CATEGORY Type: **GROUNDWATER REMEDIATION**

BACT Category: Minor Source BACT

BACT Determination Number: 288	**BACT Determination Date:** 7/15/2021

Equipment Information

Permit Number: N/A -- Generic BACT Determination

EXPIRED

Equipment Description: AIR STRIPPING SYSTEM

Unit Size/Rating/Capacity: Groundwater Remediation System with VOC < 10 lb/day

Equipment Location:

BACT Determination Information

District Contact: Permitting Section Phone No.: (279) 207-1122 email: Permitting@airquality.org

ROCs	**Standard:**	9.9 lb/day and % control based on influent
	Technology Description:	IC Engines, Thermal Oxidizers, Catalytic Oxidizers, or Carbon Adsorption that achieve the control efficiency requirements stated below.
	Basis:	Achieved in Practice
NOx	**Standard:**	(see additional BACT for technology below)
	Technology Description:	IC Engines, Thermal Oxidizers, or Catalytic Oxidizers that meet the APC-specific requirements in the BACT determination evaluation.
	Basis:	Achieved in Practice
SOx	**Standard:**	(see additional BACT for technology below)
	Technology Description:	IC Engines, Thermal Oxidizers, or Catalytic Oxidizers that meet the APC-specific requirements in the BACT determination evaluation.
	Basis:	Achieved in Practice
PM10	**Standard:**	(see additional BACT for technology below)
	Technology Description:	IC Engines, Thermal Oxidizers, or Catalytic Oxidizers that meet the APC-specific requirements in the BACT determination evaluation.
	Basis:	Achieved in Practice
PM2.5	**Standard:**	(see additional BACT for technology below)
	Technology Description:	IC Engines, Thermal Oxidizers, or Catalytic Oxidizers that meet the APC-specific requirements in the BACT determination evaluation.
	Basis:	Achieved in Practice
CO	**Standard:**	(see additional BACT for technology below)
	Technology Description:	IC Engines, Thermal Oxidizers, or Catalytic Oxidizers that meet the APC-specific requirements in the BACT determination evaluation.
	Basis:	Achieved in Practice
LEAD	**Standard:**	N/A
	Technology Description:	N/A
	Basis:	

Comments: For Effluent VOC Concentrations ≤ 10 ppmv, no required % control efficiency.
For Influent VOC Concentrations ≥ 2,000 ppmv, at least 98.5% 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.

777 12th Street, Third Floor

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

EXPIRED

DETERMINATION NO.:	288
DATE:	April 12, 2021
ENGINEER:	Michelle Joe

Category/General Equip Description: Groundwater Remediation System with VOC < 10 lb/day

Equipment Specific Description: Air Stripper

Equipment Size/Rating: Minor Source BACT

Previous BACT Det. No.: 152

This Best Available Control Technology (BACT) determination will update Determination #152 for Groundwater Remediation – Air Stripper, which was made on June 4, 2019. This source category involves the ex-situ ("out of place") mass transfer of VOCs from water to air by using a packed tower air stripper (most commonly used and the focus of this determination) or an aeration tank (less commonly used and therefore will not be discussed in this determination). In an air stripper, a spray nozzle at the top of the tower distributes pumped contaminated groundwater over the packing in the column, while a fan forces air countercurrent to the water flow; a sump at the bottom of the tower collects the decontaminated water and the VOC vapors are then treated aboveground.

This BACT determination is being updated in accordance with District Policy to review BACT determinations once every two (2) years. The District reviewed all previously reviewed BACT clearinghouses and rules, and no significant changes were found. Therefore, all other considerations made under the previous BACT will remain the same, unless otherwise noted.

BACT/T-BACT ANALYSIS:

A. ACHIEVED IN PRACTICE (Rule 202, §205.1a):

The following control technologies are currently employed as BACT/T-BACT for Groundwater Remediation – Air Stripper for projects emitting < 10 lb/day VOC by the following air pollution control districts (see Attachment A for copies of listed BACT determinations):

US EPA

BACT: The EPA RACT/BACT/LAER Clearinghouse was reviewed for any new applicable determinations made since June 2019. No new determinations were found to be more stringent than the previous BACT, which is listed again below:

Process Type 22.100 – Contaminated Ground Water Treatment[(A)] RBLC ID: AK-0022 (2/19/1991) for air stripper, 12,500 acfm capacity and 4,450 acfm capacity	
VOC	99.5% control efficiency of BTX (benzene, toluene, xylene), by activated carbon adsorption
NOx	N/A – No BACT determinations found
SOx	N/A – No BACT determinations found
PM10	N/A – No BACT determinations found
PM2.5	N/A – No BACT determinations found
CO	N/A – No BACT determinations found

(A) This BACT determination was found to be the most stringent Achieved in Practice BACT determination published in the EPA RACT/BACT/LAER clearinghouse. See Attachment B for a summary of EPA BACT Clearinghouse determinations reviewed.

T-BACT: There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:

40 CFR Part 60 – New Source Performance Standards (NSPS):
There are currently no 40 CFR, Part 60 NSPS sections that apply to this source category.

40 CFR Part 61 – National Emission Standards for Hazardous Air Pollutants (NESHAPS):
There are currently no 40 CFR, Part 61 NESHAPs that apply to this source category.

40 CFR Part 63 – NESHAPS for Source Categories (MACT Standards):
There are currently no 40 CFR, Part 63 NESHAPs that apply to this source category.

The following rule was reviewed and is discussed below to verify inapplicability:

40 CFR Part 63, Subpart GGGGG – National Emission Standards for Hazardous Air Pollutants: Site Remediation (amended 7/10/2020):
This subpart applies to remediation activities co-located at major stationary sources that emit hazardous air pollutants (HAP) and meet the affected source definition specified for a source category that is regulated by another subpart under 40 CFR Part 63 (another MACT standard). According to §63.7881(b)(2)-(4), remediation activities at gasoline stations and remediation activities performed under the authority of CERCLA or RCRA are exempt from this subpart. For standalone site remediation projects that are not co-located at a major stationary source (emitting 10 TPY or more of a single HAP or 25 TPY or more of a combination of HAPS), this subpart is not applicable.

California Air Resources Board (CARB)

BACT: The CARB BACT Determination Tool and CARB BACT Guideline List were reviewed by searching under the keywords "water," "stripper," and "remediation" for any new applicable determinations made since June 2019. No new determinations have been published in the clearinghouse that were not already previously published by the South Coast AQMD and Bay Area AQMD (see applicable air districts below for details).

T-BACT: There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
ARB Airborne Toxic Control Measures (ATCM):
There are currently no ATCMs that apply to this source category.

