DRAFT
BAY AREA
2010 CLEAN AIR PLAN

VOLUME II

Section A

Stationary Source Measures

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BAY AREA AIR QUALITY MANAGEMENT DISTRICT

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SSM 1 - Metal Melting Facilities

Brief Summary:
Limit emissions of organic compounds, fine particulates, toxic compounds and odors from foundry operations and metal melting facilities in the District.

Purpose:
Reduce organic compounds, fine particulates, toxic compounds and odor emissions.

Source Category:
Stationary

Regulatory Context and Background:
Foundries specialize in melting and casting metal into desired shapes. Foundry products are most often used in automobiles, truck parts, pipe and plumbing fixtures, train locomotives, airplanes and as metal pieces in other kinds of equipment. Die casting facilities melt metal and inject it into molds under pressure. In addition, some facilities melt metals from scrap to create specific alloys to be re-melted and cast at different locations, either in or out of the District.

Emissions produced by metal melting directly relate to the metal type, the furnace type and the molding technology used. Nonferrous foundries and steel foundries may produce hazardous emissions because of the lead, mercury, zinc, manganese, nickel, cadmium and other metals present.

Emissions of coarse and fine particulate come from mold making, pouring metal into molds, mold removal and any sand reclamation for re-use. Toxic compounds can also be emitted from fine sand particles from the shakeout (mold removal) step. Also, particulate matter is generated from receiving scrap metal for melting. Die casting uses molds, called tools, of machined steel for producing multiple casts, so little particulate matter is generated from the tool once manufactured. Metal melting and pouring can be the source of vaporized toxic compounds and odors can be generated from the organic binder systems used in mold making and from metal pouring and cooling.

Facilities in the District are currently regulated under Title V, the California ATCM for Non-Ferrous Foundries, and NESHAPS rules for Iron and Steel Foundries (40 CFR 63, subpart ZZZZZ), Aluminum, Copper and other Nonferrous Foundries (subpart EEEEE and ZZZZZZ), Secondary Aluminum Production (subpart RRR) and Electric Arc Furnace Steelmaking Facilities (subpart YYYYY). In addition, District standards governing particulate matter (Regulation 6, Rule 1) apply to these facilities and some are subject to the District's odor regulation (Regulation 7).

Implementation Actions:
The control measure would be implemented through the adoption of a new regulation targeted specifically at metal melting industries. The regulation would contemplate particulate matter control for the molding process, also consider controls on the metal melting, pouring and cooling, scrap receiving and processing and odor controls as appropriate. These would likely consist of baghouses. In addition, organic compounds (including odorous compounds) from these steps could be abated by carbon. Sand reclamation, which reduces waste from the facility, is typically done by burning, which generates fine particulate and odors. This could be abated by afterburner. Further requirements of the regulation could enhance capture of emissions through improved operating methods.

Emission Reductions:
Unknown at this time.

Emission Reduction Methodology:
TBD. Methodologies could include setting emission standards, work practice standards and management plans to reduce fugitive emissions.

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
If afterburners were used to control PM and other compounds from sand reclamation, NOx and CO2 emissions would result.

Cost:
Unknown at this time.

Co-benefits:
None. The measure would directly target PM and VOC emissions.

Monitoring Mechanisms:
Source testing, parametric / CEM.

Issues/Impediments: The technology to implement the control measure is in place at some operations, however, cost may be an impediment for smaller businesses.

Sources:
1. National Emissions Standards for Iron and Steel Foundries (40 CFR, Part 63, Subpart EEEEE)
2. National Emissions Standards for Iron and Steel Foundries, Area Sources (40 CFR, Part 63, Subpart EEEEE)
3. Iron and Steel Foundries
4. Aluminum, Copper and other Nonferrous Foundries (40 CFR, Part 63, Subpart ZZZZZZ)

SSM 2 - Digital Printing

Brief Summary:
This control measure would reduce ROG emissions from digital printing operations by one of two approaches:

- Adopting VOC limits on inks and solvents used, or
- Adopting control technology requirements.

Purpose:
Reduce emissions of VOC from digital printing operations.

Source Category:
Area Source

Regulatory Context and Background:
District Regulation 8, Rule 20: Graphics Arts Printing and Coating Operations limits organic emissions from traditional graphic arts operations during printing, coating, adhesive, and cleaning activities. Traditional printing technologies include lithographic, letterpress, gravure, flexographic, and screen printing. VOC limits are further differentiated by the types of inks and substrates used during the printing process.

The digital printing (DP) is a fairly new, non-traditional printing process that is emerging virtually every segment of the graphic arts industry. In this process a digital image stored on a computer is converted into an image that can be printed on a wide variety of substrates besides paper, such as textiles; three dimensional objects, like ball bearings; and synthetic skin. This differs from traditional graphic arts printing, which uses fixed-image masters or "plates." One primary reason DP is gaining greater acceptance is that DP has a faster turnaround time because it requires considerably less setup time for each job compared to other printing processes. Furthermore, last minute revisions are easily carried out without having to make significant changes, and may have environmental advantages, such as reduced waste. The five basic types of digital printing technology are liquid inkjet printing; thermal wax printing; laser printing, including liquid electrophotographic printing; solid ink printing; and dye sublimation printing. Of all the digital printing operations, inkjet printing appears to be gaining the largest market share in the graphic arts industry on a world-wide basis. Although DP accounted for only about three percent of the total U.S. printing industry output in 1991, it is forecast to have at least a 21 percent market share by 2025.

Emissions from the DP industry are not regulated by the District's rule to control emissions from printing presses, Regulation 8, Rule 20, however the 2008 amendments to Regulation 8, Rule 20 require certain large commercial digital printing operations to keep records of the usage of ink and other VOC-containing materials. Staff has identified two DP technologies that are believed to have significant emissions, District-wide: liquid electrophotographic printing and solvent-based inkjet printing. Staff reviewed records on one large liquid

electrophotographic press and estimated that the VOC emissions were approximately 1 ton/year. Solvent-based inkjet printers can produce images on the widest formats in the printing industry and use inks that contain high VOC contents. Inkjet printing appears to be the most likely to emit significant ROG emissions.

Implementation Actions:
One option is to establish a limit for VOC emissions from DP facilities, such as Maryland's 100 pounds per day limit. Lower VOC inks may be able to be developed, although the necessary properties of inks for some types of DP may preclude low-VOC formulations. Add-on controls or equipment requirements could be developed to prevent emissions, or add-on controls could be required. Finally, emission limits could be established for each printing technology, allowing a combination of low-VOC materials, on-board controls and add-on controls, as necessary.

Emission Reductions:
TBD. It is estimated that 40 – 50 large, liquid electrophotographic presses may exist in the Bay Area. The number of large, commercial inkjet printers is not known.

Emission Reduction Methodology:
TBD

Exposure Reduction:
TBD

Emission Reductions Trade-offs:
Add on control equipment may require the use of electricity or natural gas, increasing GHGs.

Cost:
Unknown at this time. Some DP may reduce emissions through internal controls of ink usage, making ink available for re-use.

Co-benefits:
- Reduction in ROG emissions may reduce emissions of toxic organic compounds.

Monitoring Mechanisms:
Source testing, recordkeeping, parametric monitoring.

Issues/Impediments:
Unlike traditional printing, technical barriers to the development of low-VOC inks may exist due to the nature of how the DP creates images. Inkjet printing relies on ink with a very low viscosity to be sprayed through tiny nozzles. Electrophotographic printing relies on the polarity of ink molecules to be attracted to charged plates.

Sources:

1. EPA Office of Compliance sector Notebook Project: Profile of the Printing & Publishing Industry, 1995 http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/printpt1.pdf
2. EPA Design for the Environment Printing Industry Profile, http://www.p2pays.org/ref/01/00936/execsum.htm
3. Digital Printing: The Reference Handbook, 2004, Uri Levy & Gilles Biscos
4. Today's Digital Imaging: Version 5.0, 2005, Smart Papers
5. Conference call with Sandra Lowe-Leseth, Rule Developer, San Joaquin Valley Air Pollution Control District, 5/2/07
6. Code of Maryland Regulations: 26.11.19.18. 18 Control of Volatile Organic Compound Emissions from Screen Printing and Digital Imaging http://www.dsd.state.md.us/comar/26/26.11.19.18.htm

SSM 3 - Livestock Waste

Brief Summary:
This control measure would reduce organic emissions from livestock waste by requiring best management practices already being implemented in San Joaquin Valley Unified Air Pollution Control District, Sacramento Metropolitan and South Coast Air Quality Management Districts to be applied at Bay Area dairies.

Purpose:
Reduce emissions of organic compounds from livestock waste.

Source Category:
Area source.

Regulatory Context and Background:
California law and District regulations have historically exempted agricultural sources of air pollution from obtaining air quality permits, or complying with most air quality regulation. This exemption was revoked in 2003 with the passing of Senate Bill 700 that requires air districts to adopt regulations for large confined animal facilities and amends air pollution control requirements of the California Health and Safety Code (CH&SC) related to agricultural sources of air pollution, effective January 1, 2004.

Pursuant to Senate Bill 700, the District adopted Regulation 2, Rule 10: Large Confined Animal Facilities in 2006. The regulation requires that large confined animal facilities (at least 1000 milk-producing cows for dairies) obtain a permit to operate and implement control measures to reduce emissions of POC (Precursor Organic Compound), NOx, and PM_{10} from the facility. The rule allows the APCO to establish a reasonable compliance schedule for facilities to implement these control measures within one year of the date on which the permit is issued.

Currently, the District does not provide a list of control measures that are applicable under this regulation. Based on the District's review of USDA census data, no facility in the Bay Area currently meets the applicability requirements of Regulation 2, Rule 10. According to the California Food and Agriculture Report for 2005, there are approximately 100 dairies in the Bay Area with an average herd size of 350 milking cows. Milking cows must give birth to calves in order to produce milk. On average, a milking cow produces 17,000 pounds of milk a year. Due to the high number of calve births required for cows to continue to lactate, dairy operations must also handle calves, heifers, and other support stock. Support stock typically composes about 50 percent of the total cattle on a dairy, although many larger dairies are sending calves and heifers to special farms in order to focus solely on milk producing cows.

In addition to dairies, the Bay Area also supports a small stock of chicken, turkey, goat, and swine farms. Research is ongoing to determine the number of facilities in operation and the average amount of animals being supported at these facilities. Most of these facilities as well as the dairies are located in Sonoma or Marin Counties.

