Final

Travis Air Force Base
Environmental Restoration Program
Restoration Program Manager's
Teleconference Minutes

16 September 2015, 1300 Hours

Mr. Mark Smith, of the Air Force Civil Engineer Center (AFCEC) Restoration Installation Support Team (IST), conducted the Restoration Program Manager's (RPM) teleconference on 16 September 2015 at 1300 hours in Building 248 at Travis AFB, California. Attendees included:

• Mark Smith	AFCEC/CZOW
• Glenn Anderson	AFCEC/CZOW
• Lonnie Duke	AFCEC/CZOW
• Captain Alexi Fong	Travis AFB 60 AMW/JA
• Merrie Schilter-Lowe	Travis AFB 60 AMW/PA
• William Hall (via telephone)	AFCEC/CZRW
• Adriana Constantinescu (via telephone)	California Regional Water Quality Control Board (RWQCB)
• Ben Fries (via telephone)	California Department of Toxic Substances Control (DTSC)
• Nadia Hollan Burke (via telephone)	United States Environmental Protection Agency (USEPA)
• Indira Balkissoon (via telephone)	Techlaw, Inc
• Mike Wray (via telephone)	CH2M

Handouts distributed at the meeting, discussions and presentations included:

• Attachment 1	Meeting Agenda
• Attachment 2	Master Meeting and Document Schedule
• Attachment 3	SBBGWTP Monthly Data Sheet (August 2015)
• Attachment 4	CGWTP Monthly Data Sheet (August 2015)
• Attachment 5	Subarea LF007C Monthly Data Sheet (August 2015)
• Attachment 6	ST018 Monthly Data Sheet (August 2015)
• Attachment 7	Presentation: Program Update: Activities Completed, In Progress and Upcoming

- Attachment 8 Presentation: SD034 Technology Demonstration

1. ADMINISTRATIVE

A. Previous Meeting Minutes

The 16 September 2015 RPM meeting minutes were approved and finalized as written.

B. Action Item Review.

Action items from August were reviewed.

Action item 1 will remain open: AFCEC's Travis Restoration Support Team and Travis AFB will continue to pursue opportunities for the beneficial reuse of treated water. Due date will remain TBD to ensure this action item remains visible. 16 September 2015: Mr. Duke reported that the Civil Engineering Squadron (CES) has a new energy program manager and that there is renewed interest in beneficial reuse of treated water. At the beginning of the new fiscal year 2016 (FY16), a meeting will be held to consider using some of the treated water for irrigation.

Action item 2 is ongoing: Mr. Smith to provide updates on PFOS and PFOA as he becomes aware of them. 16 September 2015: No update.

Action item 3 is open: Ms. Constantinescu will schedule a site visit of the twelve (12) oil water separator sites (OWS) when she is available. Update: 16 September 2015: Site visit will be held in the spring of 2016.

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 face to face meeting, held on Thursday, 05 November 2015 at 1400, RAB meeting to follow at 1900. The regulators agreed to cancel the 18 November 2015 RPM meeting. RPM meeting tentative dates for January and February 2016 are: 20 January 2016 (face to face), and 17 February 2016 (face to face). The 2016 RPM meeting calendar will be available for the November 2015 RPM meeting.

— Community Involvement Plan: No change to the schedule.

— Work Plan to Support Risk Assessment, Sites SD043, SD033, and SS016: New document - all dates are to be determined (TBD). This document will temporarily replace the NEWIOU and WABOU soil ROD amendments. The decision to temporarily remove the soil ROD amendments from the MMDS with this work plan (WP) is based on a recent Air Force Instruction (AFI) that Travis AFB is required to comply with (AFI 32-7020). There is not enough information at these three sites to make a decision, whether it be: active cleanup (AC), land use controls (LUC) or, no action (NA). Travis AFB has to demonstrate if the cumulative cancer risk is $1x10^{-4}$ or greater and/or the non-cancer risk is greater than 1, in order to take action in the form of active cleanup to protect human health. The Air Force position is that if the cumulative cancer risk is lower than $1x10^{-4}$ and the non-cancer risk is less than 1, then Travis AFB is not required to take action. These three sites have enough uncertainty that we need to conduct further field investigation work to assess the risk using the new EPA and/or DTSC standards, whichever one is more stringent. Ms. Balkissoon asked if there was any connection with soil and groundwater (GW) contaminants. Mr. Anderson answered no, that the chemicals of concerns (COCs) for soil and GW are not the same. Ms. Burke asked for a letter explaining the changes Travis AFB is proposing. Mr. Anderson asked if the rationale for conducting the additional sample collection/analyses and follow-on risk assessment could be placed in the cover letter of the risk assessment WP. Ms. Burke said she thinks that approach would work, unless her managers state otherwise.

— Potrero Hills Annex (FS, PP, and ROD): No change to the schedule. Ms. Constantinescu provided an update on the field work being conducted. Two phases of the investigation have been conducted; twenty-three (23) soil borings have been drilled, and soil and groundwater samples have been collected. Groundwater monitoring wells were installed this week and groundwater samples are being collected. The preliminary analyses detected perchlorate and VOCs which suggest contaminant migration has taken place. The remedial investigation work is still being conducted.

— Corrective Action Plan for Oil Water Separators 40, and 50 through 57: The document schedule has been populated with actual dates.

— Quarterly Newsletter (October 2015): No change to the schedule.

— 2014 Annual GRISR: Agency Comments Due was changed to 8 September 2015, the rest of the dates were changed accordingly. RWQCB and DTSC said they concur with EPAs comments and have no further comments. EPA will submit general comments in one final letter. EPA had no further comments regarding the 4Q15 GRIP sampling event.

— Site SD031 Technology Demonstration Construction Completion Report: Document went final, and will be moved to the history page.

— Sites SD036 and SD037 Remedial Action Construction Completion Report: No change made to the schedule. Agency comments have not been received. Ms. Balkissoon said comments will be provided to EPA by Friday, 18 September 2015, for Ms. Burke's review. DTSC and RWQCB have no comments.

— Site ST018 POCO Construction Completion Report: No change to the schedule. RWQCB approved draft, document to go final.

— Site SS016 Groundwater Remedial Action Construction Completion Report: No change made to the schedule.

— Site SS015 Remedial Action Construction Completion Report: No change made to the schedule.

— Site SS030 Remedial Action Construction Completion Report: Predraft to AF/Service Center was changed to 24 September 2015, the rest of the dates changed accordingly. Ms. Burke requested that the RACCR reports include the dates that field work started and ended.

— Site FT004 Technology Demonstration Construction Completion Report: New document, populated with all new dates.

— Site FT005 Technology Demonstration Construction Completion Report: New document, populated with all new dates.

— Site DP039 Remedial Design/Remedial Action Work Plan: Moved to history.

2. CURRENT PROJECTS

Treatment Plant Operation and Maintenance Update

South Base Boundary Groundwater Treatment Plant, August 2015 (see Attachment 3)

The South Base Boundary Groundwater Treatment Plant (SBBGWTP) performed at 100% uptime, and 3.57 million gallons of groundwater were extracted and treated during the month of August 2015. All of the treated water was discharged to Union Creek. The average flow rate for the SBBGWTP was 80.06 gallons per minute (gpm). Electrical power usage was 17,160 kWh, and approximately 23,509 pounds of CO_2 were created (based on DOE calculation). Approximately 1.28 pounds of volatile organic compounds (VOCs) were removed in August. The total mass of VOCs removed since startup of the system is 464.9 pounds.

Optimization Activities for SBBGWTP: No optimization activities are reported for the month of August 2015.

Central Groundwater Treatment Plant, August 2015 (see Attachment 4)

The Central Groundwater Treatment Plant (CGWTP) performed at 100% uptime with approximately 1.16 million gallons of groundwater extracted and treated during the month of August 2015. All treated water was discharged to the storm drain. The average flow rate for the CGWTP was 26.1 gpm. Electrical power usage was 2,107

kWh for all equipment connected to the Central Plant, and approximately 2,887 pounds of CO_2 were generated. Approximately 1.40 pounds of VOCs were removed from groundwater by the treatment plant in August. The total mass of VOCs removed since the startup of the system is 11,413 pounds.

Optimization Activities for CGWTP: No optimization activities are reported for the month of August 2015.

LF007C Groundwater Treatment Plant, August 2015 (see Attachment 5)

Subarea LF007C Treatment Plant (LF007CGWTP) performed at 81% uptime with approximately 148,818 gallons of groundwater extracted and treated during the month of August 2015. The average flow rate at the LF007CGWTP was 4.58 gpm, and electrical power use was 0 kWh for all the equipment connected to the plant; and 0 pounds of CO_2 was generated; this electrical system is 100 percent off of the power grid. Approximately $3.66x10^{-3}$ pounds of VOCs were removed from the groundwater in July. The total mass of VOCs removed by the North Groundwater Treatment Plant and LF007CGWTP combined is 174.34 pounds.

Optimization Activities for LF007CGWTP: No optimization activities to report for the month of August 2015.

ST018 Groundwater (MTBE) Treatment Plant, August 2015 (see Attachment 6)

The Site ST018 (MTBE) Treatment Plant (ST018 GWTP) performed at 70% uptime with approximately 173,081 gallons of groundwater extracted and treated during the month of August 2015. All treated water was diverted to the sanitary sewer. The average flow rate for the ST018 GWTP was 5.77 gpm. Electrical power usage for the month was 101 kWh for all equipment connected to the ST018 GWTP, which equates to approximately 138 pounds of CO_2. Approximately 0.41 pound of BTEX, MTBE and TPH was removed from groundwater in August by the treatment plant. Approximately 0.26 pound of MTBE was removed from groundwater. The total BTEX, MTBE and TPH mass removed since the startup of the system is 32.6 pounds, and the total MTBE mass removed since startup of the system is 7.8 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 extraction pumps in the system are all solar powered.

Optimization Activities for ST018GWTP: No optimization activities to report for the month of August 2015.

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

Mr. Wray reported on the status of field work and documents which are completed, in progress, and upcoming. Updates from the briefing this month included:

Newly Completed Documents: None.

Newly Completed Field Work: OWS 47, 48, and 49 Site Investigations, SS030 Trench/Conveyance/Power Installation, FT005 Trench Installation, FT005 Well Development, and FT004 Well Installation, Well Development and Baseline Sampling.

In-Progress Documents (CERCLA): 2014 Annual GRISR, Sites SD036 and SD037 Remedial Action Construction Completion Report, and Site SS016 Groundwater Remedial Action Construction Completion Report.

In-Progress Documents (POCO): ST018 POCO Construction Completion Report.

In-Progress Field Work: FT005 Baseline Sampling, DP039 Well Installation, Well Development and Baseline Sampling, and FT004 EVO Injection.

Upcoming Documents (CERCLA): Community Involvement Plan (October), SS015 Groundwater Remedial Action Construction Completion Report (October), Site SS030 Remedial Action Construction Completion Report (October), Site FT004 Technology Demonstration Construction Completion Report (December), Site FT005 Technology Demonstration Construction Completion Report (December), Work Plan to Support Risk Assessments for Sites SD043, SD033, and SS016 (TBD), and Site DP039 Remedial Action Construction Completion Report (TBD).

Upcoming Documents (POCO): Corrective Action Plan for OWSs 40, and 50-57 (January 2016), Site SS014 POCO Construction Completion Report (TBD).

Field Work Planned (CERCLA): FT004 Trench/Conveyance/Power Installation (September), FT005 EVO Injection (September), DP039 Infiltration Trench Installation (October), and DP039 EVO Injection (October).

Field Work Planned (POCO): SS014 Bioreactor Installation (October). Ms. Constantinescu requested a schedule and a one week notification via email before the construction work begins. Mr. Wray said he will provide a schedule to RWQCB once a date is confirmed.

Presentations:

Presentation: SD034 Data Gaps Investigation Update (see Attachment 8)

Mr. Wray presented on the SD034 Data Gaps Investigation Update. For details see attachment 8.

Mr. Wray started by stating the selected remedy for SD034 as described in the base groundwater record of decision (ROD) is passive skimming and enhanced attenuation. The proposed

technology demonstration will explore the viability of using an alternating extraction and oxidation technology to carry out shallow groundwater and vadose zone remediation.

SD034 Site Background: In 1994 a hole was discovered in the oil water separator (OWS). The OWS was removed and replaced. The primary chemical of concern (COC) is related to Stoddard Solvent. The new aboveground storage tank (AST) was installed in the same location as the old Stoddard Solvent AST. One of the methods of transferring Stoddard Solvent was for the personnel to use 5-gallon buckets, and there is speculation that there was some spillage.

The NEWIOU Soil ROD concluded that no action was needed to address TPH below 2,300 mg/kg in the soil, because it would naturally attenuate. The Groundwater IROD selected groundwater extraction and treatment (GET) and passive skimming for this site. The Groundwater ROD selected passive skimming and enhanced attenuation.

Data Gaps Investigation Activities:

- Installed ten (10) soil borings to evaluate the extent of the residual smear zone contamination and to confirm soil concentrations have attenuated. (Soil boring sample results are provided in attachment 8.)

- Completed three (3) additional step-out borings to confirm smear zone impacts.

SD034 Conclusions:

- Based on the smear zone results, this site is a candidate for a new kind of bioreactor we have designed: Aerobic “Washboard” Bioreactor”. It will distribute dissolved oxygen for aerobic bacteria.

- Technology demonstration work plan (WP) will include: Implement the technology demonstration. Evaluate data over a two year period. If successful, the base will develop a ROD amendment to change the remedy. (See attachment 8, slides 11, 12 and 14 for bioreactor design.)

- Oxygen gas infusion technology will be considered for oxygenating groundwater, because it is more efficient than air sparging. Each gas infuser contains over 700 hydrophobic microporous hollow fibers that supersaturate groundwater with dissolved oxygen (DO). Sustainable, does not require electricity and has no moving parts. An oxygen gas infusion technology device will be placed in wells on either side of the plume.

- This aerobic bioreactor offers onsite soil/groundwater remediation of multiple contaminant classes for unrestricted reuse: Full range of TPH, waste oils, crude oils, refined oils, VOCs, SVOCs (BTEX, MTBE, TCE, PCE, VC, PAHs), pesticides, and PCBs (removal is at 99.8%). Munitions constituents, TNT, RDX, HDX, etc.

4. New Action Item Review

Travis AFB will provide Ms. Constantinescu/RWQCB one week notification via email before construction begins at Site SS014 Bioreactor Installation.

Mr. Smith will extend an invite to the regulators for the Travis AFB site tour.

5. PROGRAM/ISSUES/UPDATE

Mr. Smith provided an update on the recruitment meeting for the new RAB members. Eight (8) out of the nine (9) attended the RAB training, as well as some existing RAB members. Mr. Smith said he explained the RAB roles and responsibilities, including the documentation review process. The new members asked for a tour of Travis AFB which is tentatively schedule for 23 October 2015.

Mr. Fries commented on the Old Skeet Range and that DTSC had a recent inquiry on small arms sites and when collecting samples for dissolved metals to also include particulate lead in the analysis. Mr. Smith said that he is aware and that the Air Force and The State are negotiating the cleanup requirements, and requested Mr. Fries to advise Travis AFB of any updates.

