

## ORPHAN SITE AND DRY CLEANING PROGRAM SPECIFICATIONS

The State of Kansas is issuing this Module to obtain competitive responses from vendors to provide services for one or all of the following categories of work at the Orphan Site and Dry Cleaning Facility Release Trust Fund Sites: 1) Investigations, 2) Remediation Design, 3) Remediation Implementation, and 4) Remediation Operation, Maintenance and Monitoring, per the attached specifications, for the Kansas Department of Health and Environment (KDHE), Topeka, KS.

**Purpose:** To conduct one or all of the following categories of work at Orphan Sites Program and Dry Cleaning Facility Release Trust Fund sites:

**A) Investigation** – Assessment and Investigation of contamination including preparation of work plans and reports for Comprehensive Investigations, Supplemental Investigations, and Monitoring Well Installations.

**B) Remediation Design** – Design and evaluation of remediation systems for contaminated soil, groundwater, and/or indoor air, including preparation of work plans and reports for a Feasibility Study, Technology Evaluation, Remedial Design and Remediation System Evaluation;

**C) Remediation Implementation** - Installation, oversight, and implementation of remediation systems for contaminated soil, groundwater, and/or indoor air, including preparation of reports involving system installation and startup, including preparation of Remedial Action Report.

**D) Remediation Operation Maintenance and Monitoring** – Operation, maintenance and monitoring of remediation systems installed at sites including, but not limited to periodic monitoring of remediation systems, system repair, groundwater sampling and preparation of a Operation Maintenance and/or Monitoring Reports. Standard OM&M includes collecting data from the systems, interpreting the information, and making necessary adjustments to optimize the system performance in consultation with KDHE. The Contractor is responsible for maintenance and cleaning of the remedial building/trailer/system/compound and the surrounding property near the system. This includes but is not limited to; maintaining a clean area, free of trash and dirt accumulation; trash, weed and grass control in the area surrounding the remedial compound; elimination of pooled water in the areas surrounding the compound; maintenance of security/privacy fencing and gates; proper gravel placement if necessary; and an overall neat general appearance.

These activities would be at/for contaminated sites being addressed under the Kansas Dry-cleaning Environmental Response Act (DERA) and the Orphan Sites Program, which are managed within the Kansas Department of Health and Environment (KDHE), Bureau of Environmental Remediation.

### **Work Plan and Reports.**

A. **Objectives:** The Work Plans and subsequent reports shall generally follow the formats provided. The primary objectives are as follows:

1. Work plans are provided to describe the proposed work to be conducted for each event. Work plans shall include any potential investigative methods for soil gas, soil, groundwater, surface water, etc. Work Plans may reference SOPs, KDHE policies or guidelines, and detailed sampling protocol if a Master Field Services Plan is submitted and approved by KDHE prior to preparing the site-specific work plan.
2. The Comprehensive Investigation Reports document the findings of a full-scale investigation of contamination completed to delineate the total extent of contamination attributed to the site.
3. Supplemental Investigation Reports document detailed investigation efforts that assess new or additional areas of contamination; or changes in the contaminant plume due to on- and off-site groundwater use, property use, etc. Supplemental Investigations may also be completed to document the extent of the vadose zone source areas.
4. Feasibility Study: The feasibility study is completed to evaluate remedial alternatives to the extent needed to select the remedy. The Feasibility Study documents that all potential

remedial alternatives are evaluated so that the appropriate remedy is selected. May include additional supplemental investigation to collect information necessary to evaluate remedial alternatives.

5. The Remedial Design must include all design plans, specifications, schedules and permit requirements necessary for the selected remedial system or remedial action. The design plans and specifications for remedial systems will include at a minimum a site plan, process and instrument diagrams, construction details, electrical schematics, and all other plans and specifications that are necessary to properly construct and implement the remedial system in accordance with the RFP. The Remedial Action Report will follow the format below.
  6. Monitoring Reports – The KDHE PM will determine what type of periodic report is needed. The three options are:
    - 1) Operations & Maintenance (O&M) of a remedial system O&M without groundwater monitoring;
    - 2) Groundwater monitoring of monitoring wells without remedial system oversight; or
    - 3) Combined operations, maintenance and groundwater monitoring of a site undergoing remediation.
- B. Report Submittal: All reports shall be submitted to KDHE as an inclusive .pdf file for the entire report and in original software format. Report submittal times are as follows:
1. Comprehensive Investigation, Supplemental Investigation and Remedial Investigation Work Plans and Reports: Within 45 days after completion of the field work or within 30 days after receipt of laboratory analytical data.
  2. Monitoring Reports: Within 30 days after receipt of laboratory analytical data.
  3. Remedial Investigation/Feasibility Study, Remedial Design, and Remedial Action Reports: Within 60 days after receipt of work order and any field data within 30 days after receipt of laboratory analytical data.
  4. All draft reports receiving comments shall be finalized within 30 days of receipt of the final KDHE comment letter.

## **Work Plan and Report Formats**

**CI – Comprehensive Investigation**

**SI – Supplemental Investigation**

**MWI – Monitoring Well Installation**

**TE – Technology Evaluation**

**RSE – Remedial System Evaluation**

**FS – Feasibility Study**

**RD – Remedial Design**

**RAR – Remedial Action Report**

**Monitoring Reports (O&M and/or Groundwater)**

**SCOPE OF WORK (SOW)**  
**FOR A**  
**COMPREHENSIVE INVESTIGATION WORK PLAN (CI WP)**

This Scope of Work outlines activities to be completed as part of the **Comprehensive Investigation Work Plan (CI WP)**. A CI WP describing proposed investigative activities must be prepared and submitted to KDHE. The work plan will describe in detail the CI activities.

Prior to issuing the SOW, KDHE will compile information regarding the suspected source area. The primary objectives of the CI WP are described as follows:

1. Gather information regarding the history of the site, as well as nearby properties that could impact the site. In general the research will include, but not be limited to:
  - a. Review of county appraiser records or web sites to determine specific property dimensions and boundaries;
  - b. Informal title search of the source area(s) property up to the current landowner and dating back as needed to document all previous landowners that may have contaminated the site;
  - c. Operational history of the impacted property - including waste generation information;
  - d. Review and documentation of available City Directories and Sanborn® Insurance Maps;
  - e. Review all available information describing geologic and hydrogeologic conditions at the site;
  - f. Review and documentation of current and historical aerial photographs;
  - g. Review of historical city directories
  - h. KDHE may request that the information generated by an ownership investigation be presented in the form of a separate comprehensive report. The KDHE PM will approve the scope and level of effort to be assigned for an ownership investigation.
2. On-site reconnaissance activities for the CI WP generally will include:
  - a. Inspection of the site and adjacent property area (including extensive photo documentation) to identify potential source areas by researching all past and present activities or operations at the site. The Contractor's Project Manager should tour the facility to help identify the location of equipment, USTs, ASTs, entrances, disposal methods, sewers, dumpsters, special waste areas, waste types, spills, leaks, location of trenches, equipment storage, buried utilities, overhead obstructions such as utility lines and trees, etc. Past and present owner/operators, managers, and/or facility employees should be interviewed to collect this information;
  - b. Utility locate, specifically including private sewer lines to identify key sampling locations.

- c. Identification of receptor areas.
    - i. Residential areas (households, nursing homes, schools, day care centers, parks or public recreations areas, churches, pedestrian routes, etc);
    - ii. Direct Exposure Pathway - identify and document any indications of direct exposure to impacted soils or surficial wastes (i.e., trails, children playing in area, workers on site, etc.);
    - iii. Surface Water Pathway - identify all surface water bodies or drainage pathways adjacent to the site.
    - iv. Groundwater Pathway - Identify all private water wells within one-mile of site (not already identified by KDHE) and document well use.
  - d. Sensitive Environments - identify any sensitive aquatic, terrestrial, or wetland ecosystems on and/or adjacent to the site.
3. Develop a work plan including a Field Sampling Plan, Quality Assurance Project Plan (QAPP), and Site Health and Safety Plan (SHSP) to delineate the vertical and horizontal extent of the contamination. The work plan should include:
- a. Text and maps identifying how the contractor will identify the nature and extent of vertical and horizontal contamination (i.e., contaminants present and media impacted);
  - b. Identification of surface water and Public Water Supply (PWS) or domestic wells to be sampled based on the research and site reconnaissance visit;
  - c. SOPs for all potential investigation techniques (e.g., drilling, probing, passive soil gas, etc.). The SOPs can be standard Appendices for each technology and the Field Sampling Plan will identify the specific use of the technologies;
  - d. Plans to identify and/or confirm potential contaminant receptors at the site;
  - e. Plans to evaluate the potential for migration from the site;
  - f. Proposed method to evaluate risk associated with any identified contamination relative to land use, receptors, and exposure pathways.

Data must be included in the final CI report to support the historical research and site reconnaissance findings. Portions of this component may be excluded if an approved site assessment was conducted at the site or sufficient background information about the site has been properly documented.

A comprehensive outline of KDHE's recommended Work Plan (content and format) is described below. Site specific conditions such as type of contaminants, geohydrologic setting, media impacted, source mechanisms, etc. will vary. The recommended content and format must therefore be adapted appropriately to ensure the work plan proposes a strategy that will clearly achieve the primary objectives of the CI for each Site evaluated.

## **1.0 Introduction**

The Introduction should provide the rationale for conducting the CI, specifically findings and recommendations based on the work plan research and site reconnaissance visit. A description of the specific objectives for the investigation must also be included in this section.

## **2.0 Site Location and Background**

- 2.1 Site Location and Demographics - Provide a description of the site location such as legal description, street address, city, and county. General demographic information regarding the site area, such as, population density, city and/or county zoning, and predominant land usage in area, (i.e., urban, rural, commercial, residential, industrial, agricultural, etc.) should be included. A description of drinking water resources for the area should be provided. The work plan should also include applicable GPS information available for the site.
- 2.2 Site History - Provide a detailed history of the site including site operations, ownership, and all past site activities leading up to the CI.
- 2.3 Previous Investigations - Briefly summarize the results and conclusions of other previous investigations conducted at the site.
- 2.4 Geology and Hydrogeology - Describe both the regional and site-specific geology and hydrogeology characteristics based on available information such as scientific reports, soil borings, or well logs.