Implementation Actions:
Emission mitigation measures are based on San Joaquin Valley Unified Air Pollution Control District Rule 4570 and South Coast Air Quality Management District Rule 223. Because most Bay Area dairies are smaller operations than those in San Joaquin and South Coast, the District is focusing on implementation of best management practices rather than requiring controls at this time. Preliminary research by Schmidt (2005) has shown that organic compounds emitted from the feed may constitute over 50% of the total organic emissions from animal facilities. Simple techniques such as keeping silage covered and reducing wet feed can potentially reduce organic emissions. Additionally, feeding the animals food that will result in more complete digestion can reduce organic emissions directly from the animal and the waste. The District will review the best management practices implemented in San Joaquin and South Coast and determine if any may be applied to Bay Area dairies. The practices include:

- Prepare feed according to National Research Council guidelines specified in the most recent version of the "Nutrient Requirements of Dairy Cattle"
- Store grain in a weatherproof storage structure from October through May
- Remove feed from the area where animals eat at least once every 14 days
- Cover the horizontal surface of silage piles, except for the area where feed is being removed from the silage pile.
- Flush or hose milking parlor immediately prior to, immediately after, or during each milking
- Flush freestalls more frequently than the milking schedule
- Use non-manure-based bedding for at least 90% of the bedding material, by weight, for freestalls (e.g., rubber mats, almond hulls, sand, or waterbeds)
- Inspect water pipes and troughs and repair leaks at least once every 14 days
- Clean concrete areas such that the depth of animal waste does not exceed twelve inches at any point or time, except in-corral mounding
- Manage corrals such that the animal waste depth in the corral does not exceed twelve inches at any point or time, except for in-corral mounding
- Knock down fence line animal waste build-up prior to it exceeding a height of twelve inches at any time.
- Scrape or flush feed aprons in corrals at least once every seven days
- Maintain corrals to ensure drainage and to prevent water from standing more than 48 hours
- Cover dry animal waste piles outside of the corrals with a waterproof covering from October through May, except for times, not to exceed 24 hours, when wind removes the covering
- Cover dry separated solids outside the corrals with a waterproof covering from

October through May, except for times, not to exceed 24 hours, when wind removes the covering.

- Remove solids from the waste system with a solid separator system, prior to the waste entering the lagoon
- Manage the liquid animal waste so it stands in the fields no more than 24 hours, if it is applied on land as fertilizer
- Do not apply any solid animal waste that has a moisture content of more than 50% as fertilizer on fields.

Emission Reductions:

Pollutants (tons per day)	2012	2020
ROG	0.30	0.30
$C0_2$-e	65.00	65.00

The emission reductions potential for this measure equals 3.4 tons per day TOG, or 0.3 tons per day ROG and 3.1 tpd of methane. Based on its global warming potential (GWP) factor of 21, the 3.1 tpd of methane emissions are equivalent to 65 tpd of CO2-e.

Emission Reduction Methodology:
The emission reduction estimates considers that a dairy would adopt all of the best management practices listed above. Additional reductions are possible from large facilities that may opt to install advanced control technologies including anaerobic digesters, aerobic lagoons, aerated static piles, and/or biofilters. Because most of these technologies are new and just beginning to reach commercial use, the emission reduction potentials are unknown. Because of the capital costs associated with construction of these technologies, they may be better suited for larger confined animal facilities similar to those typically found in San Joaquin or South Coast.

The 2005 emission inventory estimates emissions from dairy cattle are 13.75 tons per day of TOG and 1.1 tons per day of ROG. Adoption of best management practices is estimated to reduce TOG emissions by 25% or 3.4 tons per day. The majority of dairies in the Bay Area are considered small operations that house an average of 350 milking cows. It is possible that some of the Bay Area dairies are already implementing some of these practices, in which case, the emissions, and potential emission reductions, may not be as significant.

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
None.

Cost:
The control costs are based on San Joaquin staff report and knowledge of current operations performed at the affected sources. San Joaquin's Rule 4570 applies only to

Large Confined Animal Facilities and due to their small size, no Bay Area dairy meets this definition. As such, the District only estimated costs for facilities to adopt the best management practices. The annual cost is estimated at approximately $15 per cow. The District has approximately 80,000 dairy cows, so total costs are estimated to be $1.2 million per year. For an average dairy in the Bay Area that houses 350 dairy cows, the cost is estimated at $5,250 per year.

Co-benefits:
The adoption of best management practices may also reduce emissions of ammonia, a secondary precursor to the formation of particulate matter and methane, a greenhouse gas.

Monitoring Mechanisms:
District Compliance and Enforcement Staff will monitor adoption of the best management practices through facility inspections. The success of this control measure in terms of emissions reductions would be difficult to monitor, as the majority of facilities would remain exempt from permitting due to their small size. Furthermore, the ongoing variability in the determination of emission factors for livestock may complicate efforts to quantify the reduction of emissions from adoption of these management practices.

Issues/Impediments:
There may be some opposition from this industry to being regulated when only recently they were exempt from complying with air quality regulations. The best management practices, however, are supported by industry representatives and were developed through a collaborative effort with effected parties in the San Joaquin and South Coast districts.

Sources:
1. Bay Area Proposed Regulation 2, Rule 10: Large Confined Animal Facilities, Staff Report, dated 7/5/2006
2. Mitoehner, F. et al, Volatile Fatty Acids, Amine, Phenol, and Alcohol Emissions from Dairy Cows and Fresh Waste. Final Report, dated 5/31/2006.
3. Sacramento Metropolitan Air Quality Management District, Rule 496 Large Confined Animal Facilities, Staff Report, dated 6/19/2006.
4. San Joaquin Rule 4570: Confined Animal Facilities, Final Draft Staff Report, dated 6/15/2006
5. Schmidt, C.E., and Card, T.R., Dairy Air Emissions, Summary of Dairy Emission Estimation Procedures, dated May 2006.
6. South Coast Rule 1127: Emission Reductions from Livestock Waste, Final Staff Report, dated 8/6/2004

SSM 4 - Natural Gas Production and Processing

Brief Summary:
Equipment at natural gas wells in the District is prone to leaks and excess emissions. Emissions are mostly methane, which is a potent greenhouse gas (GHG), with smaller amounts of volatile organic compounds (VOCs) and some toxic compounds. Exemptions for these gas wells in Rule 8-37 would be reconsidered and excess emissions controlled.

Purpose:
Control fugitive emissions, including methane, from natural gas production wells and associated equipment.

Source Category:
Stationary source.

Regulatory Context and Background:
The District has many natural gas wells in eastern Contra Costa County and southern Solano County. These wells extract natural gas from pockets that are found at greater than 1000 ft below grade. This gas is stripped of moisture and then pressurized to main-line pressure for use by utilities. This gas has been found to contain greater than 90 percent methane. Liquids stripped from the gas often contain toxic airborne contaminants (TAC). These gas wells typically have the following equipment on site:

- Gas well
- Liquid knockout
- Compressor (natural gas fired)
- Dehydrator with associated tanks
- Pneumatic liquid transfer pump
- Oil/water separator
- Fixed roof tank(s) for water and condensate

Gas well: A gas well may have a natural pressure of up to 7200 pounds per square inch (psi) though most wellheads are typically 40 to 150 psi. The gas wells in the District have methane content at about 92 percent with a large nitrogen component in the remaining eight percent of the gas. This gas is “wet” (meaning it contains water vapor), and contains other hydrocarbons, including toxic compounds.

Liquid knockout: The liquid knockout or separator is simple tank that utilizes a series of baffles. The collected liquids are routed to the “produced water” tank via an automatic liquid level controller. These controllers are powered by pressurized natural gas and are of two types. Type one is the normally open variety that continually vents natural gas to atmosphere. Type two is a unit that is normally closed to atmosphere except when liquids are being routed to the produced water tank.

Compressor (natural gas-fired): The engine for the compressor is usually a four-cylinder, natural gas-fired compressor that is exempt from District permits and emission requirements due to being less than 50 brake horse power (Rule 2-1-114.2.1 and Rule 9-8-110.2). However these units are often 1960s units that are in very poor condition. These units should be source tested initially as they may not meet the requirements of Rule 8-2-301 for 300 ppm and 15 lbs/day.[1] The compressor is usually coupled to a two stage horizontally opposed positive displacement compressor with liquid knockout with automatic liquid level controllers that dump to the produced water tankage. Utility line pressure is generally about 500 to 600 psi. These compressors continuously emit natural gas from leaks.

Dehydration units with associated tanks: The dehydration unit is used to remove residual moisture from the gas stream prior to release of the gas to the utility. The gas stream is routed through a contact tower containing a glycol solution. The glycol solution absorbs both water and non-methane hydrocarbons, leaving the natural gas. This "dried" gas is then sent on to the utility. The glycol is regenerated via heating, which drives off the hydrocarbon and water from the glycol and this resulting vapor is then condensed via overhead piping and collected in the "cooling tank".

In the past these dehydration units just vented the vapors to atmosphere; but since 1998, more of these units have captured the vapors, referred to as closed loop systems. This additional condensing and liquid collection equipment has been added to the existing equipment in the field on an 'as needed' basis. There can be many problems with the closed loop systems, primary of which is that the cooling of the vapors is insufficient to collect them effectively. Most systems use a long, gently sloped overhead metal line (two-inch galvanized pipe approximately 50 feet long); often, these systems are not adequate to sufficiently cool the vapors. Dehydration units also generally have flash drums between the absorber tower and the regeneration units that flash methane and other light components from the glycol before generation.

Pneumatic liquid transfer pumps: These pumps are powered with natural gas that vent to the atmosphere with every stroke of the pump.

Pneumatic controls: These controls are powered with natural gas that vents to the atmosphere for safety reasons and because there is generally no electricity at remote locations.

Oil/water separator: Only a few of the facilities separate the hydrocarbons from water via equipment called a "Gun Barrel." This equipment is basically a vertical tower that allows for phase separation. Without the Gun Barrel, sites will co-mingle water and hydrocarbons in

[1] Rule 8-2 applies to miscellaneous sources of VOC emissions that are not addressed by any other rule. It limits VOC emissions from such sources to both 300 ppm and 15 lbs/day.

the single tank that is called the "produced water tank." Phase separation also occurs in the tank.

Fixed roof tank(s) for water and for condensate "produced water": As discussed above the produced water tankage allows for phase separation of hydrocarbons and water. Sampling has shown total vapor pressure of 3.2 to 3.5 psi in these tanks with 1.0 percent benzene, 5.9 percent toluene, and 6.5 percent xylene in the hydrocarbon phase. Vapor headspace sampling of these same tanks found total hydrocarbon concentrations of up to 55,000 ppm; control of these vapors would reduce emissions when tanks are serviced.

These tanks are emptied via vacuum truck from a fitting on the bottom of the tank. Vacuum truck operators commonly remove the lid from these tanks while emptying the tank due to concerns of collapsing the tank. A common problem is that these lids remain open after the unloading of the liquids.

Implementation Actions:
Staff would consider a range of possible controls including the following:

- Pumps / Compressors:
  - Identify "high bleed" pneumatic pumps (bleed natural gas at a rate of 6 scf/h) and replace with "low" (less than 1 scf/h) or no bleed pumps.
  - Address combustion emissions from compressors with requirements similar to those in Rule 9-8: IC Engines.
- Tanks:
  - Amend Rule 8-37 to address the tanks that are associated with the dehydration unit (condensation tank) that is very specialized and should be considered part of the dehydration process unit.
  - Amend Rule 8-5 to address the set pressure PV valves on fixed roof tanks that are the standard in the industry. Many of these facilities use polyethylene tanks where the set pressure of the tank's PV valve is zero, allowing venting of emissions.
  - Require that lids and hatches on tanks remain sealed at all times (including during liquid transfers), except when performing maintenance (reflect language in Rule 8-8: Wastewater Collection and Separation Systems).
- Valves:
  - Include monitoring requirement for leak checking of the pressure vacuum valves installed on the tanks and also on the piping and equipment associated with the dehydration unit.
  - Address adequate flow requirements for pressure vacuum valves when connected to vacuum trucks.
- Pipes / Connectors
  - Address fugitive emissions from vapor return lines when the reboiler burner is off.
  - Address liquids issues on the vapor return line from the cooling tank. During the summer, it is common to see uncondensed vapor at the end of the cooling segments of the vapor return line from the condensation tank. These may be controlled by requiring the condensate to be refrigerated.