6. Action Items

Item #	Responsible	Action Item Description	Due Date	Status
1.	Travis AFB	AFCEC's Travis Restoration Team and Travis AFB will continue to pursue opportunities for the beneficial reuse of treated water. Current possibilities include: Rerouting treated water from the central plant to the duck pond or as irrigation as an energy reduction project with the intent of reducing on-base water usage. Due date will remain TBD to ensure this action item remains visible. Update: Mr. Duke informed the group that Travis AFB is considering the use of treated water during EVO injection at Site FT005 as opposed to potable	TBD	Open

		water. New Action Item 5 added as a follow-up.		
2.	Mark Smith	Mr. Smith to provide updates on PFOS and PFOA as he becomes aware of them. Update: Mr. Smith stated that he has received the final preliminary assessment report from AFCEC. Direction from AFCEC for follow on steps has not yet been provided.	Ongoing	Open
3.	Adriana Constantinescu	Ms. Constantinescu will schedule a site visit of all the oil water separator sites (OWS), when she is available.	TBD	Open
4.	Travis AFB	Provide Ms. Constantinescu/RWQCB one week notification via email before construction begins at Site SS014 Bioreactor Installation	TBD	Open
5.	Mr. Smith	Extend an invite to the RAB members for the Travis AFB site tour.	23 Oct 2015	Open

TRAVIS AFB RPM TELECONFERENCE AGENDA
16 September 2015, 1:00 P.M. (PDT)

To:	EPA	Nadia Burke
	DTSC	John Hart
	RWQCB	Adriana Constantinescu
	CH2M Hill	Mike Wray
	AFCEC	William Hall
	USACE	Dezso Linbrunner

The RPM teleconference is scheduled for 1:00 PDT on 16 September 2015. **The call-in number is 1-866-203-7023. Enter the Participation code 5978-75-9736 then enter #.**

Topics for the teleconference include:

- Previous Meeting Minutes (All)
- Action Item Review (All)
- Master Meeting and Document Schedule Review (Glenn, Lonnie)
- Treatment Plant Operation and Maintenance Update (Lonnie)
- Program Update (Mike)
- Presentation SD034 Tech Demo (Jeff Gamlin)
- New Action Item Review (All)

Participants:

TRAVIS	ERP Staff	(707) 424-3062
DTSC	Ben Fries	(916) 255-3667
RWQCB	Adriana Constantinescu	(510) 622-2353
EPA	Nadia Burke	(415) 972-3187
USACE	Dezso Linbrunner	(402) 238-8846
CH2M HILL	Mike Wray	(916) 715-0949
AFCEC	William Hall	(210) 259-3252

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 TELECONFERENCE TO DISCUSS THE RESPONSES TO AGENCY COMMENTS ON THOSE DOCUMENTS THAT ARE IN PROGRESS (GRISR, SD036/37 RACCR, ST018 POCO CCR), IF NEEDED. ALL PARTICIPANTS ARE WELCOME TO PARTICIPATE.

(2015)
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.)
01-21-15	—	—
02-18-15	—	—
—	03-18-15	—
04-23-15 (Thursday 2:00 PM)	—	04-23-15
—	05-27-15	—
	06-17-15 (start at 12:00)	—
—	07-15-15 (1:00 to 3:00)	—
08-19-15 (1:00 to 3:00)	—	—
—	09-16-15 (1:00 to 3:00)	—
11-05-15 (Thursday 2:00 PM)		11-05-15
—	~~11-18-15~~	—
—	—	—

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

Travis AFB Master Meeting and Document Schedule

PRIMARY DOCUMENTS		
Life Cycle	**Community Involvement Plan Travis AFB, Mark Smith CH2M HILL, Tricia Carter**	**Work Plan to Support Risk Assessment, Sites SD043, SD033, and SS016 Travis AFB, Glenn Anderson CH2M HILL, Leslie Royer**
Scoping Meeting	**NA**	**TBD**
Predraft to AF/Service Center	NA	TBD
AF/Service Center Comments Due	NA	TBD
Draft to Agencies	10-30-15	TBD
Draft to RAB	10-30-15	TBD
Agency Comments Due	11-30-15	TBD
Response to Comments Meeting	**12-15-15**	**TBD**
Agency Concurrence with Remedy	NA	NA
Public Comment Period	NA	NA
Public Meeting	**NA**	**NA**
Response to Comments Due	01-15-16	TBD
Draft Final Due	01-15-16	TBD
Final Due	02-15-16	TBD

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	**Corrective Action Plan for Oil Water Separators 40, and 50 through 57** **Travis AFB, Lonnie Duke** **CH2M HILL, Doug Berwick**
Scoping Meeting	**NA**
Predraft to AF/Service Center	12-14-15
AF/Service Center Comments Due	12-29-15
Draft to Agencies	01-13-16
Draft to RAB	01-13-16
Agency Comments Due	02-12-16
Response to Comments Meeting	**02-17-16**
Response to Comments Due	03-02-16
Draft Final Due	NA
Final Due	03-02-16
Public Comment Period	NA
Public Meeting	**NA**

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS				
Life Cycle	**Quarterly Newsletters (October 2015)** **Travis, Glenn Anderson**	**2014 Annual GRISR** **Travis AFB, Lonnie Duke** **CH2M HILL, Leslie Royer**	**Site SD031 Technology Demonstration Construction Completion Report** **Travis AFB, Lonnie Duke** **CH2M HILL, Leslie Royer**	**Sites SD036 and SD037 Remedial Action Construction Completion Report** **Travis AFB, Glenn Anderson** **CH2M HILL, Leslie Royer**
Scoping Meeting	**NA**	**NA**	**NA**	**NA**
Predraft to AF/Service Center	NA	04-24-15	04-23-15	06-24-15
AF/Service Center Comments Due	NA	05-22-15	05-07-15	07-08-15
Draft to Agencies	10-06-15	06-10-15	05-21-15	07-30-15
Draft to RAB	NA	06-10-15	05-21-15	07-30-15
Agency Comments Due	10-20-15	09-08-15	06-22-15	08-31-15
Response to Comments Meeting	**TBD**	**09-16-15**	**07-15-15**	**09-16-15**
Response to Comments Due	10-21-15	09-30-15	08-21-15	09-30-15
Draft Final Due	NA	NA	NA	NA
Final Due	10-23-15	09-30-15	08-21-15	09-30-15
Public Comment Period	NA	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**	**NA**

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS			
Life Cycle	**Site ST018 POCO Construction Completion Report Travis AFB, Lonnie Duke CH2M HILL, Leslie Royer**	**Site SS016 Groundwater Remedial Action Construction Completion Report Travis AFB, Glenn Anderson CH2M HILL, Leslie Royer**	**Site SS015 Remedial Action Construction Completion Report Travis AFB, Glenn Anderson CH2M HILL, Leslie Royer**
Scoping Meeting	**NA**	**NA**	**NA**
Predraft to AF/Service Center	07-10-15	07-24-15	09-02-15
AF/Service Center Comments Due	07-24-15	08-07-15	09-17-15
Draft to Agencies	08-05-15	08-21-15	10-01-15
Draft to RAB	08-05-15	08-21-15	10-01-15
Agency Comments Due	09-04-15	09-21-15	11-02-15
Response to Comments Meeting	**09-16-15**	**10-22-15**	**11-05-15**
Response to Comments Due	10-06-15	11-06-15	11-19-15
Draft Final Due	NA	NA	NA
Final Due	10-06-15	11-06-15	11-19-15
Public Comment Period	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**

Travis AFB Master Meeting and Document Schedule

INFORMATIONAL DOCUMENTS			
Life Cycle	Site SS030 Remedial Action Construction Completion Report Travis AFB, Lonnie Duke CH2M HILL, Leslie Royer	Site FT004 Technology Demonstration Construction Completion Report Travis AFB, Lonnie Duke CH2M HILL, Leslie Royer	Site FT005 Technology Demonstration Construction Completion Report Travis AFB, Lonnie Duke CH2M HILL, Leslie Royer
Scoping Meeting	**NA**	**NA**	**NA**
Predraft to AF/Service Center	09-24-15	11-13-15	12-01-15
AF/Service Center Comments Due	10-08-15	12-01-15	12-15-15
Draft to Agencies	10-22-15	12-15-15	12-30-15
Draft to RAB	10-22-15	12-15-15	12-30-15
Agency Comments Due	11-23-15	01-18-15	02-01-16
Response to Comments Meeting	**12-07-15**	**01-20-16**	**02-17-16**
Response to Comments Due	12-21-15	02-03-16	03-02-16
Draft Final Due	NA	NA	NA
Final Due	12-21-15	02-03-16	03-02-16
Public Comment Period	NA	NA	NA
Public Meeting	**NA**	**NA**	**NA**

Travis AFB Master Meeting and Document Schedule

HISTORY	
Life Cycle	**Site DP039 Remedial Design/Remedial Action Work Plan** **Travis AFB, Glenn Anderson** **CH2M HILL, Leslie Royer**
Scoping Meeting	**NA**
Predraft to AF/Service Center	01-15-14
AF/Service Center Comments Due	01-29-15
Draft to Agencies	03-03-15
Draft to RAB	03-03-15
Agency Comments Due	04-02-15
Response to Comments Meeting	**05-27-15**
Agency Concurrence with Remedy	NA
Public Comment Period	NA
Public Meeting	**NA**
Response to Comments Due	07-02-15
Draft Final Due	07-02-15
Final Due	08-03-15

South Base Boundary Groundwater Treatment Plant Monthly Data Sheet

Report Number: 180 **Reporting Period: 28 July 2015 – 28 August 2015** **Date Submitted: 15 September 2015**

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 August 2015 reporting period.

Table 1 – Operations Summary – August 2015

Initial Data Collection:	07/28/2015 14:15	**Final Data Collection:**	08/28/2015 12:30
Operating Time:	Percent Uptime:	Electrical Power Usage:	
SBBGWTP: 742 hours	**SBBGWTP:** 100%	**SBBGWTP:**	17,160 kWh[a] (23,509 lbs CO_2 generated[b])
Gallons Treated: **3.57 million gallons**		Gallons Treated Since July 1998: **903 million gallons**	
Volume Discharged to Union Creek: **3.57 million gallons**		Gallons Treat From Other Sources: **4,800 gallons**[c]	
VOC Mass Removed: **1.28 lbs**[d]		VOC Mass Removed Since July 1998: **464.9 lbs**	
Rolling 12-Month Cost per Pound of Mass Removed: $2,626[e]			
Monthly Cost per Pound of Mass Removed: $1,929			

lbs = pounds

[a] Power use estimated from previous usage due to unreliable readings in August 2015.

[b] Based on Department of Energy estimate that 1 kilowatt hour generated produces 1.37 pounds of GHG.

[c] Decontamination water from investigation activities, processed through the SBBGWTP from the external settling tank

[d] Calculated using August 2015 EPA Method SW8260B analytical results.

[e] 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,b] – August 2015

FT005[b]				SS029		SS030	
EW01x05	Offline[c]	EW736x05	Offline	EW01x29	0.1	EW01x30	Offline[c]
EW02x05	0.3	EW737x05	Offline	EW02x29	3.5	EW02x30	3.7
EW03x05	Offline	EW742x05	Offline	EW03x29	1.8	EW03x30	1.3
EW731x05	Offline	EW743x05	Offline	EW04x29	Offline[c]	EW04x30	35.5
EW732x05	Offline	EW744x05	Offline	EW05x29	4.0	EW05x30	1.5
EW733x05	Offline	EW745x05	Offline	EW06x29	Offline[c]	EW06x30	Dry
EW734x05	Offline[c]	EW746x05	Offline	EW07x29	1.4	EW711x30	2.1
EW735x05	1.4						
FT005 Total:	**1.7**			**SS029 Total:**	**10.8**	**SS030 Total:**	**44.1**

SBBGWTP Average Monthly Flow[d]: 80.06 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 in the reporting period.
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	NA	--			

-- = Time not recorded
[a] Shutdown and restart times estimated based on field notes.
NA = not applicable
SBBGWTP = South Base Boundary Groundwater Treatment Plant

Summary of O&M Activities

Analytical data from the 6 August 2015 sampling event are presented in Table 4. The total VOC concentration (43.19 µg/L) in the influent sample decreased from the July 2015 sample results (64.3 µg/L). Cis-1,2-DCE (2.4 µg/L), TCE (40.3 µg/L), and 1,2-DCA (0.49 J µg/L) were detected at the influent sampling location. 1,2-DCA, chloroform, and cis-1,2-DCE were detected at concentrations of 0.65 µg/L, 0.23 J µg/L, and 0.37 J µg/L, respectively, at the midpoint location. TPH-motor oil (18.7 J µg/L) was detected at the effluent sampling location. Although TPH-mo was detected at the effluent sampling location, its concentration is less than the effluent limitation as specified in the General NPDES permit (50 µg/L). Travis AFB will continue to monitor effluent concentrations for TPH-mo as it is not typically detected at this location.

Figure 1 presents a plot of influent concentrations and average flow at the SBBGWTP over the past twelve (12) months. The average flow rate at the SBBGWTP increased in August 2015 to 80.06 gpm from the July 2015 flow rate of 73.5 gpm.

The variable frequency drive at EW01x05 had been experiencing repeated overload faults which resulted in prolonged downtime of its associated pump. EW01x05 continued to be evaluated in August 2015, and is expected to be brought back on line in September 2015. The backwash pump at the SBBGWTP may be used to provide treated water to Site FT005 during injection activities; the Water Board submitted approval on 31 July 2015 to use the treated water. The pressure transducer at EW07x29 was replaced along with the pump on 7 August 2015, and the well was brought back on line on 11 August 2015. The pressure transducer at EW06x29 was replaced on 28 August 2015; the old transducer remains in the well after having been chewed off at the wellhead. The new transducer at EW06x29 is in the well, which is online and operating.

Optimization Activities

No optimization activities were performed in August 2015.

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. The SBBGWTP produced approximately 23,509 pounds of GHG during August 2015. This amount is lower than the July 2015 amount of 25,482 pounds of GHG, which is due to the decreased runtime (742 hours in August as opposed to 794 in July 2015).

TABLE 4
Summary of Groundwater Analytical Data For August 2015 – South Base Boundary Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	6 August 2015 (µg/L)		
				Influent	Midpoint	Effluent
Halogenated Volatile Organics						
Carbon Tetrachloride	0.5	0.14	0	ND	ND	ND
Chloroform	5.0	0.16	0	ND	0.23 J	ND
1,1-Dichloroethane	5.0	0.50	0	ND	ND	ND
1,2-Dichloroethane	0.5	0.15	0	0.49 J	0.65	ND
1,1-Dichloroethene	5.0	0.19	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.19	0	2.4	0.37 J	ND
trans-1,2-Dichloroethene	5.0	0.33	0	ND	ND	ND
Methylene Chloride	5.0	0.66	0	ND	ND	ND
Tetrachloroethene	5.0	0.21	0	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.14	0	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.20	0	ND	ND	ND
Trichloroethene	5.0	0.19	0	40.3	ND	ND
Vinyl Chloride	0.5	0.18	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	1.0	0.17	0	ND	ND	ND
Ethylbenzene	5.0	0.22	0	ND	ND	ND
Toluene	5.0	0.14	0	ND	ND	ND
Xylenes	5.0	0.23 – 0.5	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	8.5	0	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	50	0	NM	NM	ND
Total Suspended Solids (mg/L)	NE	1.0	0	ND	NM	NM

* 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
N/C = number of samples out of compliance with discharge limits
ND = not detected
NE = not established
NM = not measured
µg/L = micrograms per liter

Figure 1
SBBGWTP Total VOC Influent Concentrations and Average Flowrate
Twelve Month History
Travis Air Force Base, California

