TETRA TECH

August 23, 2017

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Subject: **Final Report (Revision 02)**
Des Moines TCE Site, Des Moines, Iowa
U.S. EPA Region 7 START 4, Contract No. EP-S7-13-06, Task Order No. 0144
Task Monitor: Tonya Howell

Dear Ms. Howell:

Tetra Tech, Inc. is submitting the attached Final Report (Revision 02) that summarizes field work, trend results, and the risk assessment addendum associated with site data collected in June 2016 at the Des Moines TCE site in Des Moines, Iowa.

If you have any questions or comments, please contact me at (816) 412-1767.

Sincerely,

Mike Williams

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Enclosures

cc: Debra Dorsey, START Project Officer (cover letter only)

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FINAL REPORT
FOR
DES MOINES TCE SITE
DES MOINES, IOWA

Superfund Technical Assessment and Response Team (START) 4
Contract No. EP-S7-13-06, Task Order 0144

Prepared For:

U.S. Environmental Protection Agency
Region 7
11201 Renner Blvd.
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August 23, 2017

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ACRONYMS

ARAR	Applicable or relevant and appropriate requirement
bgs	Below ground surface
BMS	Building material sample
cm	Centimeter
Dico	Dico, Inc.
DPT	Direct-push technology
EPA	U.S. Environmental Protection Agency
FD	Field duplicate
ft	Feet
IC	Institutional control
in	Inch
O&M	Operations and maintenance
OU	Operable unit
PCB	Polychlorinated biphenyl
PCE	Tetrachloroethene
QAPP	Quality Assurance Project Plan
SB	Soil boring
START	Superfund Technical Assistance and Response Team
TBD	To be determined
TCE	Trichloroethene
Tetra Tech	Tetra Tech, Inc.
VOC	Volatile organic compound
WS	Wipe sample

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1.0 INTRODUCTION

The U.S. Environmental Protection Agency (EPA) directed the Tetra Tech Inc. (Tetra Tech) Superfund Technical Assessment and Response Team (START) to prepare a Final Report to present the results of site characterization data collected in 2016 at the Des Moines Trichloroethene (TCE) site (the site) in Des Moines, Iowa (see Figure 1). This report also summarizes a Human Health Risk Assessment addendum completed in January 2017.

The site is in south-central Des Moines on the east side of the Raccoon River (Figure 1). In all, the site encompasses more than 200 acres, which includes the property formerly operated by Dico, Inc. (Dico). The Dico property occupies approximately 43 acres and is the focus of this report. It is southwest of the intersection of W. Martin Luther King Jr. Parkway and SW 16th Street in Des Moines, Polk County, Iowa. The Dico property includes several buildings used for a variety of industrial operations throughout its history. Buildings remaining on the Dico property to be addressed in this report include the Production Building; Buildings 1, 2, and 3; and slab foundations remaining for the Maintenance Building and Buildings 4 and 5. A former office building is also located on the Dico property, but is not addressed in this report. In addition to the buildings, the Dico property includes a large area of soil contamination covered by an asphalt cap, a groundwater extraction system and air stripping tower, and a surface water feature at the south end of the site referred to as the "South Pond Area" (see Figure 2).

For approximately 40 years, historical operations at the site have included a variety of industrial uses and operations—steel wheel manufacturing, chemical and herbicide distribution, and pesticide formulation processes. Refer to the 1996 Feasibility Study for information on chemicals that were found in soil and groundwater (Black and Veatch 1996).

The site is divided into four areas known as operable units or OUs:

- OU1 – groundwater TCE plume
- OU2 – originated as source soils associated with TCE groundwater contamination, but later focused on residual pesticides and metals in shallow soils
- OU3 – source area of tetrachloroethene (PCE) groundwater contamination north of the site
- OU4 – pesticides in soil and pesticides and polychlorinated biphenyls (PCB) in buildings on the southern end of the site (including the South Pond Area), and in drainage areas of the site.

In the mid-1990s, several response actions addressed contamination at the site by cleaning building

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interior surfaces and encapsulating PCBs and pesticides in the building insulation and porous surfaces, and by capping contaminated surface soils. In addition, contaminated soils were removed from a drainage ditch adjacent to the east of the site and from the South Pond Area (EPA 2012).

Manufacturing operations at the site have ended, and the only activities currently conducted on site include operation and maintenance of a groundwater extraction and treatment system, and maintenance of an asphalt cap. The site is fenced, and the property owner provides site security.

Land use in the surrounding area is changing and much of this area has been rezoned. The City of Des Moines is planning a major redevelopment project in the River Point West area east of the site. The Dico property was previously zoned for industrial use. However, on June 13, 2005, most of the Dico property was rezoned to the Central Business Mixed Use District C-3 B designation.

The purpose of this Final Report is to present the results of site characterization data collected in June 2016 and to summarize the risk assessment addendum completed in January 2017.