- Reconsider the exemption in Rule 8-37 that allows gas wells to petition for an exemption from the standards of Rule 8-37 if the gas is more than 90 percent methane. Gas typically is predominately methane, a potent GHG.
- Require that dehydration units operate as a closed loop systems, as required in Yolo-Solano Air Quality Management District, to prevent the stripped hydrocarbons from being emitted to the atmosphere.
- Identify "high bleed" pneumatic controls and replace with "low bleed" (less than 1 scf/h) controls.

Emission Reductions:

Pollutants (tons per day)	2012	2020
ROG	0	0.30
$C0_2$-e	0	120.00

Emission Reduction Methodology:
Emission reductions are based on an overall leakage rate of 1.4 percent and the relative amounts of the components of natural gas, methane, ethane, propane and butane. Total emissions are estimated to be 11.1 tpd of total organic gases (TOG), including 0.44 tpd of ROG. Emissions reductions are estimated to be between 6 - 9 tpd TOG. This includes 0.3 tpd of ROG and 5.7 tpd of methane. Based on its global warming potential (GWP) factor of 21, the 5.7 tpd of methane emissions are equivalent to 120 tpd of CO2-e.

Exposure Reduction:
TBD

Emission Reductions Trade-offs:
Potential increases in CO2 due to combustion control equipment (which would be greatly offset with the reductions in methane emissions).

Costs:
TBD

Co-benefits:
Reductions in GHG, ROG and toxics.

Monitoring Mechanisms:
Source testing, LDAR, and parametric monitors.

Issues/Impediments:
The majority of emissions reductions would be from methane, which has historically been exempt from VOC rules.

Sources:

1. http://72.14.253.104/search?q=cache:w5Ctbf5xgrsJ:www.its.ucdavis.edu/publications/2003/UCD-ITS-RR-03-17E.pdf+emission+factors+%2B+oil+production&hl=en&ct=clnk&cd=16&gl=us or
2. http://www.its.ucdavis.edu/publications/2003/UCD-ITS-RR-03-17E.pdf.
3. http://www.engineeringtoolbox.com/gas-density-d_158.html
4. http://www.epa.gov/gasstar/documents/ll_pneumatics.pdf

SSM 5 - Vacuum Trucks

Brief Summary:
This control measure would reduce organic emissions from vacuum trucks by requiring emission controls on vacuum trucks utilized in liquid clean-up and transfer operations in refineries and at other locations.

Purpose:
Reduce emissions of organic compounds venting from mobile vacuum trucks used to clean up and transfer organic containing liquids.

Source Category:
Area source.

Regulatory Context and Background:
This measure was analyzed in the 1994 Clean Air Plan as Control Measure B6: Control of Emissions from Cleaning Up Organic Liquids. The analysis concluded that the measure would not be cost effective. However, in addition to cleaning up spills, vacuum trucks have been observed in frequent use as part of refinery operations, such as removing water from tank surfaces, cleaning of oil-water separators, and transport of sludge, slop oils and tank bottoms. Further investigation of this source category was recommended as part of the Bay Area 2005 Ozone Strategy, identified as Further Study Measure FS 11, Vacuum Trucks.

At one refinery, it was estimated that over 1,000,000 gallons of hydrocarbon containing liquids were put in vacuum trucks per month, which is the equivalent of approximately 145,000 gallons of hydrocarbons per month. On a volume basis, at least 1.5 gallons of air is emitted for every gallon of vacuum tank capacity. In some cases, emissions from the tanks are controlled by the use of a carbon canister that adsorbs organic vapors as they are emitted from the truck tank, primarily to control odors. Further analysis can more precisely determine the emissions from these activities, emission reductions and costs.

Implementation Actions:
Vacuum trucks are routinely used to transfer organic liquids throughout the District. They operate both from facility to facility and also in dedicated service within the bounds of a facility such as a refinery. Although the trucks are mobile sources, the exclusion from District regulation in Regulation 1 applies only to the engines powering the trucks. Some of these trucks control emissions by carbon adsorption, but this is not universal and usually only employed to control odors.

Additional analysis will be undertaken to more accurately determine the number of vacuum trucks in use and the level of control already employed in practice. Compliance and Enforcement personnel assigned to refineries may be able to facilitate this inventory effort, but the larger equipment providers would need to be queried to determine the extent of

vacuum truck use outside of refinery operations. Source testing could determine the efficiency of carbon adsorbers if in use, and overall emission rates.

Potential control requirements could include a requirement to use carbon adsorption when organic liquids are being collected, a sizing requirement for the carbon based on truck capacity, and a requirement to change out the carbon canister at appropriate intervals before the carbon becomes saturated. Other options could include the use of a balance system to route vacuum tank air back into the evacuated vessel.

Emission Reductions:

Pollutants (tons per day)	2012	2020
ROG	6.00	6.00

Emission Reduction Methodology:
The emission reduction estimates are based on discussions with a supplier of vacuum trucks and other tank degassing equipment. There are roughly 200 hours of vacuum truck operation per day based on rough estimates of the number of operating vacuum trucks in the Bay Area (125 trucks at 80% utilization). Assuming that each truck is likely to pull a vacuum for two hours per day, uncontrolled emissions could be as high as 15 tons per day. Assuming that current control is only 50% due to intermittent use and ineffective monitoring and change out of spent carbon canisters, emissions would still be 7.5 tons per day. Implementation of control requirements coupled with improved monitoring and change-out of the canisters could be expected to achieve 90% control of emissions resulting in emissions reductions of 6 tons per day. Additional research will refine this estimate, including a breakdown of the emission constituents. Vacuum trucks clean up a variety of compounds from a variety of sources, including non-organic materials. The mixtures and presence of water may greatly impact the volatility of the material in the tanks.

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
If activated carbon is used for control, this media will need to be stripped of organics or reactivated. Reactivation of carbon is an energy intensive process that may result in emissions of organics as well as NOx and CO from combustion if done on site. Alternatively, carbon disposal or reactivation off site would result in combustion emissions from hauling to a waste or regeneration facility.

Cost:
Activated carbon is readily available at costs between $1,100 and $2,000 per ton. Regeneration of spent carbon may be more costly than purchasing new carbon. The loading capacity for the carbon remains to be determined but is likely to be no more than 50% (by weight) and may be as low as 20% (by weight). Using the high estimate for virgin activated carbon with the low loading rate would result in a cost of $10,000 per ton of TOG reduced

($60,000 per day or $21.9 M per year). This does not take into account the costs of regeneration or disposal of spent carbon, but it does use the highest price for new carbon. Using the lower cost estimate and highest loading rate, costs would equal $2200 per ton TOG reduced ($13,200 per day or $4.8 M per year).

Co-benefits:
Reduction in exposure to toxic air contaminants, depending on what liquid is being collected.

Monitoring Mechanisms:
District Compliance and Enforcement staff will monitor adoption of emissions control through facility inspections. Vacuum trucks could be permitted as portable equipment, although they are not equipment subject to the statewide Portable Equipment Registration Program. Vacuum trucks could also be registered with the District to facilitate monitoring and enforcement.

Issues/Impediments:
Further research will be performed to improve the estimates of costs of control, the number of vacuum trucks in operation, as well as the extent that emissions control is already employed. There may also be other means of control that may prove more effective or less costly than carbon adsorption. If control were by means of combustion, the potential for increases in greenhouse gas emissions would need to be evaluated.

Sources:
1. 1994 Clean Air Plan Control Measure B6: Control of Emissions from Cleaning Up Organic Liquids
2. Bay Area 2005 Ozone Strategy, Further Study Measure FS 11, Vacuum Trucks
3. Steve Sellinger, Senior Engineer, Envent Corporation, personal communication 12 May 2005
4. BAAQMD Regulation 8, Rules 2, 5 and 9.
5. Maintenance/Startup/Shutdown (MSS) Permitting Issues, prepared by Sage Environmental Consulting, LP for The Texas Oil and Gas Association Refinery Environmental Committee, 11 June 2007

SSM 6 - General Particulate Matter Emission Limitation

Brief Summary:
Reduce the District's allowable weight rate limitations for particulate matter.

Purpose:
Reduce particulate matter emissions.

Source Category:
Stationary source.

Regulatory Context and Background:
The District has had a particulate matter emission limitation in Regulation 6, Rule 1 since 1960. Reg. 6-1 contains visible emissions standards, concentration rates in terms of weight per volume of exhaust gas, and an allowable emissions rate expressed in terms of weight per weight of material processed, as well as other limits for specialized operations. Other districts have lower limitations. For example, San Joaquin's Rule 4202 allows less than 15 lbs per hour of particulate matter emission for a process weight rate of 20,000 lbs/hr; the South Coast's Rule 405 allows less than 12 lbs/hr. BAAQMD Rule 6-1 allows 19 lbs/hr for a process weight rate of 20,000 lbs/hr. Particulate matter includes both coarse PM, PM10 or particles with an aerodynamic radius of 10 microns or less, and PM2.5, particles with an aerodynamic radius of 2.5 microns or less.

Implementation Actions:
Amend Regulation 6, Rule 1 to reduce the particulate matter allowable emissions rate.

Emission Reductions:

Pollutants (tons per day)	2012	2020
PM10	0	2.58
PM 2.5	0	0.29

Emission Reduction Methodology:
The 2005 Base Year Emissions Inventory was used to select the potential emissions that might be subject to the particulate emissions rate. Nine categories resulted in 7.79 tpd emissions of total PM. The four largest categories are Concrete Batching, Basic Refining Processes, Stone, Sand, and Gravel (Quarrying) and Other Commercial Industrial Processes. Other categories, such as Cooking and Landfills (fugitive emissions) have not been included although they have significant emissions. If facilities were operating at the current allowable emissions rate and could reduce emissions to the South Coast rate, emissions reductions would be 2.87 tpd. However, it is not known if all facilities are currently operating at close to the allowable rate. It is likely that many facilities, through the installation of more efficient control equipment reflected in their permit conditions, operate at far lower rates.

Reduction in the allowable weight rate of particulate matter would not be expected to reduce total PM, PM10 and PM2.5 equally, because the smaller particles (those that have the greatest health impact) are the lightest. This could be considered during rule development efforts.

Exposure Reduction:
TBD

Emission Reduction Trade-off:
None expected, although a need to increase control equipment could result in greater electricity use, generating more CO2 emissions.

Cost:
TBD

Co-benefits:
Reduced particulate matter is associated with improved visibility.

Issues/Impediments:
Further research is needed to determine if existing sources are operating at or already below the allowable emissions rate.

Sources:
1. BAAQMD Regulation 6, Rule 1: General Particulate Matter
2. South Coast Rule 405: Solid Particulate Matter - Weight
3. San Joaquin Valley Unified APCD Rule 4202: Particulate Matter Emission Rate

SSM 7 - Open Burning

Brief Summary:
Consider further limitations on open burning in Regulation 5: Open Burning.

Purpose:
Reduce particulate matter, NOx and VOC emissions from open burning.

