 – 1.85	1.7	0.025	ND
Zinc	4.02 – 323	86	2.5	**11.7**
Mercury	0.033 – 0.96	0.025	0.045	ND

[a] In accordance with Table 4.2-7 in the *Travis AFB Remedial Investigation Report, East Industrial Operable Unit* (Weston, 1995).

[b] In accordance with the General Fuels NPDES permit (Water Board, 2012).

Notes:

Concentrations in gray exceeded the trigger value

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

ND = not detected

NM = not measured

µg/L = micrograms per liter

Figure 1

LF007CGWTP Total VOC Influent Concentrations and Average Flowrate Twelve Month History

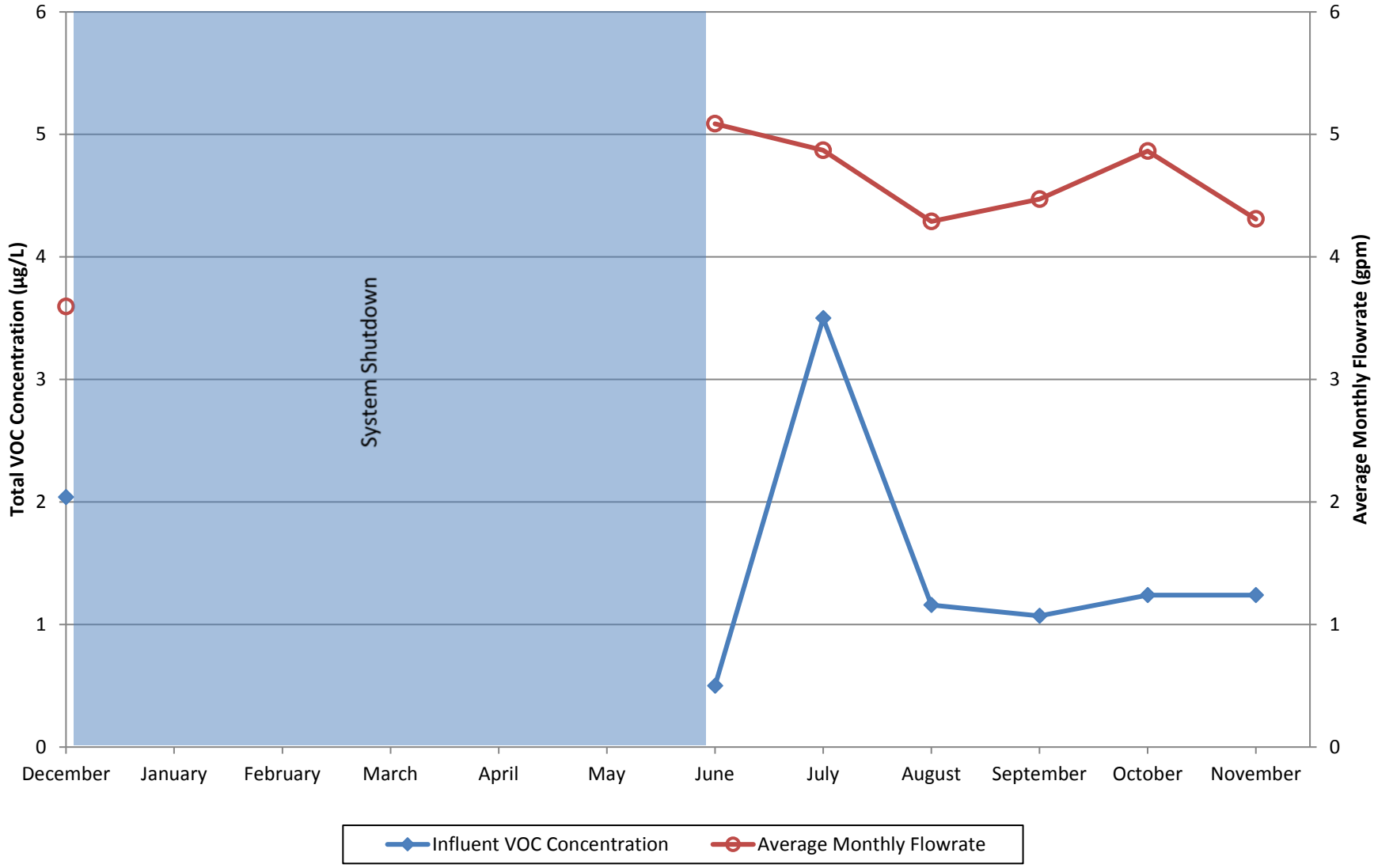
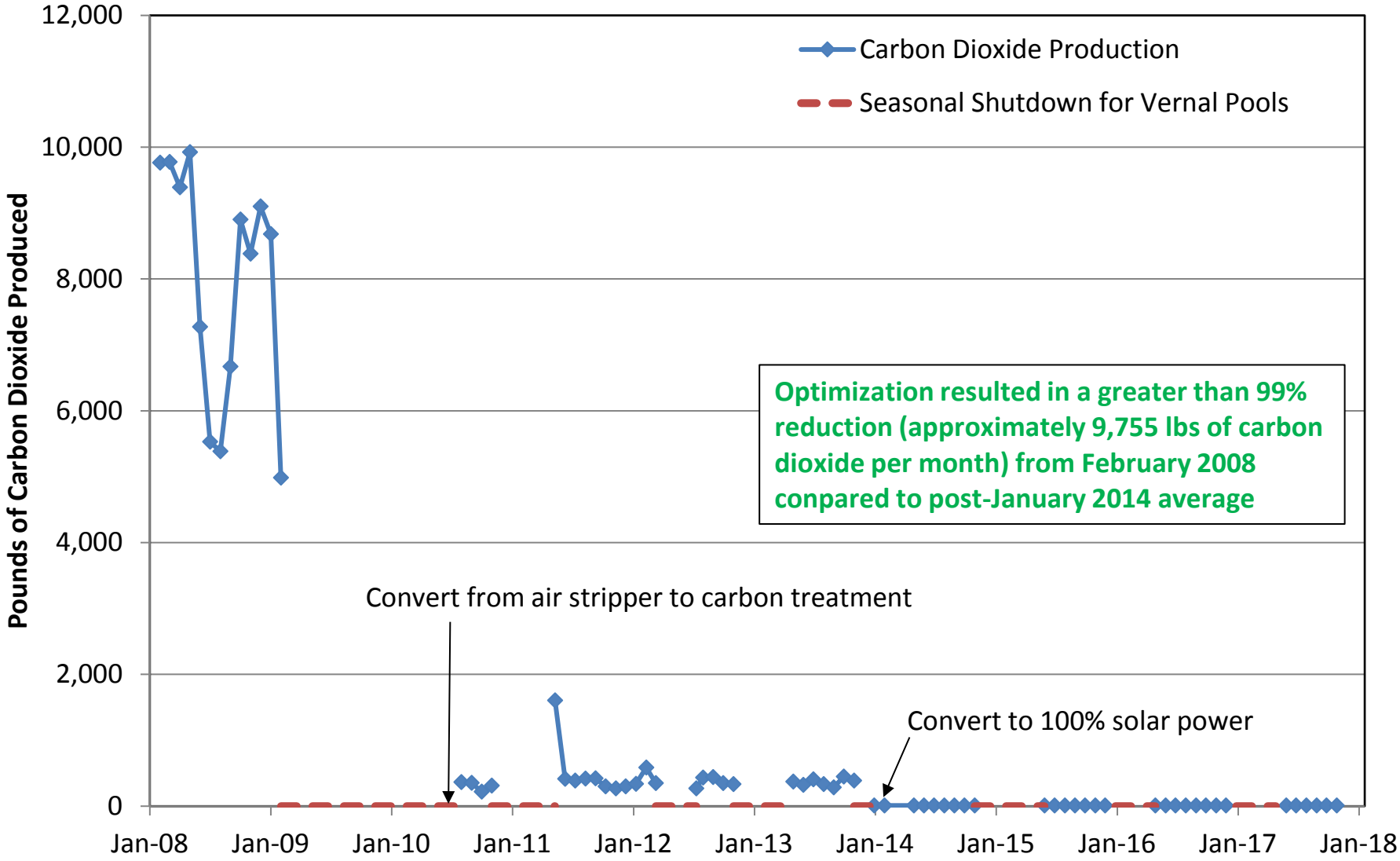


Figure 2

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



Note: Dashed line represents seasonal shutdowns due to the presence of vernal pools at Site LF007C during which no carbon dioxide production occurred.

Site ST018 Groundwater Treatment Plant Monthly Data Sheet

Report Number: 081 **Reporting Period: 1 November 2017 – 27 November 2017** **Date Submitted: 12 December 2017**

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

System Metrics

Table 1 presents operation data from the November 2017 reporting period.

Table 1 – Operations Summary – November 2017

Initial Data Collection:	11/1/2017 10:00	**Final Data Collection:**	11/27/2017 9:15
Operating Time:		Percent Uptime:	Electrical Power Usage:
ST018GWTP: 623 hours		**ST018GWTP: 100**%	**ST018GWTP:** 47 kWh (35 lbs CO_2 generated[a])
Gallons Treated: **83,880 gallons**		Gallons Treated Since March 2011: **13.8 million gallons**	
Volume Discharged to Sanitary Sewer: **83,880 gallons**		Final Totalizer Reading: **13,868,799 gallons**	
Cumulative Volume Discharged to Sanitary Sewer since 1 November 2014: **7,372,625 gallons**			
MTBE, BTEX, VOC, TPH Mass Removed: **0.07 lbs**[b]		MTBE, BTEX, VOC, TPH Mass Removed Since March 2011: **42.8 lbs**	
MTBE (Only) Removed: **0.01 lbs**[b]		MTBE (Only) Mass Removed Since March 2011: **10.6 lbs**	
Rolling 12-Month Cost per Total Pounds of Mass Removed: $17,093[bc]			
Monthly Cost per Pound of Mass Removed: $14,359[bc]			

[a] SiteWise™ estimate that 1 kilowatt hour generated produces 0.74 pounds of GHG.
[b] Calculated using November 2017 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 – November 2017

Location	Average Flow Rate Groundwater (gpm)[a]	Hours of Operation
EW2014x18	0.9	313
EW2016x18	0.8	313
EW2019x18	0.8	623
EW2333x18	1.0	313
Site ST018 GWTP	2.2	623

[a] 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.