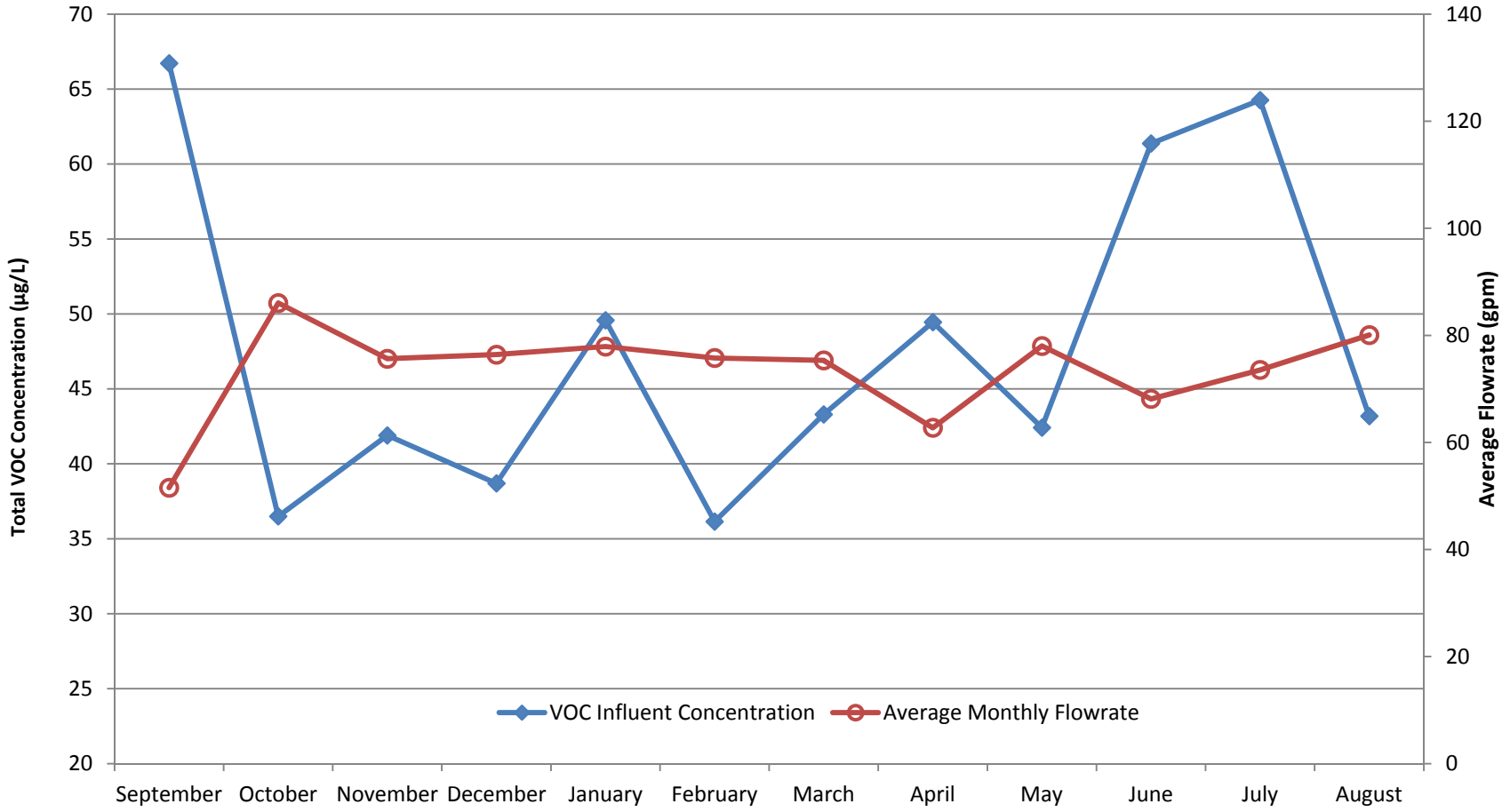
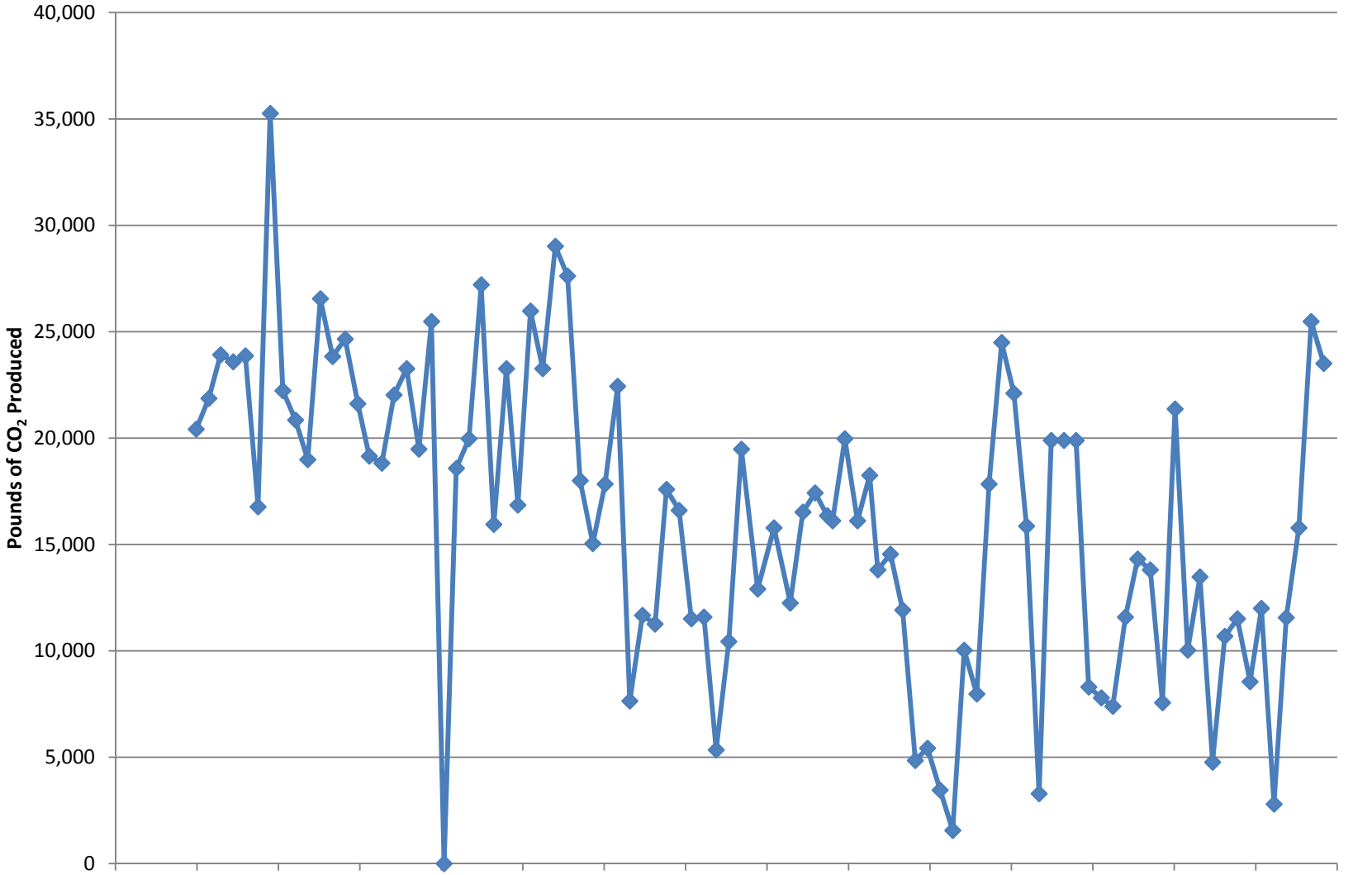


Figure 2

Equivalent Pounds of CO_2 Produced by the South Base Boundary Groundwater Treatment Plant



Central Groundwater Treatment Plant Monthly Data Sheet

Report Number: 193 **Reporting Period: 28 July 2015 – 28 August 2015** **Date Submitted: 15 September 2015**

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 August 2015 reporting period.

Table 1 – Operations Summary – August 2015

Initial Data Collection:	07/28/2015 09:23	**Final Data Collection:**	08/28/2015 09:45		
Operating Time:		Percent Uptime:		Electrical Power Usage:	
CGWTP:	744 hours	**CGWTP:**	100%	**CGWTP:**	2,107 kWh (2,887 lbs CO_2 generated[a])

Gallons Treated: **1,165,030 gallons**

Gallons Treated Since January 1996: **515 million gallons**

VOC Mass Removed from groundwater:

1.40 lbs[b]

VOC Mass Removed Since January 1996:

2,727 lbs from groundwater

8,686 lbs from vapor

Rolling 12-Month Cost per Pound of Mass Removed: $888[c]

Monthly Cost per Pound of Mass Removed: $1,014

[a] Based on Department of Energy estimate that 1 kilowatt hour generated produces 1.37 pounds of GHG.
[b] Calculated using August 2015 EPA Method SW8260B analytical results.
[c] Costs include operations and maintenance, reporting, analytical laboratory, project management, and utility costs related to operation of the CGWTP and are reported based on the calendar month.

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

Table 2 – CGWTP Average Flow Rates[a] – August 2015

Location	Average Flow Rate Groundwater (gpm)
EW01x16	17.0
EW02x16	6.9
EW03x16	1.0[b]
EW605x16	10.9
EW610x16	4.1
CGWTP	26.1

[a] Flow rates calculated by dividing total gallons processed by system operating time for the month.
[b] Flow rate based on instantaneous, beginning of the month readings for August 2015.

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	
CGTWP	NA	--			

-- = Time not recorded
[a] Shutdown and restart times estimated based on field notes
CGWTP = Central Groundwater Treatment Plant
NA = not applicable

Summary of O&M Activities

Monthly groundwater samples were collected at the CGWTP on 6 August 2015. Sample results are presented in Table 4. The total VOC concentration (144.48 µg/L) in the August 2015 influent sample has decreased from the July 2015 sample (235.68 µg/L). Vinyl chloride was detected at a concentration of 0.16 J µg/L at the influent sample and 0.24 J µg/L after the first carbon vessel, but not at the effluent sampling location. The influent concentration of vinyl chloride in August 2015 increased from not being detected in July 2015, but the concentration after the first carbon vessel was below the July 2015 concentration of 0.23 J µg/L. 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene (not listed in Table 4) were detected in the influent location at concentrations of 0.47 J µg/L, 0.68 µg/L, and 0.29 J µg/L, respectively. No other contaminants were found in samples taken after the first or second carbon vessels or effluent locations.

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 flow rate through the treatment plant remained consistent in August 2015 at 26.09 gpm, which is a slight decrease from 26.18 gpm in July 2015.

The malfunctioning flow meter at EW605x16 was replaced with a working unit on 23 July 2015 and the pump was on line and running at full capacity in August 2015. However, the signal to the CGWTP remains off line, which may be caused by a possible short in the communication wires. The pump at EW610x16 continued to shut off intermittently due to a low water level alarm, which may be a false positive. Investigations into these issues will continue into September 2015.

The Site DP039 bioreactor continues to operate in a "pulsed mode" in order to improve the rate of remediation and to preserve the amount of total organic carbon being produced within the bioreactor. The "pulsed mode" operation continued on a two (2) week transition schedule in August 2015. The bioreactor was brought back online from 14 August 2015 to 28 August 2015. The bioreactor is scheduled to be brought back online again on 11 September 2015.

Optimization Activities

No optimization activities occurred at the CGWTP in August 2015.

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 2,887 pounds of GHG during August 2015. This is an increase from the July 2015 amount of 2,267 pounds, which is consistent with a longer uptime.

TABLE 4
Summary of Groundwater Analytical Data for August 2015 – Central Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	6 August 2015 (µg/L)			
				Influent	After Carbon 1 Effluent	After Carbon 2 Effluent	System Effluent
Halogenated Volatile Organics							
Carbon Tetrachloride	0.5	0.14	0	ND	ND	ND	ND
Chloroform	5.0	0.16	0	ND	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.19	0	21.2	ND	ND	ND
1,1-Dichloroethane	5.0	0.5	0	ND	ND	ND	ND
1,2-Dichloroethane	0.5	0.15	0	ND	ND	ND	ND
1,1-Dichloroethene	5.0	0.19	0	0.45 J	ND	ND	ND
Methylene Chloride	5.0	0.66	0	ND	ND	ND	ND
MTBE	1.0	0.5	0	ND	ND	ND	ND
Tetrachloroethene	5.0	0.21	0	0.47 J	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.14	0	ND	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.2	0	ND	ND	ND	ND
Trichloroethene	5.0	0.19	0	119	ND	ND	ND
trans-1,2-Dichloroethene	5.0	0.33	0	1.76	ND	ND	ND
Vinyl Chloride	0.5	0.18	0	0.16 J	0.23 J	0.29 J	0.16 J
Non-Halogenated Volatile Organics							
Benzene	1.0	0.17	0	ND	ND	ND	ND
Ethylbenzene	5.0	0.22	0	ND	ND	ND	ND
Toluene	5.0	0.14	0	ND	ND	ND	ND
Total Xylenes	5.0	0.23 – 0.5	0	ND	ND	ND	ND
Other							
Total Suspended Solids (mg/L)	NA	10	0	ND	NM	NM	NM

* 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

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 5 presents a twelve month summary of the Site DP039 bioreactor recirculation well pulsing dates.

Table 5 – Summary of DP039 Bioreactor "Pulsed Mode" Operations

Location	Pulse On Start Date	Pulse Off Start Date
MW750x39	6 June 2014	20 June 2014
	3 July 2014	24 July 2014
	01 August 2014	15 August 2014
	01 September 2014	12 September 2014
	26 September 2014	30 September 2014[a]
	24 October 2014	7 November 2014
	21 November 2014	4 December 2014
	19 December 2014	January 2, 2015
	16 January 2015	29 January 2015
	13 February 2015	27 March 2015
	10 April 2015	24 April 2015
	8 May 2015	22 May 2015
	5 June 2015	19 June 2015
	3 July 2015	17 July 2015
	31 July 2015	14 August 2015
	28 August 2015	--

[a] = DP039 Bioreactor turned off on 30 September 2014 to replace hose.
-- = Start/Off Date to be determined
CGWTP = Central Groundwater Treatment Plant
MW = Monitoring Well

Figure 1
CGWTP Total VOC Influent Concentrations and Average Flowrate
Twelve Month History
Travis Air Force Base, California