## **3.0 Initial Evaluation**

- 3.1 Potential Contaminants of Concern - Identify chemical and waste types of all contaminants to be evaluated during the investigation.
- 3.2 Potential Source Areas - Identify all potential source areas noting the type of source such as drycleaning machines, sanitary sewers, dumpster locations, storage tanks, releases and/or spills. If multiple potential source areas exist, identify the contaminants associated with each source area. Include an identification of potential off-site source areas, if applicable.
- 3.3 Potential Contaminant Migration Pathways - Identify the primary mechanisms and pathways for contaminant transport.
- 3.4 Potential Human and Environmental Receptors and Exposure Pathways - Identify any human populations, domestic wells, sensitive environmental settings, and ecologic populations (i.e., threatened or endangered species) that could potentially be exposed to contamination from the site. Identify potential exposure pathways.
- 3.5 Extent of Known Contamination - Describe the known nature, extent and degree of contamination. Any known on-site or nearby monitoring wells should be sampled during the site recon visit and the data used to develop the CI plan for contaminant delineation.

## **4.0 Work Plan Rationale**

- 4.1 Data Needs - Identify the data needed to achieve CI objectives.
- 4.2 Work Plan Approach - Describe in detail how the work plan strategy has been developed and how proposed investigative activities will achieve the objectives of the investigation.

## **5.0 CI Tasks**

Comprehensive investigation tasks, such as groundwater probing, soil probing, source area characterization, monitoring well installation, etc., may be conducted and completed as separate phased tasks or as defined in the scope of work.

- 5.1 Proposed Field Investigation - Describe the investigative strategies proposed relative to satisfying the tasks provided in Sections 5.1.1 through 5.1.8. **Please keep in mind that CI Tasks proposed should satisfy Primary Objectives for**

**the specific site; investigation tasks may vary for different sites as conditions may vary significantly between sites.**

- 5.1.1 Source Area(s) Characterization - Identify all potential source areas and the nature of contamination.
- 5.1.2 Extent of Contamination in Soil - Define the vertical and horizontal extent of soil contamination emanating from each source area.
- 5.1.3 Extent of Contamination in Groundwater - Define the vertical and horizontal extent of groundwater contamination emanating from each source area.
- 5.1.4 Vadose Zone Physical Characteristics - Identify and collect all relevant physical parameter data; specific parameters to be evaluated should be indicated. Note that this data will be necessary in evaluating contaminant fate and transport in soil and plausible remedial technologies to address the contamination.
- 5.1.5 Aquifer Characteristics - Identify and collect all relevant aquifer parameter data; specific parameters (i.e., transmissivity, vertical and horizontal hydraulic conductivity, storativity, specific yield, boundary conditions). Note that this information may be necessary in evaluating contaminant fate and transport and definitely necessary if remediation of groundwater contamination is to be required.
- 5.1.6 Investigative Derived Wastes - Indicate the appropriate handling, treatment, analysis, and disposal of all investigative derived wastes and any relevant permitting/regulatory approval needed.
- 5.1.7 Regulatory Involvement - Describe all areas of the proposed investigation where local, state and/or federal regulatory authority will apply such as well drilling, soil boring plugging, drilling permits, etc.
- 5.2 Sample Analysis - Describe the sampling strategy to be implemented during the CI; include discussion of field screening, laboratory analysis, and types of samples that will be analyzed. Specific sample collection methods, specific sampling frequency and screening methods, and specific analyses must be discussed in detail. Quality assurance sampling and laboratory analytical methods will be discussed in detail in the Quality Assurance Project Plan. This discussion should include the following:
  - 5.2.1 Sampling Objectives - Describe objectives of sampling efforts relative to the intended use of the data. (For example, how will screening data be utilized? Will sampling strategies be modified based on field observations and screening?).
  - 5.2.2 Sampling Locations and Frequency - This section should define sample locations and rationale. This includes samples for field screening and laboratory sampling for all media being sampled.
  - 5.2.3 Sampling Equipment and Procedures - Provide the step-by-step procedures indicating how each sample will be collected. The instructions should also identify all equipment to be used for sample collection and decontamination procedures. Standard Operating Procedures (SOPs) may be referenced and included as an Appendix.
  - 5.2.4 Sample Handling and Analysis - This should consist of a table that identifies sample preservation methods, storage, types of sampling containers, shipping procedures and requirements, holding times, field screening analytical methods, and laboratory analytical methods.

5.3 Risk Evaluation - Evaluate risk associated with any identified contamination relative to potential migration pathways and receptors.

5.4 Land Use Determination - Determine the current land use onsite and for surrounding the property.

5.5 Other - Describe in detail other investigative methods proposed.

## **6.0 Schedule**

Provide a detailed schedule of proposed activities that specifically identifies the dates and time frames for implementing and completing significant tasks of the CI including initiation of fieldwork and submittal of the report.

## **7.0 References**

Please cite references throughout the report and provide a comprehensive listing of resources referenced for preparation of the Work Plan within the reference section.

## **8.0 Tables**

Provide information and data tables, as appropriate, for quick reference within the Work Plan. Necessary tabulated data such as field screening data, laboratory analytical data, water level data, well completion data, etc., from previous investigations should be included.

## **9.0 Figures (Drawn to Scale – Standard engineering scale only)**

At a minimum the following figures must be included within the Work Plan:

- A figure based on a USGS 7.5' Quadrangle depicting the site location.
- A Site Map that depicts the entire site, buildings and pertinent site features, surrounding properties, potential source areas, and potentially impacted receptors.
- A figure that depicts locations of proposed investigative sampling such as soil boring and monitoring well locations.
- Any relevant figures from previous investigation reports such as potentiometric maps, figures depicting known source areas and the known extent of contamination.

## **10.0 Appendix A - Quality Assurance Project Plan**

A Quality Assurance Project Plan (QAPP) must be developed to describe policy, organization, function activities, and quality control and quality assurance protocols necessary to achieve quality of data necessary to satisfy project objectives. The QAPP must define the following information:



- 10.1 Key Personnel - Key personnel or organizations that are necessary for each activity during the investigation, along with their responsibilities, must be defined (this information should be presented in a table).
- 10.2 Quality Assurance Objectives for Data - The degree of accuracy of sample analysis and how this degree of accuracy will be achieved must be identified. Also within this section, the numbers, collection frequency, and types of QA/QC samples such as trip blanks, field blanks, equipment blanks, and replicates must be identified.
- 10.3 Sample Custody - Identify and describe Chain of Custody procedures for samples collected for laboratory analysis.
- 10.4 Analytical Procedures - Identify specific laboratory methods to be used for analysis of samples.
- 10.5 Laboratory QA/QC - A description of the analytical laboratory's QA/QC program.
- 10.6 Data Validation and Reporting - A description of how laboratory results will be validated, after data is received from the laboratory to determine whether QA/QC protocol has been met. KDHE requires that a summary be included within the Report to allow the reviewer to verify that data has been appropriately validated. The summary must address the data validation process including discussion describing results from analysis of replicates, laboratory or method blanks, matrix spikes and matrix spike duplicates, trip blanks, field blanks, equipment (rinsate) blanks, and any other QA/QC samples.

#### **11.0 Appendix B - Health and Safety Plan**

A Site Health and Safety Plan consistent with OSHA requirements must be included with the Work Plan.

**SCOPE OF WORK (SOW)  
FOR A  
COMPREHENSIVE INVESTIGATION (CI) REPORT**

This Scope of Work outlines activities to be completed as part of the **Comprehensive Investigation (CI) Report**. The CI field work is conducted based on the approved CI Work Plan that describes in detail the activities to be developed and submitted to KDHE for review and approval. In addition, the work plan includes a quality assurance project plan and a health and safety plan as Appendix or appendices.

The CI Report presents the results of investigation activities and must be submitted to KDHE for review, comment, and approval. The report must clearly demonstrate that the Primary Objectives of the CI have been satisfied. The required content and format for the report is provided below.

**Executive Summary**

Provide a summary of the results of the CI. The executive summary should allow the reviewer to understand the general nature and magnitude of the site.

**1.0 Introduction**

The introduction should provide the rationale for conducting the investigation and the purpose of the report. A description of the specific objectives developed for the CI prior to its initiation must be stated including any additional objectives established during the implementation of the investigation.

**1.1 Site Location and Background**

1.1.1 Site Location and Demographics -Provide a description of the site location such as legal description, street address, city, and county. General demographic information regarding the site area such as, population density, city and/or county zoning, and predominant land usage in the area should be included. A description of drinking water resources for the area must be provided. Provide any GPS information collected for the site.

1.1.2 Site Ownership History - Provide a detailed history of the site including site operations, (current and historical), ownership, and all past site activities leading up to the investigation. Interviews with current and past owners are required during the CI WP site reconnaissance to help identify contaminant use and waste handling procedures.

1.1.3 Previous Investigations - If investigations relative to the site have already been conducted, briefly summarize the results and conclusions of previous investigations.

**2.0 Site Physical Characteristics**

2.1 Surface Features (i.e., topography, physical characteristics, natural/manmade features)

2.2 Climatic Conditions

2.3 Surface Water Hydrology

2.4 Site Geology – Please provide referenced geologic information for the site area as well as any geologic information observed during the investigation.

2.5 Site Soil and Vadose Zone Characteristics – Please provide referenced soil and

vadose zone characteristics for the site area as well as any soil and vadose zone information observed during the investigation.

- 2.6 Site Hydrogeology Characteristics – Please provide referenced hydrogeologic information for the site area as well as any hydrogeologic information observed during the investigation.

### **3.0 Investigative Activities**

Describe in detail all investigative activities conducted as part of the CI. Discuss the methods and procedures utilized during the investigation relative to the following (as applicable to the site):

- 3.1 Contaminant Source Areas
- 3.2 Surface and Subsurface Soil Sampling Activities
- 3.3 Groundwater Sampling Activities
- 3.4 Surface Water Sampling Activities
- 3.5 Indoor/Outdoor Air Sampling Activities
- 3.6 Any Additional Relevant Investigative Activities
- 3.7 Any Deviations from Work Plan - Provide a detailed explanation for deviation(s).

### **4.0 Nature and Extent of Contamination**

Present all analytical results from the CI. Describe in detail the horizontal and vertical extent of contamination identified for each of the following media. Provide reference to specific analytical results obtained during the investigation.