Sacramento Metropolitan AQMD

BACT: The SMAQMD BACT Clearinghouse was reviewed for any new applicable determinations made since June 2019. No new determinations were found to be more stringent than the previous BACT, which is listed again below:

<table>
<tr><td colspan="2">BACT Determination No. 152 For Groundwater Remediation with VOC <10 lb/day (6/4/2019)</td></tr>
<tr><td>VOC</td><td>
1. Catalytic Oxidizers
2. Thermal Oxidizers
3. Carbon Adsorption
4. IC Engines

Each subject to the following VOC control efficiencies and maximum emission limit:
<table>
<tr><th>For VOC Concentration at Influent of Control Device (ppmv):</th><th>For VOC Concentration at Effluent of Control Device (ppmv):</th><th>Required VOC Control Efficiency</th><th>Maximum Effluent VOC Daily Limit</th></tr>
<tr><td>N/A</td><td>≤10 ppmv</td><td>None</td><td rowspan="4">9.9 lb/day (A)</td></tr>
<tr><td>≥2,000 ppmv</td><td>N/A</td><td>≥98.5%</td></tr>
<tr><td>≥200 ppmv to <2,000 ppmv</td><td>N/A</td><td>≥97%</td></tr>
<tr><td><200 ppmv</td><td>N/A</td><td>≥90%</td></tr>
</table>
(A) The 9.9 lb/day VOC emission limit was a carry-over of the pre-2011 amendment to Rule 202 New Source Review (NSR) emission limit (which kept emissions below the 10 lb/day BACT trigger). After the 2011 NSR amendment, the following reasonable daily VOC limits were considered:
- For SCAQMD, site-specific daily VOC limits were established using initial test data and applying the applicant-provided APC control efficiency.
- For BAAQMD, a daily VOC limit was not established and instead relied on their BACT (tiered VOC control efficiency based on influent concentrations, unless effluent concentrations are ≤10 ppmv).
- For SMAQMD, at a maximum, an applicant could propose a daily limit below the facility wide offset trigger (<4,999 lb/day).
</td></tr>
</table>

BACT Determination No. 152 For Groundwater Remediation with VOC <10 lb/day (6/4/2019)	
VOC	- For SMAQMD, at a minimum, an applicant could propose an arbitrary daily limit that may reflect the maximum concentrations during the initial test, which may then be exceeded if/when concentrations fluctuate during the course of site remediation. An applicant-proposed daily limit was also discussed as being unfair and non-standardized. - For SMAQMD, based on Field Operations' past experience, exceedances of the 9.9 lb/day limit occurred when equipment malfunctioned (rather than due to "hot spots" of VOC contamination). Ultimately, it was decided that the previous 9.9 lb/day VOC emission limit was the most reasonable limit at the time and should continue to be used as the daily limit.
NOx	For thermal oxidizers: either natural gas or propane and good combustion practices (as achieved in practice). For IC engines: LPG as an auxiliary fuel and a 3-way catalytic converter (as achieved in practice).
SOx	
PM10	
PM2.5	
CO	

T-BACT: There are no T-BACT standards published in the clearinghouse for this category. From past permitting policy (refer to SMAQMD *Soil and Water Remediation Manual (12/18/2013)*), T-BACT was considered similar to BACT since the TACs of concern (typically benzene, MtBE, and/or trichloroethylene (TCE)) are VOCs. Therefore, control of VOCs through meeting the BACT standard will also control the TACs that are VOCs and will be considered equivalent to meeting T-BACT requirements.

RULE REQUIREMENTS:
There are currently no category-specific prohibitory series 400 rules that apply to groundwater remediation.

The following rule was reviewed and is discussed below to verify inapplicability:

Rule 419 – NOx from Miscellaneous Combustion Units (amended 10/25/2018):
This rule applies to any miscellaneous combustion unit with a total rated heat input capacity of 5 million Btu per hour or greater located at any area source of NOx (<25 TPY of NOx). Since the majority of thermal oxidizers used for groundwater remediation systems are both located at an area source of NOx and are rated below 5 mmBTU/hr and that Section 112 specifically exempts air pollution control devices, this rule does not apply.

South Coast AQMD

BACT: The SCAQMD BACT Guidelines for Non-Major Polluting Facilities (revised 2/5/2021) was reviewed for any new applicable determinations made since June 2019. No new determinations were found to be more stringent than the previous BACT, which is listed again below:

Air Stripper - Ground Water Treatment (10-20-2000)	
VOC	Carbon adsorber, thermal oxidizer, or catalytic oxidizer
NOx	N/A – No BACT determinations found
SOx	N/A – No BACT determinations found
PM10	N/A – No BACT determinations found
PM2.5	N/A – No BACT determinations found
CO	N/A – No BACT determinations found

T-BACT: There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:

Regulation XI, Rule 1147 - NOx Reductions from Miscellaneous Sources (amended 7/7/2017):
This rule applies to vapor incinerators, catalytic or thermal oxidizers, soil and water remediation units, and other combustion equipment with NOx emissions (except internal combustion engines subject to District Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines) that require a District permit***** and are not specifically required to comply with a NOx emission limit by other District Regulation XI rules.

*****_Rule 219 - Equipment Not Requiring a Written Permit Pursuant to Regulation II (amended 4/6/2018) exempts combustion equipment firing natural gas, for which the maximum heat input is 2 mmBTU/hr or less and for which there are no other emissions other than products of combustion (except for food ovens rated ≤ 2 mmBTU/hr), from the requirement to obtain a written permit. Therefore, in practice, the BACT, LAER and Rule 1147 standards only apply to process heaters or any combustion unit with no other emissions other than products of combustion with a heat input greater than 2 mmBTU/hr._

Requirements from Tables 1 and 2 for remediation units only:

<table>
<tr><th rowspan="3">Category</th><th colspan="3">NOx Emission Limit</th><th rowspan="3">Unit Shall
be in Compliance</th></tr>
<tr><th colspan="3">Process Temperature</th></tr>
<tr><th>≤800 ºF</th><th>>800 ºF and <1200 ºF</th><th>≥1200 ºF</th></tr>
<tr><td colspan="5">Gaseous Fuel-Fired Equipment (A)(B)(C)</td></tr>
<tr><td>In-Use remediation unit manufactured & installed prior to March 1, 2012</td><td rowspan="2">60 ppm or 0.073 lb/mmBTU</td><td rowspan="2">60 ppm or 0.073 lb/mmBTU</td><td rowspan="2">60 ppm or 0.073 lb/mmBTU</td><td>Upon combustion system modification or replacement, unit replacement, or relocation beginning March 1, 2012</td></tr>
<tr><td>Any In-Use unit with emissions ≥1 lb/day & manufactured after 1997</td><td>July 1 of the year the unit is 15 years old</td></tr>
</table>

