

# Chemical Oxidation

Facility or Tank ID: \_\_\_\_\_

Leak ID: \_\_\_\_\_

Do not proceed unless a site characterization has been completed that fully delineates the extent of contamination.

Do not proceed unless you have obtained a UIC permit or a Rule Authorization letter from the WVDEP Groundwater program authorizing injection of materials into the subsurface. Attach the authorization to this document.

What chemical oxidant are you using?

*If using a chemical oxidant that does not appear in the below list, submit a traditional CAP.*

- |  |                                       |                                       |
|--|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> Hydrogen peroxide | <input type="checkbox"/> Ozone        | <input type="checkbox"/> Persulfate   |
| <input type="checkbox"/> Fenton's reagent  | <input type="checkbox"/> Permanganate | <input type="checkbox"/> Percarbonate |

Please list additional chemicals that may be used to activate the chemical oxidant.

I. Applicability Determination (Initial Screening)	Effective	Somewhat Effective	Ineffective
<p>1. Provide a general description of the <b>intrinsic permeability (k)*</b> of soils in the area of remediation measured in cm<sup>2</sup>.</p> <p><input type="checkbox"/> Based on soil type      <input type="checkbox"/> Calculated      <input type="checkbox"/> Field/lab test</p> <p><i>Stratified soils may require special consideration in design to ensure less-permeable stratum are addressed. This will require documentation.</i></p>	<input type="checkbox"/> $k \geq 1 \times 10^{-8}$	<input type="checkbox"/> $1 \times 10^{-8} \geq k \geq 1 \times 10^{-10}$	<input type="checkbox"/> $k < 1 \times 10^{-10}$
<p>2. Is the treatment zone area soils homogenous (i.e. no stratified soils)?</p>	<input type="checkbox"/> YES		<input type="checkbox"/> NO
<p>3. Have all recoverable volumes of free product been removed from the treatment area?</p> <p><i>Do not proceed with chemical oxidation if recoverable volumes of free product are present in the treatment area.</i></p>	<input type="checkbox"/> YES		<input type="checkbox"/> NO
<p>4. Does the site exhibit limestone geology?</p> <p><i>If yes, Fenton's Reagent may not be used.</i></p>	<input type="checkbox"/> YES		<input type="checkbox"/> NO
<p>5. Has it been confirmed that active utilities and/or UST system components are not located in the immediate treatment area?</p>	<input type="checkbox"/> YES		<input type="checkbox"/> NO
<p>6. Have samples been collected at the site to determine the natural oxidant demand of the site?</p> <p><i>Chemical oxidants may preferentially react with naturally occurring organic soils and/or certain metals thus reducing the amount of oxidant available to react with contaminants.</i></p>	<input type="checkbox"/> YES		<input type="checkbox"/> NO

\* Intrinsic permeability is a measure of the ability of soils to transmit fluids and is an important factor in determining the effectiveness of chemical oxidation.

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I. Applicability Determination (Initial Screening)	Effective	Somewhat effective	Ineffective
7. Is the soil profile determined from boring logs generally free of natural organic material (e.g., layers of peat or humic material)?	<input type="checkbox"/> YES		<input type="checkbox"/> NO
8. Is the soil temperature expected to be 10°C or higher during remediation?	<input type="checkbox"/> YES		<input type="checkbox"/> NO
9. Is the pH of site groundwater between 5 and 9?	<input type="checkbox"/> YES		<input type="checkbox"/> NO
10. Is the dissolved iron concentration in the site groundwater < 10 mg/L?	<input type="checkbox"/> YES		<input type="checkbox"/> NO

## II.a Oxidation Design

1. What is the radius of influence of the proposed injection points/wells?  <i>Must be identified by showing the ROI on a site diagram.</i>	<input type="checkbox"/> > 25 ft.	<input type="checkbox"/> > 5 ft. but ≤ 25 ft.	<input type="checkbox"/> < 5 ft.
2. Are the density and configuration of the injection points/wells adequate to uniformly disperse the treatment chemicals through the target treatment zone, given site geology and hydrologic conditions?	<input type="checkbox"/> YES		<input type="checkbox"/> NO
3. Is the capacity of the chemical oxidation treatment system sufficient to generate and deliver oxygen at the required design rate?	<input type="checkbox"/> YES		<input type="checkbox"/> NO
4. Are monitoring wells adequately distributed between oxygen delivery locations to collect groundwater to evaluate the performance of the chemical oxidation system?	<input type="checkbox"/> YES		<input type="checkbox"/> NO

## II.b Oxidation Design

1. How will the oxidant be introduced into the treatment area? *(select all that apply)*

Direct push technology                       Injection wells  
 Existing monitoring wells                       Other (specify): \_\_\_\_\_

2. Estimate the treatment area (length x width x depth) in square feet. \_\_\_\_\_

Length: \_\_\_\_\_

Width: \_\_\_\_\_

Depth: \_\_\_\_\_

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## II.b Oxidation Design (continued)

3. How many injection points will be used? \_\_\_\_\_

4. Will any injections be performed at multiple depths?

Yes       No

If yes, which injection point(s) and what are the depths of injections?

5. What is the injection approach?

Single point       Circular       Multi point       Random

Other (describe):

6. If utilizing wells for injection, what will be the screen interval? \_\_\_\_\_

7. What is the calculated mass (in lbs.) of contaminants requiring biodegradation? \_\_\_\_\_

8. What is the mass (in lbs.) of dissolved oxygen required to biodegrade the contaminants? \_\_\_\_\_

## III. Sampling

1. What is the estimate of time to achieve cleanup of the site? \_\_\_\_\_

Sampling of dissolved oxygen, redox potential, and pH should be performed on at least a monthly basis to evaluate the effectiveness of chemical oxidant treatment.

Does the compliance sampling plan specifically exclude sampling from oxygen delivery wells when collecting data to evaluate chemical oxidation system performance? **Note** : *It is preferred that wells used as injection points are not also used for compliance sampling. If they are, a minimum of 1 month must pass between injection and sampling and/or additional sampling may be required.*

List the monitoring and analytical parameters that will be sampled quarterly as part of the CAP monitoring report.

Use the CAP Analytical Attachment Sheet.

Example	
Well Name	Substance(s)
MW - 1	BTEX, MTBE
MW - 3	BTEX, MTBE

# Chemical Oxidation

## IV. Sitemap

Attach a site map to this document

Site map(s) drawn to scale illustrating the following:

- a. Location of all present and former tanks, piping and dispensers in area of release;
- b. Footprint of surface and/or subsurface soil contamination;
- c. Footprint of other structures (buildings, canopies, roads, utilities, etc.);
- d. Location of injection points/wells;
- e. Monitoring wells that will be used for sampling;
- f. Groundwater flow direction;
- g. North arrow, bar scale, and map legend