**SMAQMD BACT CLEARINGHOUSE**

**SOIL REMEDIATION**

**BACT Size:** SMALL Emitter (<10 LB/DAY) AND MIN

**SOIL VAPOR EXTRACTION SYSTEM**

**BACT Determination Number:** 89  
**BACT Determination Date:** 11/17/2014

### Equipment Information

**Permit Number:** N/A -- Generic BACT Determination  
**Equipment Description:** SOIL VAPOR EXTRACTION SYSTEM  
**Unit Size/Rating/Capacity:** Soil vapor extraction with VOC <10 lb/day  
**Equipment Location:**

### BACT Determination Information

<table>
<thead>
<tr>
<th>Compounds</th>
<th>Standard</th>
<th>Technology Description</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOx</td>
<td></td>
<td>For thermal oxidizers: natural gas or propane fuel and good combustion practices</td>
<td>Achieved in Practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For IC engines: LPG as an auxiliary fuel and 3-way catalytic converter</td>
<td></td>
</tr>
<tr>
<td>SOx</td>
<td></td>
<td>For thermal oxidizers: natural gas or propane fuel and good combustion practices</td>
<td>Achieved in Practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For IC engines: LPG as an auxiliary fuel</td>
<td></td>
</tr>
<tr>
<td>PM10</td>
<td></td>
<td>For thermal oxidizers: natural gas or propane fuel and good combustion practices</td>
<td>Achieved in Practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For IC engines: LPG as an auxiliary fuel</td>
<td></td>
</tr>
<tr>
<td>PM2.5</td>
<td></td>
<td>For thermal oxidizers: natural gas or propane fuel and good combustion practices</td>
<td>Achieved in Practice</td>
</tr>
<tr>
<td>CO</td>
<td></td>
<td>For thermal oxidizers: natural gas or propane fuel and good combustion practices</td>
<td>Achieved in Practice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For IC engines: LPG as an auxiliary fuel and 3-way catalytic converter</td>
<td></td>
</tr>
<tr>
<td>LEAD</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Comments:** For Effluent VOC Concentrations <= 10 ppmv, no required % control efficiency  
For Influent VOC Concentrations >= 2,000 ppmv, at least 96.5% control efficiency required  
For Influent VOC Concentrations >= 200 ppmv and < 2,000 ppmv, at least 97% control efficiency required  
For Influent VOC Concentrations < 200 ppmv at least 90% control efficiency required

**District Contact:** Michelle Joe  
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**email:** mjoe@airquality.org

**Printed:** 12/15/2014
BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NO.: 89
DATE: November 14, 2014
ENGINEER: Michelle Joe

Category/General Equip Description: Soil Remediation
Equipment Specific Description: Soil Vapor Extraction (SVE)
Equipment Size/Rating: Small Emitter (< 10 lb/day) and Minor Source BACT
Previous BACT Det. No.: #29, 30, 31, & 32

This BACT determination will update Determination #29, 30, 31, & 32 which was made on April 5, 2012 for Soil Remediation – Soil Vapor Extraction (SVE).

BACT ANALYSIS

Step 1: Identify All Control Technologies

The following control technologies are currently employed as BACT for Soil Remediation – Soil Vapor Extraction (SVE) by the following BACT Clearinghouses:

<table>
<thead>
<tr>
<th>BACT Clearinghouse</th>
<th>(A)</th>
<th>Best Available Control Technology (BACT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMAQMD</td>
<td></td>
<td>For VOC:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Catalytic Oxidizers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Thermal Oxidizers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Carbon Adsorption</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. IC Engines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Each subject to the following VOC control efficiencies and maximum emission limit:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For VOC Concentration at Influent of Control Device (ppmv):</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
<td>≤10 ppmv</td>
</tr>
<tr>
<td></td>
<td>&gt;2,000 ppmv</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>&gt;200 ppmv to &lt;2,000 ppmv</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>&lt;200 ppmv</td>
<td>N/A</td>
</tr>
<tr>
<td>BACT Clearinghouse</td>
<td>(A)</td>
<td>Best Available Control Technology (BACT)</td>
</tr>
<tr>
<td>--------------------</td>
<td>-----</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td>EPA RBLC</td>
<td>---</td>
<td>For VOC: A BACT standard has not been established.</td>
</tr>
<tr>
<td>CARB</td>
<td>---</td>
<td>For VOC: A BACT standard has not been established.</td>
</tr>
<tr>
<td>South Coast AQMD</td>
<td>---</td>
<td>For VOC: A BACT standard has not been established.</td>
</tr>
<tr>
<td>Bay Area AQMD</td>
<td>AP</td>
<td>For VOC: Two or more activated carbon canisters in series, thermal oxidizer or catalytic oxidizer to achieve: ≤10 ppmv at outlet of control device; or ≥98.5% capture/destruction efficiency if inlet VOC ≥2000 ppmv; or ≥97% capture/destruction efficiency if inlet VOC ≥200 to &lt;2000 ppmv; or ≥90% capture/destruction efficiency if inlet VOC &lt;200 ppmv.</td>
</tr>
</tbody>
</table>
| San Joaquin Valley APCD | AP, TF | For VOC: 1. Thermal Oxidizer @ 1400 °F and 0.5 sec at 95% or greater control  
2. Catalytic Oxidizer @ 600 °F and 0.5 sec at 95% or greater control  
3. IC Engine with LPG auxiliary fuel and 3-way catalytic converter at 95% control  
4. IC Engine with natural gas or LPG auxiliary fuel and 3-way catalytic converter at 95% control  
5. Carbon Adsorption at 95% control efficiency for uncontrolled emissions over 2 lb/day  
For NOx:  
For Thermal Oxidizers: natural gas with low NOx burner  
For IC Engines: LPG as an auxiliary fuel and 3-way catalytic converter  
For SOx:  
For IC Engines: LPG as an auxiliary fuel  
For PM10:  
For IC Engines: LPG as an auxiliary fuel  
For CO:  
For Thermal Oxidizers: natural gas with low NOx burner  
For IC Engines: LPG as an auxiliary fuel |

(A) AP = Achieved in Practice, TF = Technologically Feasible

The following control technologies have been identified:

For VOC:
1. Catalytic Oxidizers
2. Thermal Oxidizers
3. Carbon Adsorption
4. IC Engines
For NOx:
For Thermal Oxidizers: natural gas or propane fuel and good combustion practices
For IC Engines: LPG as an auxiliary fuel and 3-way catalytic converter

For SOx:
For Thermal Oxidizers: natural gas or propane fuel and good combustion practices
For IC Engines: LPG as an auxiliary fuel

For PM10:
For Thermal Oxidizers: natural gas or propane fuel and good combustion practices
For IC Engines: LPG as an auxiliary fuel

For PM2.5:
For Thermal Oxidizers: natural gas or propane fuel and good combustion practices
For IC Engines: LPG as an auxiliary fuel

For CO:
For Thermal Oxidizers: natural gas or propane fuel and good combustion practices
For IC Engines: LPG as an auxiliary fuel and 3-way catalytic converter

For Lead:
For Thermal Oxidizers: natural gas or propane fuel and good combustion practices

**Step 2: Eliminate Technologically Infeasible Options**

All identified technologies are feasible.

**Step 3: Rank Remaining Control Technologies by Control Effectiveness**

1. Catalytic Oxidizers – 90% to 98.5% control efficiency
2. Thermal Oxidizers – 90% to 98.5% control efficiency
3. Carbon Adsorption – 90% to 98.5% control efficiency
4. IC Engines – 90% to 98.5% control efficiency with LPG auxiliary fuel and 3-way catalytic converter

All control technologies are equally effective at controlling VOCs. SMAQMD has identified BACT as the use of catalytic oxidizers, thermal oxidizers, carbon adsorption systems, or IC engines that achieve a control efficiency dependent on the inlet VOC concentration described in Step 1. For soil vapor extraction systems that use thermal oxidizers, either natural gas or propane and good combustion practices shall be required as BACT for NOx, SOx, PM10, PM2.5, CO, and Lead since it has been achieved in practice. For soil vapor extraction systems that use IC engines, LPG as an auxiliary fuel and a 3-way catalytic converter shall be required as BACT for NOx, SOx, PM10, PM2.5, CO, and Lead since it has been achieved in practice.
Therefore, the most effective control technology identified in Step 3 is the use of catalytic oxidizers, thermal oxidizers (which use natural gas or propane fuel and good combustion practices), carbon adsorption systems, or IC engines (which use LPG as an auxiliary fuel and 3-way catalytic converter) that achieve a control efficiency dependent on the inlet VOC concentration described in Step 1.

**Step 4: Select BACT**

BACT for the control of VOC emissions from Soil Remediation – Soil Vapor Extraction is the use of catalytic oxidizers, thermal oxidizers (which use natural gas or propane fuel and good combustion practices), carbon adsorption systems, or IC engines (which use LPG as an auxiliary fuel and 3-way catalytic converter) that achieve a control efficiency dependent on the inlet VOC concentration described in Step 1.

REVIEWED BY:  

DATE:  

APPROVED BY:  

DATE:  

17-15-14