



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 7**

11201 Renner Boulevard
Lenexa, Kansas 66219

MAR 10 2015

Received
18 March 2015
PM-ED

Mr. Craig Phillips
Restoration Program Manager
Environmental Division, DPW
407 Pershing Court
IMNW-RLY-PWE
Fort Riley, Kansas 66442

**Re: Explanation of Significant Differences (ESD) for OU5 354 Area Solvent Detection Building
Fort Riley, Kansas**

Dear Mr. Phillips:

The U. S. Environmental Protection Agency has reviewed and signed the document by the Division Director. Please proceed to address the contamination as indicated in this ESD.

Thank you for the opportunity to review this document. Please contact me via email at safadi.amer@epa.gov or at (913) 551-7825 if you have any questions or concerns.

Sincerely,

Amer Safadi
Remedial Project Manager
Missouri/Kansas Remedial Branch
Superfund Division

Enclosure: ESD Document

cc: Travis Daneke, Kansas Department of Health and Environment
Amanda Chirpich, U.S. Army Corps of Engineers, Kansas City District





REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
HEADQUARTERS, 1ST INFANTRY DIVISION and FORT RILEY
580 FIRST DIVISION ROAD
FORT RILEY, KANSAS 66442-7000

February 24, 2015

Directorate of Public Works
Environmental Division

Mr. Amer Safadi, Remedial Project Manager
U.S. Environmental Protection Agency, Region 7
Federal Facilities/Special Emphasis Branch, Superfund
11201 Renner Blvd.
Lenexa, Kansas 66219

Dear Mr. Safadi:

The Directorate of Public Works, Environmental Division, Fort Riley, Kansas is providing the Final Explanation of Significant Differences (ESD) for the 354 Area Solvent Detections (354) Operable Unit (OU) 005 FTRI-031 signed by the Garrison Commander for Mr. Jackson's signature. The document was developed to allow the installation to address increased values of tetrachloroethylene in three terrace monitoring wells that resulted from unknown causes.

The ESD was prepared in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) 40 Code of Federal Regulations, Part 300.435(c)(2)(i). This ESD documents significant change to the remedy selected in the Record of Decision dated June 16, 2006.

Copies of this correspondence are being forwarded to Mr. Travis Daneke, Kansas Department of Health and Environment, Mr. Mike Kipp, U.S. Army Environmental Command, and Ms. Amanda Chirpich, U.S. Army Corps of Engineers-Kansas City District. Any questions may be directed to Dr. Richard Shields at 785-239-3194.

Sincerely,

A handwritten signature in black ink that reads "B. Craig Phillips".

B. Craig Phillips,
Chief, Pollution Prevention & Cleanup Branch

Explanation of Significant Difference for the Record of Decision at the
354 Area Solvent Detections Operable Unit 005
Fort Riley, Kansas

1. Introduction

This Explanation of Significant Difference (ESD) applies to the remedial actions and institutional controls performed and implemented under the Record of Decision (ROD) for the 354 Area Solvent Detections (354) Operable Unit 005 at Fort Riley, Kansas signed July 3, 2006. The Department of the Army – Fort Riley hereinafter (Fort Riley) is the lead agency with the U.S. Environmental Protection Agency, Region 7 (USEPA) and the Kansas Department of Health and Environment (KDHE) as support agencies.

This ESD is prepared in accordance with Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Control Plan (NCP) 40 Code of Federal Regulations (CFR) Part 300.435(c)(2)(i) and documents a significant change to the remedy selected for the site in the ROD. The selected remedy for the 354 Site is Monitored Natural Attenuation (MNA) with institutional controls (ICs). The Army proposes a change to the remedial action to ensure effectiveness of the existing remedy, as an explanation of significant difference (ESD), based on the following observations:

- The levels of tetrachloroethylene (PCE) in three monitoring wells have rebounded. Concentrations had been significantly decreasing since March 2008; however, during the March 2014 sampling event, levels in three wells increased. The PCE increase was confirmed in July 2014. The potential for risk to the alluvial aquifer of the Kansas River requires the implementation of a treatment process and further ground water sampling to address the elevated presence of PCE in the upland terrace ground water.

This ESD will become a part of the Fort Riley OU 005 administrative record. The Fort Riley administrative record or public comments documents are available to the public at the following locations:

Directorate of Public Works
Environmental Division (Dr. Richard Shields)
407 Pershing Court
Fort Riley, Kansas 66442
785-239-3194

Hale Library
Kansas State University (Ms. Connie Kissee)
1100 Mid-Campus Drive
Manhattan, Kansas 66506
785-532-0551

2. Summary of Site History, Contamination, and Selected Remedy

2.1 Summary of Site History

The 354 Area Solvent Detections (354) site is situated on an abandoned alluvial terrace up gradient and north of the Kansas River valley. It is located in the Main Post cantonment area which is located in Geary and Riley Counties, near Junction City (Figure 1). The term 354 will be used to refer to the site throughout the ESD.