Source Category:
Area source.

Regulatory Context and Background:
The District's Regulation 5 prohibits open burning with some exceptions. These exceptions, to allow certain burning on permissive burn days, include burning for hazardous waste reduction; removal of flood debris; marsh, forest and range management; burning of contraband; fire training; and burning of agricultural debris. Burning of agricultural debris is typically limited to a certain time period depending on what is being burned; e.g., crop stubble, orchard prunings, or crops to be replaced. A permissive burn day is called when air pollution from open burning is not expected to adversely impact ambient air quality or downwind populations according to meteorological criteria established by ARB for the Bay Area. However, Regulation 5 does not limit the quantity of material burned for agricultural operations. As indicated by the level of reported complaints, in some cases, burning of large piles of vineyard prunings have significantly impacted populations on marginally permissive burn days.

In addition, in 2008, the District adopted Regulation 6, Rule 3: Wood-burning Devices, which forbids uses of fireplaces and wood stoves on predicted PM excess nights. On at least one occasion in the winter of 2008, agricultural crops were burned on a permissive burn day prior to a non-burn night. Further limits on open burning would reduce PM emissions, including during periods conducive to high PM levels.

Finally, the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) is required, pursuant to CH&SC 41855.5, to develop alternatives to burning agricultural waste. The San Joaquin District has committed to work with the agricultural industry to investigate the feasibility of reducing burning, and the consequent emissions, by up to 50%. No specific feasible alternatives to burning are identified in SJVUAPCD's 2006 PM10 plan.

Implementation Actions:
Amend Regulation 5 to restrict the amount burned on permissive burn days or under certain meteorological criteria.

Emission Reductions:
The SJVUAPCD 2006 PM10 plan addresses alternatives to burning. Based on their estimates, if alternatives to burning agricultural crop waste were available for the Bay Area, emissions could be reduced by up to 0.04 tons VOC per day, 0.01 tons NOx per day, and 0.09 tons PM2.5 per day. However, as discussed above, the control measure could reduce exposure to PM without reducing total emissions if additional meteorological conditions for burning were considered for Regulation 5.

Emission Reduction Methodology:
The emission reductions are based on San Joaquin Valley estimates and the Bay Area source inventory. Estimates for the Bay Area are based on two source categories, Managed Burning and Disposal – Agricultural Burning – Prunings and Field Crops. Emission reductions are estimated from the percentage reduction estimated in the San Joaquin Valley's PM10 Plans for PM and NOx, and a reduction of 35% reduction for VOC was estimated, consistent with the NOx PM reduction.

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
Increased composting of agricultural waste could increase emissions from composting operations, a subject of another control measure. However, a reduction of particulate matter in the atmosphere could reduce the number of days that wood burning is prohibited under Reg. 6-3: Wood Burning Devices.

Cost:
TBD

Co-benefits:
Direct reduction in PM, NOx and VOC from open burning.

Issues/Impediments:
Requiring only a part of agricultural waste to be burned may not reduce the total emissions from this source category because the remainder could be allowed to be burned on another day. However, it could result in a reduction in exposure to nearby residents.

Sources:
1. San Joaquin Valley Unified APCD 2003 PM10 Plan
2. San Joaquin Valley Unified APCD 2006 PM10 Plan
3. District emissions inventory, agricultural burning

SSM 8 - Sulfur Dioxide from Petroleum Coke Calcining

Brief Summary:
Limit emissions of sulfur dioxide from coke calcining by requiring a minimum of 80 percent sulfur capture.

Purpose:
Reduce sulfur dioxide and particulate matter emissions.

Source Category:
Stationary source.

Regulatory Context and Background:
Sulfur dioxide emissions are a precursor to fine particulate. Since the District is not in compliance with the federal ambient air quality standard for PM2.5, reductions are needed in PM2.5 and/or PM2.5 precursors. Combined, the two coke calcining kilns at District Plant 22 (ConocoPhillips Carbon Plant) emit 1232 tons per year of sulfur dioxide. The facility has committed to reducing SO2 emissions by 42 tpy to provide offsets for their Clean Fuels Expansion Project. The plant currently operates an abatement device to periodically trim emissions of sulfur dioxide to maintain compliance with the current sulfur dioxide emission limit in Regulation 9, Rule 1 of 400 ppm by volume or 113 kg (250 pounds) per hour, whichever is more restrictive. However, the South Coast AQMD requires a minimum of 80 percent sulfur capture, which is more restrictive than the current District rule requires. Hence, this control measure is intended to replicate the control measure that is in place in the South Coast.

Abatement technology includes dry scrubbing (injecting dry sodium bicarbonate or lime) into the flue gas stream, semi-dry scrubbing (injection a slurry of aqueous sodium bicarbonate or lime) into the flue gas stream, or wet scrubbing (using a sodium bicarbonate or lime slurry to absorb the SO2) from in the flue gas.

Implementation Actions:
Limit emissions of sulfur dioxide from coke calcining operations by requiring at least 80 percent sulfur reduction. This most likely requires a semi-dry flue gas desulfurization technology that has 80 – 90% SO2 removal efficiency.

Emission Reductions:

Pollutants (tons per day)	2012	2020
SO2	0	2.6

Emission Reduction Methodology:
TBD

Exposure Reduction:
TBD

Emission Reductions Trade-offs:
Use of add-on abatement equipment would be expected to increase power demand, indirectly leading to an increase in GHG emissions, mostly CO2, from power generation.

Cost:
Estimated costs for semi-dry flue gas desulfurization is $9 million capital, with an additional $4 million annual operating costs. Total amortized capital and operating costs are $5.7 million per year. Control efficiency is estimated to be at least 80%, reducing emissions by 950 tons per year. Cost effectiveness is estimated at $6000 per ton of SO2 reduced.

Co-benefits:
Reduction of secondary PM formation.

Monitoring Mechanisms:
Source testing, parametric / CEM.

Issues/Impediments:
No impediments have been identified, because the technology is in place at other similar operations.

Sources:
1. South Coast AQMD Rule 1119: Petroleum Coke Calcining Operations – Oxides of Sulfur.

SSM 9 - Cement Kilns

Brief Summary:
This control measure would reduce NOx and SOx emissions from cement kilns as well as reduce toxic air contaminants. There is one cement manufacturing facility in the Bay Area, Lehigh Southwest Cement (plant #17).

Purpose:
Reduce NOx and SOx emissions, mercury and other toxic air contaminants.

Source Category:
Combustion.

Regulatory Context and Background:
This facility is permitted to produce 1.6 million tons of clinker per year. In 2007, the facility switched from burning coal as its primary fuel to burning green petroleum coke. At the permitted clinker rate, the facility is projected to burn 171,000 tons per year of coke. The District approved the fuel switch based on EPA emission factors that indicated NOx was no greater, and all other criteria pollutants were reduced. However, EPA has recently obtained data from other areas indicating emissions are very dependent on the type of coal being used, and the characteristics of green petroleum coke. EPA has proposed additional source testing to validate that there is not an emissions increase associated with the switch. Hence, there will be source testing in the near future while burning coal and while burning coke.

2008 emissions were 1788 tpy (6.8 tpd for days in operation) of NOx and 181 tpy (0.69 tpd for days in operation) of SO2. This indicates an increase in NOx but a decrease in SO2 from coal burning. Further testing will provide better emissions data.

EPA has proposed to amend their National Emission Standard for Hazardous Air Pollutants for Cement Kilns (40CFR63 subpart LLL) to reduce emissions of mercury, particulate matter, total hydrocarbons and hydrochloric acid. A draft rule was issued and comments have been received through July, 2009. The rule sets standards for these pollutants and requires monitoring equipment and protocols.

Implementation Actions:
Require the use of abatement technology at Lehigh to reduce emissions of NOx, and consider a wet scrubber to reduce emissions of SO2 if any synergies in installing SO2 controls along with NOx controls (or other controls) can be identified.

Emission Reductions:
90% reduction of NOx of 1600 tpy, or 4.38 tpd (6.1 tpd for days in operation).

Pollutants (tons per day)	2012	2020
NOx	0	4.38

In addition to NOX reductions, SSM 9 also has the potential to provide SO2 reductions of 160 tons per year, or 0.44 tpd (0.6 tpd for days in operation). However, because of potential high costs for SO2 controls (see Cost section below), the issue of whether SO2 reductions should be required as part of this measure will be determined during the rule development process. Therefore, SO2 reductions have not been included in evaluating the cost-effectiveness of this measure.

Emission Reductions Methodology:
NOx emissions reductions have been estimated from a 90% emissions factor, consistent with estimates for modern control equipment.

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
Depending on the technology selected, NOx reductions may increase GHG emissions, specifically CO2, by reducing efficiency of the process. The installation of either selective catalytic reduction or scrubbers for SO2 control would require additional power to pull gas through the equipment, indirectly causing more CO2 emissions from power generation.

In some modeling scenarios, reduction of NOx from a significant NOx emitting source with high emission rates has been shown to impact the ozone scavenging effect of NO, resulting in higher ozone concentrations in areas within the source's emission plume.

Cost:
To reduce NOx, the estimated cost to retrofit selective catalytic reduction into the flue gas train of the kiln is from $11.0 million capital expenditure, plus another $1.7 million annual operating costs (total annual costs, including amortization, $2.8 M). Control efficiency is estimated to be 90%, reducing emissions by 1,600 tons per year. Cost effectiveness when including amortized capital is $1750 per ton of NOx reduced. Selective Non-Catalytic Reduction (SNCR) technology may also be effective in this application. SNCR costs are approximately half of SCR costs, but only achieve 40 – 50% NOx reduction. Other technologies may be applicable. To operate NOx reduction equipment, particulate may have to be removed from the flue gas first.

As noted in the emission reduction discussion above, this measure may offer potential SO2 reductions, in addition to NOx. However, since it is not yet known whether SO2 reductions will be required, cost-effectiveness calculations for purposes of the CAP are based on NOx reductions only.

To reduce SO2, estimated costs to retrofit an SO2 scrubber into the flue gas train of the kiln is $140 million capital expenditure, plus another $2.7 million annual operating costs.

Control efficiency is estimated to be 90%, reducing emissions by 160 tons per year. Cost effectiveness when including amortized capital would be on the order of $150,000 per ton of SO2 reduced.

Should the final EPA NESHAP for cement kilns require additional control equipment at this facility, some of the control equipment proposed in this measure may be able to be implemented more cost effectively.

Co-benefits:
Reduced secondary PM formation from NOx and SOx emissions.

Monitoring Mechanisms:
Source testing, CEMs and parametric monitoring.

Issues/Impediments:
The cost of SO2 control appears be a significant impediment unless synergies with NOx control or the NESHAP standards can be identified.

Sources:
1. Emissions from District databank files.
2. Alternative Control Techniques Document Update - NOx Emissions from New Cement Kilns, U.S. Environmental Protection Agency, EPA-453/R-07-006, November 2007
3. Best Available Retrofit Control Technology Assessment TXI Riverside Cement, South Coast Air Quality Management District, August 8, 2008
4. NOx Controls Cost Model, Section 4.2, Chapter 1, U.S. Environmental Protection Agency, EPA/452/B-02-001, January 2002
5. NOx Controls Cost Model, Section 4.2, Chapter 2, U.S. Environmental Protection Agency, EPA/452/B-02-001, January 2002

SSM 10 - Refinery Boilers and Heaters

Brief Summary:
Consider options to further reduce NOx emissions from petroleum refinery boilers and heaters.

