FINAL CORRECTIVE ACTION DECISION
Hanover USDA Site
Hanover, Kansas

April 21, 2015

Prepared by:

Kansas Department of Health and Environment
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Kansas Department of Health and Environment
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TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS USED IN THIS DOCUMENT

ARARs	Applicable or Relevant and Appropriate Requirements
CAD	Corrective Action Decision
CAS	Corrective Action Study
CCC/USDA	Commodity Credit Corporation/United States Department of Agriculture
EPA	United States Environmental Protection Agency
ESI	Environmental Site Investigation
KDHE	Kansas Department of Health and Environment
MCL	Maximum Contaminant Level
µg/L	micrograms per Liter
µg/kg	micrograms per kilogram
µg/m^3	micrograms per cubic meter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
RAO	Remedial Action Objective
RSK	Risk-based Standards for Kansas

GLOSSARY

Administrative Record – The body of documents that form the basis for selection of a particular response at a site. Parts of the Administrative Record are available in an information repository near the site to permit interested individuals to review the documents and to allow meaningful participation in the remedy selection process.

Air Stripping – The process of forcing air through polluted water to remove harmful chemicals. The air causes the chemicals to change from a liquid to a gas. The gas is collected and treated if necessary.

Aquifer – An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be used for drinking or other purposes. The water contained in the aquifer is called groundwater.

Applicable or Relevant and Appropriate Requirements (ARARs) – The federal and state environmental laws that a remedy will meet. These requirements may vary among sites and alternatives.

Corrective Action Decision (CAD) – The decision document in which KDHE selects the remedy and explains the basis for selection for a site.

Corrective Action Study (CAS) – A study conducted to evaluate alternatives for clean-up of contamination.

Environmental Site Investigation – A study of the source, nature, and extent of contamination.

Exposure – Contact made between a chemical, physical, or biological agent and the outer boundary of an organism. Exposure is quantified as the amount of an agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut).

Groundwater – Underground water that fills pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

Hydraulic Containment – Use of pump and treat groundwater remediation systems to hydraulically control the movement of contaminated groundwater in order to prevent continued expansion of the contamination zone.

Maximum Contaminant Levels (MCLs) – The maximum permissible level of a contaminant in water that is delivered to any user of a public water system.

Monitoring – Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action. For example,

monitoring wells drilled to different depths at the site would be used to detect any migration of the plume.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) – The federal regulations that guide the Superfund program. These regulations can be found at 40 Code of Federal Regulations, Part 300.

Operations, Maintenance, and Monitoring – Activities conducted at a site after the construction phase to ensure that the cleanup continues to be effective.

Plume – A body of contaminated groundwater flowing from a specific source.

Risk - The probability of adverse health effects resulting from exposure to an environmental agent or mixture of agents.

Superfund – Federal authority established by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), to respond directly to releases or threatened releases of hazardous substances that may endanger health or welfare. Also, the common name given by the press for CERCLA because the program was well funded in the beginning.

Tier 2 Level – Calculated risk-based cleanup value for a specific contaminant. These values can be found in Appendix A of the *Risk-based Standards for Kansas (RSK) Manual.*

Toxicity – A measure of degree to which a substance is harmful to human and animal life.

Vapor Intrusion – The migration of contaminants from the subsurface into overlying and/or adjacent buildings.

1. Purpose of the Corrective Action Decision

The primary purposes of the final Corrective Action Decision (CAD) for the Hanover United States Department of Agriculture (USDA) Site (the Site) are to: 1) summarize information from the key Site documents including the Environmental Site Investigation[1] (ESI) and Corrective Action Study[2] (CAS) reports; 2) briefly describe the alternatives for remediation detailed in the CAS report; 3) identify and describe the Kansas Department of Health and Environment's (KDHE's) selected remedy for contamination at the Site; and, 4) document public comments and KDHE's responses to the comments on the preferred remedy.

KDHE selected a final remedy for the Site after reviewing and considering all information submitted during the 30-day public comment period. The public was encouraged to review and comment on the preferred remedy presented in the draft CAD. KDHE held a public meeting in Hanover on March 31, 2015, during the 30-day public comment period. At the meeting, KDHE presented information regarding the preferred remedy and solicited public participation. The public had opportunity to submit written comments to KDHE during the public comment period from March 18 to April 17, 2015. Section 11 provides the comments received during the public comment period and KDHE's responses.

Highlight 1-1: Public Information

Administrative Record File

Kansas Department of Health and Environment
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Contact: Pamela Green
Phone: 785-296-1935
E-mail: pgreen@kdheks.gov

Web:
http://www.kdheks.gov/remedial/site_restoration/hanover.html

Local Information Repository

Hanover Public Library
205 S. Jackson Street
Hanover, Kansas 66945

Phone: 785-337-2424
Hours: Wednesday 8:00 am -1:00 pm
Tuesday, Thursday, Saturday
12:00 pm - 5:00 pm

The Applied Geosciences and Environmental Management Section of the Environmental Science Division of Argonne National Laboratory (Argonne) prepared the ESI and CAS on behalf of Commodity Credit Corporation/United States Department of Agriculture (CCC/USDA). Work performed during the ESI and CAS process followed the terms outlined in the Intergovernmental Agreement between Farm Service Agency and KDHE[3]. The public was encouraged to review and comment on the technical information presented in the ESI and CAS reports and other

[1] Argonne National Laboratory, April 2011, *Final Report: Hanover Environmental Site Investigation, 2009-2010,* prepared on behalf of USDA/CCC, approved June 21, 2011.
[2] Argonne National Laboratory, November 2013, *Final Corrective Action Study Report for the Former CCC/USDA Facility in Hanover, Kansas,* prepared on behalf of CCC/USDA, approved January 27, 2014.
[3] *Intergovernmental Agreement between Farm Service Agency and KDHE,* July 2012.

documents contained in the Administrative Record file[4]. The Administrative Record file includes all pertinent documents and Site information that form the basis and rationale for selecting the final remedy. The Administrative Record File is available for public review during normal business hours at the KDHE location shown in Highlight 1-1. Also, as shown, for convenience to interested members of the public, copies of the ESI and CAS reports, as well as the draft CAD, are available for review and copying during normal business hours at the local information repository located at the Hanover Public Library.

2. SITE BACKGROUND

2.1. Site Location

The Site is located in Hanover, Kansas, a rural city in northeastern Washington County (Section 9, Township 2 South, Range 5 East), approximately 78 miles northwest of Manhattan and 90 miles southwest of Lincoln, Nebraska, as shown in Figure 1. The former CCC/USDA grain facility occupied 6.5 acres in the northeastern part of Hanover. The former facility and adjacent properties are currently zoned as residential.

2.2. Site History

The CCC/USDA operated a grain storage facility from 1950 to 1976, consisting of a maximum of 223 grain bins and a storage building by the late 1960s. During this time, commercial grain fumigants containing carbon tetrachloride were in common use by the grain storage industry to preserve grain in their facilities. The grain fumigant 80/20, known for its composition of 80% carbon tetrachloride and 20% carbon disulfide, was used at the facility. In 1973, the CCC/USDA grain bins were sold at auction to local farmers. By 1978, all of the storage bins had been removed, four homes had been built within the footprint of the grain bin array, and a fifth home had been built on the southern boundary. By 2006, nine residences were located on or adjacent to the former CCC/USDA property.