Category	NOx Emission Limit			Unit Shall be in Compliance
	Process Temperature			
	≤800 ºF	>800 ºF and <1200 ºF	≥1200 ºF	
New remediation unit with heat rating ≥ 0.325 mmBTU/hr & installed after January 1, 2010				At the time a District permit is required
Liquid Fuel-Fired Equipment				
In-Use remediation unit manufactured & installed prior to March 1, 2012				Upon combustion system modification or replacement, unit replacement, or relocation beginning March 1, 2012
Any **In-Use** unit with emissions ≥1 lb/day & manufactured after 1997	40 ppm or 0.053 lb/mmBTU	40 ppm or 0.053 lb/mmBTU	60 ppm or 0.080 lb/mmBTU	July 1 of the year the unit is 15 years old
New remediation unit with heat rating ≥ 0.325 mmBTU/hr & installed after January 1, 2010				At the time a District permit is required

(A) Emission limit applies to burners in units fueled by 100% natural gas that are used to incinerate air toxics, VOCs, or other vapors; or to heat a unit. **The emission limit applies solely when burning 100% fuel** and not when the burner is incinerating air toxics, VOCs, or other vapors. The unit shall be tested or certified to meet the emission limit while fueled with natural gas.

(B) Exemption for Mixing Fuel with Air Toxics, VOCs, or Other Vapors Prior to Incineration: As per Section (g)(3)(E), a remediation unit in which particulate matter, air toxics, VOCs, landfill gas, digester gas or other combustible vapors are mixed in the unit's burner with combustion air or fuel, including but not limited to natural gas, propane, butane or liquefied petroleum gas, prior to or at incineration in the unit, in order to maintain vapor concentration above the upper explosion limit or above a manufacturer specified limit in order to maintain combustion or temperature in the unit is not subject to the provisions of this rule. **This exemption does not apply to a regenerative thermal or catalytic oxidizer unit with a burner used to heat up or maintain temperature of the unit or a unit that incinerates particulate matter, air toxics, VOCs or other combustible vapors in a gas stream moving past the burner flame.**

(C) Exemption for Propane, Butane or Liquefied Petroleum Gas Where Natural Gas is Not Available: As per Section (g)(7), **remediation units are exempt from the applicable emission limit in Table 1 while fueled with propane, butane or liquefied petroleum gas in a location where natural gas is not available.**

Remediation units must comply with the emission limit when natural gas is available and while fueled with natural gas.

San Joaquin Valley APCD

BACT: The SJVAPCD BACT Clearinghouse (Searchable) was reviewed for any new applicable determinations made since June 2019. No BACT standards are published in the clearinghouse for this category.

The following previously-identified BACT was rescinded on 4/20/20 and is no longer applicable:

BACT Guideline 2.3.1: Mobile Contaminated Water Air Stripper (8/9/1995)	
VOC	*95% Control of VOCs for emissions over 2.0 lb/day uncontrolled - Use of thermal/catalytic oxidizer, I.C. engine, or carbon adsorption*
NOx	*0.100 lb/MMBtu, Natural Gas or LPG auxiliary fuel for oxidizer natural gas or LPG 50 ppmvd @ 15% O2, 3-Way catalyst for I.C. Engine*
SOx	*0.0006 lb/MMBtu, Natural Gas or LPG auxiliary fuel for oxidizer 0.268 g/bhp-hr, Natural gas or LPG for I.C. Engine*
PM10	*0.012 lb/MMBtu, Natural gas or LPG auxiliary fuel for oxidizer 0.327 g/hp-hr, Natural gas or LPG for I.C. engine*
PM2.5	*N/A – No BACT determinations found*
CO	*0.021 lb/MMBtu, Natural gas or LPG auxiliary fuel for oxidizer 150 ppmvd @ 15% O2, Natural gas or LPG and 3-Way catalyst for I.C. engine*

T-BACT: There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
There are currently no category-specific Regulation IV or toxic air pollutants Regulation VII rules that apply to groundwater remediation.

Bay Area AQMD

BACT: The BAAQMD BACT/TBACT Workbook was reviewed for any new applicable determinations made since June 2019. No new determinations were found to be more stringent than the previous BACT, which is listed again below:

BAAQMD BACT Document #2.1.1 (6/16/1995) for Air Stripper – Ground Water Treatment	
VOC	Achieved in Practice: ≤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 <2000 ppmv; or ≥90% capture/destruction efficiency if inlet VOC <200 ppmv. Typical Technology: Two or more activated carbon canisters in series or thermal oxidizer or catalytic oxidizer.

BAAQMD BACT Document #2.1.1 (6/16/1995) for Air Stripper – Ground Water Treatment	
NOx	No standard
SOx	No standard
PM10	No standard
PM2.5	No standard
CO	No standard

T-BACT: The BACT standard above also represents the T-BACT standard for this category.

RULE REQUIREMENTS:
Regulation 8, Rule 47 – Air Stripping and Soil Vapor Extraction Operations (amended June 15, 2005):
This rule limits the VOC emissions from air stripping and soil vapor extracting operations which either:

1. Emit more than one of the following compounds in excess of: 0.05 lb/day of benzene, 0.2 lb/day of vinyl chloride, 0.5 lb/day of trichloroethylene, 0.5 lb/day of perchloroethylene, or 0.5 lb/day of methylene chloride, or
2. Emit a total of greater than or equal to 1 lb/day of benzene, vinyl chloride, perchloroethylene, methylene chloride, and/or trichloroethylene.

For systems subject as described above, Section 8-47-301 requires any air stripping operations which emit benzene, vinyl chloride, perchloroethylene, methylene chloride, and/or trichloroethylene to be vented to a control device which reduces emissions to the atmosphere by at least 90% by weight.

For systems with total organic compound emissions greater than 15 lb/day, Section 8-47-302 requires operations to be vented to a control device which reduces total organic compound emissions by at least 90% by weight.

San Diego County APCD

BACT: The SDCAPCD NSR Requirements for BACT Guidelines (June 2011) was reviewed for any new applicable determinations made since June 2019. No BACT standards are published in the clearinghouse for this category.

T-BACT:
There are no T-BACT standards published in the clearinghouse for this category.

RULE REQUIREMENTS:
There are currently no category-specific Regulation IV rules that apply to groundwater remediation.

The following rule was reviewed and is discussed below to verify inapplicability:

Regulation 4, Rule 68 – Fuel-Burning Equipment – Oxides of Nitrogen (9/20/1994):
This rule does not apply to fuel burning equipment which has a maximum input rating of < 50 mmBTU/hr. Since the majority of thermal oxidizers used for groundwater remediation systems are rated below 5 mmBTU/hr, this rule does not apply.