Fort Riley is identified as site KS6214020756 on USEPA's Superfund Site Information website (formerly known as USEPA's Comprehensive Environmental Response, Compensation, and Liability Information System) site KS6214020756. This document is issued by the DA, the lead agency for the activities at Fort Riley, with consultation with the USEPA and the KDHE, the support agencies. Cleanup work at 354 is funded through the Installation Restoration Program (IRP).

The 354 site currently encompasses portions of the Main Post as far north as Godfrey Avenue, and virtually the entire point bar south of the Union Pacific Railroad (UPRR) grade and east of the Henry Drive bridge. This point bar and an ancient alluvial terrace dominate the topography across this area. The point bar is part of the active flood plain and consists of approximately 60-foot (ft) of alluvial sediments overlying Permian age shale and limestone bedrock. The terrace deposits located north of the railroad grade are part of an abandoned, unconsolidated, alluvial deposit from an earlier high stand of the Kansas River and vary in thickness for nine to 64-ft.

The former building 354 was constructed in 1935 as a gasoline service station. In addition to gasoline and diesel fuel, it may have been subsequently used as a storage site for solvents and road oil. Two 10,000-gallon steel underground storage tanks (USTs), one 12,800-gallon steel UST, and one 8,500-gallon steel UST were installed circa 1935 and used to store gasoline and diesel (United States Army Corps of Engineers [USACE], 1995). Two 10,000-gallon steel USTs were installed in 1980 (Dames and Moore, 1995). Five of the six USTs that historical drawings indicated were on site, were removed in 1990 and 1991. The sixth tank, the 8,500-gallon steel UST, was not found (Dames and Moore, 1995). Building 354 was not confirmed as a source of PCE contamination.

The primary source of PCE was Building 367, located approximately 1200 feet up gradient of Building 354 on Carr Avenue. This building is within the overall 354 site and was constructed in 1903. The building originally served as an artillery gun shed. Its current use is for storage and some limited small vehicle maintenance. It is on the National Register of Historic Places as part of the Main Post Historic District.

An area directly east and adjacent to Building 367 was subject to a pilot study to remove a 'hot spot' of contamination in the soil under 8" of asphalt. The treatment area was 40 ft by 70 ft and 10 ft deep. The area was characterized with direct push borings prior to treatment, with noted PCE levels as high as 13,200 µg/kg from the 0 – 1 ft interval; 29,000 µg/kg from the 1 – 4 ft interval; 860 J (J=estimated) µg/kg from 4 – 7 ft interval; and 262 µg/kg from the 7 – 10 ft interval. The soil was treated by mechanically mixing potassium permanganate with the soil to

destroy the PCE present. This process did not completely remediate the PCE below the target cleanup goal of 180 µg/kg, which was the soil to ground water residential RSK. Additionally, precipitation of manganese oxide plugged the porosity and did not permit the water to drain from the treated soil, making it impractical to add additional potassium permanganate slurry. Therefore, the saturated soil was excavated and placed in a bermed and lined land farm. It was disked and tested until the contaminants were below risk-based levels and then utilized as construction and demolition landfill cover on the installation (Burns & McDonnell, 2005). The excavated area was backfilled with clean borrow soil.

Ground water at the site can be characterized by two distinct unconsolidated aquifers. To the north of the site, are wells screened within the upland terrace aquifer. Ground water is present just above the bedrock surface and the saturated thickness ranges from zero (dry) to 16 ft. Flow direction is to the south. Down gradient and closer to the Kansas River is the alluvial aquifer, consisting of clay, silt, sand, and gravel; and flow direction is to southeast (Burns and McDonnell 2006).

The aquifer divide can be approximated by the topographic drop between wells TS092-01 and TS092-02 (Figure 1). Here, the surface elevation difference is 17.8 ft and depth to bedrock is 26 ft in well TS092-01 and 9.2 ft in well TS092-01 (Burns and McDonnell 1998).

Recent ground water depths from 2009, 2011, 2012, and 2014 are summarized below in Table 1 and indicate fairly stable static water levels over time.