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2.0 BACKGROUND

This Final Report summarizes and includes two other reports:

1. Field Summary Trip Report (Final), dated October 28, 2016 (Appendix A)
2. Human Health Risk Assessment Addendum (Final), dated January 26, 2017 (Appendix B)

The Field Summary Trip Report (Appendix A) (1) provides information on soil, sediment, and surface water at the site; and (2) assesses remaining buildings for hazardous chemicals in anticipation of possible building demolition and redevelopment. Tetra Tech collected the following samples within current and former building areas: dust wipe samples from building surfaces, samples of building materials, concrete samples from building foundations and slabs, and soil samples. Sediment and surface water samples were collected within the South Pond Area. Sampling activities occurred during June 6-10, 2016.

The Human Health Risk Assessment Addendum report (Appendix B) was written to evaluate whether site-related chemicals may cause health problems to people on site now or in the future. Tetra Tech did not conduct an ecological risk assessment because EPA had already done so in October 2015 (EPA 2015).

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3.0 FIELD WORK

Tetra Tech collected the following samples within current and former building areas: dust wipes from building surfaces, samples of building materials, concrete samples from building foundations and slabs, and soil samples from below building slabs. Sediment and surface water samples were collected within the South Pond Area.

Sampling activities occurred during June 6-10, 2016, involving three sampling personnel and a small drilling rig that pushes metal pipes into the ground to allow collection of soil samples. The small drilling rig is called a direct-push technology (DPT) rig.

Summaries of samples collected during this investigation are in Appendix B to the Field Summary Trip Report (Appendix A to this document). Copies of field logbooks are in Appendix C to the Field Summary Trip Report. The plan showing how samples were to be collected appears in a report known as the Quality Assurance Project Plan (QAPP) which was reviewed and approved by EPA prior to collecting samples (Tetra Tech 2016). Samples were delivered to the EPA Region 7 laboratory in Kansas City, Kansas, and Pace Analytical, a laboratory in Lenexa, Kansas. Figures 3 through 6 show sampling locations. Chemicals of concern are chemicals that were used in the former buildings and considered hazardous substances based on environmental regulations or because they may harm human health or the environment. These chemicals include the following:

- Pesticides and herbicides used to control insects or weeds. These are commonly found in homes, and if used properly, are considered safe. Because the former company at this facility created and stored pesticides, certain environmental regulations consider these chemicals to be listed or characterized as hazardous.
- PCBs are a mixture of chemical compounds commonly used as coolants and lubricants in electrical equipment because they don't burn easily and are good insulators. PCBs may be harmful to humans and the environment if detected at high enough levels.
- Dioxins are chemicals that sometimes form during production of pesticides or burning of certain materials. Dioxins accumulate in fatty tissue and can be harmful to insects, fish, birds, and mammals, including humans.
- Volatile organic compounds (VOC) are chemicals that vaporize easily or change from a liquid to a gas. VOCs of concern at this facility include organic chemicals that contain chlorine. These chemicals with chlorine—such as TCE—are often used by companies to dissolve grease and are called solvents.

3.1 DUST WIPE SAMPLING SUMMARY

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Dust wipe samples were collected by use of gauze pads similar to gauze pads in first aid kits. The pads were wetted with a chemical and used to collect a sample by wiping a small area of 10 centimeters (cm) by 10 cm, which is approximately 4 inches (in.) by 4 in. Four wipe samples were collected from each of Buildings 1, 2, and 3. Ten wipe samples were collected at the Production Building from building foundation structures such as brick, concrete slab floors, sheet metal, and structural steel beams (see Figure 3). Dust wipe samples were analyzed for PCBs, pesticides, and dioxins (see Appendix C).

3.2 BUILDING MATERIALS SAMPLING SUMMARY

Building material samples were collected as follows: three at Building 1, six at Building 2, four at Building 3, and 11 at the Production Building (see Figure 4). Samples were collected from insulation, wood, brick, and other materials by use of a knife, chisel, hammer, or other hand tool. Samples were then analyzed for PCBs, pesticides, and dioxins (see Appendix C).

3.3 CONCRETE SAMPLING SUMMARY

Samples of concrete building foundation slabs were collected by use of a DPT rig equipped with a hammer drilling attachment. Concrete samples were collected by coring through building slabs at DPT soil boring locations (soil samples were collected beneath the slabs); consequently, both concrete and soil boring samples contain the designation "SB" in their sample names. A total of 17 concrete samples were tested for PCBs, pesticides, and dioxins (see Figure 5 and Appendix C).

3.4 SUB-SLAB SOIL SAMPLING SUMMARY

Soil borings were drilled at 17 locations (two to four per building). These boring locations were at the same locations as the concrete coring locations discussed in Section 3.3. Sample locations are depicted on Figure 5, and results are presented in Appendix C.

DPT soil borings were drilled to final depths between 15 and 25 feet below ground surface (bgs). Wet soils were encountered at depths ranging from 13 to 19 feet bgs. Soil consisted of clay and silt and occasionally fill material, such as red brick, coarse gravels and sands, concrete, black cinders, and charcoal. Saturated, coarse-grained sands were encountered in several borings at depths ranging from 13 to 19 feet bgs. Bedrock lies below soil, but it was not encountered in any of the borings during this investigation.

