ROCKY FLATS SITE
REGULATORY CONTACT RECORD

Purpose: Monitoring Results and Water Treatment at the MSPTS and ETPTS

Contact Record Approval Date: November 2, 2010

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Introduction: Treatment of contaminated groundwater by the MSPTS and ETPTS results in removal of the vast majority of contamination load from influent groundwater. Treatment does not result in complete removal of all groundwater contaminants, however, and low concentrations of a few volatile organic compounds (VOCs) remain in system effluent at levels that are above RFLMA Attachment 2, Table 1 standards. This has been recognized previously – for example, treatment system reports issued prior to Site closure documented ETPTS conditions, and quarterly and annual RFLMA reports issued since closure have documented conditions at both of these systems. Discussions among Site and CDPHE personnel have taken place in the past on these issues, both prior to and since site closure.

Groundwater treatment system monitoring results are evaluated in accordance with RFLMA Attachment 2, Figure 11. If the 85th percentile of the results for a Table 1 analyte in the system effluent or the performance monitoring location is above the corresponding RFLMA standard, then the consultative process is used to determine if actions should be implemented.

This Contact Record serves to document consultation regarding the evaluation of VOC levels that exceed the criteria in RFLMA Attachment 2, Figure 11 in system effluent. The RFLMA Parties consulted in June and July, 2010, following the most recent routine RFLMA required monitoring of designated sampling locations for these systems to evaluate whether any mitigating actions may be required. While mitigating actions beyond the scheduled change out of the media and minor system upgrades for the MSPTS are not deemed necessary due to the low VOC concentrations in the effluent, this Contact Record describes the follow-up actions that are underway; and next steps.

Discussion: The MSPTS was designed to treat groundwater contaminated with VOCs from the Mound source area to the south, and was installed in 1998. As a part of site closure, after the nearby Oil Burn Pit #2 (OBP#2) was remediated via source removal in 2005, contaminated groundwater from that area was routed to the MSPTS intercept trench to be treated by this system. This caused influent flow rates and contaminant loads to increase substantially. Higher flow rates result in a lower residence time within the treatment media, which can reduce treatment effectiveness. The contaminants from OBP#2 include metabolic byproducts such as cis-1,2-DCE and vinyl chloride, both of which are most effectively treated via increased residence times. The net result is reduced treatment effectiveness, with residual contaminants present in system effluent at concentrations that have exceeded RFLMA Attachment 2, Table 1 values. These conditions were first recognized in 2006,

roughly one year after the OBP#2 source removal. Replacement of the treatment media in the MSPTS in late-summer 2006 did not fully resolve these conditions.

The ETPTS was designed to treat groundwater contaminated with VOCs from the East Trenches source area to the south, and was installed in 1999. Since installation, effluent from this system has often included one or more constituents at concentrations exceeding RFLMA Attachment 2, Table 1 values. Multiple media replacements over the years since its installation have not fully resolved these conditions.

Routine RFLMA samples are collected from these systems (influent, effluent, and surface water performance locations) semiannually, in the second and fourth calendar quarters. (The analytical results for these samples are reported in the corresponding RFLMA quarterly reports.) Results for samples collected in the second calendar quarter of 2010, during wet spring (higher-flow) conditions, indicated reduced treatment effectiveness at both systems. Table 1 below presents a summary of these second-quarter results, and focuses on constituents that are present in the effluent.

Table 1: Constituents detected in system effluent in second quarter 2010 samples, and corresponding concentrations in system influent and surface water performance locations

MSPTS	**1,2-DCA**	**c12-DCE**	**MCl**	**TCE**	**VC**
Influent	ND	**1900**	ND	**79**	**79**
Effluent	**1.3**	**360**	0.82 (J)	**3.5**	**150**
GS10	ND	12	ND	0.49 (J)	ND
ETPTS	**CF**	**c12-DCE**	**MCl**	**PCE**	**TCE**
Influent	**62**	30	ND	**260**	**2500**
Effluent	**63**	57	**8.2 (B)**	**10**	**23**
POM2	0.22 (J)	0.32 (J)	ND	ND	0.38 (J)

NOTES: Constituents and RFLMA Attachment 2, Table 1 standards: 1,2-DCA = 1,2-dichloroethane, 1 ug/L; c12-DCE = cis-1,2-DCE, 70 ug/L; MCl = methylene chloride, 4.6 ug/L; TCE = trichloroethene, 2.5 ug/L; VC = vinyl chloride, 0.2 ug/L; CF = chloroform, 3.4 ug/L; PCE = tetrachloroethene, 1 ug/L.
Bold, shaded data exceed RFLMA Attachment 2, Table 1 standards. All concentrations are presented in ug/L.
Qualifiers: ND = not detected; J = estimated concentration; B = constituent detected in blank.