Table 1. Ft. Riley OU 005, Summary of Recent Static Water Levels

Monitoring Well	TOC Elevation (ft AMSL)	March 2009		August 2011		April 2012		March 2014	
		Water Level (ft BTOC)	Water Level Elevation (ft AMSL)	Water Level (ft BTOC)	Water Level Elevation (ft AMSL)	Water Level (ft BTOC)	Water Level Elevation (ft AMSL)	Water Level (ft BTOC)	Water Level Elevation (ft AMSL)
TSO292-01	1084	24.54	1059.46	23.95	1059.6	24.4	1059.6	24.72	1059.28
TSO292-02	1066.02	14.09	1051.93	12.92	1052.32	13.7	1052.32	13.9	1052.12
354-99-09	1091.12	BTOC	ND	30.72	1060	31.12	1060	31.64	1059.48
354-01-27	1116.38	51.06	1065.32	49.67	165.44	50.94	1065.44	52.21	1064.17

AMSL = above mean sea level

BTOC = below top of casing

BTOP = below top of pump

ft = feet

ND = no data

TOC = top of casing

2.2 Contaminants as Defined in the Record of Decision

The ROD was completed for the site in 2006 (Burns & McDonnell, 2006). The Contaminants of Concern (COCs) listed in the ROD at the site are:

- Tetrachloroethylene (PCE) Maximum Contaminant Level (MCL) of 5 ug/L
- Trichloroethylene (TCE) MCL of 5 ug/L
- cis-1,2-Dichloroethylene (cis-1,2-DCE) MCL 70 ug/L
- Benzene MCL 5 ug/L

2.3 Selected Remedy in the Record of Decision

The remedy selected in the ROD was Monitored Natural Attenuation (MNA) with institutional controls (ICs). The remedy resulted in hazardous substances, pollutants, or contaminants remaining in the ground water at the 354 site above levels that allow for unlimited use and unrestricted exposure. Specifically, benzene exceeded the MCL in well TS0292-02 and PCE exceeded the MCL in wells 354-01-27, 354-99-09, and TS0292-01. All of these wells are screened within the terrace aquifer. There have been no detections above the MCLs in wells screened in the alluvial aquifer since 2004.

The Remedial Action Objectives (RAOs) for this site are:

1. Prevent the potential for degradation of the surface waters of the Kansas River by reducing levels or eliminating contaminants from the margin of the Kansas River alluvial aquifer.
2. Reduce contamination levels to below MCLs within the Kansas River alluvial aquifer through use of natural and/or active remedial processes.
3. Reduce contaminant levels, to the extent practicable and appropriate, within the terrace aquifer, through natural and/or active remedial processes.

The proposed changes outlined within this ESD address these RAOs by first, sampling the wells screened within the alluvial aquifer (354-99-13C, 354-99-12C, and 354-01-30C) to confirm that COCs are still below MCLs as stated in RAO Nos.1 and 2; and secondly, to actively stimulate naturally-occurring MNA processes, to better meet RAO No. 3.

The three years of post-ROD sampling were conducted per the requirements of the ROD. Monitoring wells were sampled semi-annually from 2001 through 2004 and annually from 2005 through 2009. A Remedial Action Completion Report was drafted in 2010 but was not finalized. Additional sampling was required before the site would be approved for closure. Additional sampling events were completed in August 2011, April 2012, March 2014, and July 2014. The noted increased PCE concentrations were observed in 2014 and represent similar concentrations observed after the Pilot Study/soil excavation near Building 367. The overall PCE concentrations trends remain downward, but are not decreasing as much as the 2011 and 2012 data indicated (Figure 2). The 2014 increased concentrations likely represent rebound of sorbed PCE mass from the soil into ground water.

3. Description and Basis of the Significant Difference

After the three consecutive years of ground water sampling when the post-ROD levels in the Kansas River alluvial aquifer levels were below MCLs, the supporting agencies required that those cleanup levels be achieved in the terrace deposits as well.

Monitoring wells 354-99-09, 354-01-27, and TSO292-01 continuously had detections of PCE in excess of the MCL. TSO292-02 regularly had detections of benzene above the MCL; however, unlike PCE, detections of benzene continue to steadily decrease. PCE and its degradation products have consistently been non-detect in MW TSO292-02. Table 2 contains the data that are pertinent to those monitoring wells.

