MINNESOTA POLLUTION CONTROL AGENCY
520 Lafayette Road North
St. Paul, MN 55155-4194

Example Workplan

Project Title: Scenario A-Remedial Design/Remedial Action

1. Project Summary: Project Summary:

The site is a former agricultural chemical plant that operated from 1960 to 1991. A dry fertilizer building burned down in 1999. The fire was extinguished with firefighting foam. Only a cracked concrete slab remains of the dry fertilizer building. A scale remains at the west end of the former dry fertilizer building. A pesticide mixer/blender was located inside the fertilizer building near the west end. Agricultural chemical equipment storage/parking areas were located on the north and south sides of the fertilizer building. A water fill area is located west of the former fertilizer building with a shallow water supply well that remains operational.

A service garage used for vehicle and equipment maintenance remains on-site and is located east of the fertilizer building slab. Inspection documents indicate the maintenance garage was used to wash and maintain equipment. A trench floor drain is present in the west end of the garage. The trench drain is connected to an approximately 500-gallon UST of unknown age. It is unknown if the UST was ever cleaned out or removed. Interviews note the garage was extensively used as a degreasing area for all facility operations. A former employee stated that used parts degreaser was regularly dumped onto the ground near the steam north of the garage. Discolored soils were reported north and south of the garage. Due diligence efforts conducted during property transfer indicate the discolored soils remain.

Records note the presence of a 500-gallon fuel oil above ground storage tank at the facility used to heat the garage and a 1,000-gallon gasoline UST used to fill large trucks. Both tanks remain on site and were installed in the 1960s.

2. Statement of Problems, Opportunities, and Existing Conditions

1. **Identified Off-Site Soil Vapor Risk.** Sampling results from a limited off-site soil vapor investigation had detections of TCE in two locations; a sub-slab sample from the residence located in the northeast quadrant of Block 7 and soil gas sample from between residences located on the eastern half of block 5. The sub-slab sample from the home in Block 7 had a TCE detection of 100 µg/m^3 which is approximately 48x the TCE ISV and 16x the TCE EISV. The condition of the basement at this location is unknown. The sample from Block 5 had a TCE detection of 115 µg/m^3 which is approximately 55x the TCE ISV and 18x the TCE EISV. It is known that there is a pregnant woman currently living in the home on Block 7 where the sub-slab sample was taken. According to the VI BMP guidance the presence of a pregnant woman at a location where there is confirmed TCE vapor concentrations that exceeds 33x the ISV but less then 33x the EISV, may require expedited mitigation. There are two soil gas sampling locations that had non-detectable TCE concentrations. Both were located north of the stream in Block 3.

2. **Identified Off-Site Ground Water Risk.** A limited groundwater investigation was completed to the west, downgradient of the site. Groundwater samples were obtained from a combination of temporary push points and residential private wells. Three water samples were taken from Block 5, two from private wells and one from a temporary groundwater sampling point. All three samples had detectable concentrations of TCE. Both residential private well samples had TCE concentrations that exceed the HRL of 0.4 µg/l, the sample from the residence located in the northwest quadrant at 20 µg/l and the residence just south at 6 µg/l. Four water samples were taken from the eastern edge of Block 7, two from private wells and two from temporary monitoring wells. The sample results from two of the locations, a private well and temporary well located in the southeast quadrant of block 7 were non-detect for TCE. The other two samples had detectable concentrations of TCE. The private well sample from the residence in northeast quadrant of block 7 exceeded the HRL for TCE with a concentration of 5 µg/l.
3. **On-Site Investigation.** The on-site investigation, with the exception of under the maintenance building, was limited, however several potential sources of VOC's, agricultural chemicals and petroleum were noted.