Contamination at the Site was identified in February 1998 when low levels of the volatile organic compounds carbon tetrachloride and chloroform were detected in samples collected from two private wells near the former CCC/USDA facility. In a follow-up sampling event conducted in April 1998, carbon tetrachloride and chloroform were detected but below the respective Maximum Contaminant Levels (MCLs) established by the U.S. Environmental Protection Agency (EPA) for public water systems. In July 1998, KDHE conducted a Site Reconnaissance and Evaluation[5] to determine whether the former facility was a source of the contamination in the private wells. Carbon tetrachloride was detected in soil samples below the KDHE Tier 2 Risk-based Standards for Kansas (RSK)[6] levels for the soil-to-groundwater pathway and in three private wells below the MCL. Carbon tetrachloride was detected in one private well sample at

[4] KDHE Project Code C5-101-71668
[5] KDHE, 1998, *Pre-CERCLIS Site Reconnaissance and Evaluation*
[6] KDHE Risk-based Standards for Kansas Manual

5.9 micrograms per Liter (µg/L), above the MCL of 5.0 µg/L. KDHE concluded that the CCC/USDA facility was the source area for residual carbon tetrachloride contamination. Based on the relatively low contaminant concentrations, additional sampling was not conducted until 2006, when two private wells were resampled. Carbon tetrachloride and chloroform were detected in the samples but were below the respective MCLs.

In 2007, at the request of a Hanover resident, Argonne conducted soil sampling at the former facility on behalf of CCC/USDA. Argonne collected shallow soil samples from 61 locations across the former CCC/USDA facility and indoor air samples at nine residences on or adjacent to the former CCC/USDA facility. Carbon tetrachloride was detected at concentrations considerably below KDHE Tier 2 RSK levels for carbon tetrachloride in soil. In four of the nine air samples, carbon tetrachloride was detected at concentrations ranging from 1.4 micrograms per cubic meter (µg/m^3) to 4.8 µg/m^3. Based on these data, KDHE requested CCC/USDA to fully characterize the extent and magnitude of contamination in groundwater, soil, and indoor air at the Site.

3. ENVIRONMENTAL SITE INVESTIGATION

In January 2009, ESI sampling activities were initiated with KDHE's approval of the final ESI Work Plan[7] and conducted in five phases in 2009-2010. Objectives of the investigation process included:

- Characterizing all significant source areas to determine appropriate cleanup goals (i.e., type and nature of source(s) of contaminants, cause of release, estimated quantity of release, and if the release is active or inactive);
- Characterizing the vertical and horizontal extent of contamination (including migration mechanisms) for the purpose of developing and evaluating effective remedial alternatives;
- Characterizing the chemical and physical properties of the contaminants, their mobility and persistence in the environment and their important fate and transport mechanisms; and
- Identifying any human and environmental targets that may be affected by contamination.

3.1. Geological and Hydrogeological Setting

The ESI included assessment of the geology and hydrogeology for determining pathways of contaminant migration. A vertical sequence of nine primary lithostratigraphic units were

[7] Argonne National Laboratory, November 2008, *Final Work Plan: Investigation of Potential Contamination at the Former CCC/USDA Grain Storage Facility in Hanover, Kansas,* prepared on behalf of USDA/CCC, approved November 18, 2008.

recognized, consisting of: 1) silt and clay with a lower section of sand and sandy silt, 2) weathered shale, 3) interbedded limestone and shale, 4) gray shale, 5) an upper red shale, 6) an interval that varies laterally in facies from evaporitic deposits to soft gray shale with limestone, 7) gray dolostone and shale, 8) a lower red shale, and 9) a lower evaporitic deposit.

Four groundwater-bearing intervals were identified within the bedrock sequence. Zone 1, the uppermost water-bearing unit, consists of a few discrete, thin, saturated horizons and is restricted to the upland on which the former facility was located. The highest contaminant concentrations occur in this thin unit, which is low in permeability and groundwater production. Zone 2, the second water-bearing zone, extends toward the west from the former facility. It is thicker, more permeable, and more capable of groundwater production than Zone 1. Groundwater Zone 3 and Zone 4 lie deeper and are uncontaminated. Observations suggest the presence of a natural hydraulic barrier to downward migration of Zone 2 groundwater into the deeper parts of the flow system. The lithostratigraphic and groundwater zones are depicted in Figure 2.

Groundwater in Zone 2 is laterally more extensive than Zone 1 and flows to the west, southwest, south, and southeast; however, the observed contamination is associated with the westerly flow direction. Zone 3 and 4 receive little or no recharge through vertical infiltration from Zone 2. Localized contamination of the Zone 3 and Zone 4 groundwater might be possible in the western portions due to artificial conduits provided by continuously gravel-packed private lawn and garden wells to the west.

3.2. Summary of Remedial Investigation Results

3.2.1. Soil

In 2009-2010, the investigation process included soil sampling at 38 locations at various depths in the vadose zone at the former CCC/USDA facility. Carbon tetrachloride was detected in the subsurface soil at eight locations with a maximum concentration of 35 micrograms per kilogram (µg/kg). Chloroform was detected at two locations with a maximum concentration of 44 µg/kg. No contaminant concentrations were detected above the KDHE Tier 2 RSK levels for the soil-to-groundwater pathway of 73.4 µg/kg for carbon tetrachloride and 850 µg/kg for chloroform, indicating that a continuing source of contamination to groundwater was not found. The present concentrations detected do not pose an unacceptable health or environmental risk.

3.2.2. Groundwater

In groundwater Zone 1, carbon tetrachloride was detected at concentrations up to 617 µg/L, with the highest concentrations detected beneath the north central portion of the former facility. Concentrations exceeding 100 µg/L generally underlie the topographic upland that extends to the south and southwest. The extent of contamination in Zone 1 is depicted in Figure 3.

In groundwater Zone 2, carbon tetrachloride was detected in a relatively narrow plume extending to the west and downgradient from the former facility, ranging from 35 µg/L at the northern edge of the former facility to 11-28 µg/L near the downgradient extent of the plume. Lower levels of carbon tetrachloride (1.5-7.8 µg/L) were also found in four private wells used for lawn and garden irrigation that are located near the apparent western edge of the plume. The extent of contamination in Zone 2 is depicted in Figure 4.