Table 3 – Summary of System Shutdowns

Location	Shutdown[a]		Restart[a]		Cause
	Date	Time	Date	Time	
ST018GWTP	None.	--		--	None.

-- = Time not recorded

[a] Shutdown and restart times estimated based on field notes
ST018GWTP = Site ST018 Groundwater Treatment Plant

Table 4 presents a Site ST018 pulsing dates.

Table 6 – Summary of Site ST018 "Pulsed Mode" Operations

Pulse-on Date (All Extraction Wells Operational)	Pulse-off Date (EW2019x18 Operational Only)
	4 October 2017
16 October 2017	31 October 2017
14 November 2017	27 November 2017

Summary of O&M Activities

Monthly groundwater treatment samples were collected at the ST018GWTP on 1 November 2017. During the sampling, EW2019x18 was the only operational extraction well. Results are presented in Table 5. The complete

November 2017 laboratory data report is available upon request. The influent concentration for MTBE during the November 2017 sampling event was 6.88 µg/L, which is an increase from the October 2017 sample result of 0.80 µg/L. TPH-d, TPH-mo, and 1,2-DCA were also detected in the influent sample. MTBE was detected in the system effluent sampling location at a concentration less than the effluent limitation.

Beginning in October 2017, three of the four extraction wells (EW2014x18, EW2016x18, and EW2333x18) began operating in a two-week "pulse-mode" (two weeks off, two weeks on, two weeks off, and so forth). In the first half of November, the ST018GWTP operated in pulsed-off mode, with only the furthest downgradient extraction well EW2019x18 operating continuously.

On 14 November, wells EW2014x18, EW2016x18, and EW2333x18 were restarted in the pulsed-on mode. Approximately 4 hours after the extraction wells were restarted, groundwater treatment samples were collected and analyzed for VOCs at the ST018GWTP. Results are presented in Table 6. The influent concentration for MTBE was went up to 23.2 µg/L. Benzene and 1,2-DCA were also detected in the influent sample.

All concentrations of TPH are well below the Fairfield-Suisun Sewer District effluent limitation of 50,000 µg/L for TPH-g and TPH-d, or 100,000 µg/L for TPH-mo. Additionally, 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 influent and effluent contaminant concentrations to maintain compliance with the Fairfield-Suisun Sewer District discharge permit.

Figure 1 presents plots of the average flow rate and influent total contaminant (MTBE, TPH-g, TPH-d, TPH-mo, BTEX, and VOCs) and 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 following the wet rainy 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 because of the "pulse-mode" operations. The total influent concentrations have generally been fluctuating over the past 12 months with an overall flat trend. Similarly, the influent MTBE concentration has also fluctuated over the past 12 months with an overall flat trend.

Optimization Activities

Optimization activities this month at the ST018GWTP include experimenting with operating the system in a pulsed mode. As discussed above, the three of the four extraction wells are operating in a two-week "pulse-mode" operation. We will track the performance of operating in pulsed mode, as compared against month-over-month results from 2016, and from 2017 as we transition into 2018.

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 35 pounds of GHG during November 2017 and treated 83,880 gallons of water, which was a decrease from October 2017 (60 pounds, treating 146,380 gallons). The amount of GHG produced is directly attributed to the amount of water treated through the system because the only line-power electrical use is for a transfer pump through the GAC system.

TABLE 5
Summary Of Groundwater Analytical Data for November 2017– Site ST018 Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	1 November 2017** (µg/L)	
				Influent	System Effluent
Fuel Related Constituents					
Methyl tert-Butyl Ether	6,400	0.15	0	**6.88**	**1.99**
Benzene	25,000[a]	0.15	0	ND	ND
Ethylbenzene	25,000[a]	0.15	0	ND	ND
Toluene	25,000[a]	0.15	0	ND	ND
Total Xylenes	25,000[a]	0.15 – 0.30	0	ND	ND
Total Petroleum Hydrocarbons – Gasoline	50,000[b]	35	0	ND	ND
Total Petroleum Hydrocarbons – Diesel	50,000[b]	24	0	**68.1 J**	ND
Total Petroleum Hydrocarbons – Motor Oil	100,000	24	0	**30.8 J**	ND
Other					
Acetone	NA	1.0	0	**2.30 J**	ND
1,2-Dichloroethane	20	0.15	0	**0.20 J**	ND

* In accordance with the Fairfield-Suisun Sewer District Effluent Limitations

** During the sampling event, only EW2019x18 was operational

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
NA = not applicable
N/C = number of samples out of compliance with discharge limits
ND = not detected above method detection limit

TABLE 6
Summary Of Groundwater Analytical Data for November 2017– Site ST018 Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	14 November 2017** (µg/L)	
				Influent	System Effluent
Fuel Related Constituents					
Methyl tert-Butyl Ether	6,400	0.15	0	**23.2**	**2.34**
Benzene	25,000[a]	0.15	0	**0.15 J**	ND
Ethylbenzene	25,000[a]	0.15	0	ND	ND
Toluene	25,000[a]	0.15	0	ND	ND
Total Xylenes	25,000[a]	0.15 – 0.30	0	ND	ND
Other					
Acetone	NA	1.0	0	ND	ND
1,2-Dichloroethane	20	0.15	0	**0.41 J**	ND

* In accordance with the Fairfield-Suisun Sewer District Effluent Limitations

** During the sampling event, all four (4) extraction wells were operational

Laboratory data available on request.

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

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 Influent Concentrations and Average Flowrate Twelve Month History

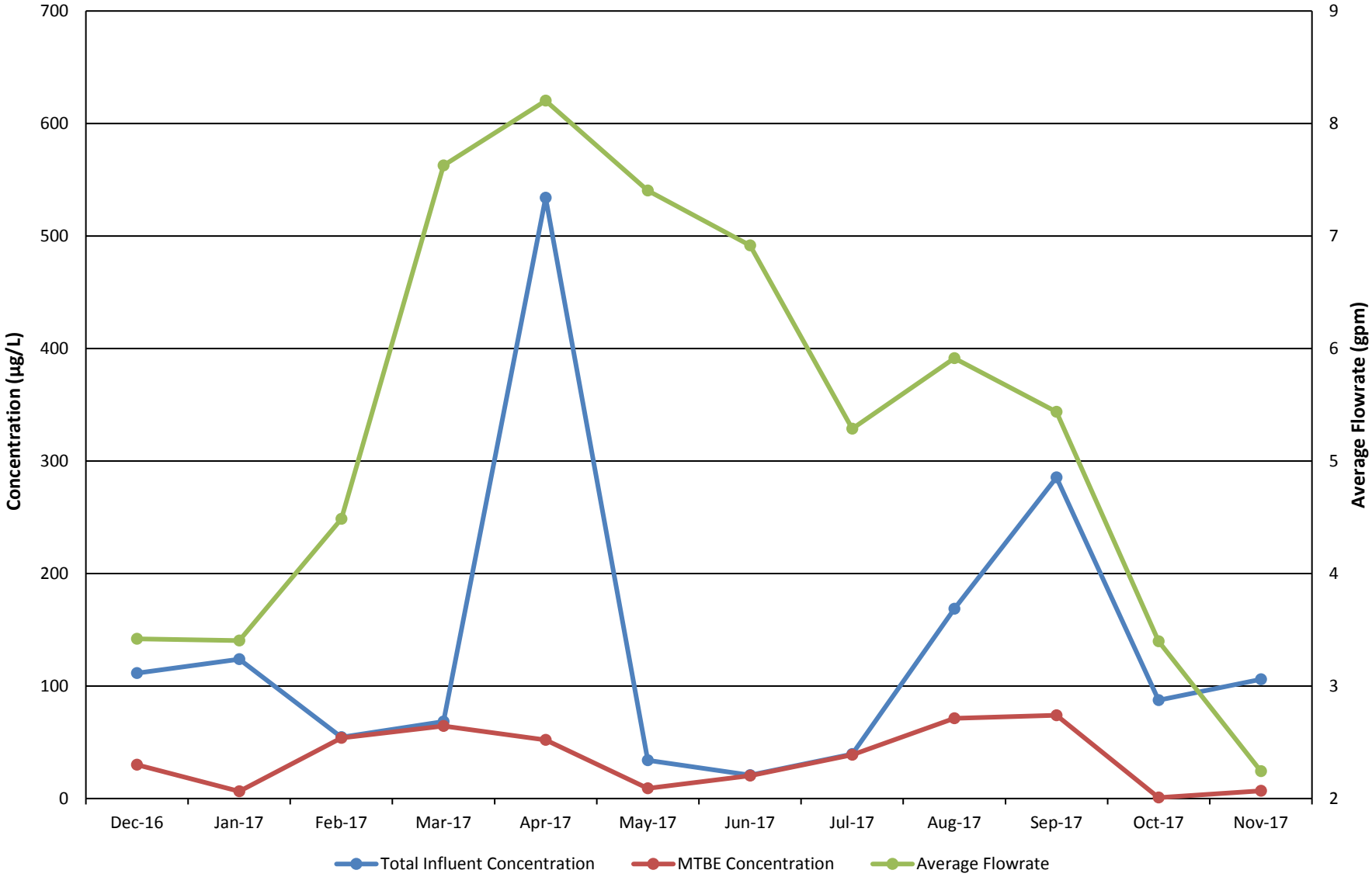
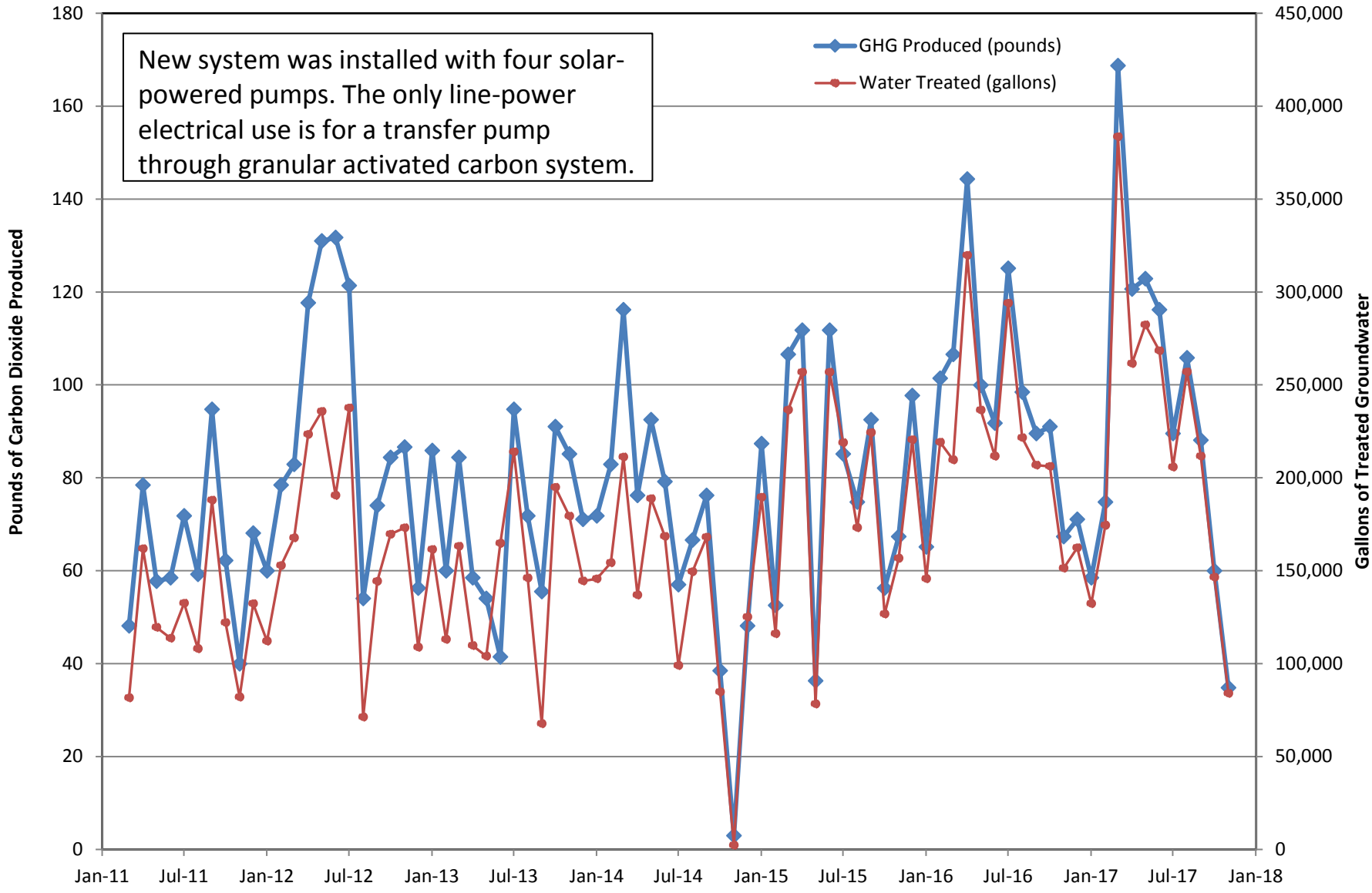