Purpose:
Reduce NOx emissions.

Source Category:
Stationary source.

Regulatory Context and Background:
BAAQMD Reg. 9, Rule 10 imposes a daily average NOx limit equivalent to 28 ppmv on refinery heaters that were in service at the time the rule was adopted in 1994. Heaters that subsequently went into service were subject to more stringent NOx limits through the BAAQMD permitting process (BACT) and are not regulated under this rule. Reg 9-10 imposes a daily NOx limit of 150 ppmv on each heater classified as a CO boiler because these devices tend to have higher emissions and because their emissions are more difficult to control, compared to non-CO boilers. Only 3 of the Bay Area refineries operate CO boilers, and there are fewer than ten of these devices.

Because Reg 9-10 required final compliance by 2002 and because it does not apply to new heaters (except for new CO boilers), this rule achieved significant emission reductions through 2002, but has had virtually no effect on refinery heaters emissions since then. Because Reg 9-10 allowed refineries to comply on a daily average basis, they installed NOx controls on the largest and highest emitting heaters. Currently, the majority of refinery heaters have advanced NOx controls (ultra low-NOx burners or SCR) and almost all have at least basic low-NOx burners. The few heaters that have no NOx controls typically have one or more factors that appear to make them less-than-ideal candidates for cost-effective NOx control. These factors are being evaluated by staff to verify their validity.

During meetings with refinery personnel and engineering consultants in July 2009, the refineries presented information regarding projected costs to retrofit remaining uncontrolled boilers with low-NOx burners and SCR and to retrofit low-NOx burner-equipped boilers with SCR. In addition, there are a number of refinery projects currently ongoing that will involve retrofits or replacements of refinery heaters. This will result in an overall NOx reduction, the extent of which is currently being evaluated.

Reg 9-10 is not directly comparable to NOx rules in the other air districts with refinery operations (South Coast AQMD and San Joaquin Valley Unified APCD) because other district rules do not allow refinery averaging as Reg 9-10 does for non-CO boilers, and because these other air districts offer compliance options for the NOx limits in their rules (a regional

NOx cap-and-trade program at South Coast, and an emission fee option in San Joaquin) that BAAQMD does not offer. Nonetheless, both South Coast AQMD and San Joaquin Valley Unified APCD have made BARCT determinations that are more stringent than the current requirements of Reg 9-10 including:

South Coast: heaters <40 MM BTU/hr and >110 MM BTU/hr, and CO boilers
San Joaquin: heaters >110 MM BTU/hr

These BARCT determinations are being evaluated by staff, considering the different compliance options in each air district, to determine to what extent they may be applied to Bay Area refinery heaters.

Implementation Actions:
Reduce NOx emissions limits in Reg. 9-10 for the averaged heaters and the CO boilers. Other options that could be considered include requiring improved performance of some existing NOx controls.

Emission Reductions:
Total NOx emissions from heaters currently subject to Reg 9-7 are 12.0 ton/day (8.0 ton/day at averaged heaters and 4.0 ton/day at CO boilers). Because CO boilers represent a disproportionate source of emissions and because they have a significantly higher emission limit than the other refinery heaters, it is likely that most emission reductions will come from CO boilers. If all CO boiler emissions are reduced to the current BACT level for these devices, then NOx emissions would be reduced by about 2.9 ton/day.

Pollutants (tons per day)	2012	2020
NOx	0	2.9

Emission Reduction Methodology:
An amendment of Reg 9-10 will achieve emission reductions by either reducing the average daily NOx limit for pre-1994, non-CO heaters, or by reducing the NOx limit for CO boilers, or both. A reduction in the limit for pre-1994, non-CO heaters will require that refineries install low-NOx burners, ultra low-NOx burners or SCR on uncontrolled heaters, or else upgrade existing controls to more effective controls (e.g., replace low-NOx burners with SCR). These controls may be applied on whichever heaters provide the most-effective reductions, in order to achieve compliance with the new, average limit. CO boilers at different refineries have significantly different operating conditions (fuel mix, operating temperature), so it is unlikely that the current CO boiler limit can simply be reduced, since control costs will probably vary significantly at different refineries. Instead, different NOx limits will probably have to be applied to different fuels and operating conditions.

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
The use of SCR could result in an increase in GHG, specifically CO2 due to increased need for electrical power.

Installation of low-NOx and ultra low-NOx burners may increase emissions of CO at the modified heaters, although CO emissions are expected to remain in compliance with the 400 ppmv limit in the rule.

In some modeling scenarios, reduction of NOx from a significant NOx emitting source with high emission rates has been shown to impact the ozone scavenging effect of NO, resulting in higher ozone concentrations in areas within the source's emission plume.

Cost:
This measure is currently going through the rule development process. Cost estimates will be refined by District staff during the course of the rule development process.

Because NOx controls have already been applied to most refinery heaters, and because there have been no cost break-through in NOx controls since Reg 9-10 was first adopted, any additional NOx reductions are expected to have relatively high cost effectiveness. Also, because each refinery has implemented a different NOx control strategy, any reduction in the average daily NOx limit will result in widely different control costs at each refinery. Although it is expected that each CO boiler arrangement will have a different NOx limit, refineries with CO boilers will also face widely different control costs because CO boilers currently operate over a wide NOx emission range.

Because refinery heaters are larger than typical non-refinery boilers and heaters and because of the complicating factors in refinery heater NOx control, control may be less cost-effective than for NOx reductions on natural gas-fired boilers. These complicating factors include: higher heating value of refinery gas and temporal and constituency variations in refinery gas.

Co-benefits: NOx reductions will also reduce secondary particulate formation.

Monitoring Mechanisms:
Initial source tests, ongoing monitoring with CEMs or periodic source tests.

Issues/Impediments:
Internal and external space limitations at uncontrolled heaters may make the installation of low-NOx burners, ultra low-NOx burners or SCR problematic. Where installation of controls is feasible, these factors may increase the cost of control. Poor or variable fuel quality, as well as the use of high-heating value fuel that results in high combustion temperatures will generally prevent refinery heaters from complying with NOx limits consistent with non-refinery heaters using natural gas fuel.

Sources:

1. U.S. EPA. 1994. "Alternative Control Techniques Document - NOx Emissions from Industrial, Commercial, Institutional (ICI) Boilers." EPA document no. EPA-453/R-94-022.
2. BAAQMD, Draft Amendments to Regulation 9, Rule 10: Nitrogen Oxides and Carbon Monoxide from Boilers, Steam Generators and Process Heaters in Petroleum Refineries, Workshop Report, 2010.

SSM 11 – Residential Fan Type Furnaces

Brief Summary:
This control measure would reduce oxides of nitrogen (NOx) emissions from residential fan type central furnaces by reducing allowable NOx emission limits on new and replacement furnace installations. This control measure does not address older homes with simple small floor heaters or larger central furnaces for condominiums, apartment buildings, and commercial space heating.

Purpose:
Reduce emissions of NOx from Residential Central Furnaces.

Source Category:
Combustion.

Regulatory Context and Background:
Natural gas fired fan-type central furnaces are used in residential and commercial buildings to provide comfort heating. Most single-family homes and many multi-unit residences have this type of heating equipment. Many older homes, with below floor furnaces, have been retrofitted with this type of forced air heaters. Typically, residential units have burners rated between 50,000 and 175,000 British thermal units per hour (Btu/hr). District Regulation 9, Rule 4 currently limits NOx emissions from fan type residential central furnaces with heat input less than 175,000 Btu/hr. Regulation 9, Rule 4 is a "point-of-sale" type regulation, requiring that any residential furnace offered for sale, installed, or sold must be certified to meet 40 nanograms (ng) of NOx per joule of delivered heat, which is equivalent to an emission concentration of about 55 ppmv at 3% oxygen. Regulation 9, Rule 4: Nitrogen Oxides from Fan Type Residential Central Furnaces was adopted in December of 1983, and has not been amended since that time. South Coast Rule 1111 includes the same NOx limit as does San Joaquin Rule 4905.

Low NOx burners have since been developed for many types of combustion equipment. These burners have been successfully retrofitted to large process heaters and boilers, and are now being designed for smaller combustion devices like residential water heaters. San Joaquin Control Measure S-COM-10 indicates that burners have been developed that achieve a 50% NOx emission reduction, although these burners are not currently commercially available. These low NOx burners can achieve NOx emission rates of about 10 – 14 ng/joule (15 – 20 ppm) of delivered heat for water heaters. This technology can be further adapted for residential space heating, due to the similar configuration of the appliances.

Implementation Actions:
Current low NOx burner technology is capable of meeting 10 – 14 ng/joule. This represents at least a 65 percent NOx reduction potential. This proposal would continue the "point-of-

sale" approach for residential furnaces to minimize the impact on individual homeowners and landlords. Central furnaces have a life expectancy of about 30 years. Should proposed amendments take a replacement, rather than a retrofit or forced retirement approach, NOx reductions will occur over the 30-year replacement cycle, or approximately a two percent NOx reduction each year.

Implementation timing may be lengthy. Efficiency and safety standards were also incorporated into low NOx residential water heaters, requiring significant redesign to meet all the requirements. There appears to be a three- to five-year period from re-design to marketable product for gas appliances.

Emission Reductions:

Pollutants (tons per day)	2012	2020
NOx	0	TBD

The emission reductions from this measure will be phased in as existing furnaces are replaced over the coming 20-30 years. Emissions reductions will be 4.2 tons per day when the measure is fully implemented.

Emission Reduction Methodology:

NOx emissions from residential space heating are included in the emission inventory as a specific category of emissions: *Category 283- Domestic Natural Gas Space Heating.* Base year 2005 emissions are estimated at 8.62 tons per day (tpd). This includes older homes that just have small floor heater units. This emission estimate includes heating devices for large apartment buildings that are larger than 175,000 Btu/hr. A rough estimate of ten percent (of the emissions inventory for this category) is attributed to these floor heaters, and 15% of the total for very large furnaces leaves 75 percent, or 6.5 tpd NOx emissions attributable to residential fan type central furnaces.

The emission reduction estimates are based on implementation only for new installations, or replacement of residential central furnaces. NOx reduction potential is 65 percent of the current 6.5 tpd NOx, or at least 4.2 tpd cumulative over the 30-year replacement cycle.

Exposure Reduction:

TBD

Emission Reduction Trade-offs:

Depending on the technology selected, NOx reductions may increase GHG emissions, specifically CO2, by reducing efficiency of the process. This is unlikely for this control measure, however, because efficient low-NOx burners have been developed for similar types of appliances. New forced air heaters will probably be more efficient than the ones they replace, reducing GHG emissions.

Cost:
Control costs are based on the costs of power premixed burners used to reduce emissions for large water heaters and small boilers. These burners are estimated to add an additional $100 to $200 to the capital cost of a furnace. Assuming a 30 year replacement cycle, total added capital cost is $150 million based on replacing 750,000 heaters over the 30 year period. Annual costs are $5.0 million.