3.2.3. Vapor Intrusion

Approximately 60 occupied residences were identified for the consideration of possible vapor intrusion that might be linked to the carbon tetrachloride contamination in groundwater-bearing Zone 1 or in the western, more downgradient portion of Zone 2. Indoor air testing was conducted in spring 2009 at all identified accessible structures, and confirmation air monitoring was performed in the summer and/or winter 2009-2010 at 17 homes. Five homes overlying the contamination in groundwater-bearing Zone 1 were identified as impacted by vapor intrusion of carbon tetrachloride at levels greater than the KDHE Tier 2 level of 4.06 µg/m^3 in indoor air. Indoor air results from residences overlying contaminated groundwater in Zone 2 were below the KDHE Tier 2 level for carbon tetrachloride. No carbon tetrachloride was detected in the indoor air at the Hanover public school facility or St. John's School, both of which lie outside the interpreted limits of the groundwater plume.

4. Interim Measures

Interim measures are actions or activities taken to quickly prevent, mitigate, or remedy unacceptable risk(s) posed to human health and/or the environment by an actual or potential release of a hazardous substance, pollutant, or contaminant.

Five homes overlying the contamination in groundwater-bearing Zone 1 were impacted by vapor intrusion above the KDHE Tier 2 RSK level for carbon tetrachloride. The CCC/USDA installed vapor mitigation systems in each of the homes and conducted performance testing of the installed systems to demonstrate that the systems were operating effectively. These homes are tested annually by CCC/USDA to ensure proper operation of the vapor mitigation systems. Performance testing has demonstrated that they have reduced carbon tetrachloride concentrations in indoor air to acceptable levels. Homes with installed vapor mitigation systems to mitigate carbon tetrachloride in indoor air are displayed in Figure 5.

5. Site Risks

Carbon tetrachloride was not detected at any locations above the KDHE Tier 2 RSK level for the soil pathway, indicating that there is no unacceptable human health or environmental exposure risks from contact with the soil. Furthermore, concentrations of carbon tetrachloride detected in subsurface soil are below the KDHE Tier 2 RSK level for the soil-to-groundwater pathway, indicating that no potential continuing source of contamination to groundwater was identified.

Carbon tetrachloride concentrations in groundwater exceed the MCL of 5 µg/L and could present an unacceptable risk posed by using groundwater for drinking or other household uses. The primary route of exposure to contaminants would be through contact with contaminated groundwater. Since February 1974, the residents of Hanover have been served by a public water supply system that obtains water from the Washington County RWD #1 at Lanham, Kansas, located 6.5 miles north of Hanover. Of the 25 accessible private wells identified in and around Hanover, none are installed in groundwater-bearing Zone 1 due to its poor production. Four existing private wells identified near the downgradient margin of the carbon tetrachloride plume in Zone 2 are used for lawn and garden purposes. Only one private well, which is screened across Zone 2, showed a detection above the MCL for carbon tetrachloride at 5.9 µg/L in July 1998. Carbon tetrachloride concentrations in a sample collected from the well in April 2006 were detected at 4.3 µg/L, below the MCL.

Vapor intrusion of carbon tetrachloride was identified as a threat to human health. Exposure occurs via the movement of contaminant vapors from soil gas within the unsaturated pore space of the vadose zone through the foundation into the interior air space of the residential structure. Five residences showed indoor air concentrations of carbon tetrachloride above the KDHE Tier 2 RSK level of 4.06 µg/m^3. This unacceptable risk was addressed by the ongoing operation of vapor mitigation systems installed by CCC/USDA. Performance testing has shown that the systems are effective at reducing concentrations below the KDHE Tier 2 RSK level.

6. Remedial Action Objectives

Remedial Action Objectives (RAOs) are media-specific goals for protecting human health and the environment. RAOs are developed through evaluation of applicable and relevant and appropriate requirements (ARARs) and To Be Considered standards with consideration of the findings of the ESI. Based on this information, the following RAOs were developed as presented below.

- Prevent human exposure (ingestion, inhalation, and dermal contact) to contaminated groundwater;

- In the relatively more permeable, more contaminated portion of Zone 1 where corrective action technologies would be effective and implementable, reduce the mass, mobility, and volume of contaminated groundwater that is serving as a vapor intrusion contamination source in Zone 1 and that is migrating from Zone 1 to Zone 2.

- Reduce the risk due to potential exposure to indoor air containing carbon tetrachloride at a concentration above the KDHE Tier 2 RSK level.

- Minimize the vertical and lateral migration of contaminated groundwater from the mass reduction area (i.e., the more permeable, more contaminated portion of Zone 1) to other areas of the Site.

- Minimize vertical and lateral expansion of the contamination in groundwater outside the mass reduction area, as defined by the compliance groundwater monitoring network to be established.

- Restore groundwater to allow for its most beneficial use.

6.1. Cleanup Levels

Contaminants of concern are carbon tetrachloride and its degradation product chloroform. For groundwater remediation being conducted at sites with drinking water aquifers, federally promulgated MCLs are used as the cleanup levels. KDHE has calculated Tier 2 RSK levels for indoor air for the protection of human health. The KDHE Tier 2 RSK levels and methods of calculation are identified in KDHE's *RSK Manual*.

The conclusions of the ESI, the formulation of RAOs, and the determination of MCLs as the cleanup levels for groundwater and KDHE Tier 2 RSK levels for indoor air provide the basis for selecting a preferred remedial alternative. Site-specific conditions will need to be taken into account in terms of the remedial goals and completion of the remedial activities. Table 1 summarizes the MCLs and KDHE Tier 2 RSK levels for contaminants in groundwater and indoor air.

7. SUMMARY OF REMEDIAL ALTERNATIVES EVALUATED

In accordance with KDHE's Corrective Action Study Scope of Work, several remedial action alternatives were assembled and evaluated in detail during the CAS phase. Each remedial alternative was evaluated with respect to their ability to satisfy the following criteria as specified in the *National Oil and Hazardous Substances Contingency Plan*[8] (NCP): overall protection of human health and the environment; compliance with federal and state ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; and cost. A detailed description of each remedial action alternative and the individual and comparative analyses is presented in the CAS.

The objective of the CAS is to identify remedial technologies and practices that can meet the site-specific remedial action objectives and then combine the technologies and practices into a suite of remedial alternatives for further evaluation. Evaluation of remedial alternatives in the CAS focused on technology types and practices potentially applicable to addressing contaminated groundwater in Zone 1 and soil vapor contamination attributable to groundwater Zone 1.

[8] National Oil and Hazardous Substances Contingency Plan, 40 CFR 300 et seq.

7.1. Remedial Alternatives Retained

Three remedial action alternatives were retained for detailed analysis. These include Alternative 1 – No Action; Alternative 2 – Municipal Land Use Controls, Monitoring, and Well Abandonment; and, Alternative 3 – Targeted Groundwater Extraction and Treatment in Zone 1.

7.1.1. Alternative 1 – No Action

The NCP requires the evaluation of a No Action alternative to serve as a baseline for comparison to other remedial action alternatives evaluated. Typically, the No Action alternative means the Site is left unchanged, and no remedial actions are evaluated or taken; however, for the purpose of the CAS and consistent with EPA guidance, the No Action alternative includes continued operation and maintenance of the vapor mitigation systems that have been installed in five residences. No further actions would be taken to reduce contaminant mass, address potential exposure pathways, or reduce the potential for contaminant migration. Since no remedial action is taken, risks to human health and environment may not be addressed. Under this Alternative, the vapor mitigation systems would continue to be inspected annually, and an air sampling event involving the collection of sub-slab, indoor air, and ambient air samples would be performed every five years. The CCC/USDA would continue to compensate the owners of the residences for the electric power required to operate the systems. The present value cost of Alternative 1 is $67,000.