Figure 2

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



Data Evaluation Considerations for Groundwater Site Closure at Travis Air Force Base

November 2017

ch2m

Purpose

- We expect several groundwater sites will achieve cleanup levels within the next few years
- Begin discussion and gain consensus on data evaluation process for groundwater site closure
- We will prepare white paper with our recommended data collection and evaluation procedure

High-Level Summary of Approach

1. Consideration of whether the remedial action is active or passive and how this may affect concentration trends
2. Site closure monitoring requirements dictated in the Groundwater Record of Decision
3. Consideration of recommendations in OSWER 9283.1-44
4. Consideration of groundwater data trends relative to the conceptual site model
5. Use of appropriate statistical methods and tools

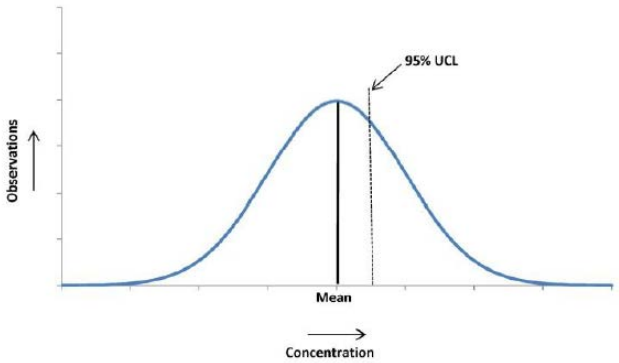
Phases of Monitoring (OSWER 9283.1-44)

- Remediation Monitoring Phase is completed until:
  - RAOs for all site COCs have been achieved as set forth in the GW ROD
- Attainment Monitoring Phase is complete when:
  1. The contaminant cleanup level for each COC has been met
  2. The groundwater will continue to meet contaminant cleanup levels for each COC in the future (GW ROD specified as 2 years of semi-annual sampling to support closure)

Attainment Monitoring Phase Considerations

Attainment Monitoring Phase Completion Determination

- Guidance recommends two lines of evidence to support completion of this phase
- Methodology:
  - Nonstatistical or visual evaluation
  - Meeting contaminant cleanup level?
    - Mean test
  - Groundwater anticipated to continue to meet contaminant cleanup levels in the future?
    - Trend test (slope)



e.g., 95% UCL evaluation, as appropriate

e.g., Mann-Kendal or Theil-Sen (Stable or Decreasing Trend)

United States Environmental Protection Agency

23

From 2015 USEPA Webinar

Conceptual Site Model Considerations

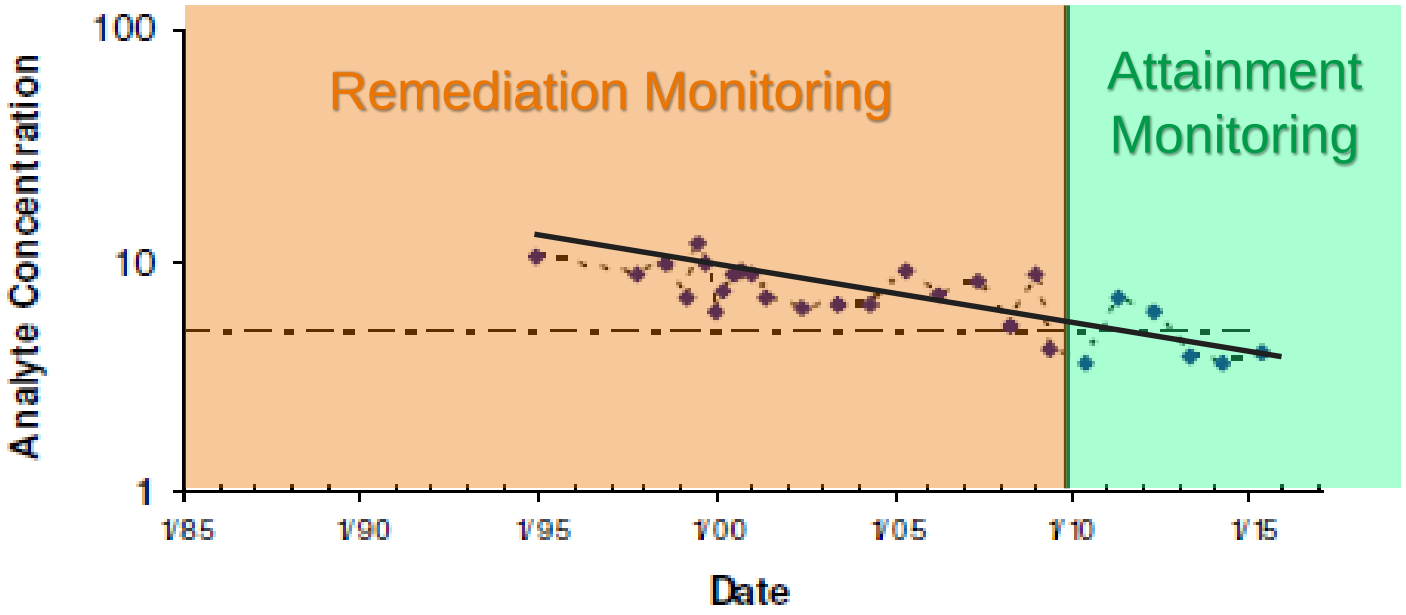
- Rate of Change – groundwater velocity, active/passive remedy, etc.
- Site Related COCs – only evaluate what is related to the site release history and CSM
  - Example – all site wells have achieved cleanup levels and upgradient well has been clean, but trespass plume from an upgradient site begins to migrate toward site.

Data Density Considerations

- OSWER 9283.1-44 allows use of data across "phases" of monitoring and does not specify a number of samples
  - Attainment phase requires enough samples for 95% UCL to be below cleanup level
  - Passive remedies may require less data points (rebound not expected)
  - Active remedies may require more data points (e.g., rebound may occur after GETs shut down, etc.)
- Many sites will have long monitoring periods to evaluate trends during remediation monitoring

Example Well for Discussion
(clearly identifiable monitoring phases)

TCE (ug/L)

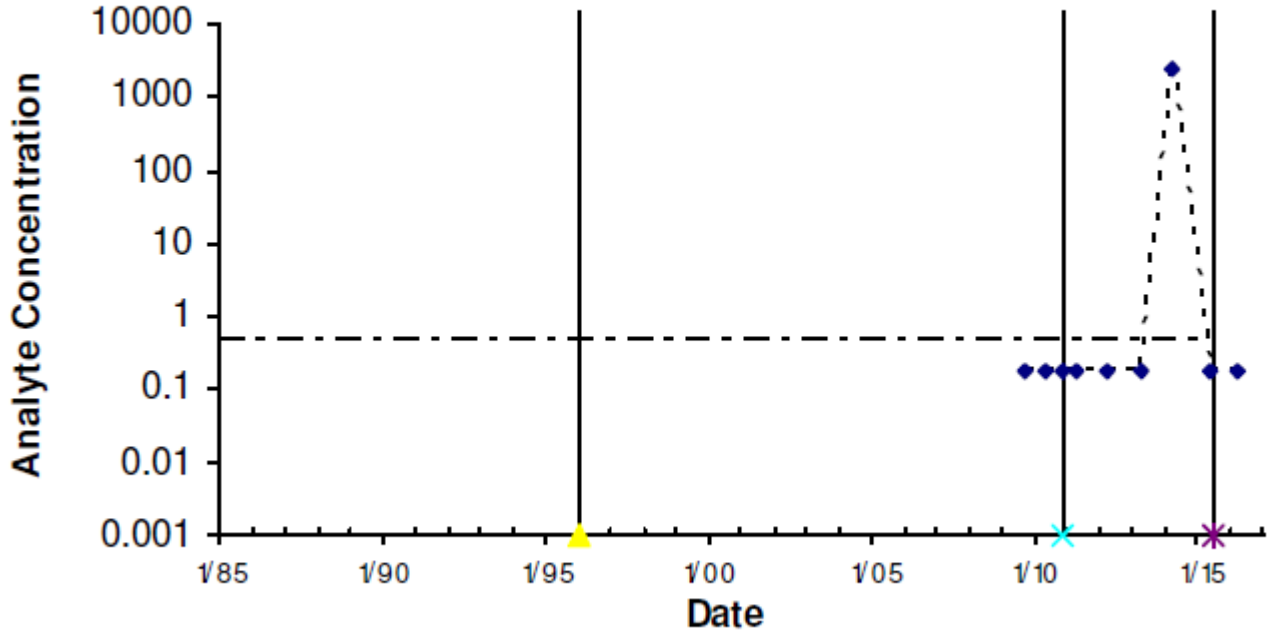


Location: MW259x06
Remedy: Monitored Natural Attenuation
Visual and Trend Analysis: Decreasing
Mean Test: Sample until 95% UCL of Attainment Phase below 5 ug/L and all other site wells have achieved cleanup levels