- 4.1 Nature and Extent of Sources and Source Areas
- 4.2 Soils and Vadose Zone Impact
- 4.3 Groundwater Impacts
- 4.4 Surface Water and Sediments
- 4.5 Air Impact

### **5.0 Contaminant Fate and Transport**

- 5.1 Contaminant Characteristics - Describe the physical, chemical, and biological properties (toxicity, degradation products, etc.) of contaminants at the site and provide specifics on behavior of these contaminants in the site setting.
- 5.2 Contaminant Migration - Describe contaminant migration pathways (air, groundwater, etc.).
- 5.3 Discuss factors affecting contaminant migration for the media of importance (e.g., sorption onto soils, solubility in water, movement of groundwater, vapor intrusion, etc.).
- 5.4 If modeling has been used, discuss modeling methods and results.

### **6.0 Identification of Potential Receptors**

- 6.1 Receptors - Identify any receptors that have been impacted or could potentially be impacted by the contamination. Receptors may include water supply wells, residential and commercial areas, sensitive populations (e.g., health care facilities, schools, or daycares), surface water bodies, sensitive ecosystems such as habitat for endangered species, etc.
- 6.2 Potential Risk - Evaluate risk associated with impact identified relative to potential

migration and exposure pathways, receptors, and contaminant toxicity.

## 7.0 Conclusions and Recommendations

7.1 Provide a summary of the CI results addressing primarily:

7.1.1 Nature and Extent of Contamination

7.1.2 Human Health and Environmental Risk

7.2 Provide Final Conclusions and Recommendations as derived from the CI.

## 8.0 References

Please cite references throughout the report and provide a comprehensive listing of resources referenced for preparation of the Report within the reference section.

## 9.0 Tables

Certain data collected during the CI must be presented in tables in the report. Tabulation of specific data must be done **as appropriate for the work conducted during the investigation**; tables to be required include, but are not limited to:

9.1 Field Screening Results - Tables providing field screening results for samples collected during the CI must be presented in the report. More than one table may be required to include the following types of information:

- Sample location identification
- Date sample was collected and screened
- Sample interval depth
- Target compounds
- Results from field screening (concentration and units)

9.2 Laboratory Analytical Results - Tables providing laboratory analytical results from samples collected during the CI must be presented in the report. A table providing any pertinent historical analytical results must also be provided. More than one table may be required to include the following types of information:

- Sample location identification
- Sample depth
- Target compounds
- Concentrations of compounds detected
- Date sampled
- QA/QC data
- Appropriate regulatory cleanup levels

9.3 Well Completion Information

- Well identification
- Ground surface elevation
- Top of casing/measuring point elevation
- Screen length
- Total depth of well

- Static water level elevation
- Date of static water level measurement
- Table listing all information collected during well development (i.e., calculated volume to be removed, actual amount removed, final measurement parameters)

#### 9.4 Well Development Information (if applicable)

- Date
- Calculated volume to be removed
- Actual amount removed
- Successive parameter measurements should demonstrate stabilization prior to development is considered complete (as applicable to the scope of work)
- Parameters should include specific conductance, dissolved oxygen, oxidation-reduction potential, turbidity, pH, temperature.
- Final measurement parameters

#### 9.5 Well Purging Data

- Provide the following data collected during purging of wells for sampling:
- Date purged
- Volumes purged
- Parameter measurement values (temp, pH, electroconductivity, dissolved O<sub>2</sub>, etc.) successive parameter measurements should demonstrate stabilization prior to sample

#### 9.6 Unsaturated and/or Saturated Zone Hydrogeological Testing Results

- Tabulate the results from vadose zone or aquifer testing.

### **10.0 Figures (Drawn to Scale – Standard engineering scale only)**

The following listed figures should be included in the CI Report (as applicable):

- 10.1 A figure based on a USGS 7.5' Quadrangle depicting the site location.
- 10.2 A Site Map that depicts the entire site, buildings and pertinent site features, surrounding properties, potential current and historical source areas, and potentially impacted receptors. All buildings at the site should be labeled indicating what the buildings current and historical uses have been.
- 10.3 A sampling location map that depicts locations of monitoring wells, soil borings, soil gas and groundwater probe locations, surface soil sampling locations, indoor air sampling locations, etc. It may be necessary to prepare separate maps for sampling locations to keep the map legible; e.g., separate maps for monitoring well locations versus groundwater survey probe locations.
- 10.4 Potentiometric surface map - control points must be labeled and data such as static water level elevations at control points must be depicted on the map.
- 10.5 Geologic cross sections (as applicable) - at least two cross sections to depict the geology of the site. The cross sections should be oriented longitudinally and transversely with respect to the orientation of soil and/or groundwater contaminant plumes. The potentiometric surface should be depicted on the cross section.
- 10.6 Soil contamination extent maps - either isocontoured soil analytical data or general

extent of soil contamination should be indicated.

10.7 Groundwater contamination isoconcentration maps - these maps should depict the extent and degree of groundwater contamination. It may be necessary to prepare an isocontour map for each contaminant, suite of contaminants, and total contamination.

10.8 Vapor intrusion contamination extent maps - either isocontoured indoor air analytical data or general extent of indoor air contamination should be indicated.

## **11.0 Appendices**

Appendices containing the following material must be included in the CI Report (as applicable). Appendices to contain other pertinent material should be developed and included as necessary.

11.1 Soil boring and monitoring well construction logs information.

11.2 KDHE monitoring well development forms

11.3 KDHE private well data sheets

11.4 KDHE utility clearance checklists

11.5 Soil gas or groundwater survey analytical reports and QA/QC results.

11.6 Laboratory certificates for soil sample analysis.

11.7 Laboratory certificates for groundwater analysis.

11.8 Data validation and usability summary.

11.9 Copies of the field notebook.

11.10 Vadose zone or aquifer testing data and parameter estimation calculations.

11.11 Vadose zone or groundwater flow modeling data and results.

11.12 Pertinent correspondence such as communications with regulatory agencies relative to permitting, waste characterization and disposal, etc.

11.13 Photographs - photographs of site features, investigative activities, etc.

11.14 Any collected GPS data given in latitude and longitude.

11.15 Any other relevant documentation necessary to provide a complete description of CI investigative activities.

**SCOPE OF WORK (SOW)**  
**FOR A**  
**SUPPLEMENTAL INVESTIGATION WORK PLAN (SI WP)**

This Scope of Work outlines activities to be completed as part of the **Supplemental Investigation Work Plan (SI WP)**. A SI may be requested when a CI has been completed and approved; however, conditions have changed and further investigation is required to complete a plume delineation (e.g., changes in local or regional groundwater pumping influences the contaminant migration or new information identifies additional sensitive receptors.) In all cases a CI will have already been conducted and the historical information may need to be updated for the new area of interest. A SI WP describing proposed investigative activities must be prepared and submitted to KDHE. The work plan will describe in detail the SI activities. Prior to issuing the SOW, KDHE will compile information regarding the suspected source area. The primary objectives of the SI WP are described as follows:

1. Gather new information, as needed, regarding the history of the target area, as well as nearby properties that could impact the site. In general the research will include, but not be limited to:
  - a. Review of county appraiser records or web sites to determine specific property dimensions and boundaries;
  - b. Informal title search of the source area(s) property up to the current landowner and dating back as needed to document all previous landowners that may have contaminated the site;
  - c. Operational history of the impacted property - including waste generation information;
  - d. Review and documentation of available City Directories and Sanborn® Insurance Maps;
  - e. Review all available information describing geologic and hydrogeologic conditions at the site;
  - f. Review and documentation of current and historical aerial photographs;
  - g. Review of historical city directories
2. On-site reconnaissance activities for the SI WP generally will include:
  - a. Inspection of the target area and adjacent property area (including extensive photodocumentation) to identify potential source areas by researching all past and present activities or operations at the site. Contractor's Project Manager should inspect the area to be assessed to identify potential buried utilities, overhead obstructions such as utility lines and trees, traffic flow, etc. Past and present owner/operators, managers, and/or facility employees may need to be interviewed to collect this information;
  - b. Identification of receptor areas.
    - i. Residential areas (households, nursing homes, schools, day care centers, parks or public recreations areas, churches, pedestrian routes, etc);

- ii. Direct Exposure Pathway - identify and document any indications of direct exposure to impacted soils or surficial wastes (i.e., trails, children playing in area, workers on site, etc.);
    - iii. Surface Water Pathway - identify all surface water bodies or drainage pathways adjacent to the site.
    - iv. Groundwater Pathway - Identify all private water wells within one-mile of site (not already identified by KDHE) and document well use.
  - c. Sensitive Environments - identify any sensitive aquatic, terrestrial, or wetland ecosystems on and/or adjacent to the site.
- 3. Develop a work plan including a Field Sampling Plan, Quality Assurance Project Plan (QAPP), and Site Health and Safety Plan (SHSP) to delineate the vertical and horizontal extent of the contamination. The work plan should include:
  - a. Text and maps identifying how the contractor will identify the nature and extent of vertical and horizontal contamination (i.e., contaminants present and media impacted);
  - b. Identification of surface water and Public Water Supply (PWS) or domestic wells to be sampled based on the research and site reconnaissance visit;
  - c. SOPs for all potential investigation techniques (e.g., drilling, probing, passive soil gas, etc.). The SOPs can be standard Appendix for each technology and the Field Sampling Plan will identify the specific use of the technologies;
  - d. Plans to identify and/or confirm potential contaminant receptors at the site;
  - e. Plans to evaluate the potential for migration from the site;
  - f. Proposed method to evaluate risk associated with any identified contamination relative to land use, receptors, and exposure pathways.

Data must be included in the final SI report to support the historical research and site reconnaissance findings. Portions of this component may be excluded if an approved site assessment was conducted at the site or sufficient background information about the site has been properly documented.

A comprehensive outline of KDHE's recommended Work Plan (content and format) is described below. Site specific conditions such as type of contaminants, geohydrologic setting, media impacted, source mechanisms, etc. will vary. The recommended content and format must therefore be adapted appropriately to ensure the work plan proposes a strategy that will clearly achieve the primary objectives of the SI for each property evaluated.

## **1.0 Introduction**

The Introduction should provide the rationale for conducting the SI, specifically findings and recommendations based on the work plan research and site reconnaissance visit. A description of the specific objectives for the investigation must also be included in this section.

## **2.0 Site Location and Background**

- 2.1 Site Location and Demographics - Provide a description of the site location such as legal description, street address, city, and county. General demographic information regarding the site area, such as, population density, city and/or county zoning, and predominant land usage in area, (i.e., urban, rural, commercial, residential, industrial, agricultural, etc.) should be included. A description of drinking water resources for the site should be provided. The work plan should also



include any GPS information available for the site.