7.1.2. Alternative 2 – Municipal Land Use Controls, Monitoring, and Well Abandonment

This alternative includes a groundwater monitoring program in which select existing monitoring wells would be sampled every year for the first 10 years and then in alternate years for the following 20 years. The vapor mitigation systems installed in five homes would continue to be inspected annually, and an air sampling event involving the collection of indoor air and ambient air samples would be performed every five years. Subject to approval by the well owners, four existing private lawn and garden wells would be plugged and abandoned in order to prevent cross-contamination of the contaminated groundwater-bearing Zone 2 with the deeper groundwater bearing Zones 3 and 4. In coordination with the Hanover municipality and KDHE, municipal land use controls would be developed to address groundwater and vapor intrusion exposure routes. Proposed ordinances would prohibit installation of water supply wells within the contamination footprint and require new habitable structures constructed within 100 feet laterally and 40 feet vertically of impacted groundwater to be assessed for vapor intrusion hazards by a third party. A public outreach program would be developed to educate the public about existing and new regulations and guidelines. This alternative does not include any active groundwater treatment or remediation. The present value cost of Alternative 2 is $999,663.

7.1.3. Alternative 3 – Targeted Groundwater Extraction and Treatment in Zone 1

This alternative combines the municipal land use controls, well abandonment, and vapor intrusion mitigation system maintenance and evaluation as presented in Alternative 2 with implementation of a targeted groundwater extraction and treatment system that will focus on contamination in a specific sub-area of groundwater-bearing Zone 1 (see Figure 6), an area that is amenable to active treatment due to its more permeable nature. The system would reduce the migration of contamination from Zone 1 to Zone 2, leading to accelerated decreases in contaminant levels in Zone 2.

The groundwater extraction system will involve the construction of a horizontal extraction well with a proposed length of approximately 660 feet. Two vertical recovery wells will be installed at each end of the horizontal well and tied into the horizontal boring. Groundwater will be pumped from the horizontal well to a treatment facility consisting of a tray aerator system. Treated groundwater will discharge via underground piping to a discharge point on the intermittent creek west of the former facility.

A groundwater monitoring program will be implemented with select wells sampled twice the first year and annually for four years thereafter. Additional monitoring wells will be sampled annually for 10 years and then every 2 years for the following 20 years. The present value cost of Alternative 3 is $1,688,297.

8. Description of the Preferred Remedy

After evaluation of the individual analysis of remedial action alternatives, a comparative analysis of the various alternatives was performed with consideration of the threshold and balancing criteria specified in the NCP as discussed in Section 7.0. On the basis of information available in the Administrative Record and summarized above, KDHE has selected Alternative 3, targeted groundwater extraction and treatment in Zone 1, as the preferred remedy. The results of the comparative analysis support the preferred remedy as outlined below. The total present value cost of the preferred remedy is $1,688,298 as presented in Table 2.

Alternative 3 targets to treat the most elevated carbon tetrachloride concentrations in water-bearing Zone 1, which contributes to the impact in Zone 2, and implements additional activities to protect against exposure to contaminated groundwater and soil vapor. The preferred remedy as outlined below satisfies or meets Federal, State, and local requirements, and will be protective of human health and the environment.

8.1. Elements of the Preferred Remedy

Elements of KDHE's preferred remedy (Alternative 3) are summarized below.

- *Groundwater Extraction and Treatment* – The groundwater extraction system will involve the construction of a horizontal extraction well with a proposed length of

approximately 660 feet. Two vertical recovery wells, one at each end of the horizontal well's screened casing, will be installed and tied into the horizontal boring. Groundwater will be pumped from the horizontal well to a treatment facility consisting of a tray aerator system inside a custom wood-framed heated structure on a concrete slab on a community-owned land parcel north of the property at 400 N. East Street. The groundwater treated by the aerator will discharge via underground piping to the discharge point on the intermittent creek west of the former facility. Other beneficial use scenarios of the treated groundwater may be considered during the remedial design. Effluent will be monitored monthly. The design is conceptual and may vary from the final design of the system. The currently proposed locations for the treatment building and piping are displayed in Figure 7.

- *Groundwater Monitoring Program* – Carbon tetrachloride and its degradation products, chloroform and methylene chloride, are the contaminants of concern that will be analyzed in the groundwater monitoring program. A one-time baseline monitoring event will be conducted before the groundwater extraction system is installed. The groundwater monitoring program will be implemented with wells located within the mass reduction area to monitor the process of mass reduction in response to pumping and additional site-wide monitoring wells (screened in various zones). The details of the performance and compliance monitoring well network will be developed in the remedial design process following selection of a remedy.

- *Inspection and Maintenance of Vapor Intrusion Mitigation Systems* – The sub-slab vapor mitigation systems installed in five homes will continue to be inspected annually to assure the continued successful operation, and indoor air samples and ambient air samples, with an evaluation of the data, will be performed every five years. CCC/USDA will provide remuneration for power requirements to current homeowners to operate the mitigation systems.

- *Abandonment of Lawn and Garden Wells* – Subject to approval by the well owners, four existing private lawn and garden wells may be plugged and abandoned in order to prevent cross-contamination of the contaminated groundwater-bearing Zone 2 with the deeper groundwater bearing Zones 3 and 4. The four private wells are on properties currently owned by B. Bruna, K. Jueneman, D. Martin, and R. Schlabach.

- *Land Use Control Program* – In coordination with the Hanover municipality and KDHE, municipal land use controls may be developed to address groundwater and vapor intrusion exposure routes. The proposed ordinance would prohibit installation of domestic water supply wells within the contamination footprint or otherwise enforce the existing water supply protective measures. The ordinance would recommend that new habitable structures constructed within 100 feet laterally and 40 feet vertically of impacted groundwater be assessed for vapor intrusion hazards by a third party and unacceptable exposure to vapor intrusion hazards be mitigated. A city agency would be empowered to monitor the ordinance(s) with CCC/USDA underwriting any specific costs

to the City associated with this activity. Continued compliance with this City ordinance will help ensure protection of human health until Site cleanup is complete. A public outreach program would be developed to educate the public about the ordinance.

- *Five-Year Reviews* – Five-year reviews will serve as a project management mechanism through which monitoring results, indoor air sampling results, and records associated with monitoring land use controls will be evaluated. CCC/USDA will submit a report to KDHE that will include the analysis of the data in relation to corrective action objectives, a summary of the site visit, areas of noncompliance, and a summary of the protectiveness of the established corrective action. As part of the first five-year review, a decision will be made whether to extend the operation of the active treatment on the basis of documented system performance and the concentrations attained.