<u>Summary of Achieved in Practice Control Technologies:</u>

The following control technologies have been identified and are ranked based on stringency (according to the required % VOC control efficiency or ppmv concentration) in **bold**:

<table>
<tr><th colspan="3">RANKING OF TECHNOLOGIES ACHIEVED – GROUNDWATER REMEDIATION (GRE)</th></tr>
<tr><th>Pollutant</th><th>Standard</th><th>Source</th></tr>
<tr><td rowspan="4">VOC (A)</td><td>1. <u>For groundwater remediation with VOC <10 lb/day and controlled by:</u>
A. Catalytic Oxidizers
B. Thermal Oxidizers
C. Carbon Adsorption
D. IC Engines

Each subject to the following VOC control efficiencies and maximum emission limit:
<table>
<tr><th>For VOC Concentration at Influent of Control Device (ppmv):</th><th>For VOC Concentration at Effluent of Control Device (ppmv):</th><th>Required VOC Control Efficiency</th><th>Maximum Effluent VOC Daily Limit</th></tr>
<tr><td>N/A</td><td>≤10 ppmv</td><td>None</td><td rowspan="4">9.9 lb/day</td></tr>
<tr><td>≥2,000 ppmv</td><td>N/A</td><td>≥98.5%</td></tr>
<tr><td>≥200 ppmv to <2,000 ppmv</td><td>N/A</td><td>≥97%</td></tr>
<tr><td><200 ppmv</td><td>N/A</td><td>≥90%</td></tr>
</table></td><td>SMAQMD
BACT No. 152</td></tr>
<tr><td>2. ≤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 <2000 ppmv; or
≥90% capture/destruction efficiency if inlet VOC <200 ppmv.</td><td>BAAQMD
BACT #2.1.1</td></tr>
<tr><td>3. For systems that emit ≥ 0.05 lb/day of benzene, 0.2 lb/day of vinyl chloride, 0.5 lb/day of trichloroethylene (TCE), 0.5 lb/day of perchloroethylene (PCE), 0.5 lb/day of methylene chloride, or a total of 1 lb/day of benzene, vinyl chloride, PCE, methylene chloride, and/or TCE: vented to a control device which reduces emissions to the atmosphere by at least 90% by weight.

For systems with total organic compound emissions greater than 15 lb/day: vented to a control device which reduces total organic compound emissions by at least 90% by weight.</td><td>BAAQMD
Regulation 8, Rule 47</td></tr>
<tr><td>4. <u>For Air Stripper – Ground Water Treatment:</u>
Carbon adsorber, thermal oxidizer, or catalytic oxidizer</td><td>SCAQMD
BACT</td></tr>
</table>

(A) The EPA RBLC BACT No. AK-0022 (entered on 5/31/1991) listed a 99.5% control efficiency of benzene, toluene, and xylene by activated carbon adsorption for a groundwater remediation project. This control efficiency was proposed by the applicant and later found to be unachievable due to inlet concentrations varying over time to below design concentrations and discovering that one of the two carbon systems could not meet the required control efficiency. A subsequent Technical Analysis Report in April 2008 detailed the issues and rescinded the 99.5% control efficiency requirement (see Attachment A – E-Mail & Excerpt from Technical Analysis Report for Permit No. AQ0035MSS02). Therefore, this BACT was considered not achieved in practice and therefore is not listed in the above table.

Then, based on the specific control device used, the following control technologies have been identified and are ranked based on stringency:

RANKING OF TECHNOLOGIES ACHIEVED – IC ENGINE CONTROLLING GRE		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)*** - and - LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
NOx	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
SOx	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
PM10	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
PM2.5	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
CO	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152

RANKING OF TECHNOLOGIES ACHIEVED – THERMAL OXIDIZER CONTROLLING GRE		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)***	
NOx	Burners fired on mixture of process gas and supplemental fuel: No standard	SCAQMD Regulation XI, Rule 1147
	Burners fired on 100% natural gas or propane[(A)]: 1. 60 ppm NOx at 3% O_2 for process temperatures ≤ 800 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures > 800 °F.	
	Burners fired on liquid fuel: 1. 40 ppm NOx at 3% O_2 for process temperatures < 1200 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures ≥ 1200 °F.	
	Either natural gas or propane and good combustion practices	SMAQMD BACT No. 152
SOx	Either natural gas or propane and good combustion practices	
PM10	Either natural gas or propane and good combustion practices	SMAQMD BACT No. 152
PM2.5	Either natural gas or propane and good combustion practices	SMAQMD BACT No. 152
CO	Either natural gas or propane and good combustion practices	

(A) Remediation units are exempt from this emission limit while fueled with propane, butane or liquefied petroleum gas in a location where natural gas is not available. Remediation units must comply with the emission limit when natural gas is available and while fueled with natural gas.

RANKING OF TECHNOLOGIES ACHIEVED – CATALYTIC OXIDIZER CONTROLLING GRE		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)***	
NOx	Burners fired on mixture of process gas and supplemental fuel: No standard	SCAQMD Regulation XI, Rule 1147
	Burners fired on 100% natural gas or propane[(A)]: 1. 60 ppm NOx at 3% O_2 for process temperatures ≤ 800 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures > 800 °F.	
	Burners fired on liquid fuel: 1. 40 ppm NOx at 3% O_2 for process temperatures < 1200 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures ≥ 1200 °F.	
SOx	No standard	
PM10	No standard	
PM2.5	No standard	
CO	No standard	

(A) Remediation units are exempt from this emission limit while fueled with propane, butane or liquefied petroleum gas in a location where natural gas is not available. Remediation units must comply with the emission limit when natural gas is available and while fueled with natural gas.

RANKING OF TECHNOLOGIES ACHIEVED – CARBON ADSORPTION CONTROLLING GRE		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)***	
NOx	No standard	
SOx	No standard	
PM10	No standard	
PM2.5	No standard	
CO	No standard	

Discussion on Achieved in Practice Control Technologies:
Although all control technologies are equally effective at controlling VOCs, the site-specific conditions and physical properties of the contaminants of concern directly influence the selection of the treatment technology and the overall treatment strategy. Based on the above review, SMAQMD has identified BACT as the use of IC engines, thermal oxidizers, catalytic oxidizers, or carbon adsorption systems to attain set VOC destruction efficiencies corresponding to set influent VOC concentration values.