Although concentrations of many of the contaminants in system influent are not shown, the summary data provided above confirm that both systems remove the majority of contamination from influent groundwater. For example, in the June samples from the MSPTS, over 81% of the cis-1,2-DCE and more than 95% of the TCE were removed; and at the ETPTS, over 96% of the PCE and more than 99% of the TCE were removed. Since the current media was installed in these two systems, they have each removed approximately 95% of the VOCs in system influent. However, effluent conditions for certain listed constituents in Table 1 do not meet all RFLMA Attachment 2, Table 1 values.

Steps taken and next steps: Conditions in treatment system effluent were discussed with CDPHE on June 8, 22, and July 27, 2010. The elevated flow rates, and correspondingly reduced residence times, were noted. The RFLMA required semi-annual sampling frequency was also discussed. It was decided per the RFLMA consultation process to increase the sampling frequency for this evaluation.

A path forward was agreed upon whereby extended sampling of these treatment systems would be performed. For the subsequent three months (June, July, and August 2010), the RFLMA locations – influent, effluent, and surface water performance – would be sampled, together with two additional points per system between the effluent and surface water performance locations. These two locations would target system effluent as it moves into the receiving drainage and toward the surface water performance location.

On June 17, 2010, potential sampling locations at the MSPTS and ETPTS were identified. At the MSPTS, the two locations represent water within Functional Channel (FC)-4; one is closer to the effluent discharge gallery and is identified as MSPTSCHAN1. On June 17, this location held what appeared to be standing water (i.e., active flow was not apparent). The second location at the MSPTS, MSPTSCHAN2, is a short distance down FC-4 from the previous location and represents what appeared on June 17 to be the farthest upstream location at which samples of visibly turbulent, flowing water could be easily collected. The two locations at the ETPTS include ETPTSDGOVER, which is at the discharge gallery; and ETPTSB4, which is where discharge gallery water joins former Pond B-4. Figure 1 below illustrates the general locations of these additional sampling points.