Soil samples were collected from each boring directly below concrete (identified as 0-2 feet bgs).

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Subsurface samples were collected within depth intervals of 8-10, 13-15, and 18-20 feet bgs, depending on depth of groundwater and field observations such as staining or odors indicating presence of contaminants. Each soil boring was described and logged by a geologist (see Appendix D to the Field Summary Trip Report).

Soil samples were submitted to EPA Region 7 laboratory in Kansas City, Kansas, for analyses for VOCs, PCBs, pesticides, and herbicides. Soil samples from the shallow sample interval (0-2 feet bgs) at each boring location were also submitted to Pace Analytical to determine if dioxins were present.

3.5 SURFACE WATER / SEDIMENT SAMPLING SUMMARY

Tetra Tech collected 10 sediment samples and two surface water samples within the South Pond Area. Sediment samples were collected within the top 6 inches of pond sediment, near water's edge, by use of a hand shovel.

One of the two surface water samples was collected at the inlet of the pond, and the other at the outfall of the pond. Sample locations are shown on Figure 6.

Sediment and surface water samples were submitted to the EPA Region 7 laboratory for analyses for VOCs, PCBs, pesticides, and herbicides. See Appendix C for analytical data.

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4.0 RESULTS

This section summarizes results from samples collected at the site.

4.1 BUILDING 1 CHEMICALS DETECTED

Pesticides, PCBs, dioxins, herbicides, and VOCs were detected at Building 1 as listed in Table 1 below. Figures 7a-10c show the chemicals detected at all buildings at the site. For a complete list of chemical results, see Appendix D.

TABLE 1

SUMMARY OF BUILDING 1 CHEMICALS DETECTED

Sample	Type of Material	Chemical
WS-09	Concrete floor	Pesticides and Dioxins
WS-10	Brick	Pesticides
WS-11	Sheet metal	Pesticides, PCBs, and Dioxins
WS-12	Metal box	Pesticides, PCBs, and Dioxins
BMS-11	Insulation	Pesticides, PCBs, and Dioxins
BMS-12	Drywall	Pesticides, PCBs, and Dioxins
BMS-13	White surface coating	Pesticides and Dioxins
SB-12	Concrete	Pesticides and Dioxins
SB-13	Concrete	Pesticides and Dioxins
SB-12 (0-2 ft)	Soil	Pesticides, Dioxins, and VOCs
SB-12 (8-10 ft)	Soil	Pesticides and VOCs
SB-12 (13-15 ft)	Soil	Pesticides and VOCs
SB-12 (18-20 ft)	Soil	Pesticides and VOCs
SB-13 (0-2 ft)	Soil	Pesticides, Dioxins, Herbicides, and VOCs
SB-13 (8-10 ft)	Soil	Pesticides and VOCs
SB-13 (13-15 ft)	Soil	Pesticides and VOCs
SB-13 (18-20 ft)	Soil	Pesticides

Notes:

BMS Building material sample
ft Feet
PCB Polychlorinated biphenyl
SB Concrete or soil boring sample
VOC Volatile organic compound
WS Wipe sample

4.2 BUILDING 2 CHEMICALS DETECTED

Pesticides, PCBs, dioxins, and VOCs were detected at Building 2 as listed in Table 2 below. Figures 7a-10c show the chemicals detected at all buildings at the site. For a complete list of chemical results, see Appendix D.

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TABLE 2

SUMMARY OF BUILDING 2 CHEMICALS DETECTED

Sample	Type of Material	Chemical
WS-05	Concrete floor	Pesticides, PCBs, and Dioxins
WS-06	Brick wall	No chemicals detected.
WS-07	I-Beam	Pesticides
WS-08	Sheet metal	No chemical detected.
BMS-05	Brick	Pesticides and Dioxins
BMS-06	Insulation	Pesticides, PCBs, and Dioxins
BMS-07	Cinder block	Pesticides, PCBs, and Dioxins
BMS-08	White surface coating	Pesticides, PCBs, and Dioxins
BMS-09	Drywall	Pesticides, PCBs, and Dioxins
BMS-10	Brick	Pesticides and Dioxins
SB-09	Concrete	Pesticides and Dioxins
SB-10	Concrete	Pesticides and Dioxins
SB-10 (FD)	Concrete	Pesticides (analysis for Dioxins did not occur)
SB-11	Concrete	Pesticides and Dioxins
SB-09 (0-2 ft)	Soil	Pesticides, Dioxins, and VOCs
SB-09 (8-10 ft)	Soil	Pesticides and VOCs
SB-09 (13-15 ft)	Soil	VOCs
SB-10 (0-2 ft)	Soil	VOCs and Dioxins
SB-10 (8-10 ft)	Soil	VOCs
SB-10 (13-15 ft)	Soil	VOCs
SB-11 (0-2 ft)	Soil	Pesticides, Dioxins, and VOCs
SB-11 (8-10 ft)	Soil	Pesticides and VOCs
SB-11 (13-15 ft)	Soil	VOCs
SB-11 (18-20 ft)	Soil	Pesticides and VOCs

Notes:

BMS Building material sample
FD Field duplicate
ft Feet
PCB Polychlorinated biphenyl
SB Concrete or soil boring sample
VOC Volatile organic compound
WS Wipe sample

4.3 BUILDING 3 CHEMICALS DETECTED

Pesticides, PCBs, dioxins, and VOCs were detected at Building 3 (see Table 3 below). Figures 7a-10c show chemicals detected at all buildings at the site. For a complete list of chemical results, see Appendix D.