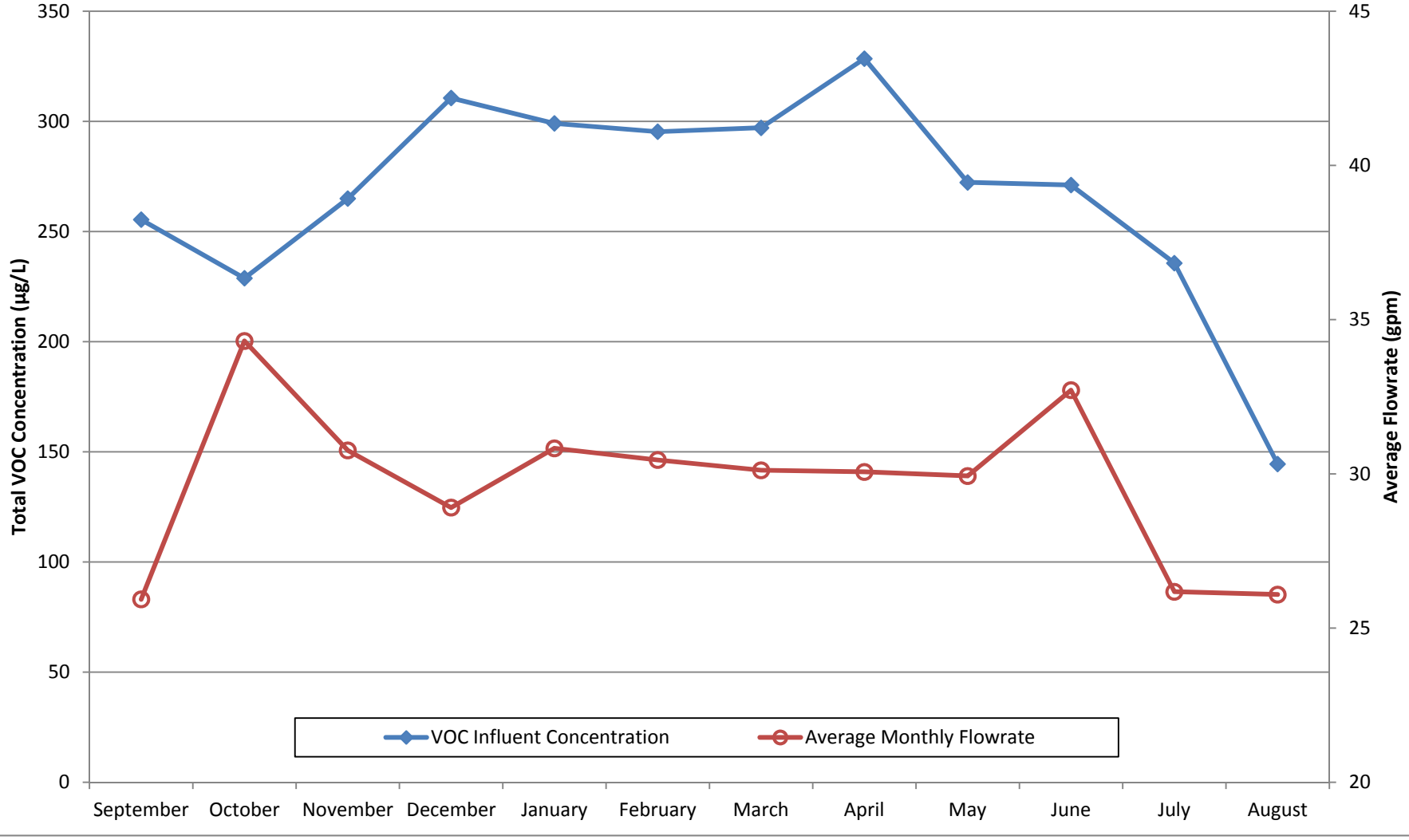
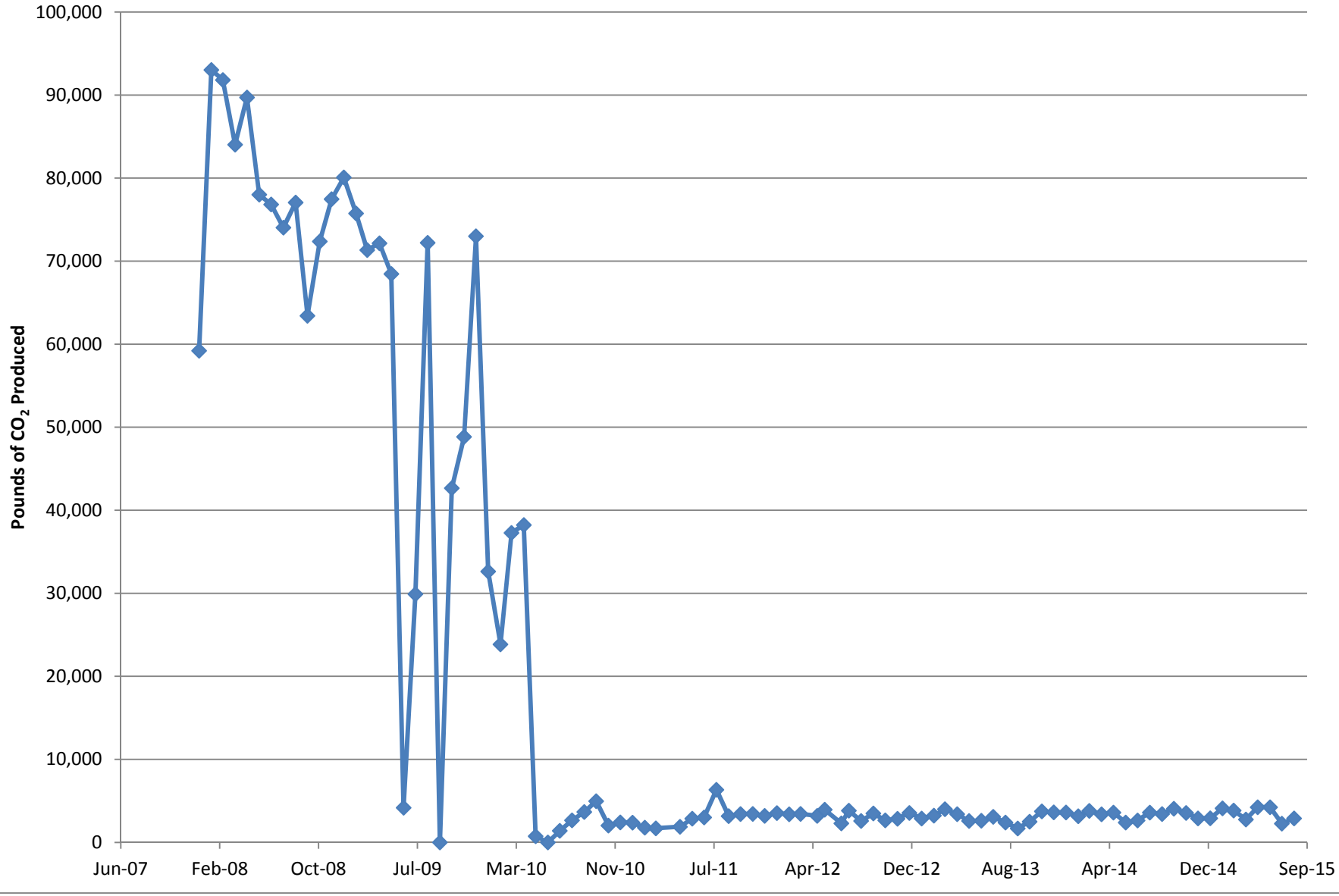


Figure 2

Equivalent Pounds of CO2 Produced by the Central Groundwater Treatment Plant



Subarea LF007C Groundwater Treatment Plant Monthly Data Sheet

Report Number: 147 **Reporting Period: 28 July 2015 – 28 August 2015** **Date Submitted: 15 September 2015**

This monthly data sheet presents information regarding the Subarea LF007C Groundwater Treatment Plant (LF007CGWTP) and associated remedial process optimization (RPO) activities.

System Metrics

Table 1 presents operational data from the August 2015 reporting period:

Table 1 – Operations Summary – August 2015

Initial Data Collection:	07/28/2015 11:30		**Final Data Collection:**	08/28/2015 11:10	
Operating Time:		Percent Uptime:	Electrical Power Usage[a]:		
LF007CGWTP:	605 hours	**LF007CGWTP**	81%	**LF007CGWTP:**	0 kWh
Gallons Treated: **148,818 gallons**			Gallons Treated Since March 2000: **84.4 million gallons**		
Volume Discharged to Duck Pond: **148,818 gallons**			Volume Discharge to Storm Drain: **0 gallons**		
VOC Mass Removed: **3.66×10^{-3} pounds**[b]			VOC Mass Removed Since March 2000: **174.34 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 LF007CGWTP operates on solar power only.
[b] VOCs from August 2015 influent sample detected by EPA Method SW8260B.
[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 – LF007CGWTP Average and Total Flow Rates – August 2015

Location	Average Flow Rate (gpm)[a]	Total Gallons Processed (gallons)
EW614x07	4.57	147,869
EW615x07[b]	0	0
LF007CGWTP	**4.58**	**148,818**

[a] Average flow rate calculated by dividing the total gallons processed collected from wellhead totalizers by the hours recorded by the system hour meter.
[b] Extraction well currently offline due to insufficient battery power.
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	
LF007CGWTP	Varied	--	7 August 2015	--	System continually shut down due to water in sump; when high water alarm in sump is tripped, the LF007CGWTP system automatically shuts down and is not restarted until technician restarts it.

-- = Time not recorded

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

LF007CGWTP = Subarea LF007C Groundwater Treatment Plant

Summary of O&M Activities

Analytical data from the 6 August 2015 sampling event are presented in Table 4. Cis-1,2-DCE (0.23 J µg/L) and TCE (2.72 µg/L) were detected at the influent sample location. No contaminants were detected at the midpoint sampling location. TPH-motor oil (not in Table 4, 34.4 J µg/L) was detected in the effluent sample location. No additional constituents were detected at the sampling locations. Although TPH-mo was detected at the effluent sampling location, its concentration (34.4 µg/L) is less than the effluent limitation as specified in the General NPDES permit (50 µg/L). Travis AFB will continue to monitor effluent concentrations for TPH-mo as it is not typically detected at this location.

Figure 1 presents a chart of influent concentrations (total VOCs) at the LF007CGWTP versus time for the past twelve months. Analytical data (Table 4) continue to indicate effective treatment of the influent process stream.

The LF007CGWTP (formerly referred to as the North Groundwater Treatment Plant [NGWTP]) was brought back on line on 2 June 2015 after having been taken off line in December 2014 when vernal pools formed at Subarea LF007C.

The anti-siphon valve at the LF007CGWTP experienced a continual drip-leak during July 2015, which slowly filled the sump. The system would then shut off once the sump was full. The anti-siphon valve was cleaned on 28 July 2015, and a new vacuum breaker valve was installed on 7 August 2015. After installation of the new valve, the system remained online with no leaks detected.

The average flow rate through the LF007CGWTP in August 2015 (4.10 gpm) was consistent with the flow rate measured in July 2015 (4.58 gpm).

Optimization Activities

No optimization activities were performed during August 2015.

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 LF007CGWTP. The LF007CGWTP is now a solar-only operated treatment system and no longer generates GHG.

TABLE 4
Summary of Groundwater Analytical Data For August 2015 – Subarea LF007C Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	6 August 2015 (µg/L)		
				Influent	After Carbon 1	Effluent
Halogenated Volatile Organics						
Bromodichloromethane	5.0	0.15	0	ND	ND	ND
Bromoform	5.0	0.19	0	ND	ND	ND
Carbon Tetrachloride	0.5	0.14	0	ND	ND	ND
Chloroform	5.0	0.16	0	ND	ND	ND
Dibromochloromethane	5.0	0.13	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	0.19	0	ND	ND	ND
cis-1,2-Dichloroethene	5.0	0.19	0	0.23 J	ND	ND
trans-1,2-Dichloroethene	5.0	0.33	0	ND	ND	ND
Methylene Chloride	5.0	0.66	0	ND	ND	ND
Tetrachloroethene	5.0	0.21	0	ND	ND	ND
1,1,1-Trichloroethane	5.0	0.14	0	ND	ND	ND
1,1,2-Trichloroethane	5.0	0.2	0	ND	ND	ND
Trichloroethene	5.0	0.19	0	2.72	ND	ND
Vinyl Chloride	0.5	0.18	0	ND	ND	ND
Non-Halogenated Volatile Organics						
Benzene	1.0	0.17	0	ND	ND	ND
Ethylbenzene	5.0	0.22	0	ND	ND	ND
Toluene	5.0	0.14	0	ND	ND	ND
Xylenes	5.0	0.23 – 0.5	0	ND	ND	ND
Other						
Total Petroleum Hydrocarbons – Gasoline	50	8.5	0	NM	NM	ND
Total Petroleum Hydrocarbons – Diesel	50	50	0	NM	NM	ND
Total Dissolved Solids (mg/L)	NA	10	0	NM	NM	NM

* 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
N/C = number of samples out of compliance with discharge limits
ND = not detected
NM = not measured
µg/L = micrograms per liter
mg/L = milligrams per liter

Figure 1
LF007CGWTP Total VOC Influent Concentrations and Average Flowrate
Twelve Month History
Travis Air Force Base, California

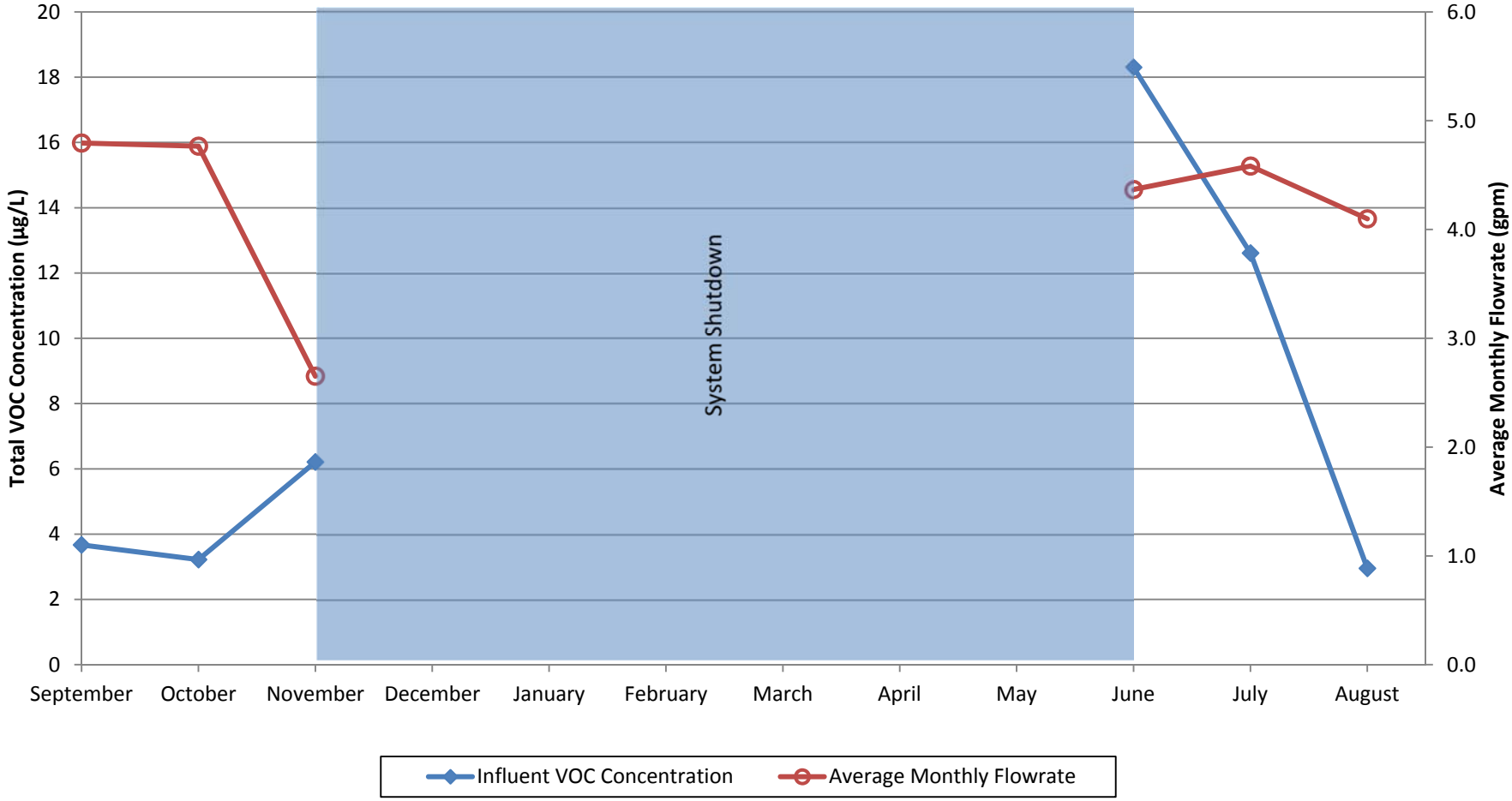
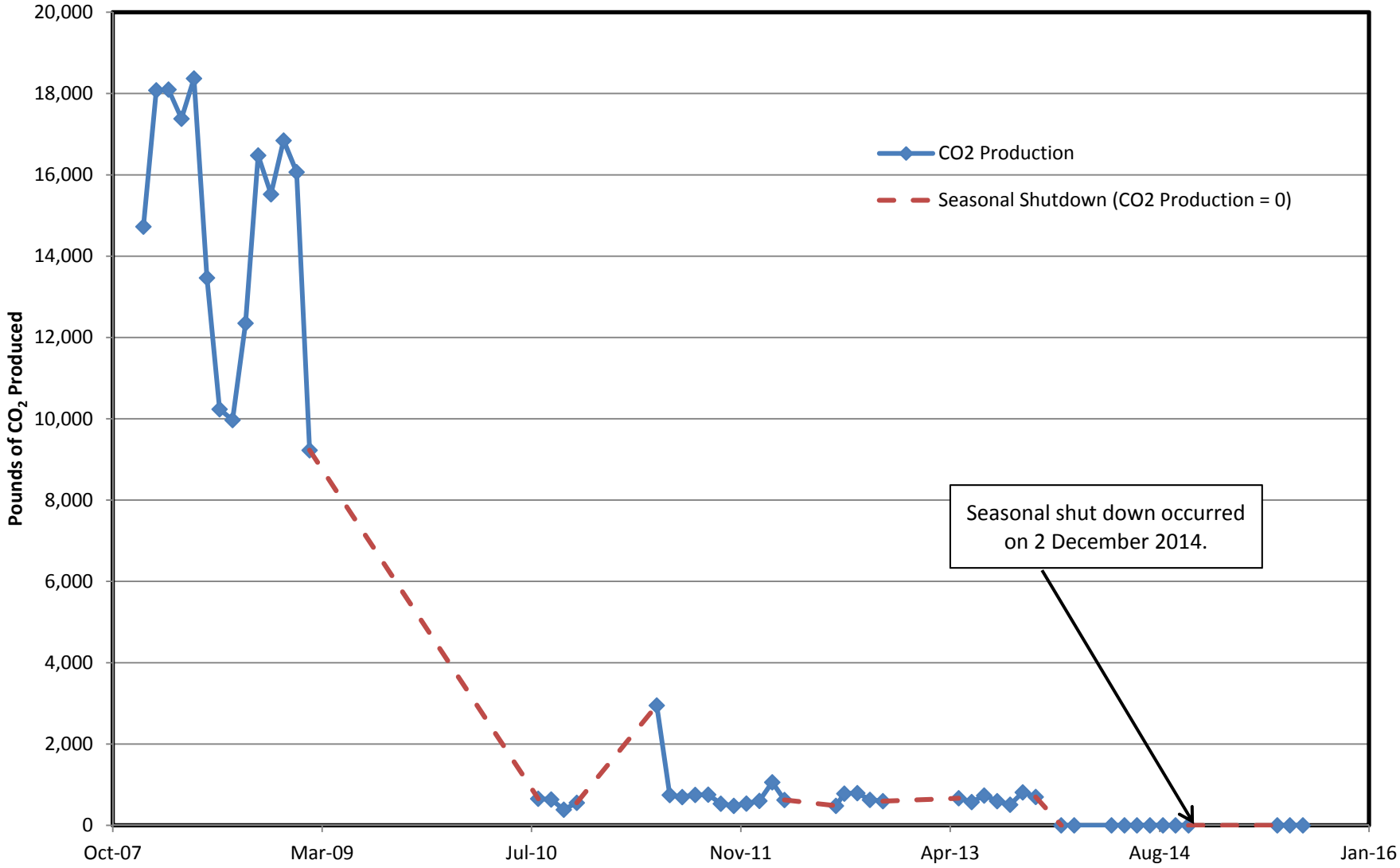