a. **The Maintenance Building.** An investigation confirmed that there were elevated TCE concentrations in soil, soil vapor and ground water beneath the building.
b. **Storage tanks.** Three storage tanks, two underground and one above ground, were near the maintenance building. One UST was used for gasoline storage and the other received wastes from a trench drain located in the maintenance building. The AST contained fuel oil used to heat the building.
c. **Stained Soils.** Stained soil indicating a surface release were found north of the fertilizer building and garage and beneath the heating oil AST.
d. **Site Operations.** Several potential source areas were identified through interviews with former employees and investigation of site historical use. These include;
    i. Pesticide mixer/blender located at the west end of the fertilizer building.
    ii. Agricultural chemical equipment storage/parking area located on the north and south sides of the fertilizer building.
    iii. Used parts degreaser was poured onto the ground near the stream

Goals, Objectives, Tasks, and Subtasks

1. **Objective 1**:

The first and most critical objective for the initial corrective action is to sever the completed receptor pathways identified by the limited off-site investigation. These include:

1. The residence located in the northeast quadrant of block 7 is the home of a woman who is currently pregnant and considered a sensitive receptor. Two routes of TCE exposure have been identified in this home. A sub-slab vapor sample with TCE concentrations above 33X ISV but below 33X EISV with the condition of the basement unknown and private well water that is impacted above the HRL. Given the potential harm from continued TCE exposure, relocating the pregnant woman from her residence is indicated. To sever the pathway of exposure in this residence to will require installation of a sub-slab depressurization system and a GAC point of entry treatment (POET) system for the water well.
2. Two additional potable water wells have TCE above the Minnesota HRL. POET systems will be installed on these wells concurrently as with the above.

   The vapor sample from Block 5 had a TCE concentration 55x the ISV. It is likely that sub slab samples from the residences to the north and south of this sample location would exceed 33x the TCE ISV. It is likely that sub slab depressurization will be required at these locations and will be initiated concurrently with the above actions.

Task A: Work with the MPCA and the pregnant woman to relocate her and any other sensitive persons located in Blocks 5 and 7, until systems are in place to sever exposure to TCE from both vapor intrusion and impacted private wells.

Task B: Fast track development of a remedial action plan to sever the known and suspected vapor intrusion and groundwater ingestion pathways identified in blocks 5 and 7. The plan would follow the standards as outlined in the MPCA "Best management practices for vapor investigation and building mitigation systems" (BMP) document and will include evaluating the integrity of each residences' basements and methods to install sub slab depressurization systems to sever the TCE vapor intrusion pathway. The VI evaluation and VI mitigation system design will be according to the Pre-Mitigation Diagnostic Checklist (Attachment A) for each of the affected residences. Concurrently, each residence will be evaluated to determine if installation of a point of entry treatment (POET) GAC system to remove VOC's prior to entering the home will be necessary.

Task C. Finalize design, procure and install sub slab depressurization systems as required in the residences located within the AOC for Vapor intrusion with priority to those with confirmed sub slab concentrations above 33x ISV and/or those with compromised basements or with identified vapor intrusion pathways. The installation of the mitigation system will be according to the BMP document and a Post Mitigation Checklist (Attachment B) will be completed for each affected residence. Upon installation and start-up of each system a Post-Mitigation Diagnostic Checklist (Attachment C) and Post-Mitigation Confirmation Sampling Checklist (Attachment D) will be completed. Concurrently install POET systems consisting of two GAC filters in series on each of the drinking water wells within the TCE plume.

Objective 1 Timeline: Objective 1 will be completed as quickly as possible. Sensitive persons that are in any of the residences where TCE exposure is confirmed should be relocated as soon as arrangements can be made to avoid continued exposure to TCE. Development of the Corrective Action workplan should be completed within one week with

the objective of installing needed systems, both POETS and sub-slab depressurization within weeks of obtaining approvals from the MPCA and property owners.