- 2.2 Site History - Provide a detailed history of the site including site operations, ownership, and all past site activities leading up to the SI.
- 2.3 Previous Investigations - Briefly summarize the results and conclusions of other previous investigations conducted at the site.
- 2.4 Geology and Hydrogeology - Describe both the regional and site-specific geology and hydrogeology characteristics based on available information such as scientific reports.

### 3.0 Initial Evaluation

- 3.1 Potential Contaminants of Concern - Identify chemical and waste types of all contaminants to be evaluated during the investigation.
- 3.2 Potential Source Areas - Identify all potential new source areas, if applicable, noting the type of source such as drycleaning machines, sanitary sewers, dumpster locations, storage tanks, releases and/or spills. If multiple potential source areas exist, identify the contaminants associated with each source area. Include an identification of potential off-site source areas, if applicable.
- 3.3 Potential Contaminant Migration Pathways - Identify the primary mechanisms and pathways for contaminant transport.
- 3.4 Potential Human and Environmental Receptors and Exposure Pathways - Identify any human populations, domestic wells, sensitive environmental settings, and ecologic populations (i.e., threatened or endangered species) that could potentially be exposed to contamination from the site. Identify potential exposure pathways.
- 3.5 Extent of Known Contamination - Describe the known nature, extent and degree of contamination.

### 4.0 Work Plan Rationale

- 4.1 Data Needs - Identify the data needed to achieve SI objectives.
- 4.2 Work Plan Approach - Describe in detail how the work plan strategy has been developed and how proposed investigative activities will achieve the objectives of the investigation.

### 5.0 SI Tasks

- 5.1 Proposed Field Investigation - Describe the investigative strategies proposed relative to satisfying the tasks provided in Sections 5.1.1 through 5.1.8. **Please keep in mind that SI Tasks proposed should satisfy Primary Objectives for the specific site; investigation tasks may vary for different sites as conditions may vary significantly between sites.**
  - 5.1.1 Source Area(s) Characterization - Identify all potential new source areas and the nature of contamination.
  - 5.1.2 Extent of Contamination in Soil - Define the vertical and horizontal extent of soil contamination emanating from each new source area, if applicable.
  - 5.1.3 Extent of Contamination in Groundwater - Define the vertical and horizontal extent of groundwater contamination emanating from each new source area or target area.
  - 5.1.4 Vadose Zone Physical Characteristics - Identify and collect all relevant physical parameter data; specific parameters to be evaluated should be indicated. Note that this data will be necessary in evaluating contaminant

fate and transport in soil and plausible remedial technologies to address the contamination.

- 5.1.5 Aquifer Characteristics - Identify and collect all relevant aquifer parameter data; specific parameters (i.e., transmissivity, vertical and horizontal hydraulic conductivity, storativity, specific yield, boundary conditions). Note that this information may be necessary in evaluating contaminant fate and transport and definitely necessary if remediation of groundwater contamination is to be required.
- 5.1.6 Investigative Derived Wastes - Indicate the appropriate handling, treatment, analysis, documentation and disposal of all investigative derived wastes and any relevant permitting/regulatory approval needed.
- 5.1.7 Regulatory Involvement - Describe all areas of the proposed investigation where local, state and/or federal regulatory authority will apply such as well drilling, soil boring plugging, drilling permits, etc.
- 5.2 Sample Analysis - Describe the sampling strategy to be implemented during the SI; include discussion of field screening, laboratory analysis, and types of samples that will be analyzed. Specific sample collection methods, specific sampling frequency and screening methods, and specific analyses must be discussed in detail. Quality assurance sampling and laboratory analytical methods will be discussed in detail in the Quality Assurance Project Plan. This discussion should include the following:
  - 5.2.1 Sampling Objectives - Describe objectives of sampling efforts relative to the intended use of the data. (For example, how will screening data be utilized? Will sampling strategies be modified based on field observations and screening?).
  - 5.2.2 Sampling Locations and Frequency - This section should define sample locations and rationale. This includes samples for field screening and laboratory sampling for all media being sampled.
  - 5.2.3 Sampling Equipment and Procedures - Provide the step-by-step procedures indicating how each sample will be collected. The instructions should also identify all equipment to be used for sample collection and decontamination procedures. Standard Operating Procedures (SOPs) may be referenced and included as an Appendix.
  - 5.2.4 Sample Handling and Analysis - This should consist of a table that identifies sample preservation methods, storage, types of sampling containers, shipping procedures and requirements, holding times, field screening analytical methods, and laboratory analytical methods.
- 5.3 Risk Evaluation - Evaluate risk associated with any identified contamination relative to potential migration pathways and receptors.
- 5.4 Land Use Determination - Determine the current land use for the property and surrounding target area property.
- 5.5 Other - Describe in detail other investigative methods proposed.

## **6.0 Schedule**

Provide a detailed schedule of proposed activities that specifically identifies the dates and time frames for implementing and completing significant tasks of the SI including initiation of fieldwork and submittal of the report.

## **7.0 References**

Please cite references throughout the report and provide a comprehensive listing of resources referenced for preparation of the Work Plan within the reference section.

## **8.0 Tables**

Provide information and data tables, as appropriate, for quick reference within the Work Plan. Necessary tabulated data such as field screening data, laboratory analytical data, water level data, well completion data, etc., from previous investigations should be included.

## **9.0 Figures (Drawn to Scale – Standard engineering scale only)**

At a minimum the following figures must be included within the Work Plan:

- A figure based on a USGS 7.5' Quadrangle depicting the site location.
- A Site Map that depicts the entire site, buildings and pertinent site features, surrounding properties, potential source areas, and potentially impacted receptors.
- A figure that depicts locations of proposed investigative sampling such as soil boring and monitoring well locations.
- Any figures from previous investigation reports such as potentiometric maps, figures depicting known source areas and the known extent of contamination.

## **10.0 Appendix A - Quality Assurance Project Plan**

A Quality Assurance Project Plan (QAPP) must be developed to describe policy, organization, function activities, and quality control and quality assurance protocols necessary to achieve quality of data necessary to satisfy project objectives. The QAPP must define the following information:

- 10.1 Key Personnel - Key personnel or organizations that are necessary for each activity during the investigation, along with their responsibilities, must be defined (this information should be presented in a table).
- 10.2 Quality Assurance Objectives for Data - The degree of accuracy of sample analysis and how this degree of accuracy will be achieved must be identified. Also within this section, the numbers, collection frequency, and types of QA/QC samples such as trip blanks, field blanks, equipment blanks, and replicates must be identified.
- 10.3 Sample Custody - Identify and describe Chain of Custody procedures for samples collected for laboratory analysis.
- 10.4 Analytical Procedures - Identify specific laboratory methods to be used for analysis of samples.
- 10.5 Laboratory QA/QC - A description of the analytical laboratory's QA/QC program.
- 10.6 Data Validation and Reporting - A description of how laboratory results will be validated, after data is received from the laboratory to determine whether QA/QC protocol has been met. KDHE requires that a summary be included within the Report to allow the reviewer to verify that data has been appropriately validated.

The summary must address the data validation process including discussion describing results from analysis of replicates, laboratory or method blanks, matrix spikes and matrix spike duplicates, trip blanks, field blanks, equipment (rinsate) blanks, and any other QA/QC samples.

**11.0 Appendix B - Health and Safety Plan**

A Site Health and Safety Plan consistent with OSHA requirements must be included with the Work Plan.

**SCOPE OF WORK (SOW)  
FOR A  
SUPPLEMENTAL INVESTIGATION (SI) REPORT**

This Scope of Work outlines activities to be completed as part of the **Supplemental Investigation (SI) Report**. A SI may be requested when a CI has been completed and approved; however, hydrogeologic conditions have changed and further investigation is required to complete a plume delineation (e.g., changes in local or regional groundwater pumping influences the contaminant migration or new information identifies additional sensitive receptors.) In all cases a CI will have already been conducted and the historical information may need to be updated for the new area of interest. The SI fieldwork is conducted based on the approved SI Work Plan that describes in detail the activities to be developed and submitted to KDHE for review and approval. In addition, the work plan must include a quality assurance project plan and a health and safety plan as an Appendix or appendices.

An SI Report presents the results of investigation activities and must be submitted to KDHE for review, comment, and approval. The report must clearly demonstrate that the Primary Objectives of the SI have been satisfied. The required content and format for the report is provided below.

**Executive Summary**

Provide a preliminary summarization of the results of the SI. The executive summary should allow the reviewer to understand the general nature and magnitude of the site.

## 1.0 Introduction

- 1.1 Introduction should provide the rationale for conducting the investigation and the purpose of the report. A description of the specific objectives developed for the SI prior to its initiation must be stated including additional objectives established during the implementation of the investigation.
- 1.2 Site Location and Background
  - 1.2.1 Site Location and Demographics -Provide a description of the site location such as legal description, street address, city, and county. General demographic information regarding the site area such as, population density, city and/or county zoning, and predominant land usage in the area should be included. A description of drinking water resources for the area must be provided. Provide any GPS information collected for the site.
  - 1.2.2 Site Ownership History - Provide a detailed history of the site including site operations, (current and historical), ownership, and all past site activities leading up to the investigation. Interviews with current and past owners are required during the CI WP site reconnaissance to help identify contaminant use and waste handling procedures.
  - 1.2.3 Site History - Provide a detailed history of the site including site operations, (current and historical), ownership, and all past site activities leading up to the investigation. Interviews with current and past owners are required during the SI WP site reconnaissance to help identify contaminant use and waste handling procedures.
  - 1.2.4 Previous Investigations - If investigations relative to the site have already been conducted, briefly summarize the results and conclusions of previous investigations.

## **2.0 Site Physical Characteristics**

- 2.1 Surface Features (i.e., topography, physical characteristics, natural/manmade features)
- 2.2 Climatic Conditions
- 2.3 Surface Water Hydrology
- 2.4 Site Geology – Please provide referenced geologic information for the site area as well as any geologic information observed during the investigation.
- 2.5 Site Soil and Vadose Zone Characteristics – Please provide referenced soil and vadose zone characteristics for the site area as well as any soil and vadose zone information observed during the investigation.
- 2.6 Site Hydrogeology Characteristics – Please provide referenced hydrogeologic information for the site area as well as any hydrogeologic information observed during the investigation.