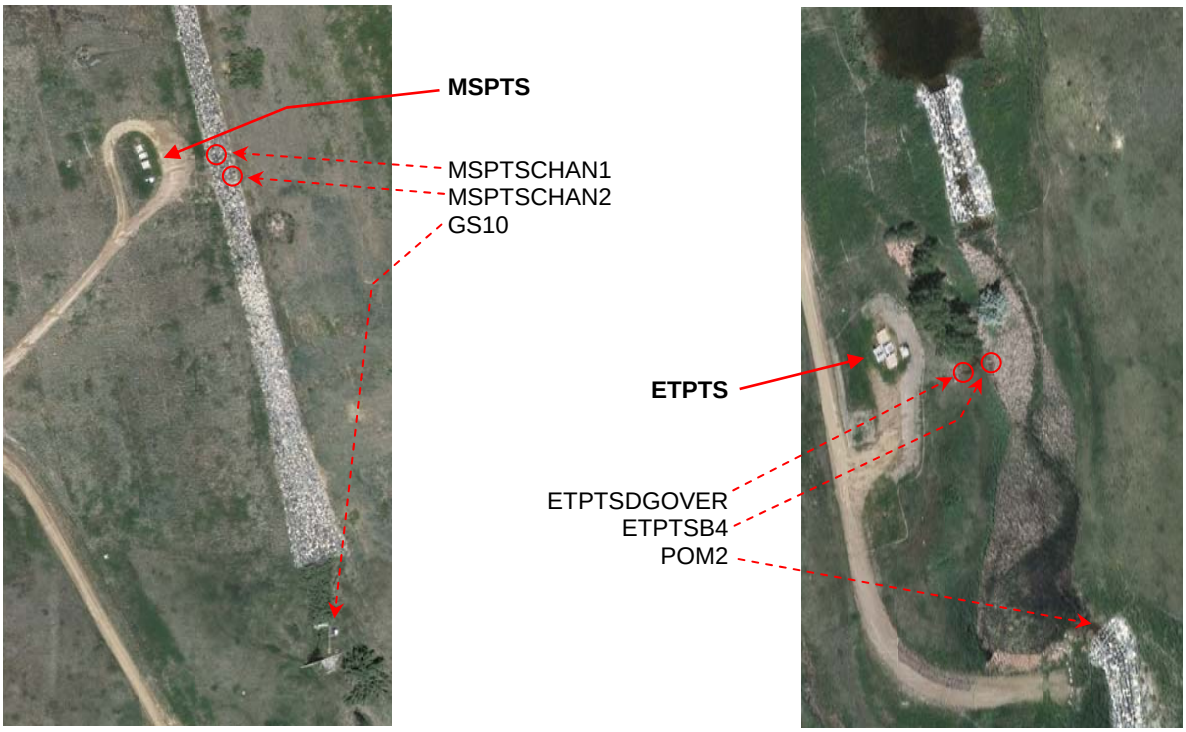

Figure 1. MSPTS (left photo), ETPTS (right photo), and approximate locations of extra sampling points with respect to treatment systems and surface water performance locations. Source photos are from 2010.

On June 22, each of the selected locations, as well as the routine RFLMA locations, were sampled. Sampling was repeated on July 28, and again on August 26. In each of these three events, the same locations were visited for sampling. Flow conditions in July at the FC-4 locations sampled in support of the MSPTS were noticeably reduced compared to the June sampling date; both held what appeared

to be standing water. In August, both of these locations were dry, preventing sample collection from the two FC-4 locations on that third visit.

Analytical results for these samples are summarized below in Table 2, which also includes both the routine second quarter results (summarized above in Table 1) as well as estimated residence times and corresponding flow rates that apply to the sampling events. The correlation among residence times/flow rates and concentrations of VOCs in system effluent are obvious: a lower flow rate, which corresponds to a higher residence time, allows for improved water treatment relative to conditions of higher flow rates and the resultant lower residence times. This correlation is more evident at the MSPTS than the ETPTS. This is because the MSPTS is more strongly impacted by variations in precipitation as a result of the local hydrology, in particular the former utility corridor that crosses the OBP#1 and empties into the MSPTS collection trench. On an annual basis, however, flow rates at the MSPTS have been generally decreasing since site closure. A second factor may be that the treatment media at the MSPTS is older and more clogged than at the ETPTS. The mineral precipitates responsible for this clogging limit the contact between the water and ZVI, and thereby reduce the treatment effectiveness.

The sample results at the performance monitoring points were evaluated in accordance with RFLMA Attachment 2, Figure 11. The concentrations do not exceed the 85th percentile of the results for the corresponding RFLMA standards in Attachment 2, Table 1. The results at GS10 for the 6/22/10 sample were slightly above RFLMA standards for TCE and VC (though the result for VC was qualified).

It should be noted that the RFLMA standard for VC, 0.023 ug/L, is based on the lowest promulgated Colorado Water Quality Control Commission (WQCC) statewide standard, which is a "water+fish" (W+F) standard. The W+F standard is based on an exposure scenario that includes human water consumption and fish consumption. The WQCC "water supply" (WS) standard is a range of 0.023 to 2 ug/L with 2 ug/L corresponding to the EPA maximum contaminant level (MCL) for drinking water supplies. There is no WQCC statewide "aquatic life based" (AL) standard for VC. The surface water at Rocky Flats is not fishable, and is not used for water supply. Based on this, and the fact that the VC levels were non-detect on the subsequent sample, the VC concentration measured on 6/22/10 does not pose any significant risk to human health and the environment.

Similarly, the TCE concentration measured on 6/22/10 does not pose any significant risk. The RFLMA standard for this constituent is also based on the WQCC W+F standard for TCE. The WQCC WS standard for TCE is 5 ug/L, and the AL standard is 45,000 ug/L for acute exposure and 21,900 ug/L for chronic exposure.

These results demonstrate that residual VOCs in system effluent dissipate very quickly, and would not represent a threat to surface water quality at surface water Points of Compliance. However, DOE is evaluating optimization of the MSPTS to provide additional VOC removal. This optimization is currently conceived as a passive air stripping component. The parties will continue to consult to finalize optimization of system performance to encourage additional VOC removal.

Table 3 summarizes calculated 85th percentile concentrations for those constituents presented in Table 1 above. The results in Table 3 incorporate data collected from January 2000 through June 2010. Note that media replacement activities are not reflected or accounted for in these calculations.