Figure 2

Equivalent Pounds of CO2 Produced by the LF007C Groundwater Treatment Plant



Note: Dashed line represents seasonal shutdowns due to the presence of vernal pools at Site LF007C during which no CO2 production occurred.

Site ST018 Groundwater Treatment Plant Monthly Data Sheet

Report Number: 054 **Reporting Period: 28 July 2015 – 28 August 2015** **Date Submitted: 15 September 2015**

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

System Metrics

Table 1 presents operation data from the August 2015 reporting period.

Table 1 – Operations Summary – August 2015

Initial Data Collection:	07/28/2015 12:00	**Final Data Collection:**	08/28/2015 09:40
Operating Time:		Percent Uptime:	Electrical Power Usage:
ST018GWTP: 536 hours		**ST018GWTP:** 70%	**ST018GWTP:** 101 kWh (138 lbs CO_2 generated[a])
Gallons Treated: **173,081 gallons**		Gallons Treated Since March 2011: **8.15 million gallons**	
Volume Discharged to Sanitary Sewer: **173,081 gallons**		Final Totalizer Reading: **8,036,481 gallons**	
Cumulative Volume Discharged to Sanitary Sewer since 1 November 2014: **1,653,396 gallons**			
BTEX, MTBE, TPH Mass Removed: **0.41 lbs**[b]		BTEX, MTBE, TPH Mass Removed Since March 2011: **32.6 lbs**	
MTBE (Only) Removed: **0.26 lbs**[b]		MTBE (Only) Mass Removed Since March 2011: **7.8 lbs**	
Rolling 12-Month Cost per Total Pounds of Mass Removed: $14,625[c]			
Monthly Cost per Pound of Mass Removed: $3,160			

[a] Based on Department of Energy estimate that 1 kilowatt hour generated produces 1.37 pounds of GHG.

[b] Calculated using August 2015 effluent EPA Method SW8260B 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 – August 2015

Location	Average Flow Rate Groundwater (gpm)[a]	Hours of Operation
EW2014x18	2.1	536
EW2016x18	2.5[b]	536
EW2019x18	2.0[b]	536
EW2333x18	2.0[b]	536
Site ST018 GWTP	5.77	536

[a] Flow rates calculated by dividing total gallons process
[b] Flow rate taken as instantaneous reading at beginning of the month
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	Varied	--	Varied	--	System continually shut down due to high pressure at bag filters; when high pressure alarm is tripped, the ST018GWTP system automatically shuts down and is not restarted until technician comes to restart it.

[a] Shutdown and restart times estimated based on field notes
-- = time not known
ST018GWTP = Site ST018 Groundwater Treatment Plant

Summary of O&M Activities

Monthly groundwater treatment samples were collected at the ST018GWTP on 6 August 2015. Results are presented in Table 4. The complete August 2015 laboratory data report is available upon request.

The influent concentration for MTBE during the August 2015 sampling event was 182 µg/L, which is an increase from the July 2015 sample (133 µg/L). MTBE was detected after the second carbon vessel at a concentration of 0.36 J µg/L. 1,2-DCA (2.41 µg/L) was also detected in the influent sample. TPH-g was detected at the influent sample location at a concentration of 96.8 J µg/L, as well as in the sample taken after the first carbon vessel (24.2 J µg/L). The influent concentration has increased from the July sample (64.5 J µg/L). The influent MTBE concentrations have increased each month over the past three (3) months. The influent concentrations are well below the Fairfield-Suisun Sewer District effluent limitation for TPH of 50,000 µg/L. Travis AFB will continue to monitor effluent contaminant concentrations and evaluate the condition of the carbon filter beds. No contaminants were detected in the effluent sample.

Figure 1 presents plots of flow rate and influent total contaminant (TPH-g, TPH-d, MTBE, and BTEX) and MTBE concentrations at the ST018GWTP versus time. The tertiary GAC vessel was off line for most of July 2015, due to a broken air release valve. The threads from the air valve had broken off inside the vessel. The

broken threads were extracted on 4 August 2015 and the GAC vessel was brought back online. The system has been shutting down due to high pressure at bag filters; when the high pressure alarm is tripped. This happened at various times in August 2015, which is likely caused by the first GAC vessel becoming impacted with silt. This condition will continue to be monitored in September 2015.

As shown on Figure 1, the average flow rate through the ST018GWTP has been seasonally variable with a slight increasing trend since the battery upgrade in 2013. August 2015 represents a decreased amount of groundwater treated and discharged by the ST018GWTP from the July 2015 amount, and may be a result of continued drought conditions.

Optimization Activities

No optimization activities occurred at the ST018GWTP in August 2015.

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.

The ST018GWTP produced 138 pounds of GHG during August 2015 and treated 173,081 gallons of water, which was consistent with the amount of GHG produced during July 2015 (158 pounds, treating 218,830 gallons). Figure 2 presents the historical GHG production from the ST018GWTP. The overall GHG generation has been decreasing since a 2014 peak in March, and remains considerably lower than traditional GWTPs since the system is predominantly powered by solar arrays. The previous increasing GHG production reflected an inverse relationship between solar exposure in the fall and winter relative to GHG production.

TABLE 4
Summary Of Groundwater Analytical Data for August 2015 – Site ST018 Groundwater Treatment Plant

Constituent	Instantaneous Maximum* (µg/L)	Detection Limit (µg/L)	N/C	6 August 2015 (µg/L)			
				Influent	After Carbon 1	After Carbon 2	System Effluent
Fuel Related Constituents							
MTBE	6,400	0.5	0	182	NM	0.36 J	ND
Benzene	25,000[a]	0.17	0	ND	NM	NM	ND
Ethylbenzene	25,000[a]	0.22	0	ND	NM	NM	ND
Toluene	25,000[a]	0.14	0	ND	NM	NM	ND
Total Xylenes	25,000[a]	0.23 – 0.5	0	ND	NM	NM	ND
Total Petroleum Hydrocarbons – Gasoline	50,000[b]	8.5	0	96.8 J	24.2 J	NM	ND
Total Petroleum Hydrocarbons – Diesel	50,000[b]	50	0	ND	ND	NM	ND
Total Petroleum Hydrocarbons – Motor Oil	100,000	160	0	ND	ND	NM	ND

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

Laboratory data available on request.

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

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

µg/L = micrograms per liter
J = analyte concentration is considered an estimated value due to a detected concentration value between the reporting limit and method detection limit for the contaminant
N/C = number of samples out of compliance with discharge limits
ND = not detected above method detection limit
NM = not measured this month

Figure 1
ST018GWTP Total VOC and MTBE Influent Concentrations
Quarterly History
Travis Air Force Base, California

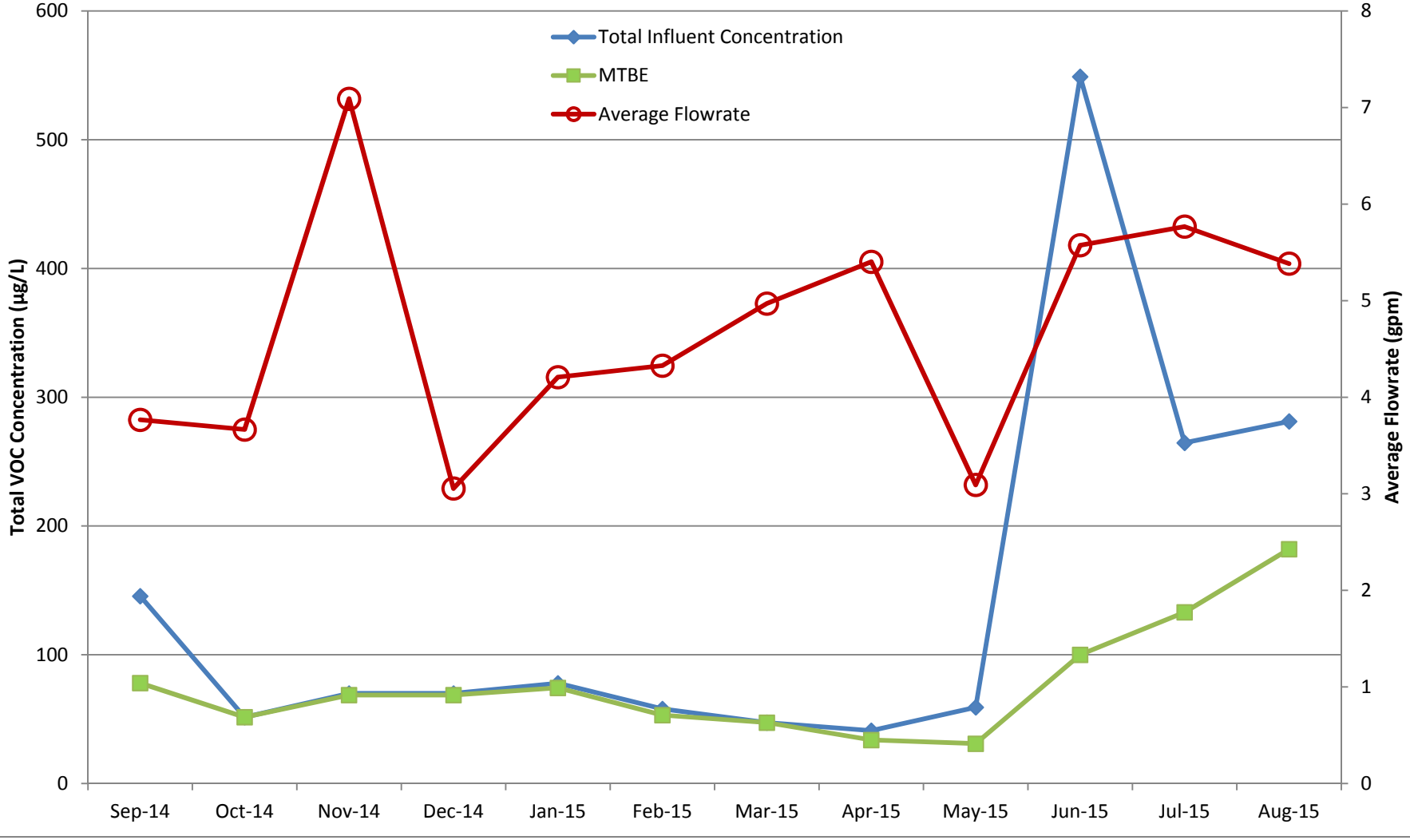
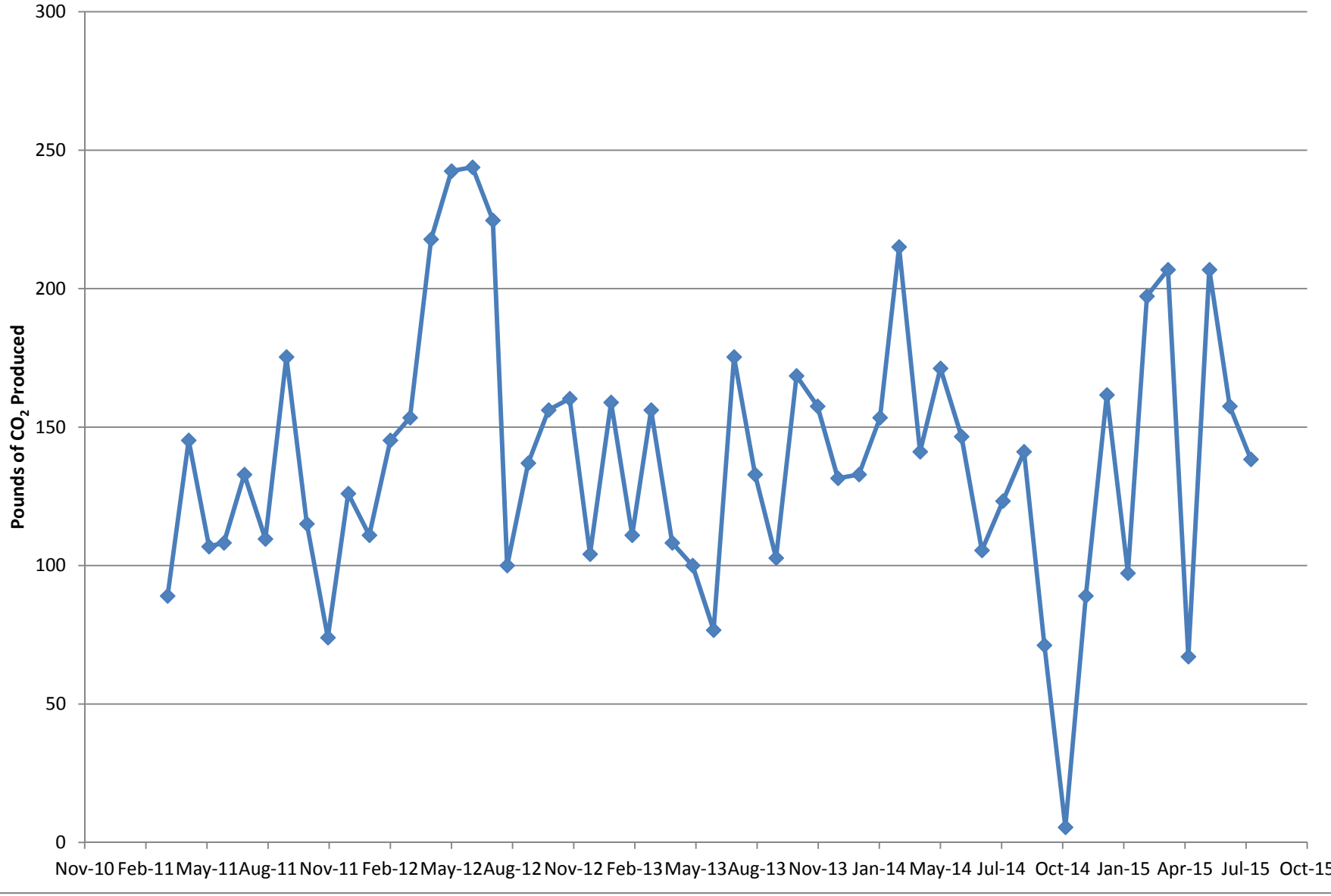


Figure 2

Equivalent Pounds of CO2 Produced by the Site ST018 Groundwater Treatment Plant



Site ST018 Groundwater Treatment Plant Monthly Data Sheet

Report Number: 054 **Reporting Period: 28 July 2015 – 28 August 2015** **Date Submitted: 15 September 2015**

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

System Metrics

Table 1 presents operation data from the August 2015 reporting period.