Example for Discussion
(monitoring phases overlap)

VC (ug/L)

Remediation Monitoring and Attainment Monitoring



Location: MW2028x16 at Site SS016
Remedy: Bioreactor and GET
Visual and Trend Analysis: No Trend
Mean Test: Sample until 95% UCL of Attainment Phase is below 0.5 ug/L and all other site wells have achieved cleanup levels

Conclusions

- We will prepare a technical memorandum outlining our proposed rationale for site closure monitoring and data evaluation

Site SS035 Closure

RPM Meeting

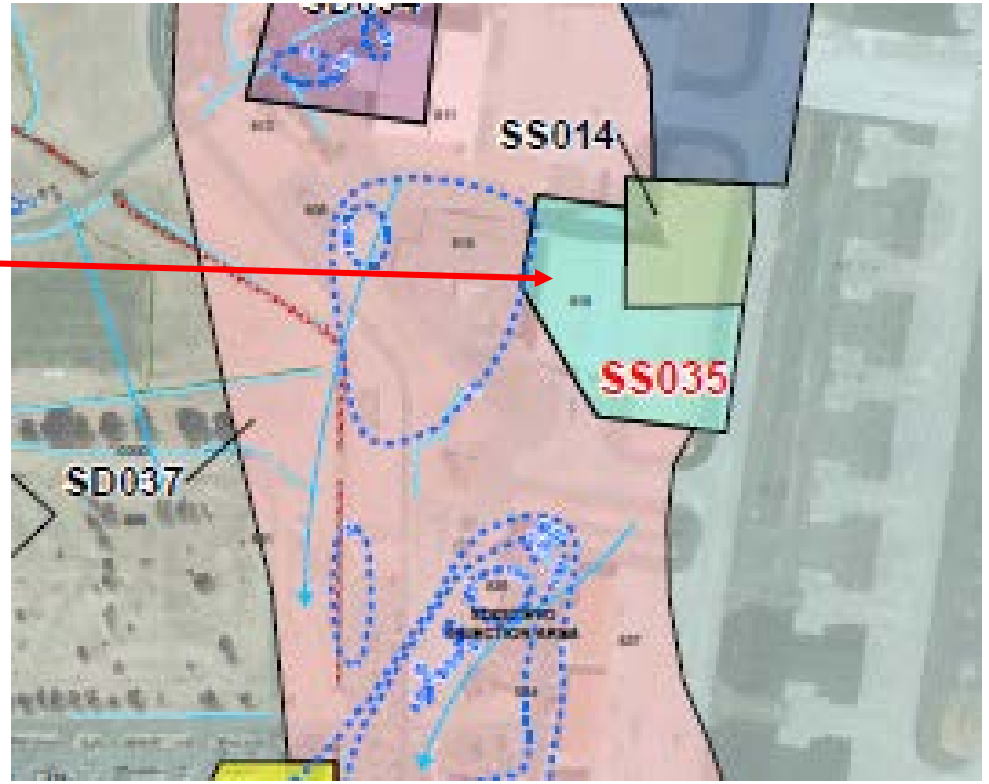
November 15, 2017

Overview

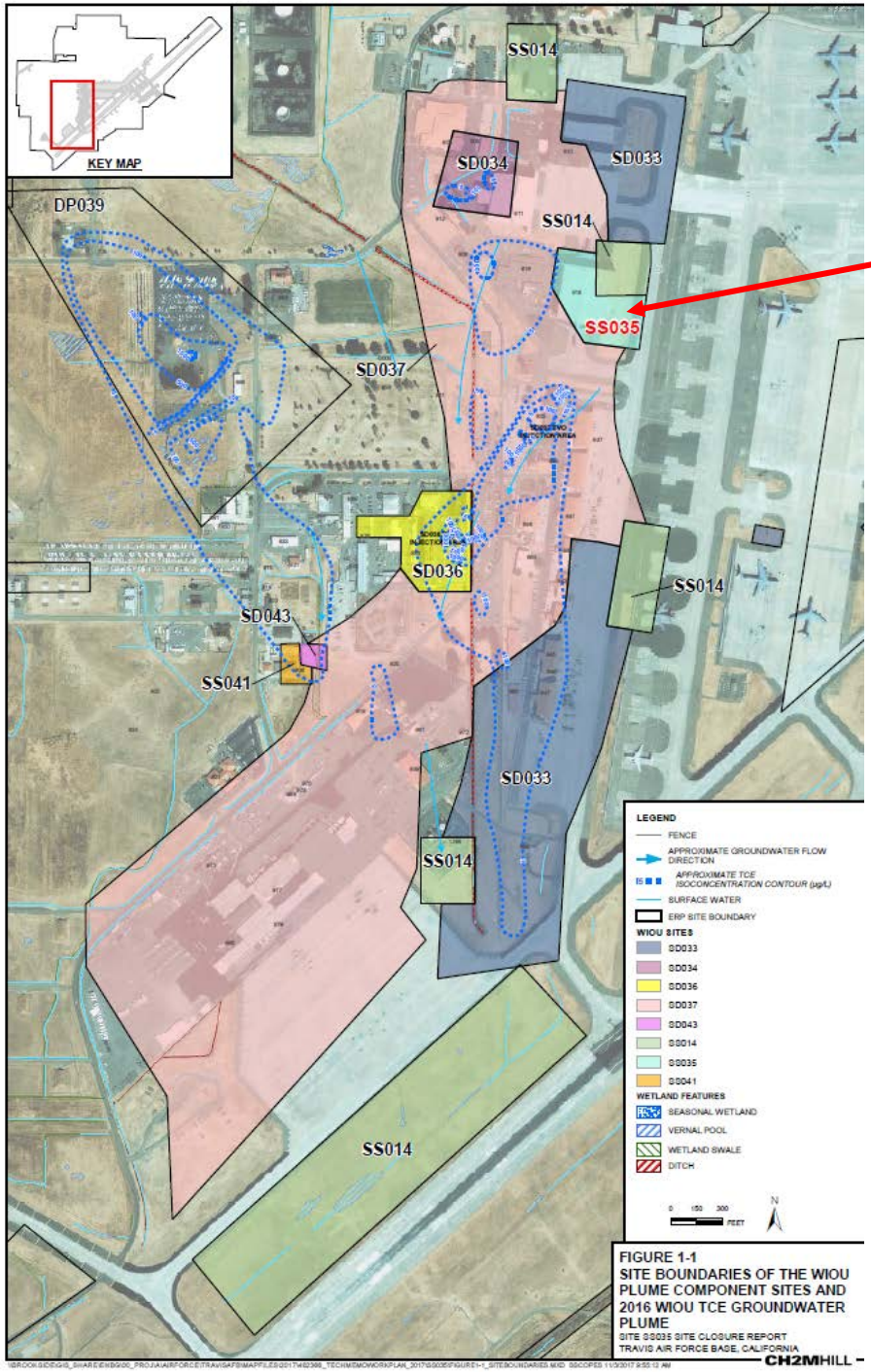
- Site SS035 attained groundwater (gw) cleanup levels of site Chemicals of Concern (COCs) [Trichloroethene (TCE) and TPH-Diesel (TPH-D)]
- GW Record of Decision (ROD) specified closure monitoring should begin
- Site closure monitoring was performed from 2Q14 to 2Q17
- Results of closure monitoring indicate Site SS035 related COCs have remained below cleanup levels
- Requirements for site closure specified in the GW ROD have been met
- Site SS035 infrastructure (monitoring wells) will be retained to support West Industrial Operable Unit (WIOU) and Site SS014

SS035 Location

- Located in the northern WIOU
- On the periphery of the large WIOU TCE plume
- Bordered on northwestern, western, and southern sides by the much larger Site SD037 (sanitary sewer)
- Overlapped by Petroleum-only Contaminated (POCO) Site SS014, Subsite 2 (Jet Fuel Spill Area 2) on the northeastern side



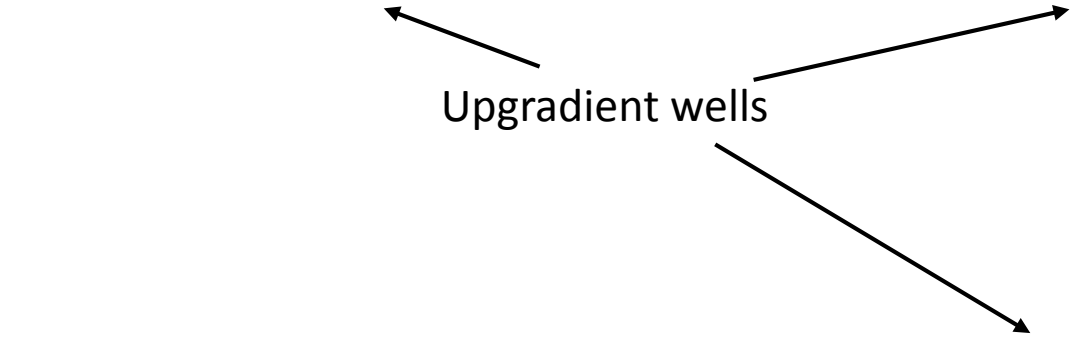
WIOU Plume Component Sites



Site SS035

Site SS035 Site Description

- Includes Facilities 818 and 819 (used for aircraft maintenance)
- Wash water from Facility 818 historically drained to two oil/water separators (OWS): OW053 (northwestern corner) and OW054 (southwestern corner)
- In 2016, both OWS were certified clean and closed in place (filled with concrete)
- A hydraulic lift storage area is located along the southwestern side of Facility 818