The cost estimates above exclude potential advantages of probable improved efficiency for the furnace itself, and the opportunity to improve the efficiency of the fan and heated air ductwork, attractive to a homeowner installing a new furnace because of the potential savings in fuel usage. These cost estimates also exclude the potential to improve the thermal efficiency of the home by taking advantage of combined space / water heating or heat pump technology.

Co-benefits:
There are potential positive benefits of reduced greenhouse gases through improved thermal efficiency of space heating, and potential combined efficiency of space and water heating through re-design of the home energy use systems.

Monitoring Mechanisms:
Manufacturers of residential fan-type furnaces would be required to certify the furnace to a NOx limit of 14 ng/joule. Only certified furnaces could be sold in the District.

Issues/Impediments:
No specific issues or impediments have been identified.

Sources:
1. SCAQMD Rule 1111
2. BAAQMD Regulation 9, Rule 4
3. San Joaquin Valley Ozone Plan, Page 405 – 406, Natural Gas-Fired, Fan-Type Residential Central Furnaces (S-COM-10)

SSM 12 - Large Residential and Commercial Space Heating

Brief Summary:
This control measure would reduce oxide of nitrogen (NOx) emissions from large condominium and apartment building central furnaces, and from commercial space heating through retrofit of low NOx burners.

Purpose:
Reduce NOx emissions from large condominium and apartment building central furnaces, and from commercial space heating.

Source Category:
Combustion.

Regulatory Context and Background:
Natural gas fired fan-type central furnaces are used in residential and commercial buildings to provide comfort heating. Most single family homes and many multi-unit residences have this type of heating equipment. Typically, residential units have burners rated between 50,000 and 175,000 British thermal units per hour (Btu/hr). The District Regulation 9, Rule 4: Nitrogen Oxides from Fan Type Residential Central Furnaces (Rule 9-4) currently limits NOx emissions from fan type residential central furnaces with heat input less than 175,000 Btu/hr. There is currently no regulation of larger central furnaces for condominium or apartment complexes, or commercial space heating. Unregulated combustion devices typically generate 75 to 100 ppm or more NOx.

Low NOx burners have been developed for many types of combustion equipment. These burners have been successfully retrofitted to large process heaters and boilers, and are now being designed for smaller combustion devices like residential water heaters. These low NOx burners can achieve NOx emissions of 14 ng/joule (approximately 20 ppm) of delivered heat for large water heaters. It appears this technology can be further developed for large central furnace and commercial space heating applications, due to similar space and size configurations of the affected units.

NOx emissions from residential space heating are included in the emission inventory as a specific category of emissions: *Category 283 - Domestic Natural Gas Space Heating.* Base year 2005 emissions are estimated at 8.62 tons per day (tpd). This emission estimate includes heating devices for large condominiums and apartment buildings that are larger than 175,000 Btu/hr. A rough estimate of 15 percent of the total for these very large furnaces are responsible for 1.3 tpd of NOx emissions.

In addition, *Category 1590 – Other External Combustion Natural Gas (area sources)* has base year 2005 emissions estimated at 7.03 tpd. Analysis of month-to-month gas consumption data indicates that approximately 24 percent of the natural gas use is for commercial

facilities, and 21 percent of the commercial gas use is cyclical from summer to winter. NOx from commercial space heating is estimated to be 0.35 tpd.

Implementation Actions:
Current low NOx burner technology is capable of meeting 14 ng/joule. This represents at least a 70 percent NOx reduction potential. This proposal includes retrofit, and probable registration of large central furnaces for condominium and apartment complexes, and commercial space heaters. These large central furnaces have a life expectancy of about 30 years. This proposal assumes a retrofit strategy for existing large furnace and space heaters. Implementation can take place over a reasonable period of 10 – 15 years, when the furnace reaches half of its potential life span.

Emission Reductions:

Pollutants (tons per day)	2012	2020
NOx	0	TBD

The emission reductions from this measure will be phased in as existing furnaces are replaced over the coming 15-20 years. Emission reductions are expected to be 1.2 tons per day NOx when the measure is fully implemented.

Emission Reduction Methodology:
The emission reduction estimates consider retrofit or replacement of existing large central furnaces and space heaters. NOx reduction potential is 70 percent of the current 1.65 tpd NOx, or at least 1.2 tpd cumulative over the 15-year half life of these devices.

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
Depending on the technology selected, NOx reductions may increase GHG emissions, specifically CO2, by reducing efficiency of the process. However, low-NOx burners of the sort used in similar applications do not tend to reduce the efficiency of the appliance noticeably. New forced air furnaces would likely be more efficient than the ones they replace, reducing GHG emissions.

Cost:
Control costs are based on the costs of power premixed burners used to reduce emissions for large water heaters and small boilers. These low-NOx burners are expected to add $500 to the cost of a large furnace replacement ($3000 - $10,000). There are an estimated 50,000 large forced air furnaces in the District, so based on a 30 year expected lifespan, approximately 1667 would be replaced annually. In 15 years, 25,000 of the furnaces will be retrofited with low NOx burners at a cost of $12.5M, resulting in an annual cost of $833,333 a year and a cost effectiveness of $3800 per ton of NOx reduced.

Approximately half the large furnaces may not be retrofitted with low-NOx burners and need to be replaced within 15 years (half their lifespan), the additional replacement capital costs are estimated at $3000, and would amortize to a total of $6.0 M annually. Cost effectiveness for these heaters is $27,400 per ton of NOx reduced. Overall cost effectiveness for this control measure is $15,600 per ton of NOx reduced.

The cost estimates above exclude potential advantages of any improved efficiency for the furnace itself, and the opportunity to improve the efficiency of the fan and heated air ductwork. These cost estimates also exclude the potential to improve the thermal efficiency of a building by taking advantage of combined space / water heating or heat pump technology.

Co-benefits:
There are potential positive benefits of reduced greenhouse gases through improved thermal efficiency of space heating, and potential combined efficiency of space and water heating through re-design of the building energy use systems.

Monitoring Mechanisms:
Manufacturers of space heaters would be required to certify the heater to a NOx limit of 14 ng/joule. Only certified heaters could be sold in the District.

Issues/Impediments:
No specific issues of impediments have been identified.

Sources:
1. SCAQMD Rule 1111
2. BAAQMD Regulation 9, Rule 4
3. San Joaquin Valley Ozone Plan, Page 405 – 406, Natural Gas-Fired, Fan-Type Residential Central Furnaces (S-COM-10)

SSM 13 - Dryers, Ovens, and Kilns

Brief Summary:
This control measure would reduce oxides of nitrogen (NOx) emissions from combustion devices that are currently exempt from the requirements of Regulation 9, Rule 7: *Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters* (Reg 9-7). Reg. 9-7 exempts the following types of combustion devices: kilns, ovens, and furnaces used for drying, baking, heat treating, cooking, calcining, or vitrifying (§9-7-110.6).

Purpose:
Reduce emissions of NOx from kilns, ovens, and furnaces.

Source Category:
Combustion.

Regulatory Context and Background:
The District regulates NOx emissions from a variety of combustion source categories. Reg. 9-7 is a non-industry specific rule that applies to a broad range of combustion devices that heat water or other fluids. Reg. 9-7 includes an exemption for "kilns, ovens and furnaces used for drying, baking, heat treating, cooking, calcining, or vitrifying." Historically, most California air districts that had a general combustion rule similar to Reg. 9-7 also had an exemption similar to that in §9-7-110.6, and did not have a separate rule that applied to these exempt devices. In December 2005 the San Joaquin Valley APCD (SJVUAPCD) adopted Rule 4309 to limit emissions of NOx from dryers, dehydrators and ovens with a rated heat input of 5 MM BTU/hr or more. Rule 4309 was fully implemented in December 2008. In December 2008 the South Coast AQMD (SCAQMD) published a draft of a new rule (Rule 1147) that would limit emissions of NOx from "ovens, dryers, dehydrators, heaters, kilns, calciners, furnaces, crematories, incinerators, heated pots, cookers, roasters, fryers, closed and open heated tanks and evaporators, distillation units, afterburners, degassing units, vapor incinerators, catalytic or thermal oxidizers, soil and water remediation units". This proposed rule has not been adopted.

The draft staff report for proposed SCAQMD Rule 1147 indicates that low-NOx burners are commercially available for all affected devices in the proposed rule.

A database query for permitted combustion devices in this category identified 62 devices with total NOx emissions of 2.1 ton per day (tpd). The cement kiln at Lehigh Southwest Cement (Plant #17) and two coke calciners at the Conoco Phillips Coke Plant (Plant #22) generate approximately 93% of the emissions from this source category. This kiln and calciners are the subject of other proposed control measures. The remaining NOx emissions from this source category are about 0.45 tpd.

Implementation Actions:
Adopt a rule similar to SCAQMD Rule 1147 for this source category.

Emission Reductions:
In the draft staff report for proposed Rule 1147, SCAQMD staff estimated that current, uncontrolled NOx emission rates at devices that would be subject to Rule 1147 range from 110 to 170 ppmv at 3% O2. The proposed NOx limits in this rule range from 30 to 60 ppmv at 3% O2. Small driers, ovens and kilns are assumed to be exempt because NOx reduction would not be cost effective for small devices. If none of these devices in the District has already implemented NOx controls, the emission reduction available by applying the SCAQMD proposed NOx limits ranges from 45% to 80%, or from 0.20 tpd to 0.36 tpd.

Pollutants (tons per day)	2012	2020
NOx	0	0.20

Cost: Low NOx burners are estimated to add $5000 to the cost of a dryer, oven or kiln replacement. Devices of this size and type may not be able to be retrofitted with low-NOx technology. There have been 59 driers, ovens and kilns identified in the Air District, half of which may be exempt because of low fuel usage. For devices unable to be retrofitted, replacement before the end of their useful like may be required. At an estimated cost of $100,000 each, replacement of all devices will cost $3M capital, amortized to $570,000 annually. The SJVUAPCD estimated costs between $7,300 and $22,300 per ton of NOx reduced for Rule 4309. The SCAQMD has estimated costs between $4,000 and $17,000 per ton of NOx reduced for proposed Rule 1147.

Emission Reduction Methodology:
The emissions reductions are derived from South Coast's estimated emissions reductions and the emissions from applicable sources in the Bay Area.

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
Depending on the technology selected, NOx reductions may increase GHG emissions, specifically CO2, by reducing efficiency of the process.

Co-benefits:
NOx is a precursor to secondary PM formation.

Monitoring Mechanisms:
Source tests, monitoring.

Issues/Impediments:
SJVUAPCD Rule 4309 exempts units used to precondition onions and garlic prior to dehydration. Gilroy Foods, Inc. (Plant #11327) has eight sources that could be controlled. It is not known if the rationale for the San Joaquin exemption would apply to these units. Proposed SCAQMD Rule 1147 does not provide a similar exemption.

Sources:
1. SJVUAPCD Rule 4309: http://www.valleyair.org/rules/currntrules/r4309.pdf
2. SCAQMD Proposed Rule 1147: http://www.aqmd.gov/rules/proposed/1147/PR1147Nov408.pdf
3. SCAQMD Proposed Rule 1147 Draft Staff Report: http://www.aqmd.gov/rules/proposed/1147/PR1147DraftStaffReportNov408.pdf

SSM 14 - Glass Furnaces

Brief Summary:
This control measure would reduce NOx emission from gas-fired glass melting facilities.