Table 1 – Operations Summary – August 2015

Initial Data Collection:	07/28/2015 12:00	**Final Data Collection:**	08/28/2015 09:40
Operating Time:		Percent Uptime:	Electrical Power Usage:
ST018GWTP: 536 hours		**ST018GWTP:** 70%	**ST018GWTP:** 101 kWh (138 lbs CO_2 generated[a])
Gallons Treated: **173,081 gallons**		Gallons Treated Since March 2011: **8.15 million gallons**	
Volume Discharged to Sanitary Sewer: **173,081 gallons**		Final Totalizer Reading: **8,036,481 gallons**	
Cumulative Volume Discharged to Sanitary Sewer since 1 November 2014: **1,653,396 gallons**			
BTEX, MTBE, TPH Mass Removed: **0.41 lbs**[b]		BTEX, MTBE, TPH Mass Removed Since March 2011: **32.6 lbs**	
MTBE (Only) Removed: **0.26 lbs**[b]		MTBE (Only) Mass Removed Since March 2011: **7.8 lbs**	
Rolling 12-Month Cost per Total Pounds of Mass Removed: $14,625[c]			
Monthly Cost per Pound of Mass Removed: $3,160			

[a] Based on Department of Energy estimate that 1 kilowatt hour generated produces 1.37 pounds of GHG.

[b] Calculated using August 2015 effluent EPA Method SW8260B 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 – August 2015

Location	Average Flow Rate Groundwater (gpm)[a]	Hours of Operation
EW2014x18	2.1	536
EW2016x18	2.5[b]	536
EW2019x18	2.0[b]	536
EW2333x18	2.0[b]	536
Site ST018 GWTP	5.77	536

[a] Flow rates calculated by dividing total gallons process
[b] Flow rate taken as instantaneous reading at beginning of the month
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	Varied	--	Varied	--	System continually shut down due to high pressure at bag filters; when high pressure alarm is tripped, the ST018GWTP system automatically shuts down and is not restarted until technician comes to restart it.

[a] Shutdown and restart times estimated based on field notes
-- = time not known
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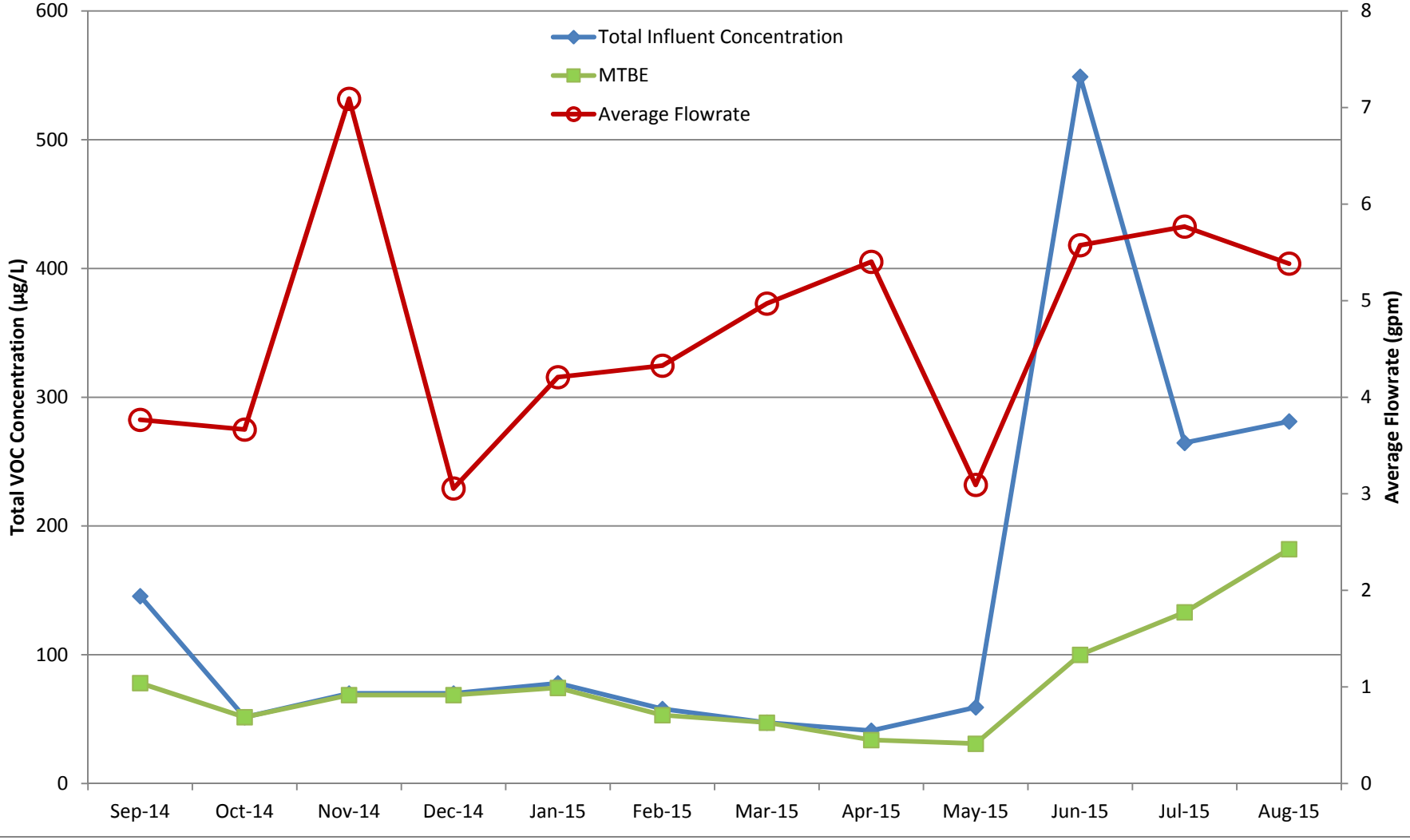

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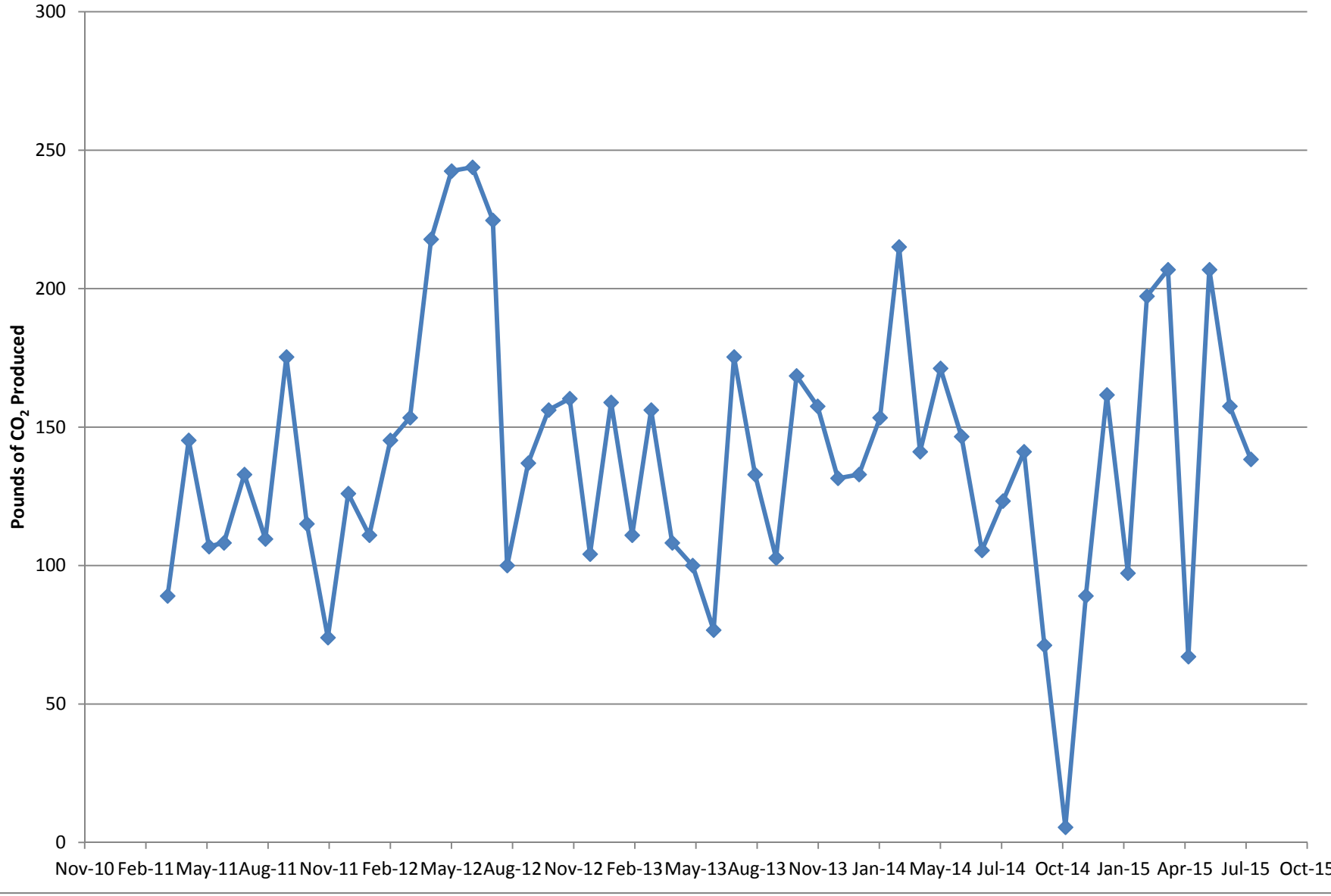


Travis AFB
Restoration Program

Program Overview

RPM Meeting

September 16, 2015

Completed Documents

- 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 (cont'd)

- 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 Technology Demonstration Work Plan
- CG508 Site Investigation/Site Closure Request Report
- 2014 Annual CAMU Monitoring Report
- DP039 GW RD/RA Work Plan
- SD031 Technology Demonstration Construction Completion Report

Completed Field Work

- 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

- 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***

Documents In-Progress

CERCLA

- 2014 Annual GRISR
- Sites SD036 and SD037 Remedial Action Construction Completion Report
- ***Site SS016 Groundwater Remedial Action Construction Completion Report***

Documents In-Progress

POCO

- ST018 POCO Construction Completion Report

Field Work In-Progress

- FT005 Baseline Sampling
- DP039 Well Installation , Well Development, Baseline Sampling
- ***FT004 EVO Injection***

Documents Planned

CERCLA

- Community Involvement Plan — Oct
- Site SS015 Groundwater Remedial Action Construction Completion Report — Oct
- Site SS030 Remedial Action Construction Completion Report — Oct
- ***Site FT004 Technology Demonstration Construction Completion Report*** — ***Dec***
- ***Site FT005 Technology Demonstration Construction Completion Report*** — ***Dec***
- ***Corrective Action Plan for OWSs 40, & 50-57*** — ***Jan***
- ***Work Plan to Support Risk Assessments for Sites SD043, SD033, and SS016*** — ***TBD***
- ***Site SD034 Technology Demonstration Work Plan*** — ***TBD***
- ***Site DP039 Remedial Action Construction Completion Report*** — ***TBD***

Documents Planned

POCO

- Corrective Action Plan for OWSs 40, & 50-57 Jan
- ***Site SS014 POCO Construction Completion Report*** ***TBD***

Field Work Planned

CERCLA

- FT004 Trench/Conveyance/Power Installation — Sep
- FT005 EVO Injection — Sep
- DP039 Infiltration Trench Installation — Oct
- DP039 EVO Injection — Oct

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

Field Work Planned

POCO

- SS014 Bioreactor Installation Oct

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

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 (4^{th} 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

SD034 Data Gaps Investigation Update
Travis AFB, California

September 2, 2015

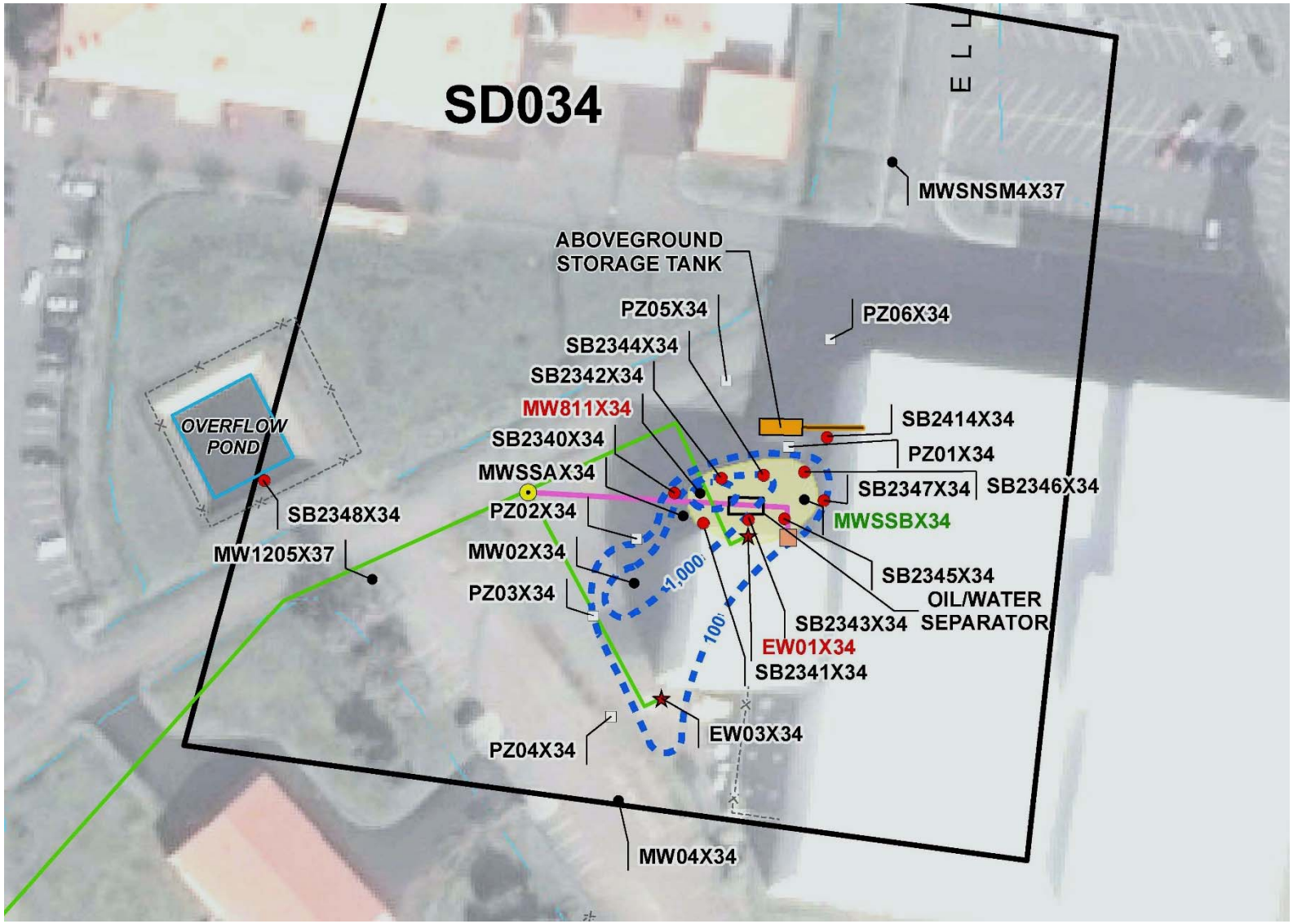
SD034 Site Background

- In 1994, hole discovered in OWS
  - OWS removed and replaced
  - Primary COCs related to Stoddard Solvent
- Stoddard Solvent AST
  - Old tank at same location as current tank installed in 1994
  - Personnel used to carry 5-gallon buckets of Stoddard Solvent from old AST into building