Upgradient wells


Former source area wells


Downgradient well

SS035 Groundwater Contaminant Sources

- Two sources identified in the Remedial Investigation (RI)
  - Former OW054 located at the southwestern corner of Facility 818 and
  - hydraulic lift storage area along the southwestern side of Facility 818
- Sources were identified with soil gas (sg) and gw data (1994-1995)
- Maximum TCE concentration detected in gw during RI was 21 µg/L near well MW818x35

RI Data Collected: 1994-1995

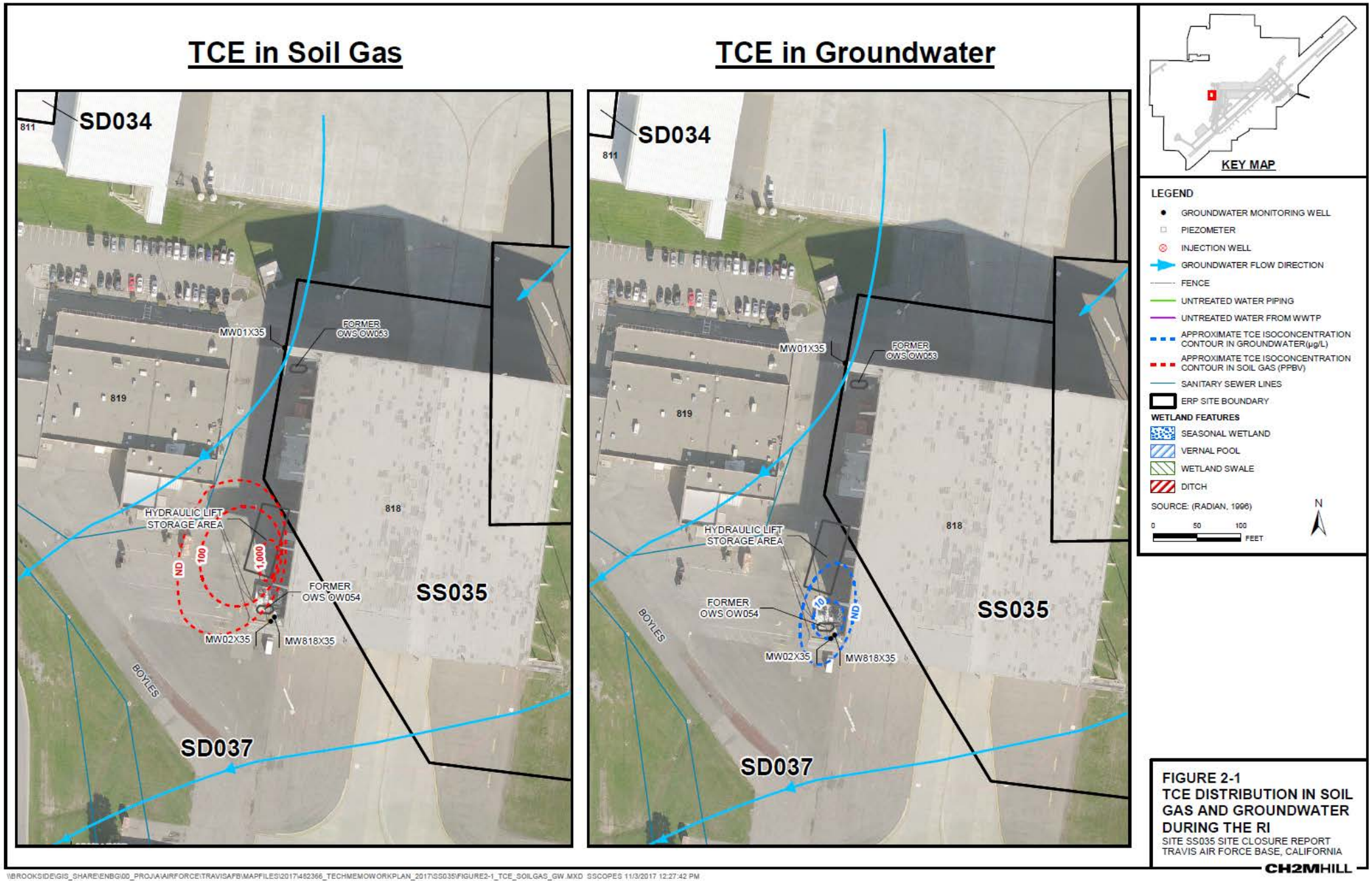


FIGURE 2-1
TCE DISTRIBUTION IN SOIL GAS AND GROUNDWATER DURING THE RI
SITE SS035 SITE CLOSURE REPORT
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

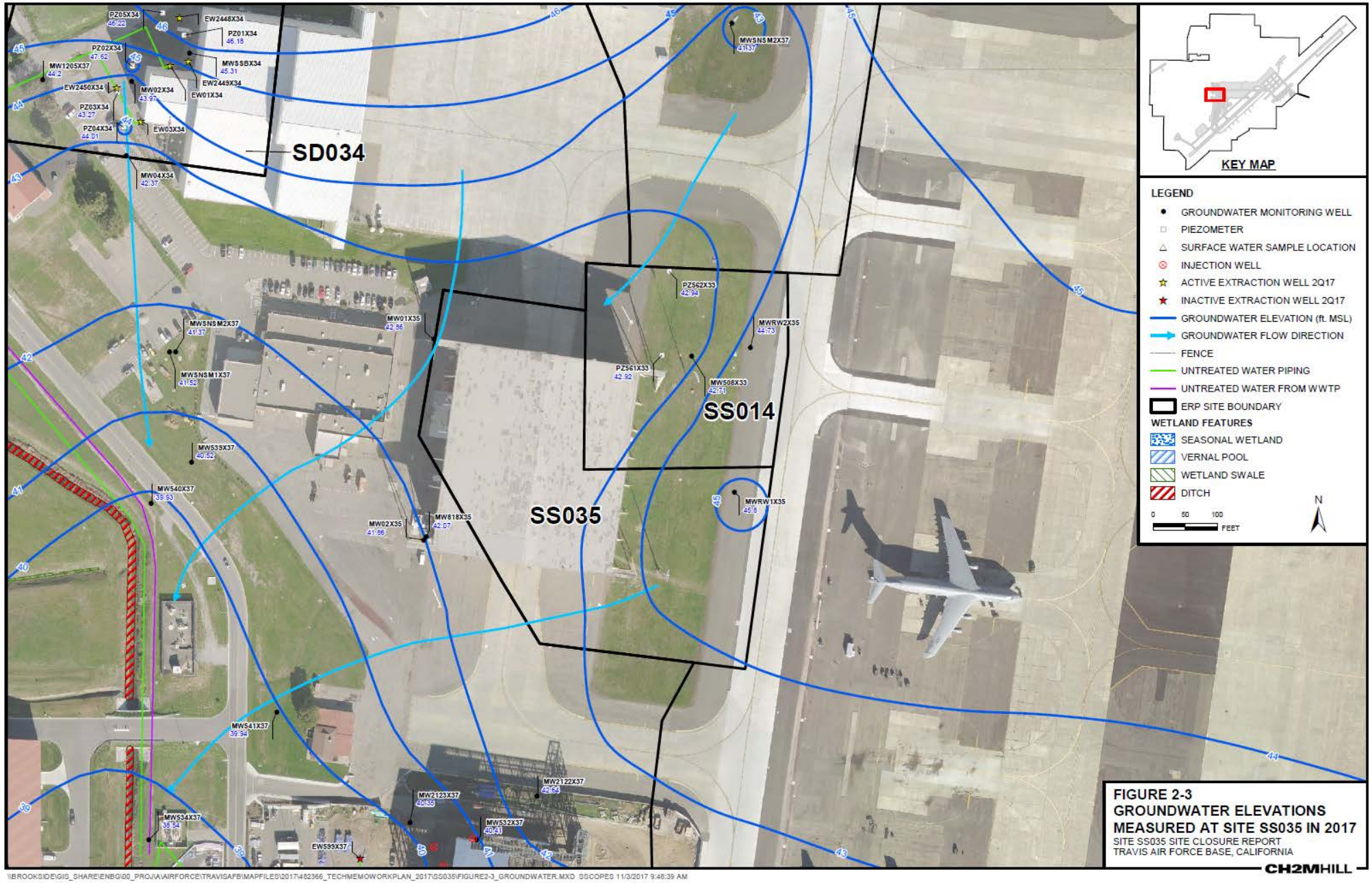
\\BROOKSIDE\GIS_SHARE\ENBG\00_PROJ\A\AIRFORCE\TRAVISAFB\MAPFILES\2017\482366_TECHMEMOWORKPLAN_2017\SS035\FIGURE2-1_TCE_SOILGAS_GW.MXD SSCOPES 11/3/2017 12:27:42 PM

Site SS035 Remedial Actions

- No Action was the remedial alternative selected for soil (PCBs and metals identified in soil found to pose no present or future risk)
- Two former OWSs associated with facility 818 were certified clean and closed in 2016
- An interim gw remedy of MNA assessment was selected to address TCE and TPH-D gw contamination over period leading to gw ROD (1997-2014)
- MNA was selected as the final gw remedy in the GW ROD (2014)
- The GW ROD specified that site closure monitoring should begin because cleanup levels had been attained

Hydrogeology

- Depth to water is approximately 10 feet bgs
- Approximately 30 feet of alluvium (primarily clay with varying amount of silt and sand) overlying weathered bedrock (Markely sandstone)
- GW flow primarily through low permeability alluvium
- GW flow predominately to the southwest; presence of a southwest trending gw trough results in more southerly gw flow direction in the northern portion of the site and a predominately westerly flow direction in the eastern portion of the site
- Trough continues into WIOU, gw contamination from various sites flows towards the trough and becomes co-mingled