- *Contingency* – If monitoring results from the monitoring network indicate groundwater contaminant concentrations are not decreasing or the contaminant plume continues to expand, additional contingency plans will be evaluated in conjunction with KDHE. In the event exposures cannot be controlled through proposed municipal land use controls and/or well abandonment activities, periodic receptor surveys will be performed to evaluate potential exposure pathways and risks posed to human health and the environment.

9. COMMUNITY INVOLVEMENT

A Community Involvement Plan for the Site was developed by KDHE[9]. Public input and comment has been encouraged by KDHE throughout the process. Public notice of the availability of the draft CAD was published in *Washington County News* and *Hanover News.* In addition, KDHE has established a webpage dedicated to the Site, available online at http://www.kdheks.gov/remedial/site_restoration/hanover.html. Relevant Site documents, including the CAD, are available on the webpage.

KDHE selected a final remedy after reviewing and considering all information submitted during the 30-day public comment period (March 18 – April 17, 2015). The public was encouraged to review and comment on the preferred remedy presented in the draft CAD. As per the Community Involvement Plan, KDHE held a public meeting in Hanover on March 31, 2015, to present information regarding the preferred remedy and solicit public participation. Notice of the public meeting was published in *Washington County News, Hanover News* and KDHE's webpage dedicated to the Site.

Public comments on the draft CAD had to be postmarked by April 17, 2015, and mailed to:

Kansas Department of Health and Environment
Bureau of Environmental Remediation
Attention: Pamela Green, Environmental Scientist

[9] KDHE, January 2010, *Community Involvement Plan: Former CCC/USDA Grain Storage Facility, Hanover, KS.*

1000 SW Jackson Street; Suite 410
Topeka, Kansas 66612-1367

Comments on the draft CAD could also be submitted to KDHE by electronic mail to pgreen@kdheks.gov. All comments that were received by KDHE prior to the end of the public comment period are addressed by KDHE in the Responsiveness Summary Section.

10. DOCUMENTATION OF CHANGES

One written comment letter containing four specific comments was received by KDHE during the public comment period. In response to the comments received, KDHE has amended the draft CAD document as specified in Section 11.0.

11. RESPONSE TO COMMENTS SUMMARY

The purpose of this section is to review and provide responses to comments made by private citizens and other interested parties during the public comment period for the Draft CAD. One comment letter was received. Comments and KDHE's responses are included below.

Comment 1*: Although no formal written comment was submitted, KDHE received informal feedback from several stakeholders to consider beneficial reuse of treated effluent.*

KDHE Response: KDHE concurs. Further evaluation will be considered as part of the remedial design. The CAD has been revised in Section 8.1, first bullet, with the addition, "Other beneficial use scenarios of the treated groundwater may be considered during the remedial design."

Comment 2: *Representatives from the Commodity Credit Corporation/U.S. Department of Agriculture (CCC/USDA) and their consultant, Argonne National Laboratory (ANL), attended the Public Availability Session hosted by the Kansas Department of Health and Environment (KDHE) in Hanover on March 31, 2015. The session was designed to provide residents with information about the proposed remedy and to allow Hanover residents to ask questions or provide comments. One resident expressed concern with cancer rates in Hanover. KDHE conducted an evaluation in 2009 of mortality rates in Hanover. It was concluded that mortality rates in Hanover are similar to those of the entire state of Kansas. However the study did not investigate the different types of cancer and evaluate whether some cancers are more prevalent than others in Hanover. An evaluation of this type may help resolve the concerns of some residents.*

KDHE Response: Noted. KDHE encourages any Hanover residents with such concerns to contact the Agency. No change to the CAD is required.

Comment 3: *One of the participants expressed concern with having an ordinance established to restrict installation and locations of new groundwater wells. The ordinance was proposed by CCC/USDA as an administrative option to help protect Hanover residents from unknowingly installing groundwater wells through the zone of groundwater contamination or from using construction methods (continuous gravel-packed wells) that could contribute to further groundwater degradation. While CCC/USDA and KDHE both recommend creation of an ordinance, CCC/USDA is open to other suggestions and working with the City as to how to best protect Hanover residents from unknowingly installing new wells in the area of groundwater contamination. KDHE noted that the ordinance could be removed in the future as appropriate.*

KDHE Response: Noted. No change to the CAD is required.

Comment 4: *One resident expressed interest in having the treated wastewater used in a beneficial manner for the community, i.e., watering the football field, rather than discharging the wastewater to a local waterway. CCC/USDA intends to explore this option with its design engineers.*

KDHE Response: KDHE concurs. The CAD has been revised in Section 8.1, first bullet, with the addition, "Other beneficial use scenarios of the treated groundwater may be considered during the remedial design."

Comment 5: *Four private wells are proposed for abandonment as part of the remedy. CCC/USDA will contact each individual homeowner to discuss their needs and interests relative to their well. KDHE noted that these are private wells and that the fate of each well is at the owner's discretion.*

KDHE Response: Noted. No change to the CAD is required.

TABLES

Table 1 – Site-Related Historical and Current Maximum Groundwater Contaminant Concentrations

Chemical Compound	Maximum Concentration µg/L (2009-2010)	Maximum Contaminant Level (MCL) µg/L
Carbon Tetrachloride	**617**	5
Chloroform	13	80

µg/L – micrograms per Liter
Red bold font indicates result above the MCL

Table 2 – Site-Related Historical and Current Maximum Indoor Air Contaminant Concentrations 2009-2010

Chemical Compound	Maximum Concentration µg/m^3 before mitigation system installed	Maximum Concentration µg/m^3 after mitigation system installed	KDHE Tier 2 RSK Level µg/m^3
Carbon Tetrachloride	**26**	ND	4.06
Chloroform	**3.6**	ND	1.06

µg/m^3 – micrograms per cubic meter
Red bold font indicates the result is above the KDHE Tier 2 RSK Level
ND = Not detected above the laboratory reporting limit

Kansas Department of Health and Environment
Environmental Remediation

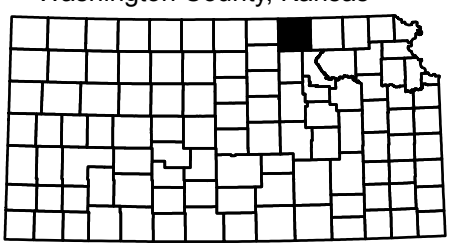
Table 3 – Summary and Estimated Cost of the Preferred Alternative for the Site

Preferred Alternative	Estimated Cleanup Timeframe	Total Capital Cost	Total O&M Cost	Present Value Cost
Alternative 3: Groundwater Extraction & Treatment, Groundwater Monitoring Program, Inspection & Maintenance of Vapor Intrusion Mitigation Systems, Abandonment of Lawn & Garden Wells, Land Use Control Program, Five-Year Reviews	Minimum 5 years of groundwater extraction and treatment; 30 years for Sitewide Monitoring	$687,848	$1,000,450	$1,688,298
$1,688,298				

‡*Costs estimated by Argonne. Costs presented do not include contingency implementation.*