Below is a brief description of the various types of GRE control technologies identified (as described in *USEPA Off-Gas Treatment Technologies for Soil Vapor Extraction Systems: State of the Practice, March 2006*):

1. IC Engines – involves mixing extracted contaminated (typically gasoline) vapors in the carburetor of the engine with air and, if necessary, auxiliary fuel (such as LPG or natural gas), and then combusted normally in the engine. This thermal treatment technology is most effective at controlling high-concentration VOC vapors and is primarily used in the initial stages of a GRE project and for tank degassing operations. Chlorinated VOC compounds are not normally treated in engines unless they are comingled with petroleum VOCs.

2. Thermal Oxidizers – using one or more LPG- or natural gas-fired burners, destroys contaminants at a sufficiently high temperature (1200 to 2000 ^{0}F) to promote oxidation (or combustion) of contaminants to carbon dioxide and water. The VOCs in the extracted vapors fuel the oxidation reaction, unless concentrations are too low (in which auxiliary fuel such as LPG or natural gas must be added) or too high (in which dilution air must be added). This thermal treatment technology is able to treat a broad range of contaminants at a wide range of concentrations (including non-halogenated VOCs, semi-volatile organic compounds, fuel hydrocarbons, alcohols, aliphatics, aromatics, esters, and ketones). However, treatment of halogenated or chlorinated compounds (including perchloroethylene (PCE) or trichloroethylene (TCE)) may generate dioxins and furans or hydrochloric acid, which may require further treatment (such as carbon adsorption or acid scrubbers).

3. Catalytic Oxidizers – using an electric-powered or a LPG- or natural gas-fired burner alongside a catalyst (typically platinum, palladium, or rubidium deposited on an aluminum oxide-coated ceramic or stainless steel substrate), creates an exothermic combustion reaction to oxidize contaminants. The addition of the catalyst accelerates the rate of oxidation and allows it to occur at lower temperatures (500 to 900 ^{0}F) than required by thermal oxidizers. As with thermal oxidizers, treatment of halogenated or chlorinated compounds (including perchloroethylene (PCE) or trichloroethylene (TCE)) may generate dioxins and furans or hydrochloric acid, which may require further treatment (such as carbon adsorption or acid scrubbers).

4. Carbon Adsorption – captures and removes contaminants through physical adsorption using a medium or matrix (including granular activated carbon, zeolite, and synthetic polymers). Using a blower or vacuum pumps, extracted vapors are either pushed or sucked through the matrix and contaminants are collected on the surface of the adsorbent medium until the medium is saturated. Most adsorption systems consist of one or more canisters connected in series or parallel to prevent breakthrough.

Therefore, the following control technologies have been identified as the most stringent, achieved in practice control technologies:

<table>
<tr><th colspan="3">BEST CONTROL TECHNOLOGIES ACHIEVED – GROUNDWATER REMEDIATION (GRE)</th></tr>
<tr><th>Pollutant</th><th>Standard</th><th>Source</th></tr>
<tr><td>VOC</td><td>
<u>For groundwater remediation with VOC <10 lb/day and controlled by:</u>

Catalytic Oxidizers
Thermal Oxidizers
Carbon Adsorption
IC Engines

Each subject to the following VOC control efficiencies and maximum emission limit:
<table>
<tr><th>For VOC Concentration at Influent of Control Device (ppmv):</th><th>For VOC Concentration at Effluent of Control Device (ppmv):</th><th>Required VOC Control Efficiency</th><th>Maximum Effluent VOC Daily Limit</th></tr>
<tr><td>N/A</td><td>≤10 ppmv</td><td>None</td><td rowspan="4">9.9 lb/day</td></tr>
<tr><td>≥2,000 ppmv</td><td>N/A</td><td>≥98.5%</td></tr>
<tr><td>≥200 ppmv to <2,000 ppmv</td><td>N/A</td><td>≥97%</td></tr>
<tr><td><200 ppmv</td><td>N/A</td><td>≥90%</td></tr>
</table>
</td><td>SMAQMD
BACT No. 152</td></tr>
</table>

Then, <u>based on the specific control device used</u>, the following control technologies have been identified as the most stringent, achieved in practice control technologies:

BEST CONTROL TECHNOLOGIES ACHIEVED – IC ENGINE CONTROLLING GRE		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)*** - and - LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
NOx	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
SOx	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
PM10	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
PM2.5	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
CO	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152

BEST CONTROL TECHNOLOGIES ACHIEVED – THERMAL OXIDIZER CONTROLLING GRE		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)***	
NOx	Burners fired on mixture of process gas and supplemental fuel: No standard	SCAQMD Regulation XI, Rule 1147
	Burners fired on 100% natural gas or propane(A): 1. 60 ppm NOx at 3% O_2 for process temperatures ≤ 800 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures > 800 °F.	
	Burners fired on liquid fuel: 1. 40 ppm NOx at 3% O_2 for process temperatures < 1200 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures ≥ 1200 °F.	
	Either natural gas or propane and good combustion practices	SMAQMD BACT No. 152
SOx	Either natural gas or propane and good combustion practices	SMAQMD BACT No. 152
PM10	Either natural gas or propane and good combustion practices	
PM2.5	Either natural gas or propane and good combustion practices	
CO	Either natural gas or propane and good combustion practices	

(A) Remediation units are exempt from this emission limit while fueled with propane, butane or liquefied petroleum gas in a location where natural gas is not available. Remediation units must comply with the emission limit when natural gas is available and while fueled with natural gas.

BEST CONTROL TECHNOLOGIES ACHIEVED – FOR CATALYTIC OXIDIZER CONTROLLING GRE		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)***	
NOx	Burners fired on mixture of process gas and supplemental fuel: No standard	SCAQMD Regulation XI, Rule 1147
	Burners fired on 100% natural gas or propane(A): 1. 60 ppm NOx at 3% O_2 for process temperatures ≤ 800 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures > 800 °F.	
	Burners fired on liquid fuel: 1. 40 ppm NOx at 3% O_2 for process temperatures < 1200 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures ≥ 1200 °F.	
SOx	No standard	
PM10	No standard	
PM2.5	No standard	
CO	No standard	

(A) Remediation units are exempt from this emission limit while fueled with propane, butane or liquefied petroleum gas in a location where natural gas is not available. Remediation units must comply with the emission limit when natural gas is available and while fueled with natural gas.