## **3.0 Investigative Activities**

Describe in detail all investigative activities conducted as part of the SI. Discuss the methods and procedures utilized during the investigation relative to the following (as applicable to the site):

- 3.1 Contaminant Source Areas
- 3.2 Surface and Subsurface Soil Sampling Activities
- 3.3 Groundwater Sampling Activities
- 3.4 Surface Water Sampling Activities
- 3.5 Indoor/Outdoor Air Sampling Activities
- 3.6 Any Additional Relevant Investigative Activities
- 3.7 Any Deviations from Work Plan- Provide a detailed explanation for deviation(s).

## **4.0 Nature and Extent of Contamination**

Present all analytical results from the SI. Describe in detail the horizontal and vertical extent of contamination identified for each of the following media. Provide reference to specific analytical results obtained during the investigation.

- 4.1 Nature and Extent of Sources and Source Areas
- 4.2 Soils and Vadose Zone Impact
- 4.3 Groundwater Impacts
- 4.4 Surface Water and Sediments
- 4.5 Air Impact

## 5.0 Contaminant Fate and Transport

- 5.1 Potential Migration Routes - Describe potential contaminant migration pathways (air, groundwater, etc.).
- 5.2 Contaminant Characteristics - Describe the physical, chemical, and biological properties (toxicity, degradation products, etc.) of contaminants at the site and provide specifics on behavior of these contaminants in the site setting.
- 5.3 Contaminant Migration
  - 5.3.1 Discuss factors affecting contaminant migration for the media of importance (e.g., sorption onto soils, solubility in water, movement of groundwater, vapor intrusion, etc.).
  - 5.3.2 If modeling has been used, discuss modeling methods and results.

## 6.0 Identification of Potential Receptors

- 6.1 Receptors - Identify any receptors that have been impacted or could potentially be impacted by the contamination. Receptors may include water supply wells, residential and commercial areas, sensitive populations (e.g., health care facilities, schools, or daycares), human populations, surface water bodies, sensitive ecosystems such as habitat for endangered species, etc.
- 6.2 Potential Risk - Evaluate risk associated with impact identified relative to potential migration and exposure pathways, receptors, and contaminant toxicity.

## 7.0 Conclusions and Recommendations

- 7.1 Provide a summary of the SI results addressing primarily:
  - 7.1.1 Nature and Extent of Contamination
  - 7.1.2 Human Health and Environmental Risk
- 7.2 Provide Final Conclusions and Recommendations as derived from the SI.

## 8.0 References

Please cite references throughout the report and provide a comprehensive listing of resources referenced for preparation of the Report within the reference section.

## 9.0 Tables

Certain data collected during the SI must be presented in tables in the report. Tabulation of specific data must be done **as appropriate for the work conducted during the investigation**; tables to be required include, but are not limited to:

- 9.1 Field Screening Results - Tables providing field screening results for samples collected during the SI must be presented in the report. More than one table may be required to include the following types of information:
  - Sample location identification
  - Date sample was collected and screened
  - Sample interval depth
  - Target compounds
  - Results from field screening (concentration and units)
- 9.2 Laboratory Analytical Results - Tables providing laboratory analytical results from



samples collected during the SI must be presented in the report. A table providing any pertinent historical analytical results must also be provided. More than one table may be required to include the following types of information:

- Sample location identification
- Sample depth
- Target compounds
- Concentrations of compounds detected
- Date sampled
- QA/QC data
- Appropriate regulatory cleanup levels

9.3 Well Completion Information

- Well identification
- Ground surface elevation
- Top of casing/measuring point elevation
- Screen length
- Total depth of well
- Static water level elevation
- Date of static water level measurement
- Table listing all information collected during well development (i.e., calculated volume to be removed, actual amount removed, final measurement parameters)

9.4 Well Development Information (if applicable)

- Date
- Calculated volume to be removed
- Actual amount removed
- Successive parameter measurements should demonstrate stabilization prior to development is considered complete (as applicable to the scope of work)
  - Parameters should include specific conductance, dissolved oxygen, oxidation-reduction potential, turbidity, pH, temperature.
- Final measurement parameters

9.5 Well Purging Data

Provide the following data collected during purging of wells for sampling:

- Date purged
- Volumes purged

- Parameter measurement values (temp, pH, electroconductivity, dissolved O<sub>2</sub>, etc.) successive parameter measurements should demonstrate stabilization prior to sample

#### 9.6 Unsaturated and/or Saturated Zone Hydrogeological Testing Results

- Tabulate the results from vadose zone or aquifer testing.

### 10.0 Figures (Drawn to Scale – Standard engineering scale only)

The following listed figures should be included in the SI Report (as applicable):

- 10.1 A figure based on a USGS 7.5' Quadrangle depicting the site location.
- 10.2 A Site Map that depicts the entire site, buildings and pertinent site features, surrounding properties, potential current and historical source areas, and potentially impacted receptors. All buildings at the site should be labeled indicating what the buildings current and historical uses have been.
- 10.3 A sampling location map that depicts locations of monitoring wells, soil borings, soil gas and groundwater survey probe locations, surface soil sampling locations, etc. It may be necessary to prepare separate maps for sampling locations to keep the map legible; e.g., separate maps for monitoring well locations versus groundwater survey probe locations.
- 10.4 Potentiometric surface map - control points must be labeled and data such as static water level elevations at control points must be depicted on the map.
- 10.5 Geologic cross sections (as applicable) - at least two cross sections to depict the geology of the site. The cross sections should be oriented longitudinally and transversely with respect to the orientation of soil and/or groundwater contaminant plumes. The potentiometric surface should be depicted on the cross section.
- 10.6 Soil contamination extent maps - either isocontoured soil analytical data or general extent of soil contamination should be indicated.
- 10.7 Groundwater contamination isoconcentration maps - these maps should depict the extent and degree of groundwater contamination. It may be necessary to prepare an isocontour map for each contaminant, suite of contaminants, and total contamination.
- 10.8 Vapor intrusion contamination extent maps - either isocontoured indoor air analytical data or general extent of indoor air contamination should be indicated.

### 11.0 Appendices

Appendices containing the following material must be included in the SI Report (as applicable). Appendices to contain other pertinent material should be developed and included as necessary.

- 11.1 Soil boring and monitoring well construction logs information.
- 11.2 KDHE monitoring well development forms
- 11.3 KDHE private well data sheets
- 11.4 KDHE utility clearance checklists
- 11.5 Soil gas or groundwater survey analytical reports and QA/QC results.
- 11.6 Laboratory certificates for soil sample analysis.
- 11.7 Laboratory certificates for groundwater analysis.
- 11.8 Data validation and usability summary.
- 11.9 Copies of the field notebook.
- 11.10 Vadose zone or aquifer testing data and parameter estimation calculations.
- 11.11 Vadose zone or groundwater flow modeling data and results.
- 11.12 Pertinent correspondence such as communications with regulatory agencies relative to permitting, waste characterization and disposal, etc.
- 11.13 Photographs - photographs of site features, investigative activities, etc.
- 11.14 Any collected GPS data given as latitude and longitude.
- 11.15 Any other relevant documentation necessary to provide a complete description of SI investigative activities.

**SCOPE OF WORK (SOW)**  
**FOR A**  
**MONITORING WELL INSTALLATION WORK PLAN (MWI WP)**

This Scope of Work outlines activities to be completed as part of the **Monitoring Well Installation Work Plan (MWI WP)**. An MWI may be requested following the completion and approval of a previous investigation in which a groundwater plume has been identified and the installation of additional monitoring wells are necessary in order to observe plume migration over time. A comprehensive outline of KDHE's recommended Work Plan (content and format) is described below. Site specific conditions such as type of contaminants, geohydrologic setting, media impacted, source mechanisms, etc. will vary. The recommended content and format must therefore be adapted appropriately to ensure the work plan proposes a strategy that will clearly achieve the primary objectives of the MWI for each Site evaluated. Monitoring Well Installation, if included as part of a CI or SI Scope of Work, will not require a separate MWI WP. The primary objectives of the MWI WP report should include the following,

**1.0 Introduction**

The Introduction should provide the rationale for conducting the MWI and a description of the specific objectives for the MWI.

**2.0 Site Location and Background**

- 2.1 Site Location and Demographics – Provide a description of the site location such as legal description, street address, city, and county. General demographic information regarding the site area, such as, population density, city and/or county zoning, and predominant land usage in area, (i.e., urban, rural, commercial, residential, industrial, agricultural, etc.) should be included. A description of drinking water resources for the site should be provided. The work plan should also include any GPS information available for the site.
- 2.2 Site History – Provide a detailed history of the site including site operations, ownership, and all past site activities leading up to the MWI WP.
- 2.3 Previous Investigations – Briefly summarize the results and conclusions of other previous investigations conducted at the site.
- 2.4 Geology and Hydrogeology – Describe both the regional and site-specific geology and hydrogeology characteristics based on available information such as scientific reports.

**3.0 Initial Evaluation**

- 3.1 Potential Contaminants of Concern – Identify chemical and waste types of all contaminants to be evaluated for sampling of the monitoring wells.
- 3.2 Potential Source Areas – Identify all potential source areas, if applicable, noting the type of source such as drycleaning machines, sanitary sewers, dumpster locations, storage tanks, releases and/or spills. If multiple potential source areas

exist, identify the contaminants associated with each source area. Include an identification of potential off-site source areas, if applicable.

- 3.3 Potential Contaminant Migration Pathways – Identify the primary mechanisms and pathways for contaminant transport.
- 3.4 Potential Human and Environmental Receptors and Exposure Pathways – Identify any human populations, domestic wells, sensitive environmental settings, and ecologic populations (i.e., threatened or endangered species) that could potentially be exposed to contamination from the site. Identify potential exposure pathways.
- 3.5 Extent of Known Contamination – Describe the known nature, extent and degree of contamination.
- 3.6 Site Reconnaissance – Discuss details of the site inspection and include photodocumentation identifying locations most suitable for monitoring well installation. Contractor's Project Manager should inspect the target area to assess the condition of existing monitoring wells (if applicable), potential source areas, utility locations, exposure pathways, sensitive environments, etc. Past and present owner/operators, managers, and/or facility employees may need to be interviewed to collect this information. Any property damage should specifically be noted and photographed.