FIGURES

Washington County, Kansas



Kansas Department of Health and Environment

SITE:	**Hanover USDA Site Hanover, Kansas C5-101-71668**			
TITLE:	**Former CCC/USDA Grain Storage Facility Location Map**			
PROJECT PHASE:	Corrective Action Decision			
DRAWN BY:	DM	11/17/2014	BASEMAP DATE:	2012
CHECKED BY:	PG	11/17/2014	**Figure 1**	

Kansas Department of Health and Environment
Environmental Remediation

Figure 2 – Hydrogeologic Cross Section of Lithostratigraphic and Groundwater Zones

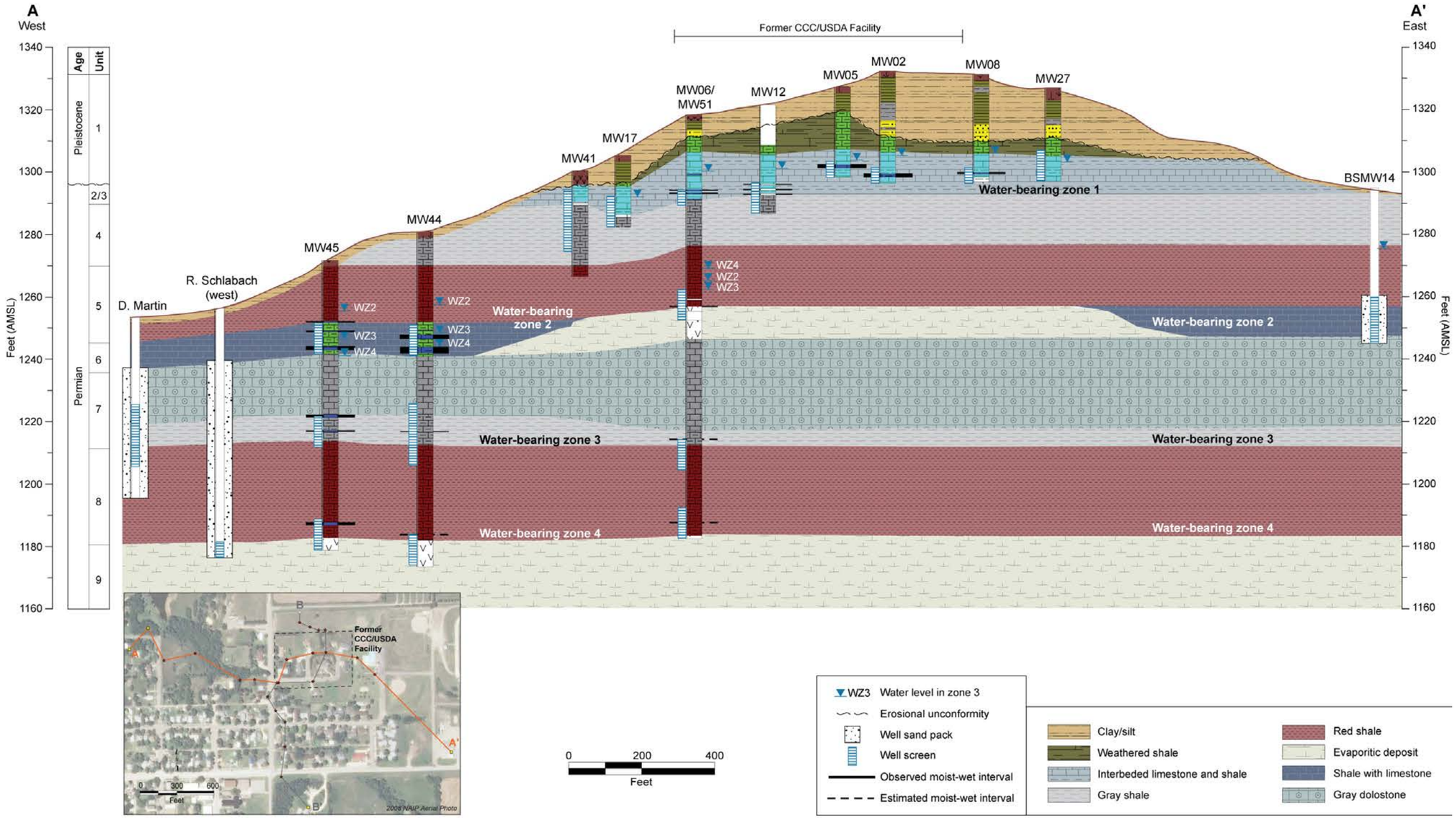


Figure prepared by Argonne on behalf of CCC/USDA, based on Figure 2.6 in the *Final Corrective Action Study*.