SD034
SS014
SS035
KEY MAP
LEGEND
GROUNDWATER MONITORING WELL
PIEZOMETER
SURFACE WATER SAMPLE LOCATION
INJECTION WELL
ACTIVE EXTRACTION WELL 2Q17
INACTIVE EXTRACTION WELL 2Q17
GROUNDWATER ELEVATION (ft. MSL)
GROUNDWATER FLOW DIRECTION
FENCE
UNTREATED WATER PIPING
UNTREATED WATER FROM WWTP
ERP SITE BOUNDARY
WETLAND FEATURES
SEASONAL WETLAND
VERNAL POOL
WETLAND SWALE
DITCH
0 50 100
FEET
N
FIGURE 2-3
GROUNDWATER ELEVATIONS
MEASURED AT SITE SS035 IN 2017
SITE SS035 SITE CLOSURE REPORT
TRAVIS AIR FORCE BASE, CALIFORNIA
CH2MHILL
\\BROOKSIDE\GIS_SHARE\ENBG\00_PROJ\A\AIRFORCE\TRAVISAFB\MAPFILES\2017\482366_TECHMEMOWORKPLAN_2017\SS035\FIGURE2-3_GROUNDWATER.MXD SSCOPES 11/3/2017 9:48:39 AM

Attainment of Cleanup Levels

- Cleanup levels/Environmental Screening Levels (ESLs):
  - TCE = 5 µg/L (cleanup level)
  - TPH-D = 100 µg/L (ESL)
- Cleanup level/ESL attained through attenuation over the interim period leading up to GW ROD
- Closure monitoring initiated in 2014 to verify maintenance of cleanup level/ESL, as specified in the GW ROD

Closure Monitoring

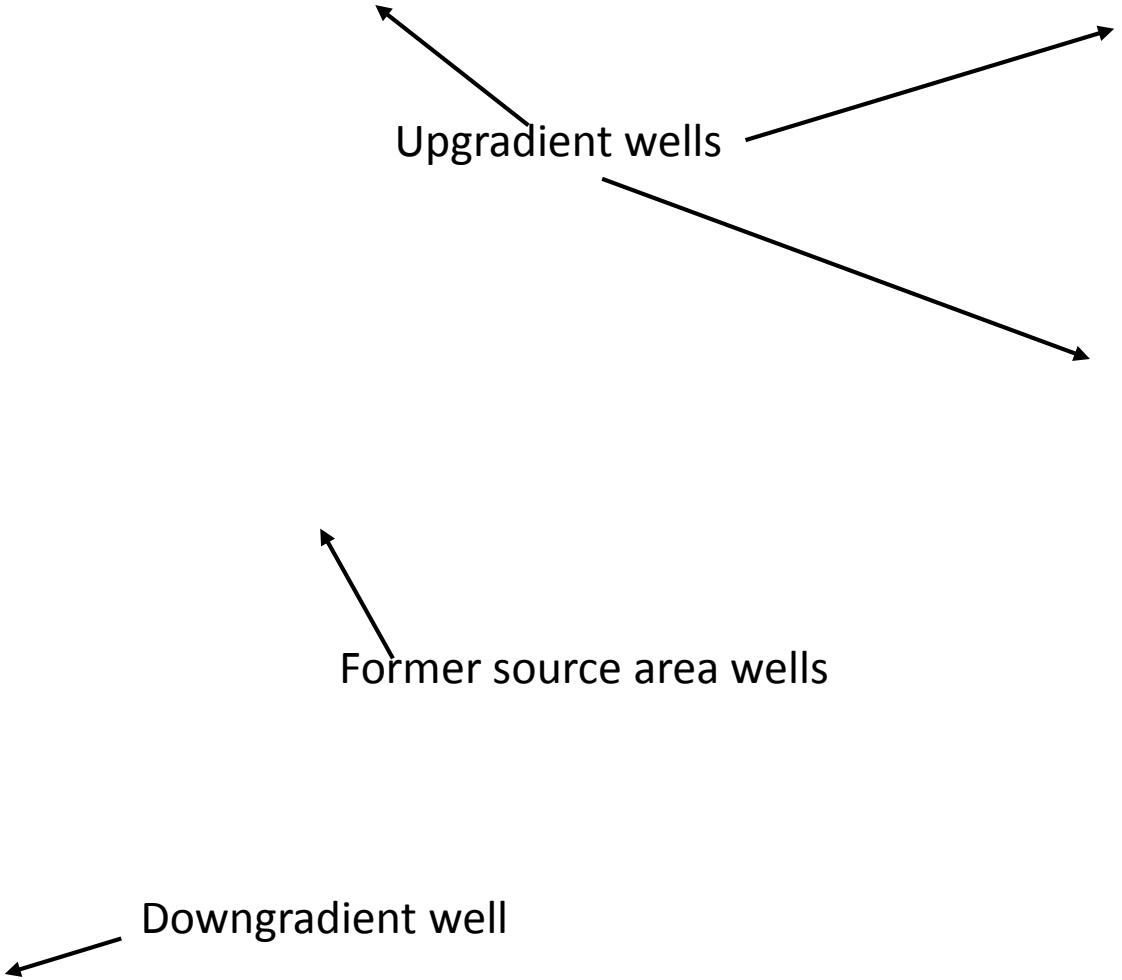
- 7 closure monitoring events conducted between 2Q14 and 2Q17 at the required 4 Site SS035 monitoring wells
- Wells MW01x35, MW02x35, MW818x35, and MWRW1x35 sampled semiannually for VOCs and TPH-D
- One well, MWRW2x35, is located within Site SS014 Subsite 2, near the historical Site SS014 source area. This well is not representative of Site SS035, and was not included in closure monitoring, although it was sampled in 2Q17 to assess conditions at Site SS014

Closure Monitoring, Cont.

- Of the 4 Site SS035 wells monitored for closure, 2 are located upgradient of the Site SS035 historical source area and are impacted by contamination from other sites
  - MW01x35 is located at the northern edge of Site SS035 and is impacted by the adjacent WIOU gw plume (installed to monitor for transgression)
  - MWRW1x35 is located adjacent to Site SS014 Subsite 2
- In addition to the Site SS035 wells, data from downgradient Site SD037 well MW541x37 (collected during routine annual sampling) was evaluated to confirm COC concentrations downgradient of Site SS035 remained below cleanup levels/ESLs

Closure Monitoring Results

- In 2Q17, TCE concentrations did not exceed the groundwater cleanup level (5 µg/L) at any Site SS035 well
- The maximum 2Q17 TCE concentration detected was 3.7 µg/L at upgradient well MW01x35
- In 2Q17, TPH-D concentrations did not exceed the ESL (100 µg/L) at any Site SS035 well, with the exception of upgradient well MWRW1x35, which has been impacted by Site SS014


Upgradient wells
Former source area wells
Downgradient well

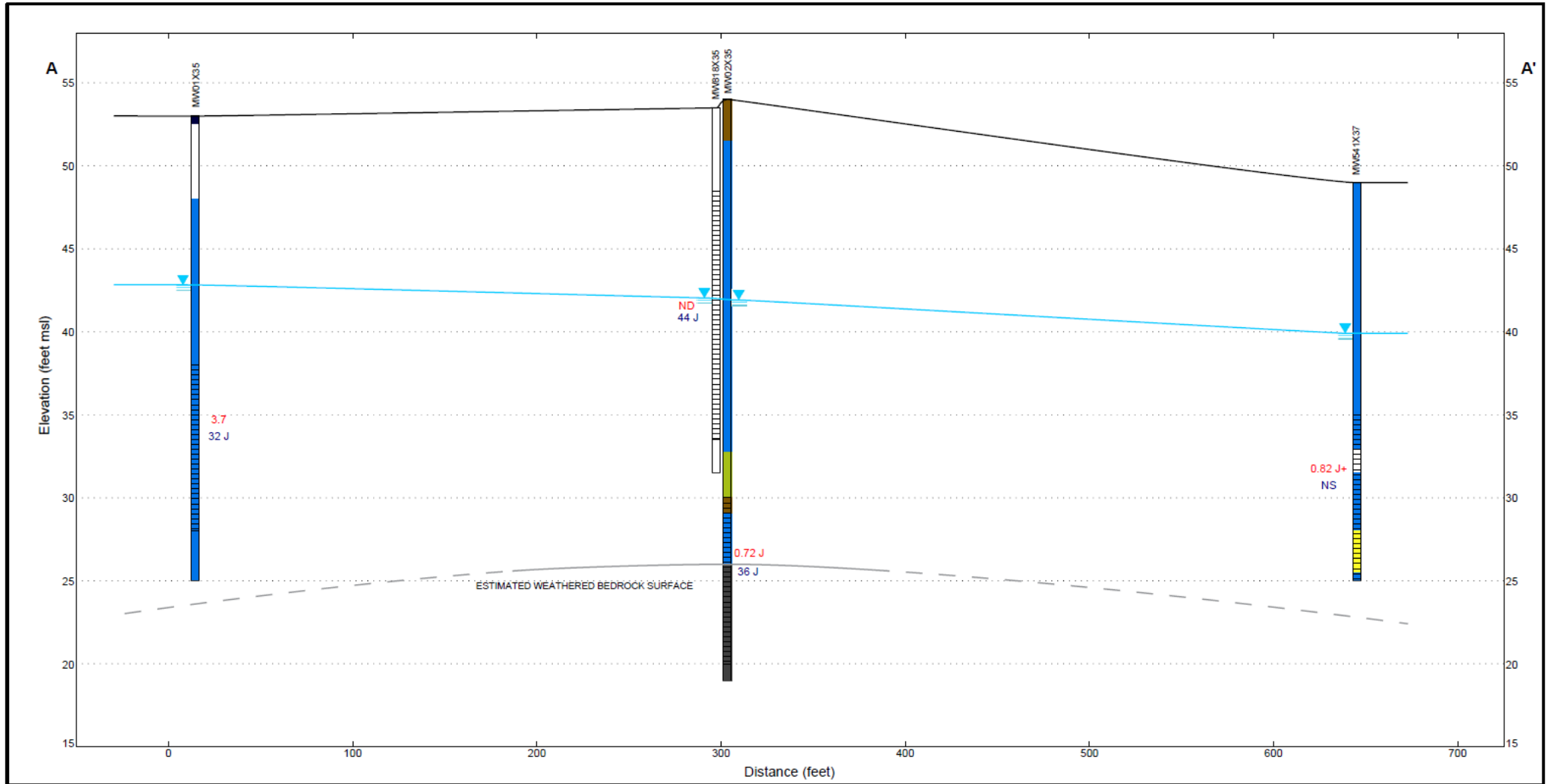


FIGURE 2-2
SITE SS035 GEOLOGIC CROSS SECTION A - A'
SITE SS035 SITE CLOSURE REPORT
TRAVIS AIR FORCE BASE, CALIFORNIA

CH2MHILL

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Closure Monitoring Results, Cont.