#### **4.0 Work Plan Details**

- 4.1 Monitoring Well Drilling and Installation – Describe, as detailed paragraphs, the specific drilling and installation methods proposed during fieldwork including type of drilling equipment, well casing and well screen specifications, well construction and well completion methods, and any additional miscellaneous materials required for installation.
- 4.2 Monitoring Well Development – Discuss proposed development methods including surging or agitation methods to be utilized for development of the filter pack and formation skin. State the criteria for determining well development volumes. Include any formulas used.
- 4.3 Surveying – Provide the number of wells to be surveyed by a licensed surveyor and proposed site benchmark location and type.
- 4.4 Groundwater Sampling – Describe the groundwater sampling strategy to be implemented during the MWI. Include discussion of well purging methods (if applicable), sampling methods, field screening methods (if applicable), and laboratory analysis. Specific sample collection methods, specific sampling frequency and screening methods, and specific analyses must be discussed in detail. Quality assurance sampling and laboratory analytical methods will be discussed in detail in the Quality Assurance Project Plan. This discussion should include the following:
  - 4.4.1 Sampling Objectives – Describe objectives of sampling efforts relative to the intended use of the data. (For example, how will screening data be utilized? Will sampling strategies be modified based on field observations and screening?)
  - 4.4.2 Sampling Locations and Frequency – This section should define sample locations and rationale. This includes samples for field screening and laboratory sampling.

- 4.4.3 Sampling Equipment and Procedures – Provide the step-by-step procedures indicating how each sample will be collected. The instructions should also identify all equipment to be used for sample collection and decontamination procedures. Standard Operating Procedures (SOPs) may be referenced and included as an Appendix.
- 4.4.4 Sample Handling and Analysis – This should consist of a table that identifies sample preservation methods, storage, types of sampling containers, shipping procedures and requirements, holding times, field screening analytical methods, and laboratory analytical methods.
- 4.4.5 Quality Assurance/Quality Control (QA/QC) – Provide details on the QA/QC procedures following sampling collection.
- 4.5 Risk Evaluation – Evaluate risk associated with any identified contamination relative to potential migration pathways and receptors.
- 4.6 Investigative Derived Waste (IDW) – Indicate the appropriate handling, treatment, analysis, documentation and disposal of all investigative derived wastes and any relevant permitting/regulatory approval needed.
- 4.7 Decontamination Procedures – Describe decontamination procedures prior to entering the site, between drilling locations, and prior to demobilization activities.
- 4.8 Regulatory Involvement – Describe all areas of the proposed investigation where local, state and/or federal regulatory authority will apply such as well drilling, soil boring plugging, drilling permits, etc.
- 4.9 Other – Discuss additional pertinent details, beyond the tasks previously listed, related to the installation and sampling of groundwater monitoring wells.

## **5.0 Schedule**

Provide a detailed schedule of proposed activities that specifically identifies the dates and time frames for implementing and completing significant tasks of the MWI including initiation of fieldwork and submittal of the report.

## **6.0 References**

Please cite references throughout the report and provide a comprehensive listing of resources referenced for preparation of the Work Plan within the reference section.

## **7.0 Tables**

Provide information and data tables, as appropriate, for quick reference within the Work Plan. Necessary tabulated data such as field screening data, laboratory analytical data, water level data, well completion data, etc., from previous investigations should be included.

## **8.0 Figures (Drawn to Scale – Standard engineering scale only)**

At a minimum the following figures must be included within the Work Plan:

- A figure based on a USGS 7.5' Quadrangle depicting the site location.

- Site diagram depicting property boundaries, proposed monitoring well locations, existing monitoring wells, remediation wells, structures, streets, above ground and sub-surface utilities (identified during utility clearance), surface use (concrete vs. grass), and other features relevant to the project. Standard industry practices should be adhered to for creating the site diagram,
- Any figures from previous investigation reports such as potentiometric maps, existing monitoring well location maps, figures depicting known source areas and the known extent of contamination.

## **9.0 Appendix A - Quality Assurance Project Plan**

A Quality Assurance Project Plan (QAPP) must be developed to describe policy, organization, function activities, and quality control and quality assurance protocols necessary to achieve quality of data necessary to satisfy project objectives. The QAPP must define the following information:

- 9.1 Key Personnel – Key personnel or organizations that are necessary for each activity during the MWI, along with their responsibilities, must be defined (this information should be presented in a table).
- 9.2 Quality Assurance Objectives for Data – The degree of accuracy of sample analysis and how this degree of accuracy will be achieved must be identified. Also within this section, the numbers, collection frequency, and types of QA/QC samples such as trip blanks, field blanks, equipment blanks, and replicates must be identified.
- 9.3 Sample Custody – Identify and describe Chain of Custody procedures for samples collected for laboratory analysis.
- 9.4 Analytical Procedures – Identify specific laboratory methods to be used for analysis of samples.
- 9.5 Laboratory QA/QC – A description of the analytical laboratory's QA/QC program.
- 9.6 Data Validation and Reporting – A description of how laboratory results will be validated, after data is received from the laboratory to determine whether QA/QC protocol has been met. KDHE requires that a summary be included within the report to allow the reviewer to verify that data has been appropriately validated. The summary must address the data validation process including discussion describing results from analysis of replicates, laboratory or method blanks, matrix spikes and matrix spike duplicates, trip blanks, field blanks, equipment (rinsate) blanks, and any other QA/QC samples.

## **10.0 Appendix B - Health and Safety Plan**

A Site Health and Safety Plan consistent with OSHA requirements must be included with the Work Plan.

**SCOPE OF WORK (SOW)**  
**FOR A**  
**MONITORING WELL INSTALLATION (MWI) REPORT**

The Monitoring Well Installation (MWI) Report shall document the installation of monitoring wells. The monitoring wells shall be installed in accordance with all local, state, and federal laws, as well as in accordance with requirements set forth in the RFP. Monitoring wells installed as part of a CI or SI will not require a separate MWI Report.

The primary objectives of the Monitoring Well Installation report are to document the monitoring well installation field activities and (if applicable) monitoring well sampling activities, including but not limited to:

**1. Boring and Monitoring Well Installation Procedures**

This should include:

- 1.1. Describing, in detail, the specific drilling and installation methods used during fieldwork including the type of drilling equipment used, lithologic description methodology of the borings, types and methods of field screening used, and equipment decontamination activities.
- 1.2. Describing, in detail, the well casing and well screen specifications, well construction and well completion methods, and any additional miscellaneous materials required for installation.
- 1.3. Describing, in detail, the monitoring well development methods including surging or agitation methods utilized for development of the filter pack and formation skin.
- 1.4. Surveying – Monitoring Well land surveys will follow the guidance in Environmental Services Contract Module A: Specific Task Requirements All surveys will be conducted in accordance with Kansas Administrative Regulation K.A.R. 66-12-1.
- 1.5. IDW generation, handling, and disposal
- 1.6. Deviations from MWI work plan as applicable.

**2. Monitoring Well Sampling**

If monitoring well sampling was included in the scope of work, the following sections also apply.

- 2.1. Describe, in detail, the groundwater sampling procedures conducted. This should include the water level and total depth measurement procedures, purging methods and procedures, sampling methods and procedures and sampling equipment decontamination procedures. Note the locations and frequency of QA/QC sample collection.
- 2.2. Provide a summary of sample analytical results
- 2.3. Provide a QA/QC analysis/review of analytical results
- 2.4. Note deviations from approved sampling procedures as defined in the relevant work plan(s).
- 2.5. Provide brief conclusions and recommendations

**3. Tables**



Certain data collected during the MWI must be presented in tables in the report. Tabulation of specific data must be done **as appropriate for the scope of work requested**; tables to be required include, but are not limited to:

3.1. Well Completion Information

- 3.1.1. Well identification
- 3.1.2. Latitude and Longitude in GPS (in Decimal Degrees).
- 3.1.3. Ground surface elevation
- 3.1.4. Top of casing/measuring point elevation
- 3.1.5. Screen length
- 3.1.6. Total depth of well
- 3.1.7. Static water level elevation
- 3.1.8. Date of static water level measurement

3.2. Well Development Information

- 3.2.1. Date
- 3.2.2. Calculated volume to be removed
- 3.2.3. Actual amount removed
- 3.2.4. Successive parameter measurements should demonstrate stabilization prior to development is considered complete (as applicable to the scope of work)
  - 3.2.4.1. Parameters should include specific conductance, dissolved oxygen, oxidation-reduction potential, turbidity, pH, temperature.
- 3.2.5. Final measurement parameters

3.3. Well Purging Data (if applicable to sampling method)

- 3.3.1. Provide the following data collected during purging of wells for sampling:
- 3.3.2. Date purged
- 3.3.3. Volumes purged
- 3.3.4. Successive parameter measurements should demonstrate stabilization prior to sampling
  - 3.3.4.1. Parameters should include specific conductance, dissolved oxygen, oxidation-reduction potential, turbidity, pH, temperature.
- 3.3.5. Measurement of the final purge parameters.

3.4. Laboratory Analytical Results - Tables providing laboratory analytical results from samples collected during the MWI must be presented in the report. A table providing any pertinent historical analytical results should also be provided. More than one table may be required to include the following types of information:

- 3.4.1. Sample location identification
- 3.4.2. Sample depth
- 3.4.3. Target compounds

3.4.4. Concentrations of compounds detected

3.4.5. Date sampled

3.4.6. QA/QC data

3.4.7. Appropriate regulatory cleanup levels

3.5. Hydrogeological Testing Results

3.5.1. Tabulate the results from vadose zone or aquifer testing if applicable.

**4. Figures (Drawn to Scale – Standard engineering scale only)**

The following listed figures should be included in the MWI Report (as applicable):

4.1. A figure based on a USGS 7.5' Quadrangle depicting the site location.

4.2. A Site Map that depicts the entire site, buildings, property boundaries, streets, pertinent site features and monitoring well locations.

4.3. Potentiometric surface map - control points must be labeled and data such as static water level elevations at control points must be depicted on the map.

4.4. Geologic cross sections (if requested in the scope of work) - at least two cross sections to depict the geology of the site. The cross sections should be oriented longitudinally and transversely with respect to the orientation of soil and/or groundwater contaminant plumes. The potentiometric surface should be depicted on the cross section.