Purpose:
Reduce NOx

Source Category:
Stationary source.

Regulatory Context and Background:
SJVUAPCD Rule 4354 imposes NOx limits for several types of glass plants: flat glass, container glass, and fiberglass. The limit went to 4.0 lbs NOx / ton of glass in 2008. In 2008, SJVUAPCD adopted further amendments to Rule 4354 that set a standard for container glass of 1.5 lbs NOx / ton effective in 2014.

BAAQMD Regulation 9, Rule 12: Nitrogen Oxides from Glass Melting Furnaces (Rule 9-12) imposes a NOx limit of 5.5 lbs NOx / ton glass. This limit was based on the South Coast limit but also on differences between Bay Area furnaces and South Coast furnaces. The South Coast furnaces are largely end-port furnaces. The operators of the furnaces used electric boost and flame modifications to reduce emissions to meet the SCAQMD limit. The Bay Area has only one facility (Plant 30) that has three glass melting furnaces. These three furnaces are side port furnaces, and flame modification techniques used in the South Coast cannot be used on these furnaces. In addition, the Bay Area furnaces use electric boost to increase production and, therefore, cannot use it to reduce emissions without decreasing production. Limits lower than 4.0 lbs NOx / ton glass have been achieved by an oxy-fuel system operated by Gallo in Modesto, but this plant manufactures glass for Gallo wines and does not sell to the open market. It is unclear whether oxy-fuel combustion is cost-effective in the current market.

Another relatively new technology, the Pilkington 3R process, has been developed since the SCAQMD and BAAQMD rules were adopted in the early 1990's; but it has been used only in flat glass furnaces. It is unknown whether the process will prove to be suitable for container glass furnaces and whether there is any potential for emission reductions.

Of the three Bay Area glass melting furnaces, two of these (S-11, S-12) have explicit NOx emission rate limits (4.0 lb/ton of glass in a 3-hr period) imposed by permit conditions that are more stringent than the current Tier 2 limit in San Joaquin's Rule 4354. However, the Tier 3 limit effective in 2014 (1.5 lb/ton, 30-day average) is more strict than the permit conditions for these two furnaces.

Because San Joaquin has adopted "Tier 3" NOx emission rate limits that are significantly stricter than those in BAAQMD Rule 9-12 or in the permit conditions applicable to Plant 30, further emission reductions at Plant 30 may be able to be obtained. The 2005 Base Year inventory for the source category "glass melting furnaces - natural gas" included 1.42 ton/day of NOx.

San Joaquin's Tier 3 standard represents a 43 percent reduction in NOx emissions compared to the weighted average emission rate (2.65 lb NOx/ton glass) at the three furnaces at Plant 30.

Implementation Actions:
The control measure will be implemented through amendments to Rule 9-12.

Emission Reductions:

Pollutants (tons per day)	2012	2020
NOx	0	0.38

Emission Reduction Methodology:
TBD

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
Depending on the technology selected, NOx reductions may increase GHG emissions, specifically CO2, by reducing efficiency of the process.

In some modeling scenarios, reduction of NOx from a significant NOx emitting source with high emission rates has been shown to impact the ozone scavenging effect of NO, resulting in higher ozone concentrations in areas within the source's emission plume.

Cost:
An oxy-fuel system or selective catalytic reduction are both viable options to reduce NOx. The capital cost for either option is estimated to be approximately $4 M, amortized to $760,000 per year.

Co-benefits:
Reduction in secondary particulate formation

Monitoring Mechanisms:
Source tests and monitoring equipment will be used to enforce emission standards.

Issues/Impediments:
None identified.

1. **Sources**: http://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/11%20Chapter%206%20April%202007.pdfhttp://www.valleyair.org/Air_Quality_Plans/docs/AQ_Ozone_2007_Adopted/26%20Appendix%20I%20April%202007.pdf
2. Workgroup Recommendations and Other Potential Control Measures Stationary Combustion Sources Workgroup – Glass/Fiberglass Furnaces, Subhash Shah, New Jersey Department of Environmental Protection, February 22, 2007. http://www.state.nj.us/dep/baqp/rapt/wps/SCS007_fin2.pdf
3. BAAQMD. 1993. Staff Report, Regulation 9, Rule 12, Nitrogen Oxides from Glass Melting Furnaces.
4. SJVUAPCD. 2002. "Final Draft Staff Report, Amendments to Rule 4354 (Glass Melting Furnaces)." SJVUAPCD. Rule 4354.

SSM 15 - Greenhouse Gases in Permitting, Energy Efficiency

Brief Summary:
This control measure would mitigate increases in greenhouse gas (GHG) emissions from new and modified permitted sources, reviewing implementation of energy efficiency measures, where appropriate on new sources subject to the Air District's jurisdiction.

Purpose:
Reduce GHG emissions from new and modified permitted sources.

Source Category:
Stationary source.

Regulatory Context and Background:
Sources that require permits are evaluated according to the District's Permit Handbook and BACT/TBACT Workbook. Projects are ministerial for the purposes of CEQA if the specific procedures, fixed standards and objective measurements established in the Handbook and Workbook apply to the permit application. For larger sources, those for which there is no BACT established in practice for the specific source, the source would not be classified as ministerial and a CEQA evaluation is required.

When reviewing sources for permitting, District staff does not consider GHG emissions. Under existing federal, state and District guidelines, a new source is required to abate criteria pollutants to the maximum extent feasible consistent with other, like sources, or to install the most effective control technology that can be demonstrated to be cost effective.

Implementation Actions:
This control measure could be implemented in two ways. First, some larger projects that are currently considered ministerial could be made to undergo CEQA, specifically to consider mitigation of GHG emissions. This could be accomplished by a change in the Permit Handbook so that some discretion in the evaluation of these permits could be used. Examples of projects that would fall into this category are boilers, steam generators or process heaters with a rated heat input greater than some threshold amount.

Second, some ministerial projects could have certain energy efficiency-related measures imposed as standard permit conditions to minimize the amount of GHGs emitted. As an example, combustion devices such as boilers or internal combustion engines that operate at less than a certain size could be required to have a certain manufacturer's efficiency rating.

Emission Reductions:
Undetermined. This control measure would not reduce existing emissions. It would, like new source review provisions, mitigate increases in GHG emissions from new and modified plants and equipment. As existing equipment ages and is replaced, or new facilities are

built, this control measure could help reduce GHGs that would otherwise be emitted. As the control measure could apply across many of the permitted sources required to obtain District permits, it is impossible to estimate the amount of emissions subject to control.

Emission Reduction Methodology:
TBD

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
None identified.

Cost:
Increased efficiency as a permit condition may add costs to new equipment, but energy efficiency measures often pay for themselves within 5 years. Flexibility in permitting could reduce applicant costs while reducing GHGs.

Co-benefits:
The co-benefits of reducing GHG emissions are myriad, from reducing the likelihood of increased global temperatures, sea level rise, increased frequency and severity of storm activity, to impacts on water quality from increased salinity in the delta and damage to infrastructure from flooding. The development of energy efficiency technologies and equipment that controls criteria pollutant and TACs that does not produce secondary GHG emissions may spur green job creation. One possible means of reducing GHG emissions would be increased energy efficiency resulting in energy savings and reduced consumer costs in the long term. An additional benefit of energy efficiency for combustion equipment is the reduction of other combustion contaminants, such as SO2 and PM.

Monitoring Mechanisms:
The success of this control measure would be monitored by examining the emission inventory for increases in criteria pollutants and TACs from permitted sources above what would be expected if this measure were not in place. GHG emissions from permitted sources are tracked as a result of the May 21, 2008 adoption of the GHG fee in Regulation 3, section 334. Trends in GHG emissions from permitted sources would be examined before and after adoption of this measure.

Issues/Impediments:
None identified.

Sources:
1. BAAQMD Permit Handbook: http://www.baaqmd.gov/pmt/handbook/rev02/permit_handbook.htm
2. BAAQMD Regulations 2-2, and 2-5: http://www.baaqmd.gov/dst/regulations/index.htm

SSM 16 - New Source Review Addressing PM2.5

Brief Summary:
This control measure would amend Regulation 2, Rule 2 to address the District's anticipated non-attainment status of the 24-hour PM2.5 National Ambient Air Quality Standard. In addition, more stringent standards will be considered for sources located in areas of sensitive populations as determined by the Community Air Risk Evaluation (CARE) program.

Purpose:
Reduce emissions of PM2.5 from new and modified permitted sources and to address the cumulative air quality impacts of stationary sources on sensitive receptors and impacted communities.

Source Category:
Stationary source.

Regulatory Context and Background:
Existing District rules require that permit applications be submitted for a wide variety of new and modified stationary sources prior to construction so that District staff can complete a review of compliance with applicable air quality requirements. Applicable air quality requirements include rules and regulations adopted by the District, the California Air Resources Board, and the U.S. Environmental Protection Agency. New Source Review (NSR) rules require that new and modified sources utilize the Best Available Control Technology to minimize air pollution impacts. Additional NSR requirements include emission offsets, air quality impact analysis for criteria air pollutants and their precursors, and health risk screening analysis for toxic air contaminants (TACs). The existing District NSR rules are Regulation 2, Rule 2: New Source Review, and Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.

The Community Air Risk Evaluation (CARE) Program was initiated in 2004 to evaluate and reduce health risks associated with exposures to outdoor toxic air contaminants (TACs) in the Bay Area. The program examines cumulative TAC emissions from point sources, area sources and on-road and off-road mobile sources. District risk reduction activities will be focused on priority communities that have been identified based on sources of TAC emissions, modeled exposure of sensitive populations, and socioeconomic factors.

US EPA has proposed designating the Bay Area as a non-attainment area for the recently revised 24-hour PM2.5 national ambient air quality standard, but final action is pending. When EPA finalizes the District's non-attainment designation for the 24-hour PM2.5 standard, the District will have a period of time to amend Regulation 2, Rule 2, NSR requirements to address PM2.5. At that time, District staff will consider whether more

stringent permitting requirements should be established for sources of PM2.5 locating in priority communities.

Implementation Actions:
Prepare amendments to Regulation 2, Rule 2: New Source Review pursuant to EPA requirements. During this process, more stringent requirements for sources located in priority communities may be considered. Amendments to Regulation 2, Rule 5 resulting in more stringent permitting requirements for sources of TACs are currently being developed. Lessons learned from this process will help implementation of similar requirements for sources of PM2.5 in Regulation 2, Rule 2.

Emission Reductions:
Undetermined. This control measure would reduce increases in PM 2.5 emissions from new and modified plants and equipment. As existing equipment ages and is replaced, or new facilities are built, this control measure would help reduce PM 2.5 that would otherwise be emitted. As the control measure could apply across many of the permitted sources required to obtain District permits, the amount of emissions subject to control and emission reductions have not been calculated at this time.

Emission Reduction Methodology:
TBD

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
None expected, although a need to increase control equipment could result in greater electricity use, generating slightly more green house gas emissions.

Cost:
TBD

Co-benefits:
PM2.5 can contribute significantly to regional haze and reduction of visibility. A particle of 2.5 microns or less in diameter is also a particle of 10 microns or less in diameter. In other words, PM2.5 is a subset of PM10, so a reduction in the former will result in a reduction in the latter.