- TCE cleanup level has been maintained at the 2 Site SS035 historical source area wells (MW02x35 and MW818x35)
- The maximum TCE concentrations detected at wells MW02x35 and MW818x35 over the closure monitoring period were 2.1 µg/L (2Q14) and 1.5 µg/L (4Q14)
- TCE concentrations remained below cleanup level at downgradient Site SD037 well MW541x37 over closure monitoring period
- TCE was not detected at upgradient wells MWRW1x35 and MWRW2x35 (within and adjacent to Site SS014 Subsite 2)
- TCE concentrations intermittently exceeded cleanup level at upgradient well MW01x35, which is being impacted by adjacent WIOU gw plume

Closure Monitoring Results, Cont.

- TPH-D remained below ESL (100 µg/L) in Site SS035 former source area wells; each exceeded the ESL only once during closure monitoring
- The only well with consistent TPH-D exceedances was MWRW1x35, which is impacted by Site SS014
- TPH-D concentrations downgradient of Site SS035 are below the ESL (well MW451x37)

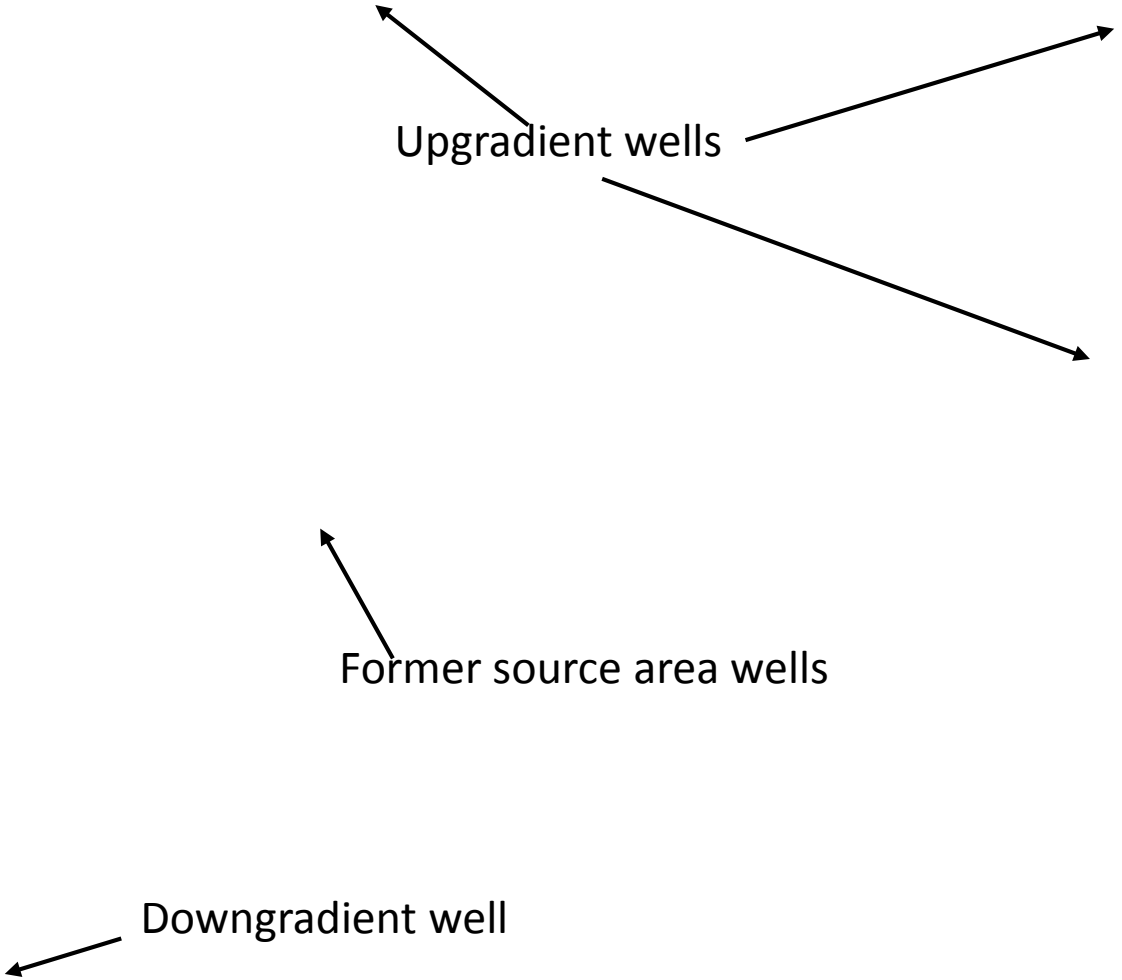
Closure Monitoring Results, Cont.

Upgradient
Former Source Area
Downgradient

Well	Cleanup Level/ESL (µg/L)	2Q14	4Q14	2Q15	4Q15	2Q16	4Q16	2Q17
MW01x35 (upgradient well, impacted by WIOU TCE plume)								
TCE	5	*4.4*	***5.2***	***5.4***	***5.2***	*4.6*	***7.1***	*3.7*
TPH-D	100	ND (< 100)	35 J	54 J	71 J	ND (< 120)	ND (< 86)	32 J
MWRW1x35 (upgradient well, impacted by Site SS014 TPH-D plume)								
TCE	5	ND (< 0.5)	ND (< 0.2)	ND (< 0.4)	ND (< 0.4)	ND (< 0.4)	ND (< 0.4)	ND (< 0.4)
TPH-D	100	*73 J*	***420***	***300***	***170 J***	***110 J-***	ND (< 240)	***200 J***
MWRW2x35 (upgradient of Site SS035, located within Site SS014, included for reference)								
TCE	5	NS	NS	NS	NS	NS	NS	ND (< 0.4)
TPH-D	100	NS	NS	NS	NS	NS	NS	*48 J*
MW02x35 (Site SS035 historical source area well)								
TCE	5	2.1	1.6	1.4	1.1	1.2	1.8	0.72 J
TPH-D	100	ND (< 100)	77 J	ND (< 120)	**350***	ND (< 120)	ND (< 100)	36 J
MW818x35 (Site SS035 historical source area well)								
TCE	5	ND (< 0.5)	1.5	0.74 J	1.3	ND (< 0.4)	ND (< 0.4)	ND (< 0.4)
TPH-D	100	57 J	**110 J**	79 J	90 J	72 J	ND (< 130)	44 J
MW541x37 (downgradient of Site SS035, located within Site SD037, included for reference)								
TCE	5	*1.6*	NS	*1.8*	NS	*0.94 J*	NS	*0.82 J+*
TPH-D	100	ND (< 50)	NS	NS	NS	NS	NS	NS

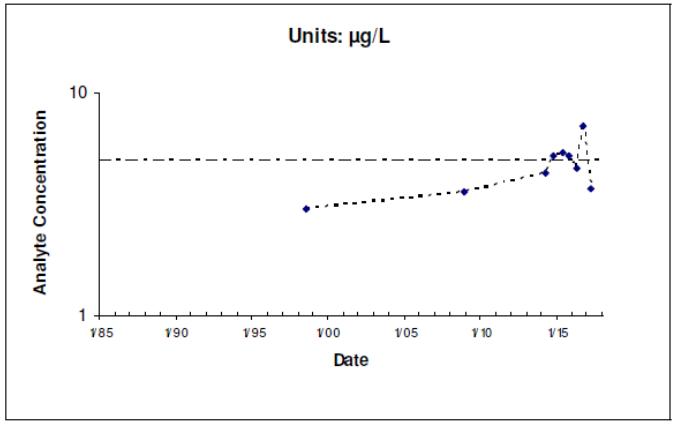
*Result appears anomalous, based on monitoring history, and review of chromatogram indicates this detection does not fit with a typical diesel range detection.

Notes:
Cleanup level or ESL exceedances are **bolded**.
Detections that are a result of adjacent site contamination are *italicized*.

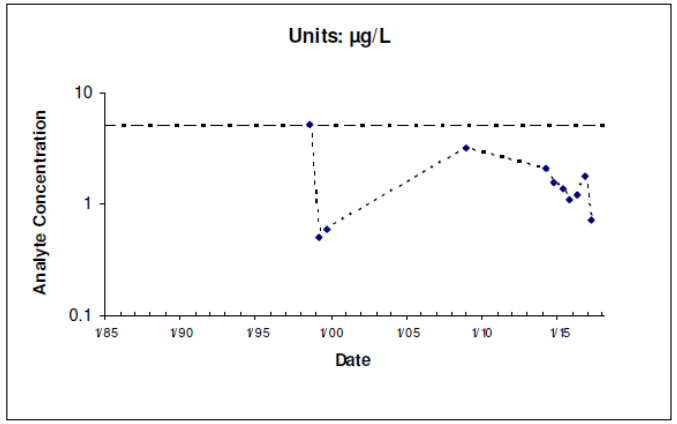

Upgradient wells
Former source area wells
Downgradient well

Mann Kendall Trend analysis and chemical time series plots indicate decreasing or no TCE trend