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TABLE 3

SUMMARY OF BUILDING 3 CHEMICALS DETECTED

Sample	Type of Material	Chemical
WS-01	Brick	Dioxins
WS-02	I-Beam	No chemical detected.
WS-03	Concrete floor	Pesticides, PCBs, and Dioxins
WS-04	Metal surface	No chemicals detected.
BMS-01	Brick	Pesticides, PCBs, and Dioxins
BMS-02	Insulation	Pesticides, PCBs, and Dioxins
BMS-03	Cinder block	Pesticides and Dioxins
BMS-04	White surface coating	Pesticides, PCBs, and Dioxins
SB-07	Concrete	Pesticides and Dioxins
SB-08	Concrete	Pesticides and Dioxins
SB-07 (0-2 ft)	Soil	VOCs
SB-07 (0-2 ft) (FD)	Soil	Pesticides and VOCs
SB-07 (8-10 ft)	Soil	VOCs
SB-07 (13-15 ft)	Soil	VOCs
SB-07 (18-20 ft)	Soil	VOCs
SB-08 (0-2 ft)	Soil	Pesticides, Dioxins, and VOCs
SB-08 (8-10 ft)	Soil	Pesticides and VOCs
SB-08 (13-15 ft)	Soil	VOCs

Notes:

BMS Building material sample
FD Field duplicate
ft Feet
PCB Polychlorinated biphenyl
SB Concrete or soil boring sample
VOC Volatile organic compound
WS Wipe sample

4.4 FORMER BUILDING 4 CHEMICALS DETECTED

Chemicals detected at the former Building 4 included pesticides, dioxins, and VOCs (see Table 4 below). Figures 7a-10c show chemicals detected at all buildings at the site. For a complete list of chemical results, see Appendix D.

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TABLE 4

SUMMARY OF FORMER BUILDING 4 CHEMICALS DETECTED

Sample	Type of Material	Chemical
SB-03	Concrete	Pesticides and Dioxins
SB-04	Concrete	Pesticides and Dioxins
SB-03 (0-2 ft)	Soil	VOCs and Dioxins
SB-03 (8-10 ft)	Soil	VOCs
SB-03 (13-15 ft)	Soil	Pesticides and VOCs
SB-03 (18-20 ft)	Soil	VOCs
SB-04 (0-2 ft)	Soil	Pesticides, Dioxins, and VOCs
SB-04 (0-2 ft) (FD)	Soil	VOCs
SB-04 (8-10 ft)	Soil	VOCs
SB-04 (13-15 ft)	Soil	Pesticides and VOCs
SB-04 (18-20 ft)	Soil	Pesticides and VOCs

Notes:

FD Field duplicate
ft Feet
SB Concrete or soil boring sample
VOC Volatile organic compound

4.5 FORMER BUILDING 5 CHEMICALS DETECTED

Pesticides, herbicides, dioxins, and VOCs were detected at the former Building 5 as listed in Table 5 below. Figures 7a-10c show chemicals detected at all buildings at the site. For a complete list of chemical results, see Appendix D.

TABLE 5

SUMMARY OF FORMER BUILDING 5 CHEMICALS DETECTED

Sample	Type of Material	Chemical
SB-01	Concrete	Pesticides and Dioxins
SB-02	Concrete	Pesticides and Dioxins
SB-01 (0-2 ft)	Soil	VOCs
SB-01 (8-10 ft)	Soil	VOCs and Herbicides
SB-01 (13-15 ft)	Soil	Pesticides and VOCs
SB-01 (18-20 ft)	Soil	VOCs
SB-02 (0-2 ft)	Soil	VOCs and Dioxins
SB-02 (8-10 ft)	Soil	Pesticides and VOCs
SB-02 (13-15 ft)	Soil	Pesticides and VOCs
SB-02 (18-20 ft)	Soil	Pesticides and VOCs

Notes:

ft Feet
SB Concrete or soil boring sample
VOC Volatile organic compound

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4.6 FORMER MAINTENANCE BUILDING CHEMICALS DETECTED

Samples collected at the former Maintenance Building included pesticides, dioxins, and VOCs (see Table 6 below). Figures 7a-10c show chemicals detected at all buildings at the site. For a complete list of chemical results, see Appendix D.