Objective 1 Deliverables: The deliverables for this objective include

- Design documentation for each of the homes with POETS installed
- Pre and Post POET potable well sampling results for each affected residence.
- Completed Pre-Mitigation Diagnostic Checklist for each affected residence
- Completed Active Mitigation System Installation Checklist for each affected residence
- Completed Post Mitigation Diagnostic Checklist for each affected residence
- Completed Post-Mitigation Confirmation Checklist for each affected residence.
- Vapor Intrusion Property Summary Reports

Objective 2: The limited onsite investigation identified 3 tanks that remain on the site. These tanks may be acting as continuing sources of contaminants to both soil and groundwater. Removal of the tanks concurrently with additional site investigation would limit additional contaminant mass from entering the environment and remove heavily impacted source area soils.

Task A: Remove the AST and two UST's that remain on the site.

Subtask 1: Evaluate the contents of each of the remaining tanks. Pump out and dispose of any fluids remaining in each of the tanks.
Subtask 2: Develop a tank removal plan including a soil management plan for over excavating to remove and dispose of impacted soil surrounding the tank for MPCA approval
Subtask 3: Complete a UST removal report for submission to the MPCA

Objective 2 Timeline: The tank removals will be completed within the first 12 months. The Corrective Action Plan would be completed in the first quarter and the tank removal completed upon approval of the workplan by the MPCA.

Objective 2 Deliverables:
The Objective 2 deliverables will include a UST Removal Workplan, UST Removal RFP and Post Excavation Report following MPCA Guidance Document 3-02.

Objective 3: The limited investigation completed on-site to date identified several contaminants of concern that will likely need to be addressed to move the site to closure. These include TCE, nitrate, metolachlor, dicamba, and, though not yet identified, the site is likely impacted with petroleum hydrocarbons. Active remediation will likely be required to eliminate the risks posed by the contaminants to the downgradient receptors.

Task A: Develop a site conceptual model once the remedial investigation is complete. Evaluate the impacted media, contaminants of concern and potential open pathways. This information would be used to develop a Focused Feasibility Report outlining potential remedial technologies. Among the technologies that would be explored include one or a combination of the following.

1. Hot spot excavation and soil disposal.
2. In-situ chemical oxidation
3. Anaerobic reductive dichlorination
4. Injection or barriers of zero valent iron.

Task B: Upon completion of the Focused Feasibility Study the next step would be to select a technology or technologies to pilot test. These technologies and the information required to evaluate their efficacy would be outlined in a Pilot Test Workplan that would be submitted to the MPCA for approval.

Task C Completion of the onsite pilot testing of the technology or technologies and completion of a Pilot Test Report.

Objective 3 Timeline: The Focused Feasibility Report would be started upon completion of the site RI and development of a site conceptual model. The Pilot Test Workplan would be completed upon MPCA approval of the Feasibility Report. The Pilot Test Report would be completed upon completion of all the approved technology pilot tests.

Objective 3 Deliverables:
The deliverables for this objective will include a Focused Feasibility Report, Pilot Test Work Plan and Pilot Test Report.

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Attachment B
*Example Scenario Project

Project title: Scenario A - Remedial Design/Remedial Action - Former Ag-Chem Site

	1. Personnel							2. Subcontracting	3. Equipment		4. Other Expenses			Totals (Extended)
Project Budget	Project Manager	Scientist 2	Scientist 1	Field Technician	Engineer 1	Engineer 3	GIS/CADD Specialist		field eqiup					
Objective 1														
Task A	16	0												
Task B-VI Mitigation	24	40		40	40	24	28		$2,000.00					
Lab Subcontractor								$3,500.00						
Task B-Private Well Mitigation	24	40		40		8	16							
Lab Subcontractor								$3,000.00						
Task C-VI Mitigation Installation	40	40		80	40	8	24							
Equipment Vendor								$45,000.00						
Installation Contractor								$90,000.00						
Task C-POET Installation	40	40		40	24	8	18							
Equipment Vendor								$90,000.00						
Installation Contractor								$23,000.00						
Total for Objective 1 (Hrs)	**144**	**160**	**0**	**200**	**104**	**48**	**86**							
Objective 2														
Task A	40		40	60	8	4	4		$2,000.00					
Lab Subcontractor								$5,000.00						
Excavation Subcontractor								$75,000.00						
Total for Objective 2 (Hrs)	**40**	**0**	**40**	**60**	**8**	**4**	**4**							
Objective 3														
Task A	24	24	40		24	16	4							
Task B	24	24	40		24	16	8							
Task C	40	16	40	64	40	24	8							
Subcontractor Costs								$30,000.00						
Total for Objective 3 (Hrs)	**88**	**64**	**120**	**64**	**88**	**56**	**20**							
Total Project Hours	**272**	**224**	**160**	**324**	**200**	**108**	**110**							**1398**
Subcontractor and equipment costs are estimates only for discussion purposes														
Project location not considered - Meals, hotel, travel time and mileage not included														