BEST CONTROL TECHNOLOGIES ACHIEVED – CARBON ADSORPTION CONTROLLING GRE		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)***	
NOx	No standard	
SOx	No standard	
PM10	No standard	
PM2.5	No standard	
CO	No standard	

B. <u>TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE (Rule 202, §205.1.b.):</u>

<u>Technologically Feasible Alternatives:</u>
Any alternative basic equipment, fuel, process, emission control device or technique, singly or in combination, determined to be technologically feasible by the Air Pollution Control Officer. The table below shows the technologically feasible alternatives identified as capable of reducing emissions beyond the levels determined to be "Achieved in Practice" as per Rule 202, §205.1.a:

TECHNOLOGICALLY FEASIBLE ALTERNATIVES		
Pollutant	**Technologically Feasible Alternatives**	**Source**
VOC	<u>For air stripper – ground water treatment:</u> <u><</u>10 ppmv at outlet of control device; or <u>></u>98.5% capture/destruction efficiency. <u>Typical Technology:</u> Two or more activated carbon canisters in series or thermal oxidizer.	BAAQMD BACT #2.1.1
NOx	No other technologically feasible option identified	
SOx	No other technologically feasible option identified	
PM10	No other technologically feasible option identified	
PM2.5	No other technologically feasible option identified	
CO	No other technologically feasible option identified	

<u>Discussion on Technologically Feasible Alternatives:</u>

<u>GRE ≤ 10 ppmv VOC at Outlet of Control Device or ≥ 98.5% Capture/Destruction Efficiency:</u>
The ≤ 10 ppmv VOC limit at the outlet of a control device or ≥ 98.5% capture/destruction efficiency using two or more activated carbon canisters in series or thermal oxidizer [BAAQMD] is already required as part of the achieved in practice BACT for VOC by SMAQMD.

However, the achieved in practice BACT is defined as attainment of set VOC destruction efficiencies corresponding to set influent VOC concentration values. This allows for a tiered approach rather than a single VOC concentration limit or control efficiency, and which takes into account the physical and chemical difficulties of:

- achieving higher capture/destruction efficiencies as inlet VOC concentrations decrease (i.e., requiring smaller and smaller effluent concentrations (which may fall under a laboratory's detection limit) to achieve the required destruction efficiency)
- the fact that GREs "do not have consistent influent VOC concentrations over time" (as described on page 2-5, *USEPA Off-Gas Treatment Technologies for Soil Vapor Extraction Systems: State of the Practice, March 2006*)
- the variability of influent VOC concentrations in order to maintain a safe lower explosive level (LEL) range to prevent explosive GRE air streams; generally, influent concentrations are limited 10 to 25% of the LEL (defined as the minimum concentration of a chemical vapor in atmospheric air that is sufficient to support combustion), and the desired LEL concentration can be obtained by diluting the GRE influent with ambient air ("dilution air") (as described on pages 2-7 and 3-9, *USEPA Off-Gas Treatment Technologies for Soil Vapor Extraction Systems: State of the Practice, March 2006*)
- the "likelihood that influent VOC concentrations to the thermal treatment system will decrease over time, thereby affecting both cost to operate and achievable DREs (destruction and removal efficiencies), is an important consideration for soil vapor extraction [and GRE] off-gas application selection. This consideration must be accounted for in the engineering and economic analysis" (as described on page 3-10, *USEPA Off-Gas Treatment Technologies for Soil Vapor Extraction Systems: State of the Practice, March 2006*).

Therefore, this BACT limitation is not considered technologically feasible without the tiered and will not be considered as a technologically feasible BACT.

Cost Effective Determination:
Since the tiered approach to VOC capture/destruction efficiency is already achieved in practice, a cost effectiveness analysis is not required.

C. SELECTION OF BACT:

BACT for the control of VOC emissions from Groundwater Remediation – Air Stripper is the use of IC engines, thermal oxidizers, catalytic oxidizers, or carbon adsorption systems to attain set VOC destruction efficiencies corresponding to set influent VOC concentration values.

Based on the above analysis, BACT for VOC, NOx, SOx, PM10, and CO will remain at what is currently achieved in practice and BACT for PM2.5 will be set to be the same as for PM10.

<table>
<tr><th colspan="3">BACT FOR GROUNDWATER REMEDIATION (GRE) USING AN AIR STRIPPER
FOR PROJECTS EMITTING <10 LB/DAY VOC</th></tr>
<tr><th>Pollutant</th><th>Standard</th><th>Source</th></tr>
<tr><td>VOC</td><td>
<u>For groundwater remediation with VOC <10 lb/day and controlled by:</u>
1. Catalytic Oxidizers
2. Thermal Oxidizers
3. Carbon Adsorption
4. IC Engines

Each subject to the following VOC control efficiencies and maximum emission limit:

<table>
<tr><th>For VOC Concentration at Influent of Control Device (ppmv):</th><th>For VOC Concentration at Effluent of Control Device (ppmv):</th><th>Required VOC Control Efficiency</th><th>Maximum Effluent VOC Daily Limit</th></tr>
<tr><td>N/A</td><td>≤10 ppmv</td><td>None</td><td rowspan="4">9.9 lb/day</td></tr>
<tr><td>≥2,000 ppmv</td><td>N/A</td><td>≥98.5%</td></tr>
<tr><td>≥200 ppmv to <2,000 ppmv</td><td>N/A</td><td>≥97%</td></tr>
<tr><td><200 ppmv</td><td>N/A</td><td>≥90%</td></tr>
</table>
</td><td>SMAQMD
BACT No. 152</td></tr>
</table>

Then, <u>based on the specific control device used</u>, the following control technologies have been identified as the most stringent, achieved in practice control technologies:

BACT FOR IC ENGINE CONTROLLING GROUNDWATER REMEDIATION (GRE) FOR PROJECTS EMITTING <10 LB/DAY VOC		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)*** - and - LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
NOx	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
SOx	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
PM10	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
PM2.5	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152
CO	LPG as an auxiliary fuel and a 3-way catalytic converter	SMAQMD BACT No. 152

BACT FOR THERMAL OXIDIZER CONTROLLING GROUNDWATER REMEDIATION (GRE) FOR PROJECTS EMITTING <10 LB/DAY VOC		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)***	
NOx	Burners fired on mixture of process gas and supplemental fuel: No standard	SCAQMD Regulation XI, Rule 1147
	Burners fired on 100% natural gas or propane[(A)]: 1. 60 ppm NOx at 3% O_2 for process temperatures ≤ 800 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures > 800 °F.	
	Burners fired on liquid fuel: 1. 40 ppm NOx at 3% O_2 for process temperatures < 1200 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures ≥ 1200 °F.	
	Either natural gas or propane and good combustion practices	SMAQMD BACT No. 152
SOx	Either natural gas or propane and good combustion practices	SMAQMD BACT No. 152
PM10	Either natural gas or propane and good combustion practices	
PM2.5	Either natural gas or propane and good combustion practices	
CO	Either natural gas or propane and good combustion practices	

(A) Remediation units are exempt from this emission limit while fueled with propane, butane or liquefied petroleum gas in a location where natural gas is not available. Remediation units must comply with the emission limit when natural gas is available and while fueled with natural gas.