Table 2. Constituents detected in system effluent in second quarter 2010 samples and follow-up sampling events, with corresponding flow information and concentrations in system influent and at surface water performance locations

CONSTITUENT (RFLMA standard)	MONTH (2010)	MSPTS							ETPTS						
		R1-O (influent)	R2-E (effluent)	MSPTSCHAN1	MSPTSCHAN2	GS10	Average Flow (gpm)	HRT Days	ET INFLUENT	ET EFFLUENT	ETPTSDGOVER	ETPTSB4	POM2	Average Flow (gpm)	HRT Days
Chloroform (3.4)	June	0.46 (J)	**9.9**	1	0.54 (J)	0.49 (J)	**2.27**	**1.70**	**70**	**64**	**60**	**10**	0.3 (J)	**3.92**	**1.50**
	July	**22**	3.3 (J)	0.87 (J)	0.19 (J)	0.18 (J)	**1.08**	**3.50**	**95**	**57**	**57**	**6.9**	0.3 (J)	**4.22**	**1.40**
	August	**15**	**3.5**	NF	NF	ND	**1.23**	**3.10**	**78**	**39**	**39**	1.1	ND	**3.96**	**1.50**
Cis-1,2-DCE (70)	June	**110**	**1800**	**160**	**84**	70	**2.27**	**1.70**	34	55	49	7.6	0.3 (J)	**3.92**	**1.50**
	July	**2800**	**790**	**200**	36	42	**1.08**	**3.50**	43	55	54	7.9	0.24 (J)	**4.22**	**1.40**
	August	**1700**	**960**	NF	NF	25	**1.23**	**3.10**	37	56	57	5.6	ND	**3.96**	**1.50**
PCE (1 - PQL)	June	**8.7**	**29**	**2.4**	**1.2**	0.93 (J)	**2.27**	**1.70**	**260**	**14**	**12**	**1.3**	ND	**3.92**	**1.50**
	July	**74**	**11**	**3.4**	0.57 (J)	0.62 (J)	**1.08**	**3.50**	**320**	**20**	**16**	**1.4**	ND	**4.22**	**1.40**
	August	**44**	**20**	NF	NF	0.34 (J)	**1.23**	**3.10**	**280**	**18**	**18**	0.94 (J)	ND	**3.96**	**1.50**
TCE (2.5)	June	**9.3**	**77**	**7.3**	**3.8**	**2.8**	**2.27**	**1.70**	**2100**	**13**	**11**	1.3	ND	**3.92**	**1.50**
	July	**230**	**40**	**12**	2.2	2.2	**1.08**	**3.50**	**2600**	**16**	**14**	1.5	ND	**4.22**	**1.40**
	August	**160**	**84**	NF	NF	1.8	**1.23**	**3.10**	**2600**	**19**	**19**	1.3	ND	**3.96**	**1.50**
Meth. Chloride (4.6)	June	0.39 (JB)	**5.6 (JB)**	0.62 (JB)	0.49 (JB)	0.49 (JB)	**2.27**	**1.70**	2.1 (JB)	**8.4 (B)**	**7.7 (B)**	1.6 (B)	ND	**3.92**	**1.50**
	July	**7.7 (J)**	**6.4**	0.83 (J)	0.36 (J)	0.36 (J)	**1.08**	**3.50**	3.7 (J)	**15**	**15**	2.8	ND	**4.22**	**1.40**
	August	3.1 (JB)	4.3 (B)	NF	NF	ND	**1.23**	**3.10**	**5.8 (JB)**	**19 (B)**	**19 (B)**	1.8 (B)	ND	**3.96**	**1.50**
VC (0.2 - PQL)	June	ND	**270**	**7.7**	**2.6**	**0.69 (J)**	**2.27**	**1.70**	ND	ND	ND	ND	ND	**3.92**	**1.50**
	July	**70**	**40**	**13**	**0.6 (J)**	ND	**1.08**	**3.50**	**0.76 (J)**	ND	**0.52 (J)**	ND	ND	**4.22**	**1.40**
	August	ND	**160**	NF	NF	ND	**1.23**	**3.10**	ND	ND	ND	ND	ND	**3.96**	**1.50**
1,1-DCE (7)	June	2.2	**24**	1.9	0.91 (J)	0.58 (J)	**2.27**	**1.70**	0.93 (J)	3.7 (J)	0.69 (J)	ND	ND	**3.92**	**1.50**
	July	**42**	**8.5**	2.1	0.33 (J)	0.24 (J)	**1.08**	**3.50**	0.75 (J)	5.9 (J)	0.53 (J)	ND	ND	**4.22**	**1.40**
	August	**22**	**12**	NF	NF	ND	**1.23**	**3.10**	5.3 (J)	0.52 (J)	0.51 (J)	ND	ND	**3.96**	**1.50**
1,2 DCA (1 - PQL)	June	ND	ND	ND	ND	ND	**2.27**	**1.70**	ND	ND	ND	ND	ND	**3.92**	**1.50**
	July	ND	ND	ND	ND	ND	**1.08**	**3.50**	ND	ND	ND	ND	ND	**4.22**	**1.40**
	August	ND	**1.8 (J)**	NF	NF	ND	**1.23**	**3.10**	ND	ND	ND	ND	ND	**3.96**	**1.50**

NOTES: HRT = estimated hydraulic residence time; assumes uniform packing of media and no precipitates (i.e., no media clogging), which is known to be inaccurate particularly at the MSPTS. Flow rate is estimated average over the corresponding HRT prior to effluent sample collection.