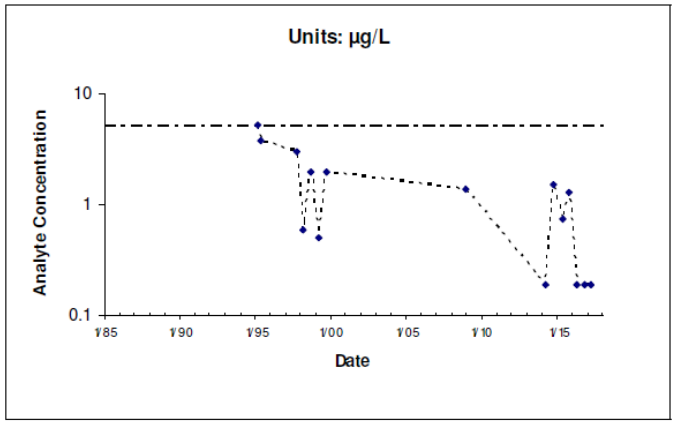
Upgradient well, impacted by WIOU



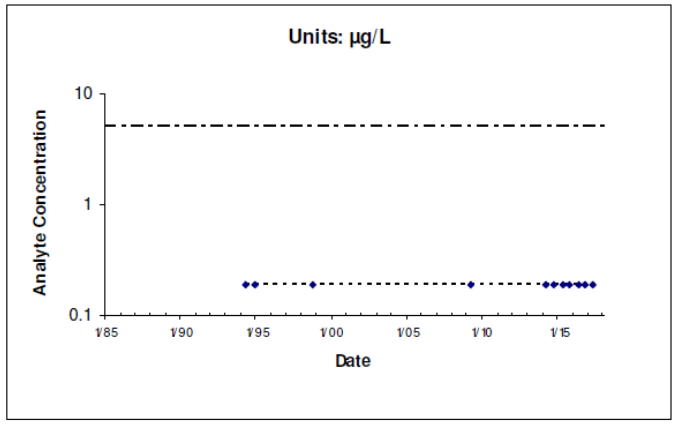
Location: MW01X35 Maximum: 7.1



Location: MW02X35 Maximum: 5.2



Location: MW818X35 Maximum: 5.3



Location: MWRW1X35 Maximum: 0.19

— - — - — ESL (5 µg/L)

*Nondetects shown as the Method Detection Limit (0.19 µg/L)

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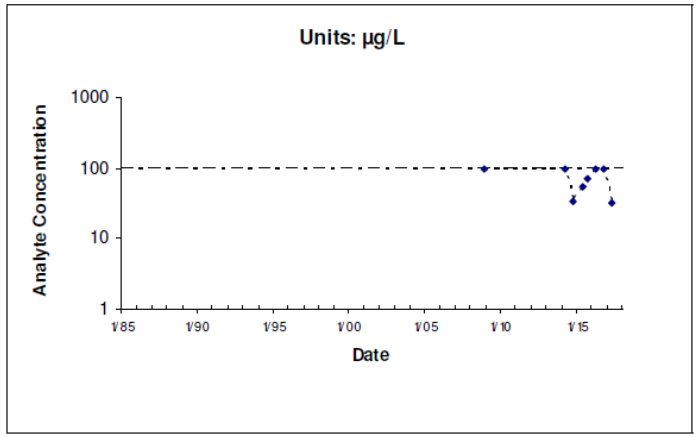
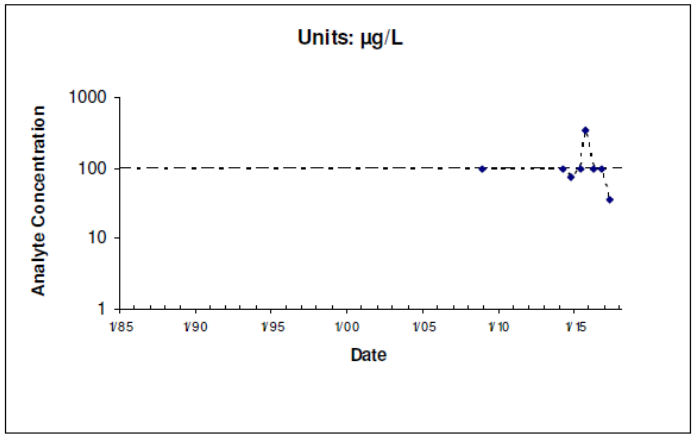
FIGURE 2-5
Site SS035
TCE
Chemical Time-series Plots
Page 1 of 2

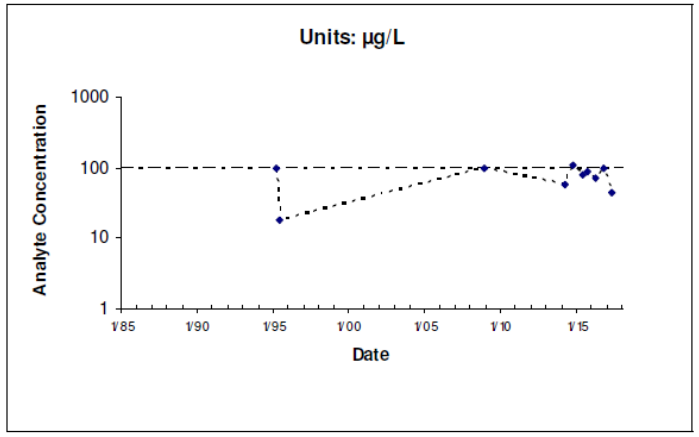
Mann Kendall Trend analysis and chemical time series plots indicate decreasing or no TPH-D trend



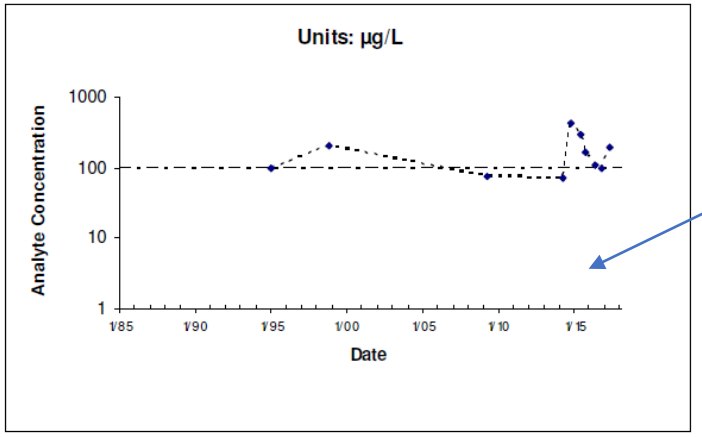
Location: MW01X35 Maximum: 100



Location: MW02X35 Maximum: 350



Location: MW818X35 Maximum: 110



Location: MWRW1X35 Maximum: 420

Upgradient well, impacted by Site SS014

— - — - — ESL (100 µg/L)

*Nondetects shown as the Method Detection Limit (100 µg/L)

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FIGURE 2-6
Site SS035
TPH-D
Chemical Time-series Plots
Page 1 of 2

Site SS035 Closure

- Two years of closure monitoring required by the GW ROD have been completed
- Closure monitoring demonstrates groundwater contamination resulting from historical Site SS035 activities has naturally attenuated and has been maintained below cleanup levels
- Groundwater site closure requirements (per the GW ROD) have been met and site closure is appropriate for Site SS035

Existing Infrastructure

- Site monitoring wells will be retained to support monitoring of the adjacent WIOU plume and Site SS014
- MW01x35 was designated as an EA well for the WIOU TCE plume in the 2016 GRISR
- MW02x35 and MW818x35 are retained as contingent WIOU monitoring wells
- MWRW1x35 and MWRW2x35 will be retained until Site SS014 is closed

Questions?

Travis AFB
Restoration Program

Program Update

RPM Meeting

November 15, 2017

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***

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 (3)

- 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***

Documents In-Progress

CERCLA

- Community Relations Plan
- 2016 Annual GRISR
- Data Gap Investigation Results, Technical Memorandum for Soil, Sites SD033, SD043, SS046

POCO

- None

Field Work In-Progress

CERCLA

- SS015 EVO Optimization
- SD031 EVO Optimization
- FT005 Installation of Pumps and Controls in 5 New Extraction Wells

POCO

- None

Documents Planned

CERCLA

- Data Gap Investigation Results, Technical Memorandum for Site SS016 — Nov
- Amendment to the Soil ROD for WABOU sites DP039, SD043, and SS046 — Nov
- TS060 Removal Action Completion Report — Dec
- ***SS035 Site Closure Report*** — ***Dec***
- ***DP039 RACCR Addendum for newly installed downgradient monitoring wells*** — ***Feb***
- ***Amendment to the Soil ROD for NEWIOU Sites SS016 and SD033*** — ***Mar***
- ***SD031 RI/FS*** — ***Apr***

POCO

- POCO Evaluation/Closure Report for DERA-funded Oil/Water Separators OW040, OW047, OW048, OW049, OW050, OW052, OW055, OW056, and OW057 — Nov

Field Work Planned

CERCLA

- SD034 Install bollards around SBGR May

POCO

- None

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

Technology Demonstration Projects (1)

- SS014: Recycled Drywall SBGR
  - Evaluate the effectiveness of sulfate (gypsum from crushed drywall) to enhance anaerobic biodegradation of petroleum in groundwater
  - Installation was completed November 2016
  - First quarter performance results
    - TPH-G: 99% reduction in source area (1,900 to 14 J μg/L), 18% for remaining 7 site wells
    - TPH-D: 98% reduction in source area (5,500 to 130 J μg/L), 33% for remaining 7 site wells
    - Benzene: 98% reduction (22 to <0.4 μg/L), 49% for remaining 7 site wells
- Multisite Bioaugmentation: EVO and KB-1 Plus
  - 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 reinjecting with nanoEVO in 2017
  - Too early to evaluate performance data

* SBGR = Subgrade Biogeochemical Reactor

Technology Demonstration Projects (2)

- SD034: Washboard SBGR
  - Evaluate the effectiveness of an oxygen-enhanced aerobic SBGR on reducing TPH as diesel (TPH-D) in groundwater
  - Installation was completed November 2016
  - Installed six (6) SBGR trenches.
  - Too early to evaluate performance data
- 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
  - Installation completed May 2016
  - Slightly elevated TOC and reduced COC concentrations in the north, but too early to evaluate performance data
  - In the process of optimization of GETs in southern portion of site, which may help accelerate TOC dispersal to support this TD

Technology Demonstration Projects (3)

- 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
  - Limited TOC dispersal, additional EVO injection underway with nanoEVO to determine if this can enhance TOC dispersal
  - COC concentrations have declined
    - ~50% total molar reduction plume-wide through first year
    - Max monitoring well TCE concentration reduced from 560 to 140 μg/L

Technology Demonstration Projects (4)

- SD031: EVO distribution via Gravel Chimneys
  - 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:
    - Reducing conditions have initiated as expected throughout the TD area and are supporting anaerobic degradation
    - TOC concentrations are increasing at several wells
    - Recirculation through chimneys has been successful relative to our design assumptions
    - 1,1-DCE (primary COC) concentrations have reduced by 93% (sum of key wells within TD area, excluding 2 wells to SW that increased)
    - Total Molar concentration (sum of CVOCs) has reduced by 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 area)

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

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 (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