TABLE 6

SUMMARY OF FORMER MAINTENANCE BUILDING CHEMICALS DETECTED

Sample	Type of Material	Chemical
SB-05	Concrete	Pesticides and Dioxins
SB-06	Concrete	Pesticides and Dioxins
SB-05 (0-2 ft)	Soil	VOCs and Dioxins
SB-05 (8-10 ft)	Soil	Pesticides and VOCs
SB-05 (13-15 ft)	Soil	Pesticides and VOCs
SB-05 (18-20 ft)	Soil	VOCs
SB-06 (0-2 ft)	Soil	VOCs and Dioxins
SB-06 (8-10 ft)	Soil	Pesticides and VOCs
SB-06 (13-15 ft)	Soil	VOCs
SB-06 (18-20 ft)	Soil	VOCs

Notes:

ft Feet
SB Concrete or soil boring sample
VOC Volatile organic compound

4.7 PRODUCTION BUILDING CHEMICALS DETECTED

Pesticides, dioxins, PCBs, and VOCs were detected at the Production Building (see Table 7 below). Figures 7a-10c show chemicals detected at all buildings at the site. For a complete list of chemical results, see Appendix D.

TABLE 7

SUMMARY OF PRODUCTION BUILDING CHEMICALS DETECTED

Sample	Type of Material	Chemical
WS-13 and WS-13 (FD)	Concrete floor	Pesticides and Dioxins
WS-14	Concrete floor	Pesticides and Dioxins
WS-15	Concrete floor	Pesticides and Dioxins
WS-16	I-Beam	No chemicals detected.
WS-17	I-Beam	PCBs and Dioxins
WS-18	I-Beam	No chemicals detected.
WS-19	Sheet metal	PCBs
WS-19 (FD)	Sheet metal	No chemicals detected.
WS-20	Sheet metal	No chemicals detected.

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TABLE 7 (Continued)

SUMMARY OF PRODUCTION BUILDING CHEMICALS DETECTED

WS-21	Brick	Dioxins
WS-22 and WS-22 (FD)	Brick	Pesticides and Dioxins
BMS-14	Large brick	Pesticides, PCBs, and Dioxins
BMS-15	Small brick	Pesticides and Dioxins
BMS-16	Cinder block	Pesticides, PCBs, and Dioxins
BMS-17	Insulation – ceiling	Pesticides, PCBs, and Dioxins
BMS-18	Drywall	Pesticides and Dioxins
BMS-19	Pink insulation	Pesticides, PCBs, and Dioxins
BMS-20	Ridged brick material	Pesticides, PCBs, and Dioxins
BMS-21	White surface coating	Pesticides and Dioxins
BMS-22	Insulation	Pesticides and Dioxins
BMS-23	Interior wood wall	Pesticides and Dioxins
BMS-24	Wooden structure material	Pesticides and Dioxins
SB-14	Concrete	Pesticides and Dioxins
SB-15	Concrete	Pesticides and Dioxins
SB-16	Concrete	Pesticides and Dioxins
SB-17	Concrete	Pesticides and Dioxins
SB-14 (0-2 ft)	Soil	Pesticides, Dioxins, and VOCs
SB-14 (8-10 ft)	Soil	Pesticides and VOCs
SB-14 (8-10 ft) (FD)	Soil	Pesticides and VOCs
SB-14 (13-15 ft)	Soil	Pesticides and VOCs
SB-15 (0-2 ft)	Soil	Pesticides, Dioxins, and VOCs
SB-15 (8-10 ft)	Soil	Pesticides and VOCs
SB-15 (13-15 ft)	Soil	VOCs
SB-16 (0-2 ft)	Soil	Pesticides, Dioxins, and VOCs
SB-16 (8-10 ft)	Soil	VOCs
SB-16 (13-15 ft)	Soil	VOCs
SB-16 (18-20 ft)	Soil	VOCs
SB-17 (0-2 ft)	Soil	Pesticides, Dioxins, and VOCs
SB-17 (8-10 ft)	Soil	VOCs
SB-17 (8-10 ft) (FD)	Soil	Pesticides and VOCs
SB-17 (13-15 ft)	Soil	VOCs
SB-17 (13-15 ft) (FD)	Soil	No chemicals detected.
SB-17 (18-20 ft)	Soil	VOCs

Notes:

BMS Building material sample
FD Field duplicate
ft Feet
PCB Polychlorinated biphenyl
SB Concrete or soil boring sample
VOC Volatile organic compound
WS Wipe sample

4.8 SOUTH POND AREA CHEMICALS DETECTED

South Pond Area sediment and surface water samples indicated presence of pesticides and VOCs (see Table 8 below). These detections are shown on Figure 11, and all details are in Appendix D. Further evaluation is in Section 5.0 and the Risk Assessment Addendum (Appendix B).

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TABLE 8

SUMMARY OF SOUTH POND CHEMICALS DETECTED

Sample	Type of Material	Chemical
SD-01	Sediment	Pesticides and VOCs
SD-02	Sediment	Pesticides and VOCs
SD-02 (FD)	Sediment	Pesticides and VOCs
SD-03	Sediment	Pesticides and VOCs
SD-04	Sediment	Pesticides and VOCs
SD-05	Sediment	Pesticides and VOCs
SD-06	Sediment	Pesticides and VOCs
SD-07	Sediment	Pesticides and VOCs
SD-08	Sediment	Pesticides and VOCs
SD-09	Sediment	Pesticides and VOCs
SD-10	Sediment	Pesticides and VOCs
SW-01	Surface water	Pesticides and VOCs
SW-01 (FD)	Surface water	Pesticides
SW-02	Surface water	Pesticides and VOCs

Notes:

FD Field duplicate
SD Sediment sample
SW Surface water sample
VOC Volatile organic compound

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5.0 RISK ASSESSMENT SUMMARY AND CONCLUSIONS

This section summarizes and presents conclusions of the Human Health Risk Assessment Addendum (risk assessment) completed in January 2017. This addendum was based solely on data collected during the 2016 site characterization study and recent groundwater data collected by the property owner, and does not represent a comprehensive evaluation of risks posed by contaminants across the entire site.