BACT FOR CATALYTIC OXIDIZER CONTROLLING GROUNDWATER REMEDIATION (GRE) FOR PROJECTS EMITTING <10 LB/DAY VOC		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)***	
NOx	Burners fired on mixture of process gas and supplemental fuel: No standard	SCAQMD Regulation XI, Rule 1147
	Burners fired on 100% natural gas or propane[(A)]: 1. 60 ppm NOx at 3% O_2 for process temperatures ≤ 800 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures > 800 °F.	
	Burners fired on liquid fuel: 1. 40 ppm NOx at 3% O_2 for process temperatures < 1200 °F. 2. 60 ppm NOx @ 3% O_2 for process temperatures ≥ 1200 °F.	
SOx	No standard	
PM10	No standard	
PM2.5	No standard	
CO	No standard	

(A) Remediation units are exempt from this emission limit while fueled with propane, butane or liquefied petroleum gas in a location where natural gas is not available. Remediation units must comply with the emission limit when natural gas is available and while fueled with natural gas.

BACT FOR CARBON ADSORPTION CONTROLLING GROUNDWATER REMEDIATION (GRE) FOR PROJECTS EMITTING <10 LB/DAY VOC		
Pollutant	**Standard**	**Source**
VOC	***(see VOC standard under Groundwater Remediation BACT above)***	
NOx	No standard	
SOx	No standard	
PM10	No standard	
PM2.5	No standard	
CO	No standard	

D. <u>SELECTION OF T-BACT:</u>

The toxics at issue with this technology are VOCs. The control of VOCs through meeting the BACT standard will also control toxics found in the VOCs. Therefore, the BACT VOC controls are also the T-BACT controls.

For Chlorinated Compounds (T-BACT):

Based on the concerns identified above about generating dioxins and furans or hydrochloric acid from the thermal treatment (i.e., IC engines, thermal oxidizers, or catalytic oxidizers) of chlorinated compounds (including perchloroethylene (PCE) or trichloroethylene (TCE)), further treatment (such as carbon adsorption or acid scrubbers) will be required as T-BACT.

APPROVED BY: Brian F Krebs **DATE:** **07-15-2021**

Attachment A

Review of BACT Determinations published by Other Agencies

Pollutant Information

Click on the Process Information button to see more information about the process associated with this pollutant.
Or click on the Process List button to return to the list of processes.

RBLC Home | New Search | Search Results | Facility Information | Process List
Process Information | Pollutant Information

Help

FINAL

RBLC ID: AK-0022
Corporate/Company: TESORO ALASKA PETROLEUM COMPANY
Facility Name: TESORO ALASKA PETROLEUM COMPANY
Process: STRIPPER, AIR

Pollutant: Benzene

CAS Number: 71-43-2

Pollutant Group(s): Hazardous Air Pollutants (HAP), Organic Compounds (all), Organic Non-HAP Compounds, Volatile Organic Compounds (VOC),

Substance Registry System: Benzene

Pollution Prevention/Add-on Control Equipment/Both/No Controls Feasible: A

P2/Add-on Description: ACTIVATED CARBON ADSORPTION

Test Method: Unspecified

EPA/OAR Methods | All Other Methods

Percent Efficiency: 99.500
Compliance Verified:
EMISSION LIMITS:
Case-by-Case Basis: BACT-PSD
Other Applicable Requirements:
Other Factors Influence Decision:
Emission Limit 1: 99.5000 % CONTROL OF BTX
Emission Limit 2: 0
Standard Emission Limit: 0
COST DATA:
Cost Verified? No
Dollar Year Used in Cost Estimates:
Cost Effectiveness: 0 $/ton
Incremental Cost Effectiveness: 0 $/ton
Pollutant Notes:

E-Mail for Permit No. AQ0035MSS02:

RE: Request for Copy of BACT Determination for P...

Mon 12/12/2016 4:57 PM

Baumgartner, James R (DEC) <jim.baumgartner@alaska.g

RE: Request for Copy of BACT Determination for Permit 9023-AA010

To Michelle Joe

From: Baumgartner, James R (DEC)
Sent: Monday, December 12, 2016 3:52 PM
To: 'Michelle Joe' <MJOE@airquality.org>
Cc: Walker, Tammy M (DEC) <tammy.walker@alaska.gov>; Baumgartner, James R (DEC) <jim.baumgartner@alaska.gov>
Subject: RE: Request for Copy of BACT Determination for Permit 9023-AA010

Michelle,

My recollection was that the applicant, Tesoro proposed the 99.5% level of destruction/removal efficiency (DRE) for benzene, toluene, and xylene (BTX) by using activated charcoal controls for the Soil vapor extraction (SVE) system. We accepted the applicant's proposal. The SVE consisted of air sparging wells, collection system, packed tower exhaust scrubbers, followed by two or three activated charcoal canisters in parallel before discharge of effluent.

In 2000, we subsequently removed the DRE % removal because the packed tower effluent BTX concentrations would vary over time, creating a greater challenge meeting the DRE when the activated charcoal inlet concentrations were lower than design concentrations. We retained the numerical concentration limits. We revised the BTX BACT decision and authorized Tesoro to use a thermal oxidation system, but retain the activated carbon system for back-up. See pages 31 and 32 of the technical analysis report for a discussion of the BTX BACT and revisions. This report also references that one activated carbon system met the DRE, but he second did not.

Regards,

Jim Baumgartner, Compliance Program Manager
Air Permits Program, DEC
(907) 465-5108
(907) 465-5129 fax

Baumgartner, James R (DEC) No Items

Excerpt from Technical Analysis Report for Permit No. AQ0035MSS02:

AQ0035MSS02 Tesoro Kenai Refinery.pdf - Adobe Acrobat Reader DC

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Xylene (BTX). The air strippers were thus subject to Best Available Technology Review (BACT). The permit included a requirement that the **air strippers** operate at "not less than 99.5 percent removal efficiency". The permit required them to monitor by determining and report the flow rate and concentration of purgeable aromatic hydrocarbons in the **liquid influent and effluent** from the air strippers.[5] The BTX removed from the liquid is transferred to the air, within the air stripper. The permit required the contaminated airstream in the air stripper to be treated by a carbon adsorption system (which the department determined to be BACT). The BACT emission limits established in Permit No. 9023-AA010, for the two air strippers, were 0.24 mg/sec for AS 1310 and 0.94 mg/sec for AS 1320, as listed in Exhibit B.F of the permit. The permit required Tesoro to monitor the concentration of BTX in the exhaust using a gas chromatograph.