SD034 Remedial Action

- NEWIOU Soil ROD concluded no action was needed to address TPH below 2,300 mg/kg in soil because it would naturally attenuate
- Groundwater IROD included GET and passive skimming
- Groundwater ROD selected passive skimming and enhanced attenuation

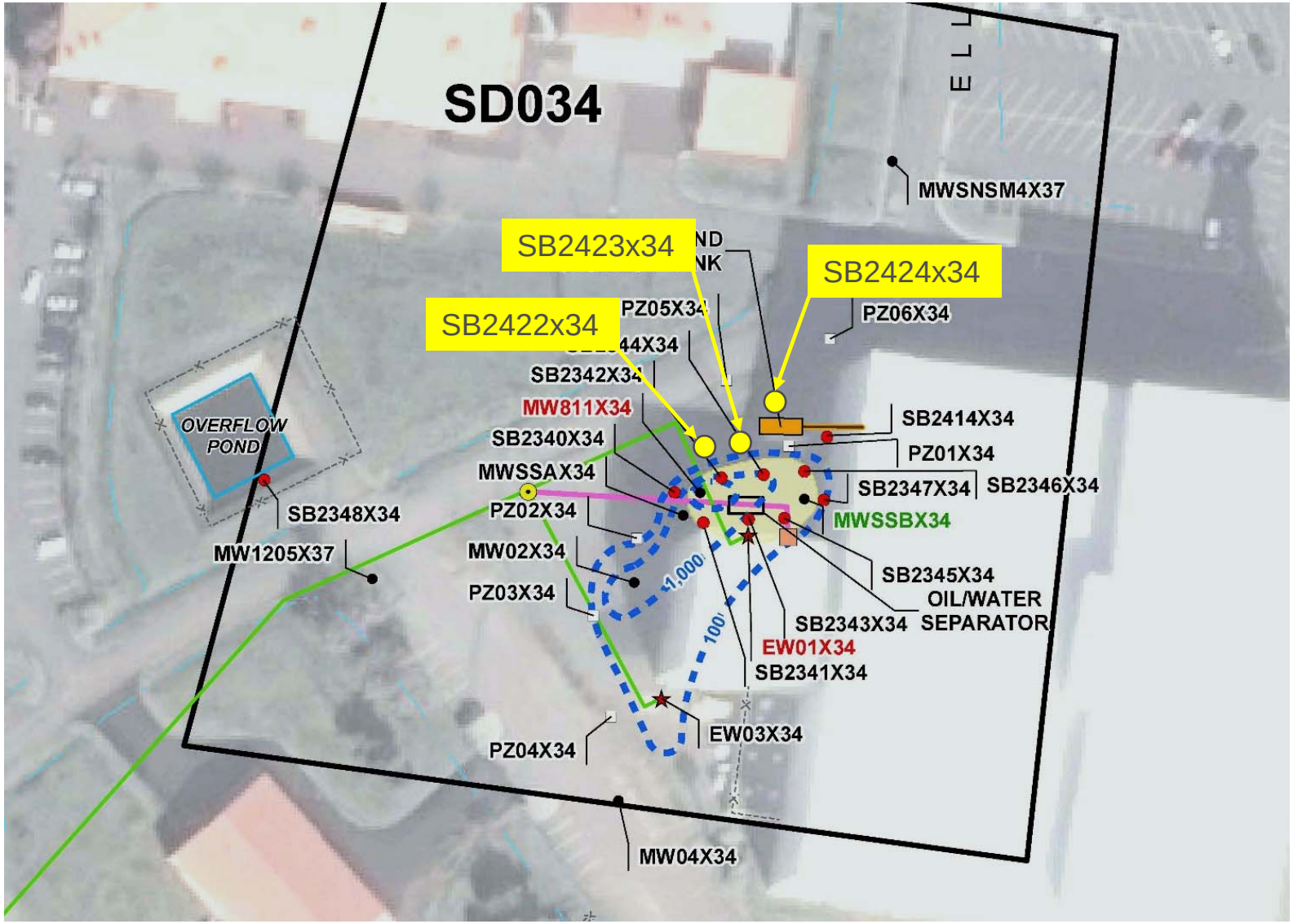
SD034 Site Plan



SD034 Data Gaps Investigation Activities

- Installed 10 soil borings to evaluate extent of residual smear zone contamination and to confirm soil concentrations have attenuated
  - Completed 3 additional step-out borings to confirm smear zone impacts

SD034 Step-out Borings



Investigation Photos

SD034 Soil Boring Results

Depth (ft bgs)/DRO (mg/kg)
Bold if above soil ROD risk level (2,300)
Brown if in smear zone

0.5-1/15
4-5/2.6
9-10/420
14-15/70

0.5-1/16
4-5/ND
9-10/1,200
16.5-17.5/120

0.5-1/34
4-5/1.6
9-10/650
15-17/410

0.5-1/18
4-5/5.9
9-10/1,200
19-20/22

0.5-1/49
4-5/2.3
9-10/3,900
16-17/130
17-18/6,400

0.5-1/2,000
4-5/1,200 (409 in 1995)
9-10/940 (31.9 in 1995)
15-16/6,000 (**9,400** in 1995)
16-17/13,000

0.5-1/11
4-5/4.1
9-10/2,000
14-15/3,000
15-16/9,700
16-17/65

0.5-1/2.7
4-5/1.9
9-10/510
15-16/120

0.5-1/86
4-5/ND
9-10/1,300
15-16/2,500

0.5-1/170
4-5/6.9
9-10/1,700
14.5-15.5/330
15.5-16.5/3,900

0.5-1/330 (ND in 1996)
4-5/25 (43 in 1994)
9-10/15 (494 in 1994)
16-17/47
17-18/7,000 (312 in 1994)

0.5-1/12
4-5/130 (ND in 1994)
9-10/24 (**2,909** in 1994)
16-17/430 (999 in 1994)
17-18/4,700

0 40
feet

SD034 Conclusions

- Based on smear zone results, site is a candidate for a new kind of bioreactor we have designed
  - Aerobic “Washboard” Bioreactor
  - Will distribute dissolved oxygen for aerobic bacteria
- Technology Demonstration Work Plan
  - Implement the Technology Demonstration
  - Evaluate data over a ~2 year period
  - If successful develop a ROD Amendment to change the remedy

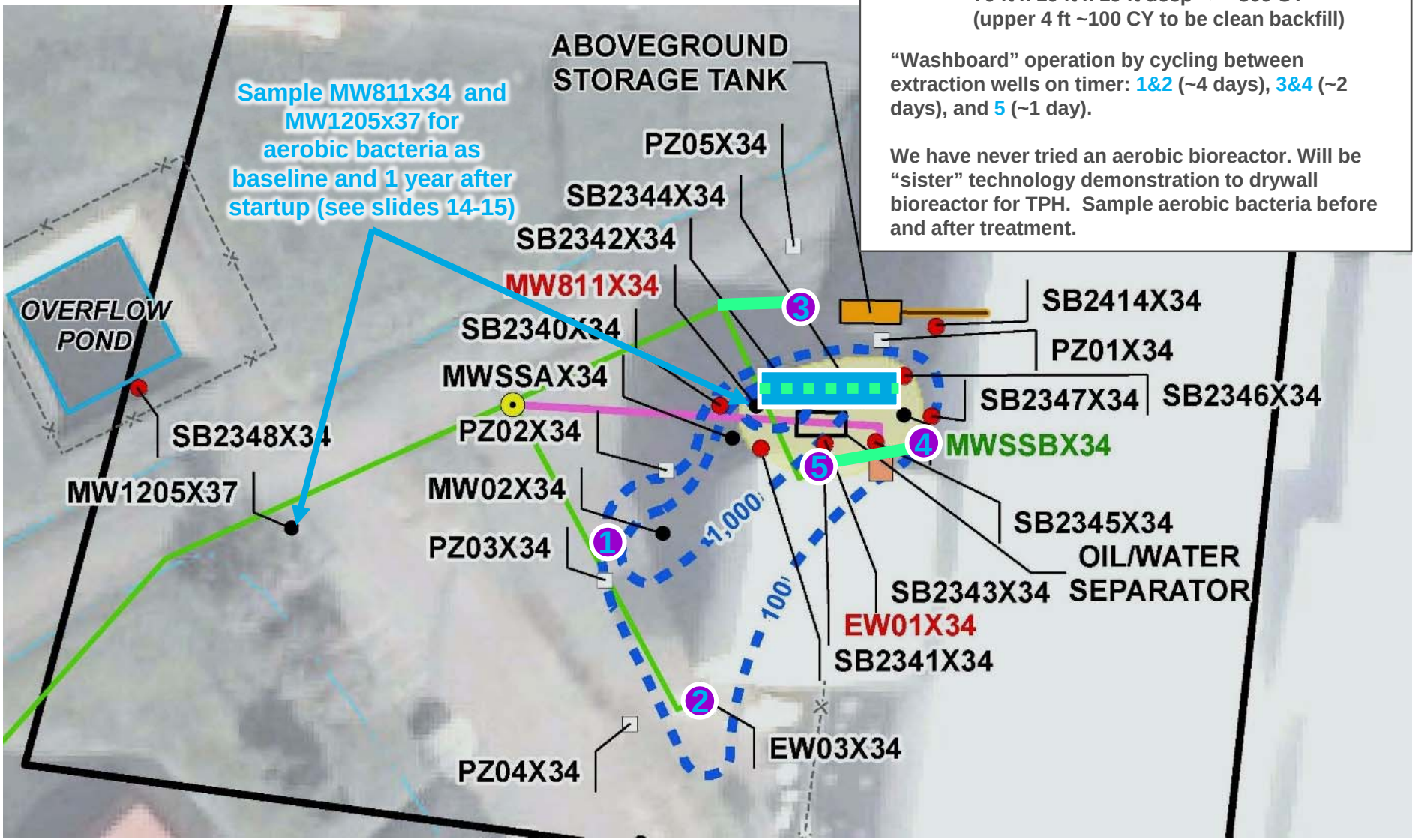
Aerobic Bioreactor Conceptual Layout

5 extraction wells (2 existing) (install iSOCs)

Aerobic SBGR (gravel from 4 ft to 13 ft bgs; gravel & ORC/TersOx bottom 5 ft)
70 ft x 10 ft x 19 ft deep => ~500 CY
(upper 4 ft ~100 CY to be clean backfill)

"Washboard" operation by cycling between extraction wells on timer: 1&2 (~4 days), 3&4 (~2 days), and 5 (~1 day).

We have never tried an aerobic bioreactor. Will be "sister" technology demonstration to drywall bioreactor for TPH. Sample aerobic bacteria before and after treatment.



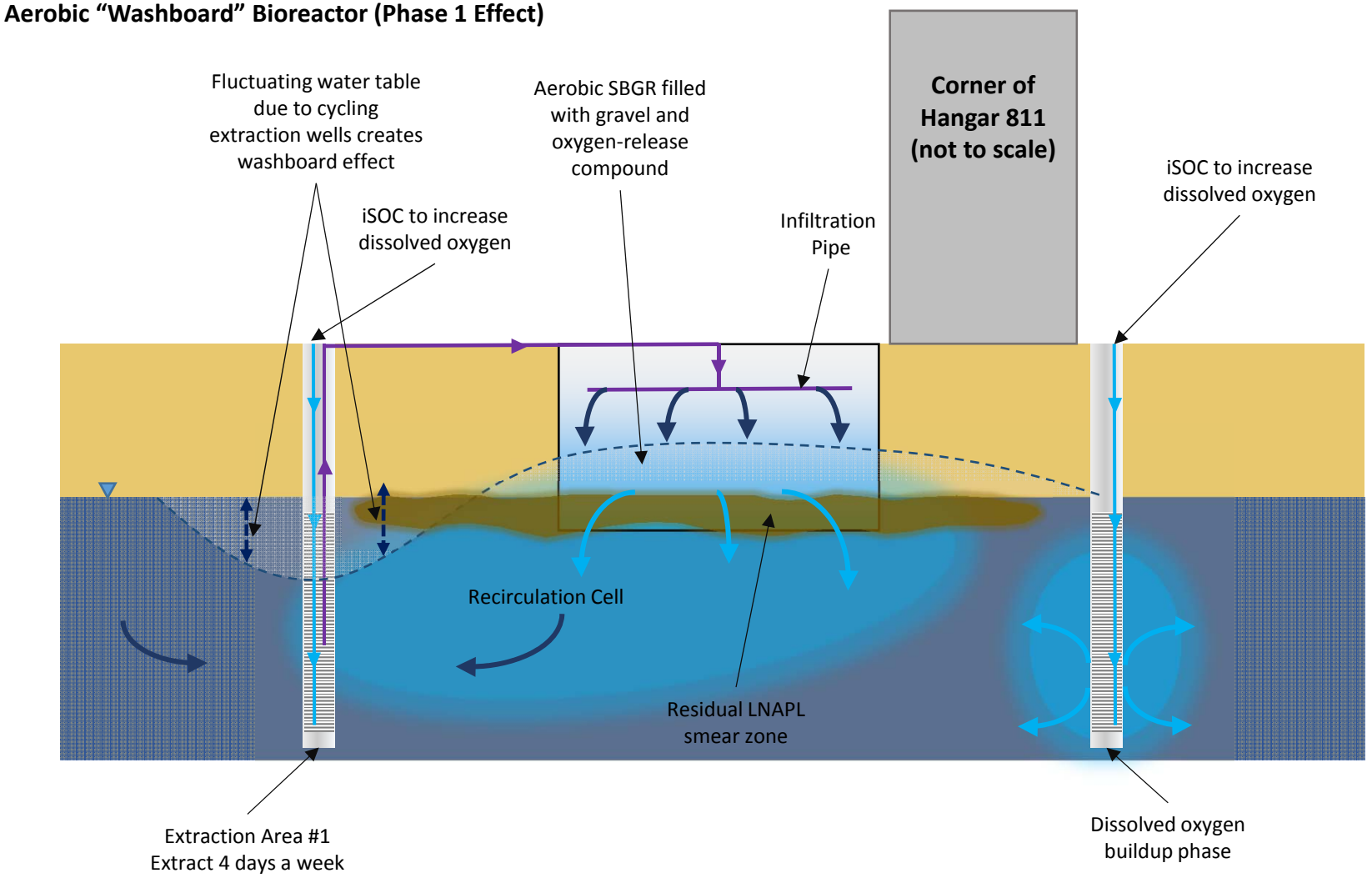


FIGURE 1.
SITE SD034 AEROBIC "WASHBOARD" BIOREACTOR CONCEPTUAL DESIGN - PHASE 1 EFFECT
SITE SD034 TECHNOLOGY DEMONSTRATION WORK PLAN
TRAVIS AIR FORCE BASE, CALIFORNIA

