THE CALIFORNIA RAILROAD INDUSTRY

December 8, 2006

Mr. Joseph Cassmassi
Planning and Rules Manager
South Coast Air Quality Management District
21865 Copley Drive
Diamond Bar, CA 91765

Re: Railroad Industry Comments on Draft 2007 Air Quality Management Plan

Dear Mr. Cassmassi:

On behalf of the Association of American Railroads and the Class I freight railroads operating in California (the Railroads), we appreciate the opportunity to provide comments on the Draft 2007 South Coast Air Quality Management Plan (Draft AQMP). The Railroads look forward to continuing to work cooperatively with the SCAQMD staff as you move forward towards a final plan.

Overview

The Railroads have several policy-level and technical concerns with the current Draft AQMP. Each of these areas is listed below and discussed in more detail in the remainder of this document.

Policy Concerns

1. Any mobile source control measures in the AQMP should assume emission reductions based on adopted CARB and US EPA rulemakings.
2. The locomotive measures in the Draft AQMP fail to meet the standard listed in Item 1 above.
3. The locomotive measures in the current Draft AQMP also rely on unfounded assumptions regarding when new standards will go into effect.
4. The Draft AQMP assumes that key measures will be implemented through a future Memorandum of Understanding (MOU) between the Railroads and CARB. AQMP measures should not be based on potential future voluntary actions that might not occur.
5. The Draft AQMP makes claims about the availability and costs of locomotive emissions control technology that are inaccurate and unfounded.
6. The Draft AQMP fails to accurately and consistently describe the relative contribution of federal sources to the emissions inventory in the District.

7. Backstop measures that affect mobile sources are the province of CARB and should not be a part of the AQMP.

8. The double asterisks text in Table 3-7 and Table 3-8 referencing "Trains" (AQMP page 3-23 and page 3-25) is inaccurate and the District does not have authority to implement its 3500 Rules.

Technical Concerns

1. Consistent use of the reference to "locomotives" rather than "trains."

Policy Concerns

1. Any mobile source control measures in the AQMP should assume emission reductions based on adopted CARB and US EPA rulemakings.

The Draft AQMP includes three measures which impact railroad operations:

- OFFRD-05 – Further Emission Reductions from Locomotives, and
- OFFRD-08 – Further Emission Reductions from Cargo Handling Equipment
- MOB-01 -- Mitigation Fee Program of Federal Sources[1]

Mobile sources are the regulatory domain of either CARB or, in some cases, the US EPA. Any mobile source control measures in the AQMP should assume emission reductions based on adopted CARB and US EPA rulemakings and should not go beyond them. Furthermore, OFFRD-05 offers unfounded and inaccurate speculation concerning the availability of certain locomotive emissions control technologies, as discussed in Railroad Comment #4 below and Appendix A.

Railroad Recommendation

Any reference to mobile source measures in the AQMP should assume emission reductions based on adopted CARB and US EPA rulemakings and should not go beyond them as mobile source control measures are the domain of CARB and US EPA.

2. The locomotive measures in the Draft AQMP fail to meet the standard listed in Item 1 above.

Measure OFFRD-05 creates unrealistic and unachievable targets for achieving emission reductions from locomotives. The Measure also sets unrealistic expectations for emission reductions which can

[1] We offer no specific comments on this measure, as it is a conceptual measure that speculates on future federal rulemaking proceedings and then assigns a "shortfall" in emissions reductions to the U.S. EPA. As such, it is well beyond the scope of the District's authority and legal mandates.

be achieved through retrofit technologies such as DPF, DOC, and SCR. Lastly, the measure also relies on unsubstantiated expectations for fleet turnover. New locomotive standards are expected to be proposed by US EPA in early 2007. Any mobile source control measures in the AQMP should be based on adopted federal emission standards for locomotives.