Table 2. Ft. Riley OU 005, Data Summary (PCE, TCE, and benzene)

MCL Date	354-01-27		354-99-09		TSO292-01			TSO292-02
	PCE 5	TCE 5	PCE 5	TCE 5	PCE 5	TCE 5	Benzene 5	Benzene 5
Feb-00	NA	NA	25.1	0.6U	69.3	3.2	3.5	14.6
Jul-00	NA	NA	96.8	1.4	75.9	3.3	3.2	17.5
Oct-00	NA	NA	75.9	1.2	56.8	3.6	4.2	25.3
Mar-01	NA	NA	53.2	1	66.5	3.6	0.9	15.2
Oct-01	181	2.6	58.2	1.1	44.2	2.7	3	17.8
Jan-02	208	2.8	50.8	0.8	27.9	2.2	0.4U	31
Apr-02	166	2.5	29.3	0.6U	33	2.2	0.4U	37.4
Jul-02	179	3.2	27.5	0.6U	39	2.7	0.4U	40.3
Mar-03	180	1.9	31.7	0.7	32.6	3	0.4U	42.6
Sep-03	121	1.7	27.7	0.7	21.6	3	0.7	18.8
Apr-04	95.9	1.3	60	1.2	32.1	2.7	0.4U	7.5
Oct-04	71.7	1.2	37.8	0.7	24.8	3	0.4U	25
Apr-05	98.5	1	27.3	0.6U	55.8	3.8	0.4U	24
Sep-06	96.6	0.9	75.9	1.1	23.3	2.8	9.5	12.3
Apr-07	82.9	1.1	49	0.7	43	3.9	0.5U	10
Mar-08	76.1	1	39.4	0.6U	60.4	5.7	0.5	7.8
Mar-09	21.1	0.6J	34.5	0.6U	49.5	2.8	0.5U	4.3
Aug-11	28	1.0U	13	1.0U	20	2.1	0.2J	7.9
Apr-12	8.9	1.0U	8.1	1.0U	13	1.2	1.0U	3.3
Mar-14	94.1	1.4	33.1	0.45J	56.6	4.3	0.5 U	0.5 U
Jul-14	80.5	1.1	27.3	0.31	50.1	4.6	0.58 J	2.7

NA = not analyzed (well was not yet installed)

MCL = maximum contaminant level

J = estimated

U = below detection limit

Shaded - Exceeds MCL

Bold - Detection

All concentrations are in µg/L.

In 2012, the USEPA released new Integrated Risk Information System (IRIS) toxicity data for PCE (USEPA, 2012). USEPA indicated in the February 2012 publication, *Toxicological Review of Tetrachloroethylene (Perchloroethylene) (CAS No. 127-18-4)* that PCE was believed to be less carcinogenic than previous toxicity assessments, but slightly more toxic for noncancer effects. However, EPA's MCL, which is the ground water cleanup level for this site, remains unchanged at 5 ug/L. There will be no changes to the COCs outlined in the ROD and listed above in Section 2.2.

Prior to the March 2014 sampling event, the concentrations of PCE in the three monitoring wells were decreasing, as seen in Table 2. These decreasing values served as indications that Monitored Natural Attenuation was yielding a reduction in the PCE levels in the ground water. In March 2014, a sampling event was conducted at the site utilizing the four monitoring wells within the current sampling network. Monitoring wells 354-99-09, 354-01-27, and TSO292-01 showed levels of PCE similar to the 2006 levels. Another round of sampling was conducted in July 2014 to confirm the March 2014 results. The results indicated a minor decrease in PCE levels but still significantly elevated above previous concentrations.

3.1 Summary of Basis

In summary, active remediation is required to address the levels of PCE in the three terrace material monitoring wells identified as 354-01-27, 354-99-09, and TSO292-01. Continuing with the passive MNA remedy as stated in the ROD would result in ineffective PCE treatment of terrace ground water (RAO No. 3), that could eventually impact down gradient Kansas River alluvial ground water (RAO Nos. 1 and 2). Additionally, ground water sampling and analysis is recommended from the three alluvial wells, 354-99-13C, 354-99-12C, and 354-01-30C to confirm that concentrations are still below MCLs. These wells were last sampled in 2009.

The changed remedy will consist of *in situ* bioremediation of the soil and ground water in the upland terrace materials at the site followed by MNA in the terrace and alluvial aquifers in order to monitor remedial progress. *In situ* bioremediation will consist of injections of a carbon donor substrate in order to create a reducing environment in the subsurface that will promote anaerobic degradation of the PCE contamination by naturally-occurring microbial populations in the subsurface.

A potential course of action is to install a line of GeoProbe© injections with overlapping radii of influence up gradient and down gradient of each of the three terrace monitoring wells. The injections will be from just below the surface of the soil to the top of the ground water level. A substance such as emulsified soybean oil will be injected into the soil to ground water zone in order to enhance soil microbial activity. This proposed change is expected to result in the increased destruction of the PCE and its daughter products within the terrace aquifer.