All concentrations are in ug/L. RFLMA standards are from Attachment 2, Table 1, and correspond to the applicable water quality standard or practical quantitation limit (PQL), as appropriate. cis-1,2-DCE = cis-1,2-dichloroethene; meth.chloride = methylene chloride; VC = vinyl chloride; 1,1-DCE = 1,1-dichloroethene; 1,2-DCA = 1,2-dichloroethane.

Bold, shaded values exceed corresponding RFLMA Att. 2, Table 1 value. ND = not detected; NF = location not flowing (no water available for sampling); J = estimated value; B = constituent also detected in blank.

Locations MSPTSCHAN1, MSPTSCHAN2, ETPTSDGOVER, and ETPTSB4 are not RFLMA monitoring locations, but were established specifically for this evaluation.

The reported higher concentration of some constituents (such as PCE and TCE) in MSPTS effluent vs. influent in the June samples may be a result of several factors or mechanisms. Perhaps most importantly, for example, the samples are collected at approximately the same time, and therefore do not represent the exact same volume of water as it moves through the media.

Table 3. Calculated 85th-percentile concentrations

MSPTS	**1,2-DCA**	**c12-DCE**	**MCl**	**TCE**	**VC**
Influent	1	**5670**	3.9	**140**	**126.2**
Effluent	**2.11**	**328**	**4.64**	1.87	**35.8**
GS10	0.00845	40.35	0.001	0.471	0.001
ETPTS	**CF**	**c12-DCE**	**MCl**	**PCE**	**TCE**
Influent	**97.23**	40	**11.995**	**371.5**	**3204.5**
Effluent	**15.7**	39.94	**19**	**13.4**	**20**
POM2	0.07765	0.307	0.001	0.001	0.2435

NOTES: Constituents and RFLMA Attachment 2, Table 1 standards: 1,2-DCA = 1,2-dichloroethane, 1 ug/L; c12-DCE = cis-1,2-DCE, 70 ug/L; MCl = methylene chloride, 4.6 ug/L; TCE = trichloroethene, 2.5 ug/L; VC = vinyl chloride, 0.2 ug/L; CF = chloroform, 3.4 ug/L; PCE = tetrachloroethene, 1 ug/L.
Bold, shaded data exceed RFLMA Attachment 2, Table 1 standards. All concentrations are presented in ug/L. Calculations include all analytical data collected from January 2000 (consistent with the RI/FS and Integrated Monitoring Plans data base) through end of June 2010 and do not recognize or otherwise take into account media replacement activities.

While the treatment media in the ETPTS is fresh, having been replaced in October-November 2009, that in the MSPTS is due for replacement. The scope of this activity has been reconsidered, and the work will be postponed beyond the original schedule of late 2010 into early 2011.

As noted above, the MSPTS was not designed to treat high concentrations of metabolic byproducts such as cis-1,2-DCE and vinyl chloride such as have been present in system influent since site closure. Following the media replacement in this system, it is anticipated that treatment effectiveness will be improved significantly and impacts to surface water reported at performance location GS10 during higher flow conditions (such as June 2010) will be eliminated. Additional measures will be incorporated as part of the media replacement activity to further reduce concentrations in system effluent. This work will be discussed in a separate Contact Record.

At the ETPTS, data from samples collected at performance location POM2 show the applicable RFLMA standards are being met consistently. As the objective of these treatment systems is to protect surface water quality, this is seen as an indication that the ETPTS is performing adequately. However, as at the MSPTS, it is important to replace the media promptly when it becomes clogged and treatment effectiveness is reduced.

The events and data summarized in this Contact Record will be discussed and presented in the RFLMA Annual Report for 2010 and subsequent RFLMA Quarterly Reports as needed.

Closeout of the Contact Record: This Contact Record will be closed out when the media at the MSPTS has been replaced.

Resolution: Carl Spreng, CDPHE, approved the summary of the consultation provided by this Contact Record.

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