In general, a risk assessment proceeds as follows: (1) looks at detected concentrations of chemicals, (2) uses values from scientific studies to estimate about how much time a person might spend on site, and (3) based on (1) and (2), determines risk or the chance that a chemical on site might cause a health problem to human populations. Risks are of two types. The first risk is from cancer, and it is referred to simply as "risk." The second risk is possibility of a noncancerous health problem, known as a "hazard."

The following sections discuss risk assessment objectives, exposure areas, approach, and results, and present overall conclusions regarding the site.

5.1 OBJECTIVES

The 2017 risk assessment evaluated current and possible future health risks and hazards associated with exposure to chemicals detected during the limited data collection effort conducted at the site in June 2016, plus recent groundwater data collected by the property owner. Primary objectives of the risk assessment were as follows:

- To determine if detected, site-related chemicals pose unacceptable risks or hazards to current and future human populations
- To provide information on potential risk and hazards during future land use.

5.2 EXPOSURE AREAS

The risk assessment evaluated potential exposures and related risks and hazards at on-site locations from exposures to site soils beneath existing buildings, groundwater, and surface water and sediment at the South Pond Area.

5.3 RISK ASSESSMENT APPROACH

The risk assessment followed EPA guidance (EPA 1989), and included the following: (1) data evaluation and selection of chemicals, (2) exposure assessment, (3) toxicity assessment, and (4) risk characterization.

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Details of the risk assessment approach are in Appendix B.

This risk assessment considers soils, sediment, surface water, groundwater, air within a hypothetical construction trench, and vapors that could move from below ground into houses or buildings. Potential exposures include direct and indirect exposures to groundwater, soils, sediment, surface water, and vapors. This risk assessment addendum only considers data collected during the June 2016 site sampling effort and recent groundwater data collected by the property owner, and does not consider exposures to soil beneath the existing asphalt cap which covers much of the Dico property.

The site assessment considered human populations and different ways that someone could be exposed to a chemical, as follows:

Targeted Populations and Exposure Routes

- **Future Resident:** A future resident would live in a house built on site. A future resident could be exposed to chemicals in surface soil and subsurface soil, and to groundwater, but only if future residents choose to use groundwater as a drinking water source, which is unlikely. Also, the future resident could be exposed to vapors coming from groundwater that could move indoors.

- **Future Industrial/Commercial Worker:** A future worker would not spend as much time as a resident at the site so he/she would not encounter the chemicals as often. Future workers could be exposed to chemicals in surface and subsurface soils and groundwater. Also, they could be exposed to vapors in indoor air that come from groundwater. Although unlikely, future workers could use groundwater as a drinking water source.

- **Future Outdoor Worker:** One potential future site use could be as a recreational facility, such as a park with athletic fields. This would require a staff of workers to maintain these fields at the site. These workers would be exposed to soils only, either surface soils or subsurface soils, assuming significant regrading of the site.

- **Future Construction/Utility Workers:** Construction workers could be exposed to site-related chemicals while working temporarily in construction at the site. Therefore, the future on-site construction worker could be exposed to chemicals in surface soil, subsurface soil (0-10 feet bgs, assuming soil activities that disturb deeper soils), groundwater, and vapors from groundwater in a construction trench.

- **Future Recreational User:** One potential future site use is as a recreational facility. A recreational user would engage in a variety of activities at locations on the site including, but not limited to, trails, athletic fields, and vegetated areas. These activities would include uses of athletic fields for baseball, football, and soccer; of playground equipment; and of trails or paths around the park. Picnics and other similar activities in the park also would occur. As part of their activities, recreational visitors could be exposed to surface soils and subsurface soils (0-10 feet bgs), presuming the site will have undergone redevelopment to become a park, and subsurface site soils will have been mixed and redistributed at the surface. The site has a small pond on the southern portion, and assuming this pond will remain after redevelopment, the recreationalist may be exposed to sediment and surface water from wading in the pond.

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- **Current and Future Trespasser:** Evidence of trespassing has been observed at the site. Therefore, current trespassers could be exposed to chemicals in surface soil (0-2 feet bgs). If the site is redeveloped, future trespassers could be exposed to surface soils and subsurface soils (0-10 feet bgs). The trespasser would also be exposed to surface water and sediment from wading in the pond.