Figure 3 – Extent of Groundwater Contamination in Zone 1

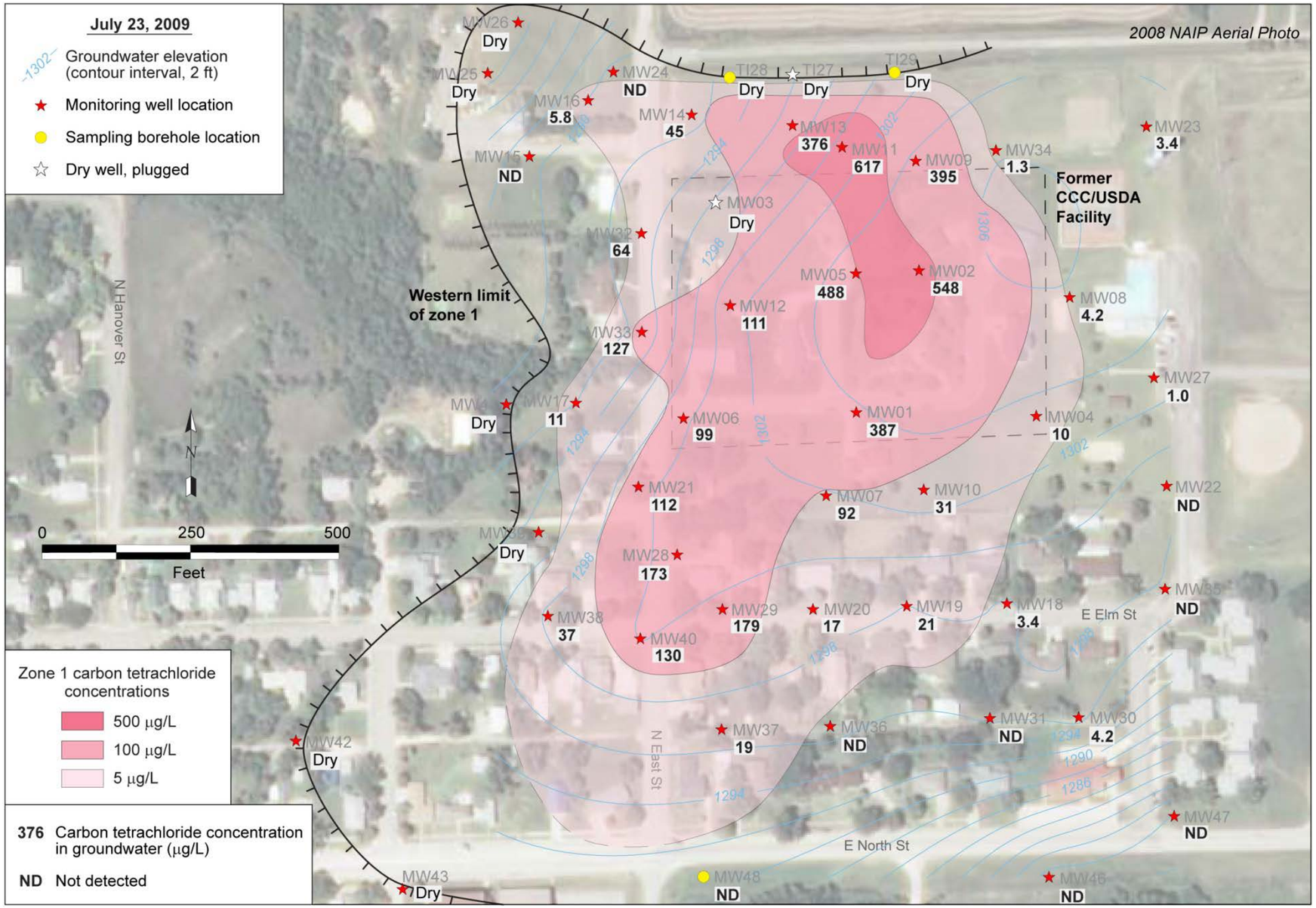


Figure prepared by Argonne on behalf of CCC/USDA, based on Figure 2.9 in the *Final Corrective Action Study*.

Figure 4 – Extent of Groundwater Contamination in Zone 2

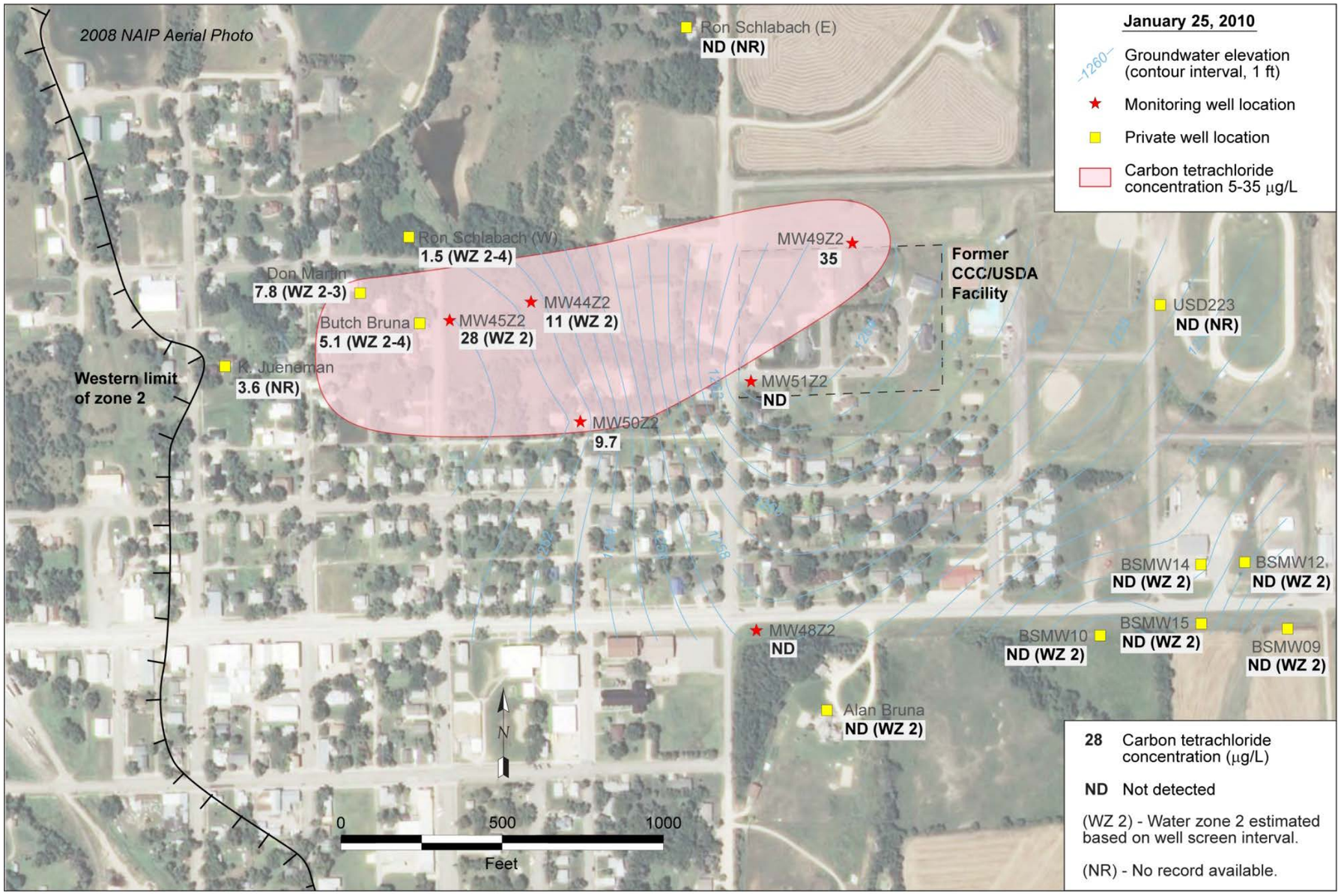


Figure prepared by Argonne on behalf of CCC/USDA, based on Figure 2.11in the *Final Corrective Action Study*.

Figure 5 – Homes with Vapor Mitigation Systems Installed to Treat Carbon Tetrachloride in Indoor Air

Figure prepared by Argonne on behalf of CCC/USDA, based on Figure 2.14 in the *Final Corrective Action Study*.

Figure 6 - Contaminant Distribution in Groundwater in Zone 1 and the Area Targeted for Active Remediation