Monitoring Mechanisms:
The success of this control measure would be monitored by examining the emission inventory for increases in criteria pollutants and TACs from permitted sources above what would be expected if this measure were not in place. In particular, trends in PM2.5 from permitted sources would be examined before and after adoption of this measure. Ongoing

monitoring of impacted communities as part of the CARE program also will help gauge the success of this measure.

Issues/Impediments:
Amendments to Regulation 2, Rule 2 to address PM2.5 in general are unlikely to face much opposition, however more stringent rules for sources in impacted communities may raise concerns in the regulated community.

Sources:
3. BAAQMD Permit Handbook: http://www.baaqmd.gov/pmt/handbook/rev02/permit_handbook.htm
4. BAAQMD Regulations 2-2, and 2-5: http://www.baaqmd.gov/dst/regulations/index.htm
5. Update on CARE Program and Associated Regulatory Initiatives, Memo to Stationary Source Committee from Jack Broadbent 6 July 2009
6. Draft Concept Paper, *More Stringent Permitting Requirements for Proposed New/modified Stationary Sources of Air Pollution Located in Impacted Communities or in Proximity to Sensitive Receptors.* February 23, 2009.
7. Brian Bateman, April 2009 Presentation given to the CARE Task Force.

SSM 17 - New Source Review for Toxic Air Contaminants

Brief Summary:
This measure proposes to revise District permitting requirements via amendments to Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants (TACs). For Priority Communities identified in the Air District's Community Risk Evaluation (CARE) Program, cumulative impacts will be addressed by tracking the toxicity-weighted emissions from all sources in the identified communities. Incorporation of revisions to Cal/EPA's Environmental Health Hazard Assessment (OEHHA) methodologies into District Health Risk Screening Analysis Guidelines will result in more stringent standards for new and modified sources.

Purpose:
Reduce the cumulative air quality effects of TACs from new and modified stationary sources in the District and develop a periodic reporting mechanism to track toxic air contaminant emissions in CARE Priority Communities.

Source Category:
Stationary source.

Regulatory Context and Background:
Existing District rules require that permit applications be submitted for a wide variety of new and modified stationary sources prior to construction so that District staff can complete a review of compliance with applicable air quality requirements. Applicable air quality requirements include rules and regulations adopted by the District, the California Air Resources Board, and the U.S. Environmental Protection Agency. New Source Review (NSR) rules require that new and modified sources utilize the Best Available Control Technology to minimize air pollution impacts. Additional NSR requirements include emission offsets, air quality impact analysis for criteria air pollutants and their precursors, and health risk screening analysis for TACs. The existing District NSR rules are Regulation 2, Rule 2: New Source Review, and Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants.

The requirements of Regulation 2, Rule 5 are based on the results of a site-specific Health Risk Screening Analysis (HRSA), which is an assessment that describes the possible adverse health effects that may result from public exposure to routine and predictable emissions of TACs. All permit applications for new and modified sources are screened for emissions of TACs. Where the predicted health risks from a proposed project exceed specified threshold levels, the new/modified source(s) must use the Best Available Control Technology to minimize TAC emissions (TBACT). The TBACT and Project Risk standards in Regulation 2, Rule 5 are uniformly applied throughout the District's jurisdiction.

Procedures used for completing HRSAs are based on guidelines adopted by Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA) for use in the Air Toxics Hot Spots Program. Procedures for assessing health risks are intended to protect sensitive individuals such as children, and individuals with pre-existing health conditions. The Children's Environmental Health Protection Act (Senate Bill 25) established specific requirements for OEHHA to determine whether existing health risk assessment procedures are adequate to protect infants and children from the harmful effects of air pollution. OEHHA has already acted under SB 25 to revise procedures for assessing non-cancer health risks to provide a greater margin of safety for children. Age Sensitivity Factors (ASFs) were adopted by OEHHA on June 1, 2009 to account for inherent increased susceptibility to carcinogens during infancy and childhood, and exposure assessment procedures are expected to be revised by mid-2010. These changes in exposure assessment procedures, when combined with ASFs, will increase estimates of residential cancer risk by a factor of 2 to 3 relative to existing procedures.

The Community Air Risk Evaluation (CARE) Program was initiated in 2004 to evaluate and reduce health risks associated with exposures to outdoor TACs in the Bay Area. The program examines cumulative TAC emissions from point sources, area sources and on-road and off-road mobile sources. Based on sources of TAC emissions, modeled exposure of sensitive populations, and socioeconomic factors, Priority Communities have been identified where District risk reduction activities will be focused.

Implementation Actions:
Prepare amendments to Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants. District staff proposes to incorporate the latest OEHHA health risk assessment methodologies into Health Risk Screening Analyses completed for proposed new/modified permitted sources. This will effectively increase the stringency of the standards of Regulation 2, Rule 5. Incorporation of ASFs will increase the strigency of cancer risk standards by a factor of 1.7. Incorporation of revised exposure assessment procedures, when combined with the use of ASFs, will further increase the stringency of these standards by a factor of 2 to 3. Staff also proposes that cumulative emissions of toxic air contaminants be tracked in CARE communities on a toxicity-weighted basis and reported periodically.

Emission Reductions:
Undetermined. This control measure would reduce increases of TAC emissions from new and modified plants and equipment. As existing equipment is replaced, or new facilities are built, this control measure would reduce TACs that would otherwise be emitted. As the control measure could apply across many of the permitted sources required to obtain District permits, the amount of emissions subject to control and potential emission reductions have not been calculated at this time. The District will calculate and track emission reductions as the rule is implemented.

Emission Reduction Methodology:
TBD

Exposure Reduction:
TBD

Emission Reduction Trade-offs: None expected, although a need to increase control equipment could result in greater electricity use, generating slightly more green house gas emissions.

Cost:
TBD

Co-benefits:
Reducing TAC emissions will likely result in reduced emissions of TOG, ROG, and possibly particulate matter.

Monitoring Mechanisms:
The District will track cumulative toxicity-weighted risk from affected facilities in Priority Communities along with other sources of emissions. Ongoing ambient monitoring of impacted communities as part of the CARE program also will help gauge the success of this measure.

Issues/Impediments:
On January 6, 2010, the Board of Directors adopted amendments to Regulation 2, Rule 5 including provisions to track cumulative impacts in CARE communities. However, the Board directed staff to consider further setting different standards in the CARE communities for permit issuance under this rule.

Sources:
1. BAAQMD Permit Handbook: http://www.baaqmd.gov/pmt/handbook/rev02/permit_handbook.htm
2. BAAQMD Regulations 2-5:
3. http://www.baaqmd.gov/dst/regulations/index.htm
4. Update on CARE Program and Associated Regulatory Initiatives, Memo to Stationary Source Committee from Jack Broadbent 6 July 2009
5. Brian Bateman, April 2009 Presentation given to the CARE Task Force.
6. Proposed Amendments to Regulation 2-5, Workshop Report, July 2009.
7. Brian Bateman, October 2009 Presentation given to the CARE Task Force
8. Update on Proposed Amendments to Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants report to the Stationary Source Committee, October 19, 2009

SSM 18 - Revisions to Air Toxics Hotspots Program

Brief Summary:
Revise the District's Air Toxics Hot Spots program focusing on existing sources of toxic air contaminants.

Purpose:
Revise the District's Air Toxic Hotspots program focusing on existing sources of toxic air contaminants (TACs).

Source Category:
Stationary source.

Regulatory Context and Background:
Applicable air quality requirements related to controlling stationary sources include rules and regulations adopted by the District, the California Air Resources Board, and the U.S. Environmental Protection Agency. In California, air districts have the primary responsibility for controlling air pollution from non-vehicular stationary sources of air pollution. The Air District regulates stationary sources through rulemaking for specific source categories, through its permitting process and New Source Review for new and modified sources, and by administering the Air Toxics "Hot Spots" Program for existing sources.

The Air Toxics "Hot Spots" (ATHS) program is a state program implemented by California air districts. Assembly Bill 2588, the Air Toxics "Hot Spots" Information and Assessment Act, was enacted by the State legislature in 1987. AB 2588 requires companies throughout California to provide information to the public about emissions of TACs, and the impact that those emissions may have on public health. SB 1731, which provided the air districts with the authority to require facilities with significant risks to implement a site-specific risk reduction audit and plan, amended the Act in 1992. Each air district has the authority to establish health risk thresholds for public notification and risk reduction requirements.

The requirements of the ATHS program are based on the results of a site-specific Health Risk Screening Analysis (HRSA), which is an assessment that describes the possible adverse health effects which may result from public exposure to routine and predictable emissions of TACs.

Procedures used for completing HRSAs are based on guidelines adopted by Cal/EPA's Office of Environmental Health Hazard Assessment (OEHHA). Procedures for assessing health risks are intended to protect sensitive individuals such as children, and individuals with pre-existing health conditions. The Children's Environmental Health Protection Act (Senate Bill 25) established specific requirements for OEHHA to determine whether existing health risk assessment procedures are adequate to protect infants and children from the harmful

effects of air pollution. OEHHA has already acted under SB 25 to revise certain procedures for assessing non-cancer health risks to provide a greater margin of safety for children, and revisions to cancer risk assessment procedures are expected to be proposed in late 2009.

Implementation Actions:
The District will revise its ATHS program for existing facilities to incorporate more stringent risk reduction requirements than are provided in existing District policy. As was previously described, OEHHA is considering revising cancer risk assessment procedures to provide a greater margin of safety for protecting children. Based on discussions with OEHHA staff, it is possible that these revisions could increase calculated residential cancer risks by a factor of three or more relative to existing risk assessment procedures. Due to the potential significance of these revisions in risk assessment methodologies, the District believes that it is prudent to develop the District risk reduction rule concurrent with the OEHHA guideline revisions. OEHHA does not expect that these risk assessment guideline revisions will be finalized for some time, perhaps late in 2010.

Emission Reductions:
TBD

Emission Reduction Methodology:
TBD

Exposure Reduction:
TBD

Emission Reduction Trade-offs:
None expected.

Cost:
TBD

Co-benefits:
Reducing TAC emissions will likely result in reduced emissions of TOG, ROG, and possibly particulate matter.

Monitoring Mechanisms:
The success of this control measure would be monitored by examining the emission inventory for increases in criteria pollutants and TACs from permitted sources above what would be expected if this measure were not in place. Ongoing monitoring of impacted communities as part of the CARE program will help gauge the success of this measure.

Issues/Impediments:
The regulated community not already subject to the notification and risk reduction requirements of the current ATHS program may oppose more stringent thresholds for these requirements. Those already subject may be opposed to increased restrictions as a results of lowering these thresholds.

Sources:

1. BAAQMD Permit Handbook: http://www.baaqmd.gov/pmt/handbook/rev02/permit_handbook.htm
2. BAAQMD Regulations 2-5:
3. http://www.baaqmd.gov/dst/regulations/index.htm
4. Update on CARE Program and Associated Regulatory Initiatives, Memo to Stationary Source Committee from Jack Broadbent 6 July 2009
5. Draft Concept Paper, *More Stringent Permitting Requirements for Proposed New/modified Stationary Sources of Air Pollution Located in Impacted Communities or in Proximity to Sensitive Receptors.* February 23, 2009.
6. Brian Bateman, April 2009 Presentation given to the CARE Task Force.