5.4 RISK ASSESSMENT RESULTS

This risk assessment evaluated potential exposures of targeted populations to chemicals detected in soil beneath existing buildings, surface water, sediment, and groundwater at the site. Risks and hazards were characterized for a series of targeted population types: residents, industrial/commercial workers, outdoor workers, construction and utility workers, recreationalists, and trespassers. Objectives of the risk assessment were to evaluate whether site-related chemicals present unacceptable risks and hazards to current and possible future populations, and to provide information to support decisions regarding future land use.

EPA has developed a risk range based on potential development of cancer over a lifetime. The bottom of the range is 1 death in a million or 1 divided by 1,000,000, which is 0.000001. In scientific notation, the number is 1E-06. The upper part of the range is 1 in 10,000 or 1E-04. When a risk exceeds 1E-04, it must be managed or removed; when risk is between 1E-04 and 1E-06, management of it may or may not be necessary; when below 1E-06, risk is low enough to be considered safe.

Regarding (noncancerous) hazards, chemicals may cause serious problems to human health, such as liver or kidney problems. By use of equations developed by EPA, and with knowledge of chemicals present and likely types of exposures, hazards can be added up. If the total of hazards—called the Hazard Index—exceeds 1, a threat to health is posed that may have to be addressed; when below 1, the threat to health is low enough to be considered safe.

The original risk assessment (Black & Veatch 1995) identified unacceptable risks associated with exposure to site soils, which contain aldrin, dieldrin, chlordane, and heptachlor. The unacceptable risks from site soils were addressed through the implementation of an asphalt cap. This risk assessment—which supplements the previous risk assessment—did not identify unacceptable risks (i.e., > 1E-04) to target populations from chemicals in soils below foundations or surface water; however, risks from TCE and vinyl chloride in groundwater and aldrin and dieldrin in sediment exceeded EPA's risk range. The following summary and conclusions are based on information presented in the Human Health Risk Assessment Addendum (Appendix B).

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- **Future Residents:** Total cancerous risk to future residents was 1 in 1,000 (1E-03), above EPA's risk range of 1E-06 to 1E-04. Cancer risk was driven by groundwater used for domestic purposes and inhalation of indoor air from vapor intrusion. Chemicals of concern are TCE and vinyl chloride. Total hazards for future residents exceeded 1 because of TCE in groundwater. Processes to remove/lower concentrations of TCE and vinyl chloride in groundwater are currently occurring at the site. This risk assessment identified risks to future residents from dioxins, DDT (a pesticide), chloroform and TCE in soils below foundations at the mid-point of EPA's risk range—approximately 9E-06 to 1E-05.

- **Future Industrial/Commercial Workers:** Total risk to future workers was 1 in 10,000 (1E-04), within EPA's risk range of 1E-06 to 1E-04. Cancer risk was driven by groundwater used for domestic purposes and inhalation of indoor air from vapor intrusion. Chemicals of concern are TCE and vinyl chloride. Total hazards for future workers exceeded 1 because of TCE in groundwater. Processes to remove/lower concentrations of TCE and vinyl chloride in groundwater are currently occurring at the site. This risk assessment identified risks to future workers from soils below foundations from 1E-06 to 2E-06, which is within EPA's risk range.

- **Outdoor Workers:** Total risk to outdoor workers was 2 in a million (2E-06), within EPA's risk range of 1E-06 to 1E-04. Risks were from surface and subsurface soils below foundations; however, no individual chemical had a cancer risk greater than 1E-06. Hazards were less than 1, meaning that no significant noncancerous hazards threaten human health.

- **Construction/Utility Worker:** Total risk for construction/utility workers was 1 in 100,000 (1E-05), within EPA's risk range of 1E-06 to 1E-04. Risk was due to TCE in groundwater. Total hazards for future construction/utility workers exceeded 1 because of TCE in groundwater.

- **Child Recreationalist:** Total cancer risk to recreational users, such as children playing on site, was 1 in 10,000 (1E-04). Cancer risk was primarily due to exposure to sediments in the South Pond, and to a lesser extent surface water and surface soil below foundations. Chemicals causing the risk were pesticides (aldrin and dieldrin) and dioxins. Total hazards for future recreational users exceeded 1 because of aldrin in sediment.

- **Adolescent Recreationalist:** Total risk was 4 in 100,000 (4E-05), within EPA's risk range of 1E-06 to 1E-04, but above the midpoint (1E-05) used for cleanup. Risks were due to dieldrin in surface water and aldrin and dieldrin in sediments. Hazards were less than 1, meaning that no significant noncancerous hazards threaten human health.

- **Adult Recreationalist:** Total risk was 3 in a 100,000 (3E-05), within EPA's risk range of 1E-06 to 1E-04, but above the midpoint (1E-05) used for cleanup. Risks were due to dieldrin in surface water and aldrin and dieldrin in sediments. Hazards were less than 1, meaning that no significant noncancerous hazards threaten human health.

- **Adolescent Trespasser:** Total risk was 2 in 100,000 (2E-05), within EPA's risk range of 1E-06 to 1E-04, but above the midpoint (1E-05) used for cleanup. Risks were due to dieldrin in surface water and aldrin and dieldrin in sediments. Hazards were less than 1, meaning that no significant noncancerous hazards threaten human health.