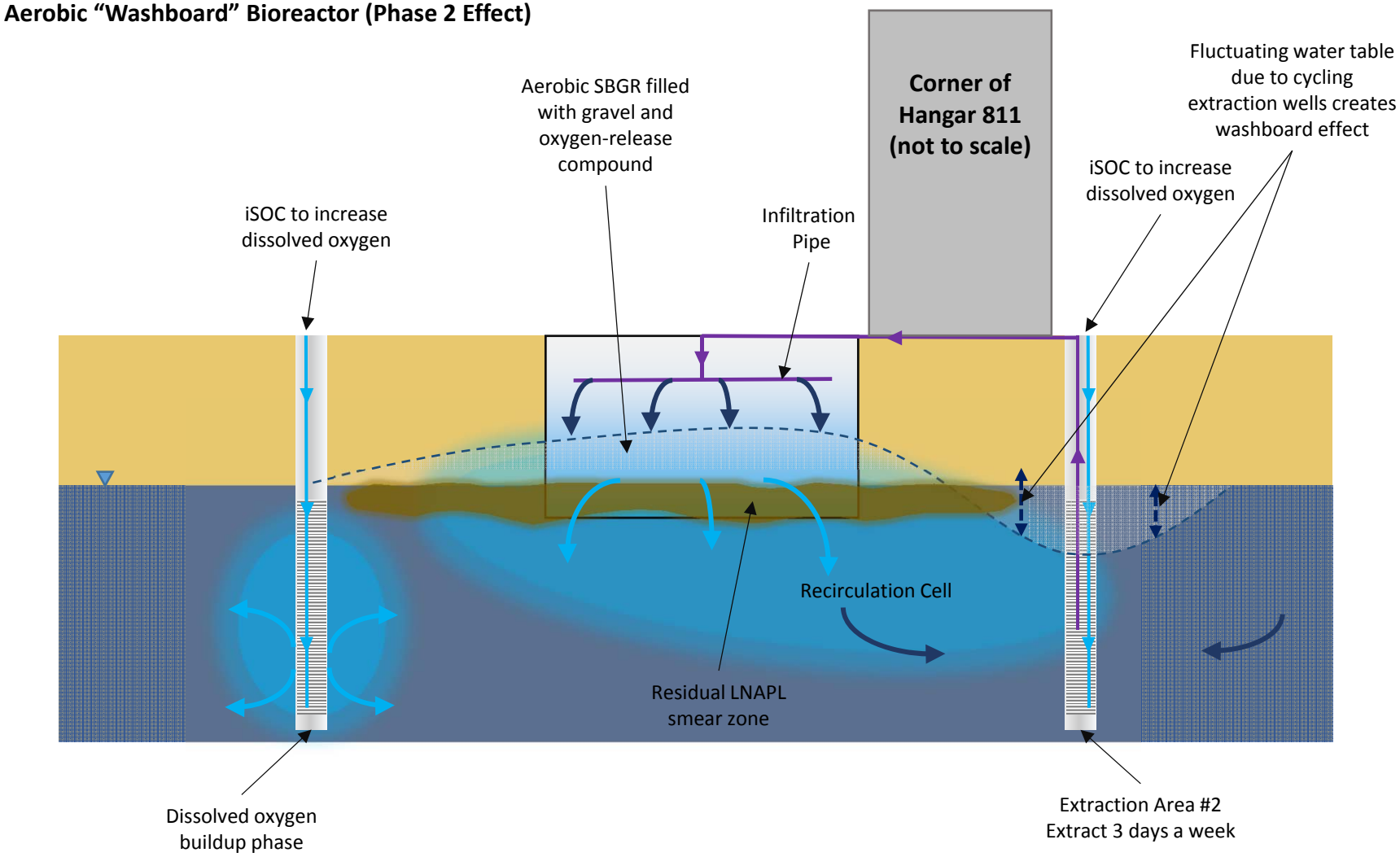


FIGURE 2.
SITE SD034 AEROBIC "WASHBOARD" BIOREACTOR CONCEPTUAL DESIGN - PHASE 2 EFFECT
SITE SD034 TECHNOLOGY DEMONSTRATION WORK PLAN
TRAVIS AIR FORCE BASE, CALIFORNIA

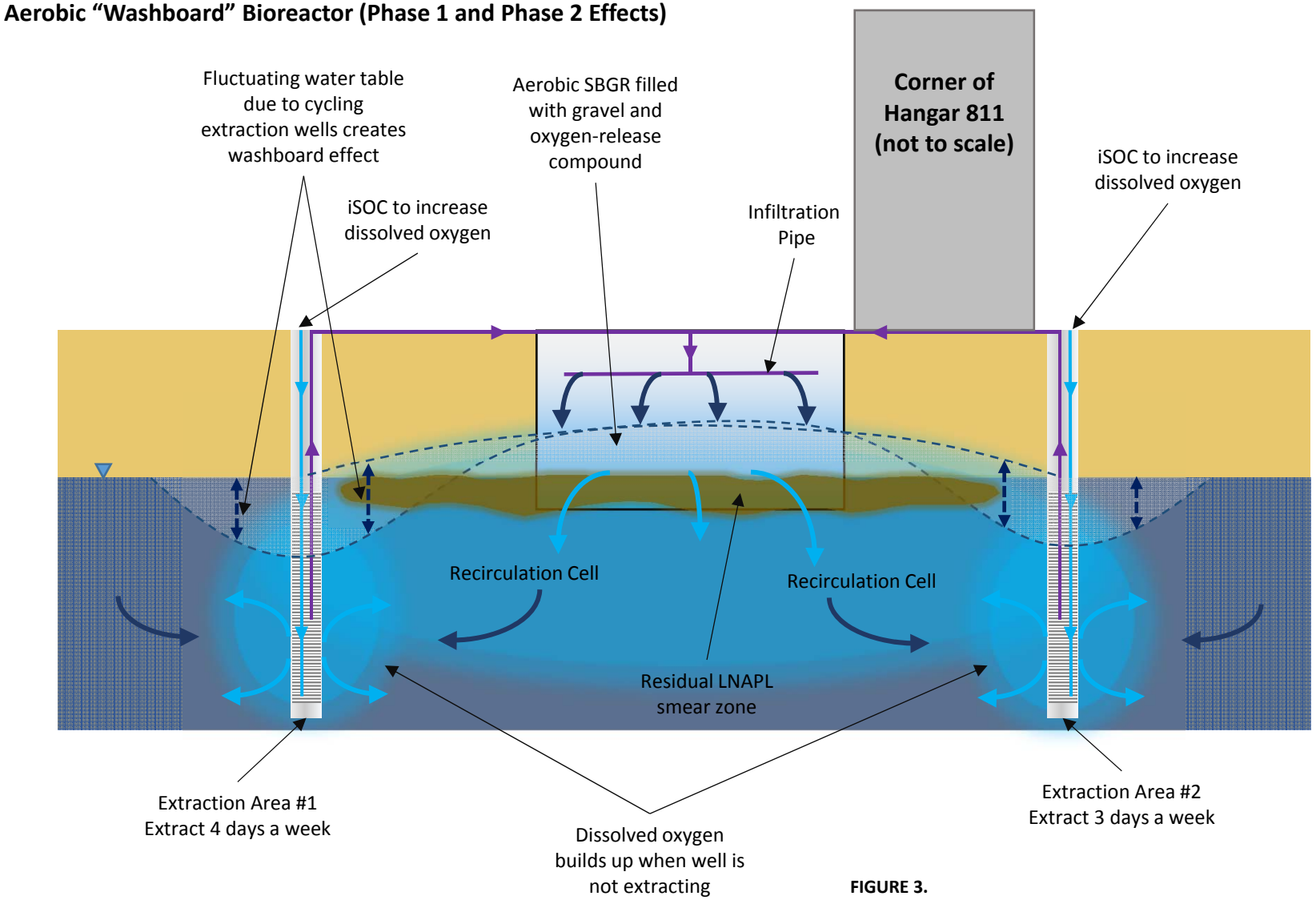
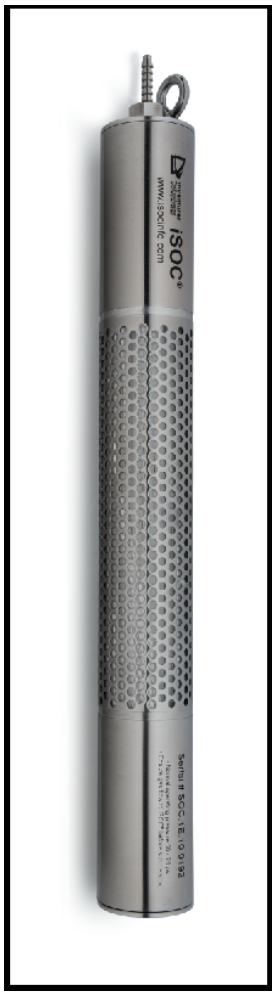


FIGURE 3.
SITE SD034 AEROBIC "WASHBOARD" BIOREACTOR CONCEPTUAL DESIGN - PHASE 1 AND 2 EFFECTS
SITE SD034 TECHNOLOGY DEMONSTRATION WORK PLAN
TRAVIS AIR FORCE BASE, CALIFORNIA

iSOC



- Oxygen gas infusion technology
  - More efficient than air sparging
  - Contains over 700 hydrophobic microporous hollow fibers that supersaturate groundwater with DO
  - Sustainable, does not require electricity and has no moving parts

Aerobic Bacteria Analysis

QuantArray®—Petroleum

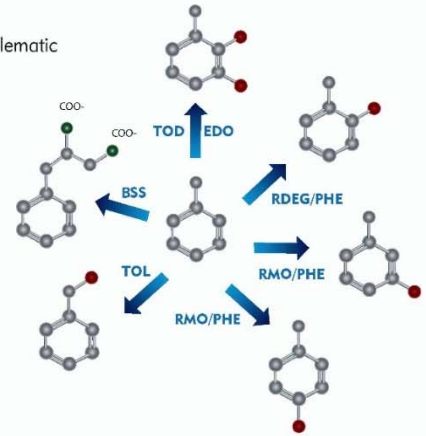
QuantArray®
MOLECULAR BIOLOGICAL TOOL

Simultaneously quantify functional genes responsible for aerobic and anaerobic biodegradation of petroleum hydrocarbons in a single analysis

Comprehensive evaluation of biodegradation potential at petroleum impacted sites is inherently problematic due to two factors: (1) Petroleum products are complex mixtures of hundreds of aliphatic, aromatic, cyclic and heterocyclic compounds (2) Even for common classes of contaminants like benzene, toluene, ethylbenzene, and xylenes (BTEX), biodegradation can proceed by a multitude of pathways. For example, biodegradation of toluene can proceed via five known aerobic pathways and one known anaerobic pathway as shown.

The Petroleum QuantArray has been designed to address both of these issues by providing the simultaneous quantification of the specific functional genes responsible for both aerobic and anaerobic biodegradation of BTEX, PAHs, and a variety of short and long chain alkanes.

Thus, when combined with chemical and geochemical groundwater monitoring programs, the QuantArray allows site managers to simultaneously yet economically evaluate the potential for biodegradation of a spectrum of petroleum hydrocarbons through a multitude of aerobic and anaerobic pathways to give a much more clear and comprehensive view of contaminant biodegradation.



BTEX and MTBE

- Benzene/toluene dioxygenases (TOD) monooxygenases (RMO, RDEG, PHE) and other functional genes responsible for aerobic biodegradtion of BTEX
- Includes MTBE utilizing strain *Methylibium petroleiphilum* PM1 and TBA monooxygenase
- Benzylsuccinate synthase (BSS) for anaerobic biodegradation of toluene, ethylbenzene, and xylenes
- Benzene carboxylase (ABC) initiates the only known pathway for anaerobic benzene biodegradation

Naphthalene and PAHs

- Includes three groups of naphthalene dioxygenase genes (NAH, NAG, PHN) for aerobic biodegradation
- Naphthylmethylsuccinate synthase (NMS) for anaerobic biodegradation of methyl-naphthalenes
- Naphthalene carboxylase (ANC) initiates the only known pathway for anaerobic naphthalene biodegradation

Alkanes/TPH

- The *n*-alkanes are a substantial portion of petroleum products
- The Petroleum QuantArray includes quantification of alkane monooxygenase genes (alkB)
- Also includes quantification of alkylsuccinate synthase (assA) genes to evaluate anaerobic biodegradation of alkanes

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Aerobic Bacteria Analysis (continued)

Quantification of a multitude of key functional genes responsible for aerobic and anaerobic biodegradation of petroleum hydrocarbons.

Aerobic Biodegradation

- Benzene/toluene dioxygenase (TOD)
- Toluene/benzene monoxygenases (RMO, RDEG)
- Phenol hydroxylase (PHE)
- Ethylbenzene and isopropylbenzene dioxygenases (EDO, BPH4)
- Naphthalene dioxygenases (NAH, NAG, PHN)
- MTBE-utilizing strain PM1
- TBA monooxygenase
- Alkane monooxygenases

Anaerobic Biodegradation

- Benzylsuccinate synthase (BSS)
- Benzene carboxylase (ABC)
- Naphthalene carboxylase (ANC)
- Naphthylmethylsuccinate synthase (NMS)
- Alkylsuccinate synthase
- Benzoyl Coenzyme A reductase (BCR)

Other Groups

- Total Bacteria (EBAC)
- Sulfate reducing bacteria (APS)

miQuantArray® MOLECULAR BIOLOGICAL TOOL

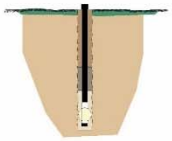
How does it work?

The QuantArray is a hybrid technology combining the highly parallel detection of DNA microarrays with the accurate and precise quantification of qPCR into a single platform. The key to the approach is nanoliter fluidics for low volume, solution phase qPCR allowing simultaneous quantification of different gene targets and therefore more comprehensive site assessment.

In many other respects, the QuantArray is the same as conventional qPCR with TaqMan® probes so you can expect the same level of accuracy and precision. qPCR is a process whereby many copies of a specific gene are generated. The gene copied during the process (target gene) is determined by short segments of DNA called "primers" and a TaqMan® "probe". As each gene copy is made, a fluorescent marker is released from the TaqMan® probe, measured, and used to quantify the number of target genes present in the sample.

Other methods like multiplex qPCR have been described that achieve some level of parallel quantification. There is a fundamental difference between the QuantArray and multiplex qPCR however. For multiplex qPCR, multiple primer sets are added to a reaction mixture to quantify multiple gene targets. Unlike multiplex qPCR, the QuantArray employs discrete through-holes for individual qPCR reactions ensuring that reaction kinetics are not compromised.

Sample Collection

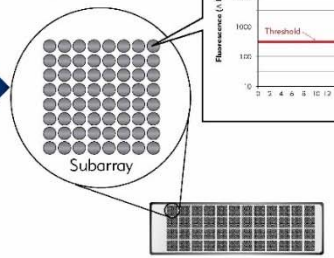


Groundwater, soil, or Bio-Trap® Sampler collected and shipped overnight on ice (4°C)

DNA Extraction

DNA is extracted from samples upon arrival

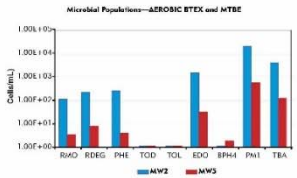
Amplification



Quantification of a multitude of gene targets

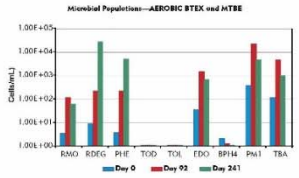
Results

Sample Information	MW2	MW3
Aerobic BTEX and MTBE		
Toluene Ring Hydroxylating Monooxygenases (RMO)	1.39E+02	4.17E+00
Toluene 2 Monooxygenase/Phenol Hydroxylase (RDEG)	2.80E+02	1.00E+01
Phenol Hydroxylase (PHE)	3.28E+02	4.57E+00
Toluene/Benzene Dioxygenase (TOD)	<1.00E+00	<1.00E+00
Xylene/Toluene Monooxygenase (TOL)	<1.00E+00	<1.00E+00
Ethylbenzene/Isopropylbenzene Dioxygenase (EDO)	2.10E+03	4.47E+01
Biphenyl/Isopropylbenzene Dioxygenase (BPH4)	1.20E+00	1.64E+00
Methylibium petroliphilum PM1 (PM1)	2.87E+04	5.22E+02
TBA Monooxygenase (TBA)	5.21E+03	1.63E+02



Quantification of a broad spectrum of different microorganisms and key functional genes responsible for various biodegradation pathways critical for site remediation.

Assessment



QuantArray results are integrated with other site parameters to optimize site management

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