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Example Workplan

Project Title: Scenario A-Remedial Design/Remedial Action

1. Project Summary: Project Summary:

The site is a former agricultural chemical plant that operated from 1960 to 1991. A dry fertilizer building burned down in 1999. The fire was extinguished with firefighting foam. Only a cracked concrete slab remains of the dry fertilizer building. A scale remains at the west end of the former dry fertilizer building. A pesticide mixer/blender was located inside the fertilizer building near the west end. Agricultural chemical equipment storage/parking areas were located on the north and south sides of the fertilizer building. A water fill area is located west of the former fertilizer building with a shallow water supply well that remains operational.

A service garage used for vehicle and equipment maintenance remains on-site and is located east of the fertilizer building slab. Inspection documents indicate the maintenance garage was used to wash and maintain equipment. A trench floor drain is present in the west end of the garage. The trench drain is connected to an approximately 500-gallon UST of unknown age. It is unknown if the UST was ever cleaned out or removed. Interviews note the garage was extensively used as a degreasing area for all facility operations. A former employee stated that used parts degreaser was regularly dumped onto the ground near the steam north of the garage. Discolored soils were reported north and south of the garage. Due diligence efforts conducted during property transfer indicate the discolored soils remain.

Records note the presence of a 500-gallon fuel oil above ground storage tank at the facility used to heat the garage and a 1,000-gallon gasoline UST used to fill large trucks. Both tanks remain on site and were installed in the 1960s.

2. Statement of Problems, Opportunities, and Existing Conditions

1. **Identified Off-Site Soil Vapor Risk.** Sampling results from a limited off-site soil vapor investigation had detections of TCE in two locations; a sub-slab sample from the residence located in the northeast quadrant of Block 7 and soil gas sample from between residences located on the eastern half of block 5. The sub-slab sample from the home in Block 7 had a TCE detection of 100 µg/m^3 which is approximately 48x the TCE ISV and 16x the TCE EISV. The condition of the basement at this location is unknown. The sample from Block 5 had a TCE detection of 115 µg/m^3 which is approximately 55x the TCE ISV and 18x the TCE EISV. It is known that there is a pregnant woman currently living in the home on Block 7 where the sub-slab sample was taken. According to the VI BMP guidance the presence of a pregnant woman at a location where there is confirmed TCE vapor concentrations that exceeds 33x the ISV but less then 33x the EISV, may require expedited mitigation. There are two soil gas sampling locations that had non-detectable TCE concentrations. Both were located north of the stream in Block 3.