4.5. Groundwater contamination isoconcentration maps (if applicable to the scope) - these maps should depict the extent and degree of groundwater contamination. It may be necessary to prepare an isocontour map for each contaminant, suite of contaminants, total contamination and/or sample depth intervals

**5. Appendices**

Appendices containing the following material must be included in the MWI Report (as applicable). Appendices to contain other pertinent material should be developed and included as necessary.

5.1. Any access agreements obtained.

5.2. Utility Clearance documentation using the KDHE Utility Clearance checklist or Vendor equivalent.

5.3. Photodocumentation: Photographs must be taken at all monitoring well installation locations before, during, and after monitoring well installation to document site conditions and prevent unwarranted claims of property destruction. Any property damage should specifically be noted and photographed.

5.4. Boring logs and monitoring well completion forms shall meet or exceed the requirements listed in Attachment D of the RFP.

5.5. WWC-5 Forms – Forms should list KDHE or the appropriate KDHE program as the well owner. Forms will be submitted to KDHE BOW.

5.6. Monitoring well development forms (see RFP Attachment F for examples)

5.7. Copies of the field notebook.

5.8. Pertinent correspondence such as communications with regulatory agencies.

5.9. Local, state, and federal permits, forms, etc.

5.10. IDW waste disposal documentation, including waste characterization laboratory certificates, waste authorization and disposal manifests or receipts.

5.11. Survey data.

5.12. Any collected GPS data given as latitude and longitude (in Decimal Degrees).

If groundwater sampling is included in the scope of work, the appendices will also include

5.13. Laboratory certificates for groundwater analysis.

5.14. Data validation and usability summary.

If applicable to the scope of work

5.15. Vadose zone or aquifer testing data and parameter estimation calculations.

5.16. Vadose zone or groundwater flow modeling data and results.

**SCOPE OF WORK (SOW)  
FOR A  
TECHNOLOGY EVALUATION REPORT (TER)**

The primary objectives of the Technology Evaluation Report (TER) are described as follows:

- 1) to evaluate the feasibility, effectiveness, and cost of **one** specific remedial technology based on the site characteristics.
- 2) to determine the health and environmental effects of the remedial action
- 3) to determine if a Remedial Design for the technology in question is justified for the site

A TER will only be needed when a specific technology needs to be evaluated prior to commencing design of a remediation system. The Scope of Work shall at a minimum include the following components:

**1.0 Evaluation of site specific data**

The Contractor shall review existing site data and reports to determine whether a site is a candidate for the technology being considered for design. Some sites may utilize a treatment train approach, therefore the TER should include an evaluation to determine applicability with other technologies. For example: If a site has an air sparge (AS) system will another technology adversely affect existing or planned remediation efforts.

**2.0 Recommendation for advancing to preparation of a Remedial Design.**

The evaluation shall determine whether a Remedial Design should be prepared for the technology in question. The corrective action for the site should satisfy the requirements for protection of human health and the environment and the applicable State laws and standards. Recommendations may determine the technology is not a good fit for the subject property. A cost/benefit analysis should be included when making such recommendations.

**SCOPE OF WORK (SOW)  
FOR A  
REMEDIATION SYSTEM EVALUATION (RSE) REPORT**

The primary objectives of the remediation system evaluation are to evaluate the effectiveness and feasibility of a remediation system(s) currently in operation at a site and recommend changes to the remediation system, if warranted. KDHE will use a remediation evaluation task to evaluate existing remediation systems and determine if the system is performing effectively. System often reach a state where the operation needs to be modified to greater enhance the removal of contaminants from the soil, groundwater or air.

This Scope of Work outlines activities to be completed as part of the Remediation System Evaluation (RSE) Report. The RSE Report shall be developed and submitted for KDHE approval. The RSE Report shall at a minimum include the following components:

**1.0 Evaluation of existing system(s)**

The Contractor shall review existing O&M data and reports to determine the operating effectiveness of each system. Some sites may utilize a treatment train approach, therefore the RSE should include an evaluation of each technology. For example: A site may have an air sparge (AS) system and chemical oxidation injection system treating the groundwater and a soil vapor extraction (SVE) system addressing the vadose zone contamination. The systems should be evaluated together to determine if they are effectively and efficiently remediating the target media.

**2.0 Recommendation for continued operation or potential changes**

The evaluation shall determine recommended corrective action for the site that satisfies the requirements for protection of human health and the environment and satisfies the applicable State laws and standards. Recommendations may determine the current system is operating efficiently and no changes are needed. Any recommended changes should be discussed in detail and the benefits should be outlined. A cost/benefit analysis should be included for recommended changes.

**SCOPE OF WORK (SOW)  
FOR A  
FEASIBILITY STUDY (FS)**

The primary objectives of the Feasibility Study (FS) are described as follows:

- 1) to evaluate the feasibility, effectiveness, and cost of potential remedial actions based on the findings of the comprehensive investigation (CI) and to evaluate the "no action" alternative
- 2) to recommend and justify a specific corrective action for the site
- 3) to determine the health and environmental effects of the remedial action

This Scope of Work outlines activities to be completed as part of the FS. A work plan that describes in detail the FS activities shall be developed and submitted for KDHE approval.

The Scope of Work shall at a minimum include the following components:

**1.0 FS SCHEDULE**

Submission of a schedule that summarizes the FS tasks, provides a date for the completion of the FS and submission of the FS report, and briefly describes the corrective actions to be evaluated during the FS.

**2.0 EVALUATION OF CORRECTIVE ACTIONS**

Evaluate possible corrective actions and a "no action" alternative for the site. The corrective actions and the no action alternative shall address potential threats to human health and the environment.

The evaluation shall include: a description of the contaminants of concern, an evaluation of the possible exposure route(s), the corrective action goals, consideration of the nature and extent of contamination as defined by the CI or other KDHE approved investigation documents, an evaluation of the effectiveness of the corrective action in terms of the corrective action goals, and a comparison of the costs of each corrective action.

Identify and implement necessary treatability studies for corrective actions considered "unproven" (e.g., a new technology or one that is dependent on site characteristics) or to obtain site-specific information to evaluate the success of the corrective action.

**3.0 RECOMMEND A CORRECTIVE ACTION**

The evaluation of corrective actions shall determine a recommended corrective action for the site that satisfies the requirements for protection of human health and the environment and satisfies the applicable State laws and standards.

**4.0 FS REPORT**

The FS Report shall include:

- (1) a description of the evaluation of possible corrective actions and a "no action" alternative for the site which addresses the points in section 2.0 above,
- (2) a description of the recommended corrective action described in section 3.0 above, and

(3) an Appendix containing any background information or literature which was used to evaluate each corrective action.

## **SCOPE OF WORK (SOW) FOR A REMEDIAL DESIGN (RD)**

The primary objectives of the Remedial Design (RD) are described as follows:

- 1) to provide detailed design plans and specifications for the full implementation of the corrective action (CA)
- 2) to describe the tasks necessary to implement the selected CA
- 3) to identify necessary easements, utilities and permits required for the implementation of the CA
- 4) to complete a plan to monitor the effectiveness of the CA during implementation

This Scope of Work outlines the required elements of the RD which is to be prepared as a deliverable document.

The Scope of Work shall at a minimum include the following components:

### **1.0 RD SCHEDULE**

Submission of a schedule that summarizes the RD tasks, provides a date for the completion of the RD and submission of the Remedial Action Report that shall include a schedule for the construction and implementation of the CA.

### **2.0 TASKS REQUIRED TO COMPLETE THE CORRECTIVE ACTION**

Describe in detail the tasks required to complete the CA. The tasks shall be listed so that they clearly state the manner in which the CA is to be implemented. The tasks shall include those necessary to complete the site monitoring system and those necessary for obtaining necessary easements and permits.

### **3.0 DESIGN SPECIFICATIONS FOR THE CORRECTIVE ACTION**

The complete design specifications - including any relevant figures or site/system engineering layouts shall be provided. These specifications shall be presented in sufficient detail so that contractors could bid on the completion of the CA.

### **4.0 MONITORING PLAN DESIGN**

The design shall include plans for the completion and operation of the monitoring program including: frequency of system/site monitoring, a description of quality assurance/quality control (QA/QC) considerations for the laboratory and field, and a description of reporting methods and frequency. The primary objectives of the Monitoring Report are to document sampling and/or remediation operation & maintenance (O&M) results for the defined reporting period.

See the Scope of Work for Monitoring Reports in this Appendix for details on what to include in the monitoring reports.

### **5.0 REMEDIAL DESIGN DOCUMENT**

The RD shall be submitted for KDHE approval as a document including: the description of the CA and site, description of the tasks required to complete the CA, the design specifications for the CA, a description and layout of the monitoring program, and a



schedule for completing all activities necessary to construct and implement the CA as described in the paragraphs above.

**SCOPE OF WORK (SOW)  
FOR A  
REMEDIAL ACTION REPORT (RA)**

The primary objectives of the Remedial Action Report (RA) are described as follows:

- 1) to detail the implementation of the Remedial Design (RD) as approved by KDHE
- 2) evaluate the progress/success of the CA for a two month period
- 3) document communication with KDHE through reporting and other methods during CA implementation

The RA Report shall at a minimum include a description of the following components:

**REMEDIAL ACTION REPORT**

- 1.0 Submit a RA Report for KDHE approval that (1) describes the design as installed (including all as-built maps, diagrams, etc.), tasks, and day-to-day operation and maintenance of the CA system; and (2) describes in detail the emergency contingency plan(s) that will go into effect in the case of any failure in the CA operations.
  - 1.0.1 The development of an "As-Built" Report documenting the remediation implementation.
  - 1.0.2 Description of the corrective action and site conditions.
  - 1.0.3 Description of the design as installed (including all As-Built maps, diagrams, etc.)
  - 1.0.4 Specific notation of changes to the RD
  - 1.0.5 Copies of all permits, easements, fees, etc.
  - 1.0.6 Well installation and completion info, including but not limited to boring logs, well construction diagrams and survey info.
  - 1.0.7 Evaluation of data from the system startup and operation and maintenance of any remedial systems installed as part of the CA for a period of two months.
  - 1.0.8 Site monitoring during remediation, and post remediation clean-up verification monitoring, if requested.
  - 1.0.9 All maps shall be in standard engineering scale.
  - 1.0.10 Certification of Completion: The installation Contractor's Project Engineer must submit to the KDHE Project Manager by registered mail a completed Certification of Completion (RFP Attachment F) verifying that the remedial system has been implemented in accordance with the RD. This shall include a complete list of modifications as approved by the KDHE Project Manager. The Contractor's Project Engineer is responsible for overseeing staff involved in all aspects of the onsite construction activities and is required to be present during remedial system start-up. The Certification of Completion (COC) must be signed and stamped by the Project Engineer. A copy of the COC must be included in the Remedial Action Report.