In Permit 9323-AA008, as amended through January 11, 1994 in Exhibit C, the department maintained the provisions for the BTX removal efficiency through the carbon absorption units. This included the need to determine (on a weekly basis), and report on the aromatic hydrocarbons in the liquid effluent were carried over into Permit No. 9923-AC010.

Tesoro was not able to meet the required BTX removal efficiency for the air strippers and entered into a Compliance Order by Consent June 1, 1999. The COBC allowed them to maintain a removal efficiency of at least 90 percent **or** 0.048 mg/sec in AS 1310 and 0.188 mg/sec in AS 1320. The department issued Permit No. 9923-AC010 on March 21, 2000, rescinding the 99.5 percent BTX removal efficiency requirement **(but did not remove the measurement and reporting requirements for purgeable aromatics associated with the BTX concentrations in the liquid).** The department retained the BACT mass emissions rates for both air strippers.

The department agrees that the requirements to measure and report the concentration of purgeable aromatic hydrocarbons in the liquid influent and effluent of the air strippers as required in condition 11.5 and 11.7c of the operating permit (and is included in Permit No. 9923-AC10, revision 1) are not required as a removal efficiency is no longer required. As such, the department approves the request to remove these conditions.

The department previously removed the requirement to monitor and report flow rates and concentrations of BTX in liquid influent of the air strippers. The department is now removing the requirement to measure the liquid effluent concentration leaving the air strippers, the request to modify the method called out for determining BTX concentrations in the water as described in condition 11.5 of the operating permit (and originally established in Exhibit D of Permit No. 9023-AA010) is moot. As a side note, the departments contaminated sites section has indicated

[5] The 99.5 percent removal efficiency is for the cleaning the BTX contaminated airstream in the air stripper through the carbon adsoprtion system. In any event, the monitoring and recordkeeping of the liquid BTX concentrations were necessary for subsequent calculation of the concentration of BTX in the contaminated airstream going into the carbon adsorption system. The change in concentration, at a given flow rate, could be used to calculate the realeased mass of BTX into the air in the air stripper. The permit required the calculation and reporting of the efficiency of each carbon adsorption unit. This seems superfluos however, because the permit did not specify an efficiency for the carbon adsorption unit, it just specifies a mass emission rate as BACT.

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

10-20-2000 Rev. 0

Equipment or Process: Air Stripper – Ground Water Treatment

	Criteria Pollutants					
Rating/Size	**VOC**	**NOx**	**SOx**	**CO**	**PM_{10}**	**Inorganic**
All	Carbon Adsorber, Thermal Oxidizer, or Catalytic Oxidizer (10-20-2000)					

* Means those facilities that are minor facilities as defined by Rule 1302 - Definitions

BAY AREA AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guideline

Source Category

Source:	***Air Stripper - Ground Water Treatment***	Revision:	***3***
		Document #:	***2.1.1***
Class:	***All***	Date:	***06/16/95***

etermination

POLLUTANT	BACT 1. Technologically Feasible/ Cost Effective 2. Achieved in Practice	TYPICAL TECHNOLOGY
POC	1. *≤10 ppmv at outlet of control device; or ≥98.5% capture/destruction efficiency*[a,T] 2. *≤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 <2000 ppmv; or ≥90% capture/destruction efficiency if inlet VOC <200 ppmv*[a,T]	1. *Two or More Activated Carbon Canister in Series or Thermal Oxidizer*[a,T] 2. *Two or More Activated Carbon Canisters in Series or Thermal Oxidizer or Catalytic Oxidizer*[a,T]
NOx	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
SO_2	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
CO	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
PM_{10}	1. *n/a* 2. *n/a*	1. *n/a* 2. *n/a*
NPOC	1. *≤10 ppmv at outlet of control device*[a,T] 2. *≤10 ppmv at outlet of control device; or ≥95% capture/recovery efficiency*[a,T]	1. *Two or More Activated Carbon Canisters in Series* [a,T] 2. *Two or More Activated Carbon Canisters in Series* [a,T]

References

a. BAAQMD
T. TBACT

Attachment B

Review of BACT Determinations published by EPA

List of BACT determinations published in EPA's RACT/BACT/LAER Clearinghouse for Contaminated Ground Water Treatment:

RBLC#	Permit Date	Process Code[(A)]	Rating	Pollutant	Standard	Case-By-Case Basis
NV-0047	2/26/2008	22.100	Ground water and soil remediation of TPH, controlled by thermal/catalytic oxidizer, 0.4 mmBTU/hr capacity	VOC	0.18 lb/hr, 0.77 TPY, 99% control efficiency, by incineration	Other Case-by-Case, SIP, Operating Permit
				NOx	0.06 lb/hr, 0.27 TPY, by good operating practice	Other Case-by-Case, SIP, Operating Permit
				CO	0.01 lb/hr, 0.04 TPY, by good operation practice	Other Case-by-Case, SIP, Operating Permit
CA-0664	8/9/1995	22.100	Mobile contaminated water air stripper	VOC	100 ppm, 95% control efficiency, by carbon adsorption, thermal/catalytic oxidation, or IC engine with 3-way catalyst	Other Case-by-Case
				NOx	13.7 lbm/day, 50 ppm @ 15% O_2, by 3-way catalytic converter if IC engine is used as a control for VOC	Other Case-by-Case
				SOx	5.5 lbm/day, by use of clean-burning supplemental fuel (natural gas or LPG)	Other Case-by-Case
				PM10	6.6 lbm/day, by use of clean-burning supplemental fuel (natural gas or LPG)	Other Case-by-Case
				CO	24 lbm/day, by 3-way catalytic converter if IC engine is used as a control for VOC	Other Case-by-Case
CA-0617	2/3/1994	22.100	Air stripper – groundwater treatment, controlled by thermal/catalytic oxidizer, 1.5 mmBTU/hr, 500 SCFM, propane/gasoline fired	VOC	25 ppmvd ROG, 99% control efficiency, by thermal/catalytic oxidizer	Other Case-by-Case
OH-0210	7/13/1993	22.100	Air stripper	VOC	0.011 lb/hr, 0.262 lb/day, 0.048 TPY, by good engineering practice, emission limit	BACT-PSD
AK-0022	2/19/1991	22.100	Air stripper, 12,500 ACFM capacity and 4,450 ACFM capacity	TAC	99.5% control efficiency of BTX (benzene, toluene, xylene), by activated carbon adsorption	BACT-PSD

(A) Process Code 22.100 includes contaminated ground water treatment.

[light blue] = Excluded from review since BACT determination was based on a case-by-case and/or SIP basis.

[yellow] = Selected as the most stringent BACT determination achieved in practice.