- **Adult Trespasser**: Total risk was 5 in 100,000 (5E-05), within EPA's risk range of 1E-06 to 1E-04, but above the midpoint (1E-05) used for cleanup. Risks were due to dieldrin in surface water

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and aldrin and dieldrin in sediments. Hazards were less than 1, meaning that no significant noncancer hazards threaten human health.

5.5 RISK ASSESSMENT UNCERTAINTIES

Risk assessments are based on many assumptions of what might happen, some of which may either overestimate or underestimate risks or hazards. See Appendix B for more information on the uncertainties.

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6.0 SUMMARY AND CONCLUSIONS

START was tasked by EPA Region 7 Superfund to prepare a Final Report regarding the Des Moines TCE site in Des Moines, Iowa. The purpose of this Final Report is to present the results of site characterization data collected in June 2016 and to summarize the risk assessment addendum completed in January 2017.

Tetra Tech conducted a limited site characterization including the collection of chemical samples of building materials, soil below buildings, and sediment and surface water from the South Pond Area. Sampling occurred during the week of June 6, 2016 (Appendix A). Chemicals known as pesticides and VOCs were detected at all buildings and within the South Pond Area in surface water and sediment. Dioxins were found in all buildings. PCBs were detected only in Buildings 1, 2, and 3 and the Production Building. Herbicides were detected in Buildings 1 and 5. Tables 1 through 8 list the types of chemicals detected. Figure 1 shows the location of the site. Figure 2 shows the site layout. Figures 3 through 6 show locations of samples. Figures 7a through 11 show chemicals detected at sampling locations.

A risk assessment addendum was also prepared to aid in decision-making about removing buildings and cleaning the pond area south of the buildings (Appendix B). The risk assessment considered different types of people who might encounter chemicals now or in the future. The results indicated risk in the future from groundwater unless buildings are protected from underground vapors and no one is allowed to drink groundwater at the site. Treatment of chemicals in groundwater is currently occurring to remove them/lower their concentrations in order to reduce risk. Results also showed risk from chemicals in sediment and surface water at the South Pond Area to current and future workers, trespassers, or recreational users. Laboratory results appear in Appendices C and D.

Before future development of the site, decision makers should consider the findings of this report, reports included as appendices, and historical information about the Des Moines TCE site.

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7.0 REFERENCES

Black & Veatch Waste Science, Inc. 1995. Final Baseline Risk Assessment Des Moines TCE Site Operable Unit No. 4, Des Moines, Iowa. June 21.

Black & Veatch Special Projects Corp. 1996. Final Feasibility Study for the Des Moines TCE Site Operable Unit Nos. 2 and 4, Des Moines, Iowa. May 30.

Tetra Tech, Inc. (Tetra Tech). 2016. Quality Assurance Project Plan for Site Characterization Sampling Activities. Des Moines TCE Site, Des Moines, Iowa. May 23.

U.S. Environmental Protection Agency (EPA). 1989. *Risk Assessment Guidance for Superfund (RAGS). Volume I, Human Health Evaluation Manual (Part A)*, Interim Final. Office of Emergency and Remedial Response (OERR). Washington, DC. EPA/540/1-89/002. December.

EPA. 2012. Fact Sheet. Fifth Five-Year Review to Begin, Des Moines TCE Superfund Site, Des Moines, Polk County, Iowa. February. https://archive.epa.gov/region07/factsheets/web/html/5th_five_yr_des_moines_tce_sprfnd_des_moines_ia.html

EPA. 2015. "Screening Level Ecological Risk Assessment, South Pond Area, Des Moines TCE Site." Region 7.

FIGURES

ACRONYMS FOR FIGURES

$\mu g/cm^2$	Micrograms per square centimeter
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
bgs	Below ground surface
BHC	Benzene hexachloride
BMS	Building material sample
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
ft	Feet
HpCDD	Heptachlorodibenzo-p-dioxin
HpCDF	Heptachlorodibenzofuran
HxCDD	Hexachlorodibenzo-p-dioxin
HxCDF	Hexachlorodibenzofuran
J	Estimate
ng/kg	Nanograms per kilogram
ng/m^2	Nanograms per square meter
OCDD	Octachlorodibenzodioxin
OCDF	Octachlorodibenzofuran
PeCDD	Pentachlorodibenzo-p-dioxin
PeCDF	Pentachlorodibenzofuran
PRG	Preliminary remediation goal
RSL	Regional screening level
SB	Soil boring
SD	Sediment
SW	Surface water
TCDD	Tetrachlorodibenzo-p-dioxin
TCDF	Tetrachlorodibenzofuran
TCE	Trichloroethylene
TEQ	Toxic equivalency
WS	Wipe sample

APPENDIX A

FINAL SUMMARY TRIP REPORT

APPENDIX B

HUMAN HEALTH RISK ASSESSMENT ADDENDUM

APPENDIX C

ANALYTICAL DATA FROM BUILDING AND SOUTH POND AREA SAMPLES

APPENDIX D

CHEMICAL RESULTS TABLES