**SCOPE OF WORK (SOW)**  
**FOR A**  
**LONG TERM MONITORING SAMPLING AND ANALYSIS PLAN (LTM SAP)**

This Scope of Work outlines activities to be completed as part of the Long-Term Monitoring (LTM) Sampling and Analysis Plan (SAP). An LTM SAP may be requested following groundwater monitoring well installation and site placement into Long-Term Monitoring. An LTM SAP discussing proposed sampling and analytical methods must be prepared and submitted to KDHE and approved prior to sampling activities. The primary objectives of the LTM SAP are described as follows:

1. Gather information on long term trends for contaminants of concern at recognized environmental sites.
2. Develop an LTM SAP including a Field Sampling Plan, Quality Assurance Project Plan (QAPP), and Site Health and Safety Plan (SHSP) to establish long term data trends. The work plan should include:
  - a. Text, tables and maps identifying the proposed methods for sampling of the existing groundwater monitoring network;
  - b. SOPs for all potential sampling methods. The SOPs can be standard appendices for each technology and the Field Sampling Plan will identify the specific use of the technologies;

A comprehensive outline of KDHE's recommended LTM SAP (content and format) is described below. Site specific conditions such as type of contaminants, geohydrologic setting, media impacted, source mechanisms, etc. will vary. The recommended content and format must therefore be adapted appropriately to ensure the LTM SAP proposes a strategy that will clearly achieve the primary objectives of the LTM Report for each site evaluated. The SAP must include generic language throughout the document for continued use in multiple sampling events (up to 5 years).

## **1.0 Introduction**

A description of the specific objectives/tasks for the LTM SAP must also be included in this section.

## **2.0 Site Location and Background**

- 2.1 Site Location and Demographics - Provide a description of the site location such as legal description, street address, city, and county. General demographic information regarding the site area, such as, population density, city and/or county zoning, and predominant land usage in area, (i.e., urban, rural, commercial, residential, industrial, agricultural, etc.) should be included. A description of drinking water resources for the site should be provided. The work plan should also include any GPS information available for the site.
- 2.2 Site History - Provide a brief history of the site including site operations and past site activities leading up to the LTM SAP.
- 2.3 Previous Investigations - Briefly summarize the results and conclusions of other previous investigations conducted at the site.

- 2.4 Geology and Hydrogeology – Describe both the regional and site-specific geology and hydrogeology characteristics based on available information such as scientific reports.

### **3.0 Purpose and Objective**

- 3.1 Groundwater Sampling Network – Provide a list/table identifying the existing groundwater sampling network associated with the site, including all well construction details (depth, screened interval, diameter). Include potential public/domestic wells that may be sampled during LTM events. GPS coordinates for each well should be included in the table. Special conditions should be noted for any wells requiring special access including locks, barriers, contact person, etc.
- 3.2 Water Level and Total Depth Measurements – Describe the methods in which water levels and total depth measurements will be collected during the sampling event.
- 3.3 Groundwater Sampling Procedure – Discuss, in detail, all sampling strategies that are applicable for use for all current & future sampling events at the site. Include discussion of well purging methods, field screening methods (if applicable), and laboratory analysis.
- 3.4 Sampling Analysis - This should consist of a table that identifies sample preservation methods, storage, types of sampling containers, shipping procedures and requirements, holding times, field screening analytical methods, and laboratory analytical methods.
- 3.5 Sampling Handling and Transport – Discuss, in detail, sample handling and transport including sample labeling and chain of custody procedures.
- 3.6 Sampling Equipment Decontamination Procedures – Describe decontamination procedures of sampling collection equipment
- 3.7 Investigative Derived Waste – Provide acceptable procedures for the treatment of decontamination and purge water, and disposal of non-dedicated sampling equipment.
- 3.8 Field Documentation – Discuss how field activities will be documented and presented in the groundwater monitoring report.

### **4.0 Analytical Methods**

All samples collected will be submitted to a KDHE accredited laboratory. Avoid specifying a single laboratory as it limits options for future work under this LTM SAP. Discuss how laboratory analytical methods used will provide an acceptable reporting limit to facilitate comparison to the corresponding RSK/MCL numbers as well as previous data.

### **5.0 Quality Assurance Project Plan (QAPP)**

A Quality Assurance Project Plan (QAPP) must be developed to describe policy, organization, function activities, and quality control and quality assurance protocols necessary to achieve quality of data necessary to satisfy project objectives. The QAPP must define the following information:

- 5.1 Key Personnel – Provide a list of key personnel or organizations that are necessary for each activity during the investigation, along with their responsibilities, must be defined (this information should be presented in a table).
- 5.2 Quality Assurance Objectives for Data - The degree of accuracy of sample analysis and how this degree of accuracy will be achieved must be identified. Also, within this section, the numbers, collection frequency, and types of QA/QC samples such as trip blanks, field blanks, equipment blanks, and duplicates must be identified.
- 5.3 Sample Custody - Identify and describe Chain of Custody procedures for samples collected for laboratory analysis.
- 5.4 Analytical Procedures - Identify specific laboratory methods to be used for analysis of samples including sample preservatives and hold times.
- 5.5 Laboratory QA/QC - A description of the analytical laboratory's QA/QC program.
- 5.6 Data Validation and Reporting -A description of how laboratory results will be validated, after data is received from the laboratory to determine whether QA/QC protocol has been met. KDHE requires that a summary be included within the Long Term Monitoring Report to allow the reviewer to verify that data has been appropriately validated. The summary must address the data validation process including discussion describing results from analysis of replicates, laboratory or method blanks, matrix spikes and matrix spike duplicates, trip blanks, field blanks, equipment (rinsate) blanks, and any other QA/QC samples.

## **6.0 Schedule**

Provide a detailed schedule of proposed activities that specifically identifies the time frames for implementing and completing significant tasks of the LTM SAP including initiation of fieldwork and submittal of the report.

## **7.0 References**

Provide a comprehensive listing of resources referenced for preparation of the LTM SAP.

## **8.0 Appendix A – Figures (Drawn to Scale – Standard engineering scale only)**

At a minimum the following figures must be included within the Work Plan:

- A figure based on a USGS 7.5' Quadrangle depicting the site location.
- A Site Map that depicts the entire site, buildings and pertinent site features, surrounding properties, potential source areas, and potentially impacted receptors.
- A figure that depicts proposed sampling locations such as public/private water wells and groundwater monitoring wells.

## **9.0 Appendix B – HASP**

A Site Health and Safety Plan consistent with OSHA requirements must be included with the Sampling and Analysis Work Plan.

## **SCOPE OF WORK (SOW) FOR MONITORING REPORTS**

The primary objectives of the monitoring reports are described below. KDHE may request a groundwater monitoring report, operations & maintenance (O&M) report or combine groundwater monitoring and O&M report.

### **1.1. Remediation operation and monitoring (O&M) reports shall include:**

- 1.1.1. Current and historical static water level elevation measurements and top of casing elevations (KDHE programs may limit the number of years, if appropriate);
- 1.1.2. Current and historical remediation system laboratory analytical results (KDHE programs may limit the number of years, if appropriate);
- 1.1.3. Analytical data sheets;
- 1.1.4. Current and historical system readings for gauges, meters, etc. (KDHE programs may limit the number of years, if appropriate);
- 1.1.5. A figure based on a USGS 7.5' Quadrangle depicting the site location.
- 1.1.6. Site map in standard engineering scale showing all pertinent features including structures, wells, sample points, remediation components, etc.;
- 1.1.7. Deviations from approved sampling procedures as defined in the relevant work plans;
- 1.1.8. QA/QC data;
- 1.1.9. Water table contour map (when appropriate),
- 1.1.10. Notice of system deficiencies;
- 1.1.11. Observations of the site in general;
- 1.1.12. Evaluation of the effectiveness of the corrective action during the reporting period (may include calculation of mass removal and cumulative mass removal);
- 1.1.13. Recommendations for future changes, repairs, etc.; and
- 1.1.14. Field notes and all other relevant site data collected during the reporting period.
- 1.1.15. All maps shall be standard engineering scale.

### **1.2. Groundwater sampling reports shall include:**

- 1.2.1. Current and historical static water level elevation measurements and top of casing elevations (KDHE programs may limit the number of years if appropriate);
- 1.2.2. Current and historical monitoring well laboratory analytical results (KDHE programs may limit the number of years if appropriate);
- 1.2.3. Analytical data sheets;
- 1.2.4. A figure based on a USGS 7.5' Quadrangle depicting the site location.
- 1.2.5. Site map showing all pertinent features including structures, wells, sample points, remediation components, etc.;

- 1.2.6. Deviations from approved sampling procedures as defined in the relevant work plans;
  - 1.2.7. QA/QC data;
  - 1.2.8. Water table contour map,
  - 1.2.9. Contaminant isoconcentration map(s);
  - 1.2.10. Evaluation of the changes in contaminant concentrations during the reporting period;
  - 1.2.11. Recommendations for future changes, and
  - 1.2.12. Field notes and all other relevant site data collected during the reporting period. Relevant photographs should be included with the field notes.
  - 1.2.13. All maps shall be standard engineering scale.
- 1.3. Combined reports shall include aspects from each of the above reports.
- 1.4 The following listed figures should be included in the Groundwater Monitoring Report:
- 1.4.1 A figure based on a USGS 7.5' Quadrangle depicting the site location.
  - 1.4.2 A Site Map that depicts the entire site, buildings and pertinent site features, surrounding properties, potential current and historical source areas, and potentially impacted receptors. All buildings at the site should be labeled indicating what the buildings current and pertinent historical uses have been.
  - 1.4.3 A sampling location map that depicts locations of monitoring wells. It may be necessary to prepare separate maps for sampling locations to keep the map legible; e.g., separate maps for multiple sample intervals at the same monitoring well locations.
  - 1.4.4 Potentiometric surface map - control points must be labeled and data such as static water level elevations at control points must be depicted on the map.
  - 1.4.5 Groundwater contamination isoconcentration maps - these maps should depict the extent and degree of groundwater contamination. It may be necessary to prepare an isocontour map for each contaminant, suite of contaminants, and total contamination.