After the injection of the soybean oil, a year of quarterly ground water sampling will be conducted, which will include the four terrace monitoring wells (354-01-27, 354-99-09, TSO292-01, and TSO292-02) as well as the remaining down gradient monitoring wells (354-99-12C, 354-99-13C, and 354-01-30C). This ground water monitoring will include analysis of contaminant concentrations as well as key parameters that provide information on the progress of

the anaerobic degradation process. Depending on the outcome of those initial sampling events, the next year's sampling may remain quarterly or be reduced to semi-annual. Based on the outcome of the data analyses, there may be indications for the need to perform additional injection treatments to effectively ensure the contamination does not degrade the Kansas River alluvial aquifer quality.

Quality Control Summary Reports will be prepared for each sampling event and an annual report will be prepared following each year of sampling. Sampling is projected for years 1 through 5 as follows, assuming that concentrations decline in the terrace wells, no exceedances are observed in the alluvial wells, and no additional injection is required:

- Quarterly sampling, year 1 (seven wells, four terrace and three alluvial)
- Semi-annual sampling, years 2 and 3 (four terrace wells only)
- Annual sampling, years 4 and 5 (four terrace wells only)

The final details of the injection program including locations, injected quantities, methods, carbon donor substrate, and any bioaugmentation, if necessary, will be presented in a work plan for KDHE and USEPA review before the start of any field work. Additionally, the final details of the follow-on ground water monitoring, to include frequency, sampling locations, and chemical analytes will be provided to KDHE and USEPA as part of this work plan.

The site has not achieved an unlimited use/unrestricted access (UU/UE) status. Until the remaining PCE levels fall below the MCL, the site will require completion of five-year reviews per 40 CFR Part 300.430(f)(4)(ii) of the National Oil and Hazardous Substance Pollution Control Act (NCP).

4. Agency Comments

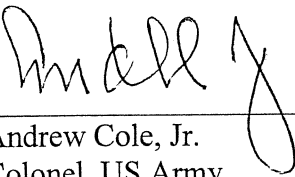
The support agencies of the USEPA, Region 7 and the KDHE support the conclusions of the ESD.

5. Public Participation

The Department of the Army – Fort Riley will publish public notices in the following local newspapers: the Manhattan Mercury, the Junction City Daily Union, and the 1st Infantry Division Post in accordance with the requirement set out in the NCP 40 CFR Part 300.435(c)(2)(i).

6. Affirmation of Statutory Determinations

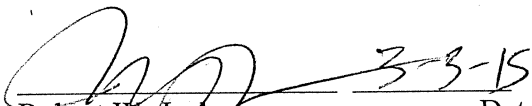
The Department of Army – Fort Riley believes that the MNA portion of the ROD for the 354 Area Solvent Detections Operable Unit 005 site is not functioning adequately to protect the alluvial aquifer of the Kansas River. It has been determined that remediation involving *in situ* bioremediation of the soil and ground water in the terrace materials is necessary based on increasing PCE concentrations above MCLs. This ESD represents a significant change to the ROD by adding an active component to the selected remedy. The active component is proposed as an addition to MNA in accordance with Remedial Action Objective 3, so that the remedy is compliant with the statutory requirements of CERCLA, specifically Section 121, and remains protective of human health and the environment.



Andrew Cole, Jr.
Colonel, US Army
Garrison Commander

23 Feb 15

Date



Robert W. Jackson
Superfund Division
US EPA, Region 7

3-3-15

Date

7. References

Burns & McDonnell, 1998. *Draft Final Initial Field Investigation Report for the Former Building 354 at Main Post, Fort Riley, Kansas.*

Burns & McDonnell, 2005. *Pilot Study Report, Pilot Study for Soil Remediation, 354 Area Solvent Detections (Operable Unit 005) at Main Post, Fort Riley, Kansas.*

Burns & McDonnell, 2006. *Record of Decision 354 Area Solvent Detections (Operable Unit 005) at Main Post Fort Riley, Kansas.*

Dames & Moore, 1995. *Building 354 Site Investigation: POL UST Investigations/Remedial Action Plans, Fort Riley, Kansas.*

United States Army Corps of Engineers (USACE), 1995. *Preliminary Evaluation of Data: Building 354 Solvent Detections, Fort Riley, Kansas.*

United State Environmental Protection Agency, 2012. *Toxicological Review of Tetrachloroethylene (Perchloroethylene) (CAS No. 127-18-4), In Support of Summary Information on the Integrated Risk Information System (IRIS).*



Explanation of Significant Differences
 354 Area Solvent Detections Operable Unit 005, Fort Riley, Kansas

Figure 2
PCE in MWs 354-99-09, 354-03-27, and TSO292-01