2. **Identified Off-Site Ground Water Risk.** A limited groundwater investigation was completed to the west, downgradient of the site. Groundwater samples were obtained from a combination of temporary push points and residential private wells. Three water samples were taken from Block 5, two from private wells and one from a temporary groundwater sampling point. All three samples had detectable concentrations of TCE. Both residential private well samples had TCE concentrations that exceed the HRL of 0.4 µg/l, the sample from the residence located in the northwest quadrant at 20 µg/l and the residence just south at 6 µg/l. Four water samples were taken from the eastern edge of Block 7, two from private wells and two from temporary monitoring wells. The sample results from two of the locations, a private well and temporary well located in the southeast quadrant of block 7 were non-detect for TCE. The other two samples had detectable concentrations of TCE. The private well sample from the residence in northeast quadrant of block 7 exceeded the HRL for TCE with a concentration of 5 µg/l.
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c. **Stained Soils.** Stained soil indicating a surface release were found north of the fertilizer building and garage and beneath the heating oil AST.
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    ii. Agricultural chemical equipment storage/parking area located on the north and south sides of the fertilizer building.
    iii. Used parts degreaser was poured onto the ground near the stream

Goals, Objectives, Tasks, and Subtasks

1. **Objective 1**:

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2. Two additional potable water wells have TCE above the Minnesota HRL. POET systems will be installed on these wells concurrently as with the above.

   The vapor sample from Block 5 had a TCE concentration 55x the ISV. It is likely that sub slab samples from the residences to the north and south of this sample location would exceed 33x the TCE ISV. It is likely that sub slab depressurization will be required at these locations and will be initiated concurrently with the above actions.

Task A: Work with the MPCA and the pregnant woman to relocate her and any other sensitive persons located in Blocks 5 and 7, until systems are in place to sever exposure to TCE from both vapor intrusion and impacted private wells.

Task B: Fast track development of a remedial action plan to sever the known and suspected vapor intrusion and groundwater ingestion pathways identified in blocks 5 and 7. The plan would follow the standards as outlined in the MPCA "Best management practices for vapor investigation and building mitigation systems" (BMP) document and will include evaluating the integrity of each residences' basements and methods to install sub slab depressurization systems to sever the TCE vapor intrusion pathway. The VI evaluation and VI mitigation system design will be according to the Pre-Mitigation Diagnostic Checklist (Attachment A) for each of the affected residences. Concurrently, each residence will be evaluated to determine if installation of a point of entry treatment (POET) GAC system to remove VOC's prior to entering the home will be necessary.

Task C. Finalize design, procure and install sub slab depressurization systems as required in the residences located within the AOC for Vapor intrusion with priority to those with confirmed sub slab concentrations above 33x ISV and/or those with compromised basements or with identified vapor intrusion pathways. The installation of the mitigation system will be according to the BMP document and a Post Mitigation Checklist (Attachment B) will be completed for each affected residence. Upon installation and start-up of each system a Post-Mitigation Diagnostic Checklist (Attachment C) and Post-Mitigation Confirmation Sampling Checklist (Attachment D) will be completed. Concurrently install POET systems consisting of two GAC filters in series on each of the drinking water wells within the TCE plume.

Objective 1 Timeline: Objective 1 will be completed as quickly as possible. Sensitive persons that are in any of the residences where TCE exposure is confirmed should be relocated as soon as arrangements can be made to avoid continued exposure to TCE. Development of the Corrective Action workplan should be completed within one week with

the objective of installing needed systems, both POETS and sub-slab depressurization within weeks of obtaining approvals from the MPCA and property owners.

Objective 1 Deliverables: The deliverables for this objective include

- Design documentation for each of the homes with POETS installed
- Pre and Post POET potable well sampling results for each affected residence.
- Completed Pre-Mitigation Diagnostic Checklist for each affected residence
- Completed Active Mitigation System Installation Checklist for each affected residence
- Completed Post Mitigation Diagnostic Checklist for each affected residence
- Completed Post-Mitigation Confirmation Checklist for each affected residence.
- Vapor Intrusion Property Summary Reports

Objective 2: The limited onsite investigation identified 3 tanks that remain on the site. These tanks may be acting as continuing sources of contaminants to both soil and groundwater. Removal of the tanks concurrently with additional site investigation would limit additional contaminant mass from entering the environment and remove heavily impacted source area soils.

Task A: Remove the AST and two UST's that remain on the site.