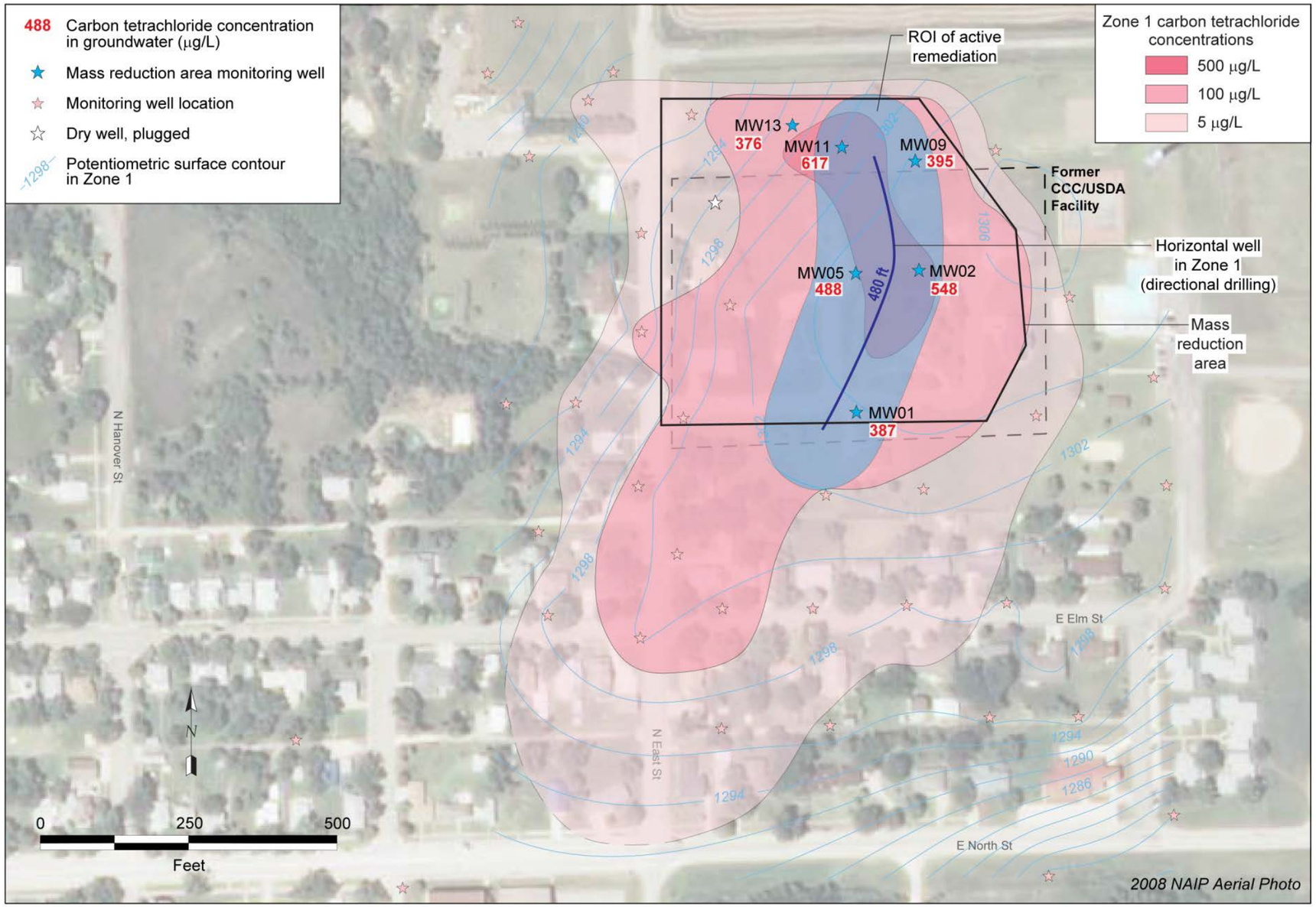


Figure prepared by Argonne on behalf of CCC/USDA, based on Figure 5.4 in the *Final Corrective Action Study*.

Figure 7 – Preferred Alternative: Groundwater Extraction and Treatment System Components

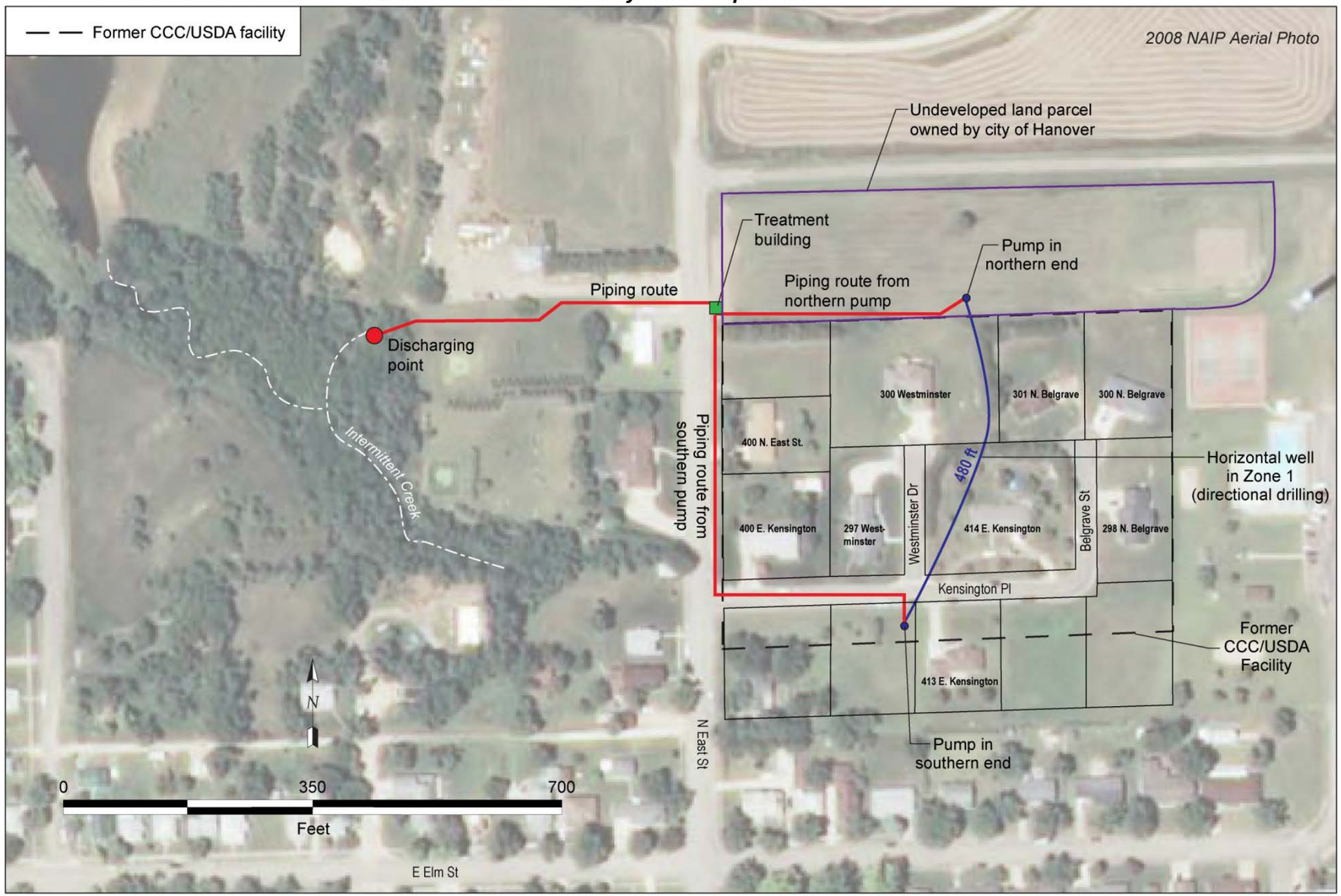


Figure prepared by Argonne on behalf of CCC/USDA, based on Figure 5.2 in the *Final Corrective Action Study*.