Subtask 1: Evaluate the contents of each of the remaining tanks. Pump out and dispose of any fluids remaining in each of the tanks.
Subtask 2: Develop a tank removal plan including a soil management plan for over excavating to remove and dispose of impacted soil surrounding the tank for MPCA approval
Subtask 3: Complete a UST removal report for submission to the MPCA

Objective 2 Timeline: The tank removals will be completed within the first 12 months. The Corrective Action Plan would be completed in the first quarter and the tank removal completed upon approval of the workplan by the MPCA.

Objective 2 Deliverables:
The Objective 2 deliverables will include a UST Removal Workplan, UST Removal RFP and Post Excavation Report following MPCA Guidance Document 3-02.

Objective 3: The limited investigation completed on-site to date identified several contaminants of concern that will likely need to be addressed to move the site to closure. These include TCE, nitrate, metolachlor, dicamba, and, though not yet identified, the site is likely impacted with petroleum hydrocarbons. Active remediation will likely be required to eliminate the risks posed by the contaminants to the downgradient receptors.

Task A: Develop a site conceptual model once the remedial investigation is complete. Evaluate the impacted media, contaminants of concern and potential open pathways. This information would be used to develop a Focused Feasibility Report outlining potential remedial technologies. Among the technologies that would be explored include one or a combination of the following.

1. Hot spot excavation and soil disposal.
2. In-situ chemical oxidation
3. Anaerobic reductive dichlorination
4. Injection or barriers of zero valent iron.

Task B: Upon completion of the Focused Feasibility Study the next step would be to select a technology or technologies to pilot test. These technologies and the information required to evaluate their efficacy would be outlined in a Pilot Test Workplan that would be submitted to the MPCA for approval.

Task C Completion of the onsite pilot testing of the technology or technologies and completion of a Pilot Test Report.

Objective 3 Timeline: The Focused Feasibility Report would be started upon completion of the site RI and development of a site conceptual model. The Pilot Test Workplan would be completed upon MPCA approval of the Feasibility Report. The Pilot Test Report would be completed upon completion of all the approved technology pilot tests.

Objective 3 Deliverables:
The deliverables for this objective will include a Focused Feasibility Report, Pilot Test Work Plan and Pilot Test Report.

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520 Lafayette Road North
St. Paul, MN 55155-4194

Attachment B
*Example Scenario Project

Project title: Scenario A - Remedial Investigation - Former Ag-Chem Site

	1. Personnel					2. Subcontracting	3. Equipment		4. Other Expenses			Totals (Extended)
Project Budget	Project Manager	Scientist 2	Sciientist 1	Field Technician	GIS/CADD Specialist		field eqiup		Materials			
*** Objective 1**												
Task A	8	6	24	12			$1,500.00					
Lab subcontractor						$2,500.00						
Drilling subcontractor						$7,000.00						
Reporting	4	8	14	6	10							
Total for Objective 1 (Hrs)	**12**	**14**	**38**	**18**	**10**							
Objective 2												
Task A	6	12	40				$400.00					
Lab Subcontractor						$12,000.00						
Drilling Subcontractor						$12,000.00						
Task B	6	8	26				$300.00					
Lab Subcontractor						$7,500.00						
Drilling Subcontractor						$15,000.00						
Task C	2	4		6			$200.00					
Lab Subcontractor						$1,500.00						
Task D	6	4	40	20		$12,000.00	$600.00					
Lab Subcontractor						$1,000.00						
Surveying Subcontractor						$1,500.00						
Drilling Subcontractor						$18,000.00						
Task E (data management and reporting)	8	10	24	10	15							
Total for Objective 2 (Hrs)	**28**	**38**	**130**	**36**	**15**							
Total Project Hours	**40.0**	**52.0**	**168.0**	**54.0**	**25.0**							**339.0**
Subcontroctor and equipment costs are estimates only for discussion purposes												
Project location not considered - Meals, hotel, travel time and mileage not included												