The current AQMP measure (MOB-05) is built on various assumptions and estimates contained in CARB's Emissions Reduction Plan ("the CARB Plan") which was adopted by CARB in April 2005.[2] However, the CARB Plan merely was a snapshot of its thinking at the that time of what might be possible if: (1) the US EPA took certain actions with respect to timing and stringency on new locomotive standards, and (2) other emissions reductions measures could be implemented. In fact, the SCAQMD staff seems to acknowledge the tentative nature of the CARB plan on Page IV-A-122 of the Draft AQMP where they note, "The measures described in the plan are described in conceptual terms, and implementing agencies generally are not identified."

Compounding this problem, the Draft AQMP either alters or misstates the language in the CARB Plan and also makes additional assumptions. For instance:

Example #1

What the Draft AQMP says the CARB Plan says

"This plan [the CARB Plan] proposes several control measures including Tier-3 locomotive emission standards which would reduce Tier-2 NOx and PM by 90 percent starting with 2011 locomotives." [Emphasis Added.] Page IV-B-71

What the CARB Plan actually says

"Tier 3 Emission Standards. [3] *US EPA is developing new locomotive emission standards, commonly referred to as Tier 3, modeled after the 2007/2010 highway and Tier 4 off-road diesel engine programs. These standards would likely apply to new locomotives manufactured in 2011 and beyond. This technology, based on high-efficiency catalytic aftertreatment, will be enabled by the use of 15 ppm sulfur diesel fuel in the national locomotive fleet beginning in 2012. The application of exhaust emission control technologies in new locomotives could achieve 90 percent control of both NOx and PM emissions."* [Emphasis Added.] Pages 101-102

As can be read in this plain language of the CARB plan, it does not "propose Tier-3" locomotive standards at all. That is the US EPA's job. Nor does the CARB Plan indicate the adopted standards "would reduce" emissions of "NOx and PM by 90% starting with 2011 locomotives." Later in the

[2] The recently adopted Clean Air Action Plan also erroneously incorporates many of these same assumptions.
[3] While "Tier 3" is generally used by several agencies to refer to the upcoming US EPA rulemaking on locomotive emissions standards, in fact, the railroads believe the rulemaking may incorporate one or more tiers over time at various levels of stringency.

plan, CARB does state "we are relying on the US EPA to adopt the necessary Tier 3 locomotive engine standards to achieve 90% control of diesel PM and NOx," but this statement explicitly acknowledges US EPA's authority to set locomotive emission standards.

Example #2:

What the Draft AQMP says the CARB Plan says

"In addition, all locomotives entering in and out of the twin ports in Southern California region would be equipped with Tier-3 equivalent controls by 2011." Page IV-B-72

The CARB Plan actually says

The CARB Plan does not include this statement or any other similar statements.

Railroad Recommendation

The SCAQMD should revise this measure to: 1) make clear to the reader that any suggestions concerning the stringency or timing of locomotive standards are merely speculative, as they will be driven by the upcoming US EPA rulemaking, and 2) reflect the true CARB Plan it purports to mimic.

3. The locomotive measures in the current Draft AQMP also rely on unfounded assumptions regarding when new standards will go into effect

As noted above, the CARB Plan states CARB has assumed the US EPA will promulgate rules that achieve a 90% control of diesel PM and NOx from uncontrolled levels and that these standards will be effective in 2011. The railroads believe a 90% reduction cannot be achieved by 2011 and presumably the US EPA will not promulgate standards that are not achievable.

The US EPA in its Advanced Notice of Proposed Rulemaking makes statements such as:

- "We are considering emissions standards for new locomotives built as early as 2011, based on the application of advance emissions control technologies." [Emphasis Added.] Federal Register Page 39282
- "The availability of EGR and other engine-based means of achieving some degree of emissions control also introduces the potential for Tier 3 control in multiple phases…" [Emphasis Added.] Federal Register Page 39282

These statements and others in the notice clearly indicate that the US EPA will be considering a range of technologies and timing to provide the most stringent control of locomotive emissions it believes is technologically achievable. However, the CARB Plan and the Draft AQMP fail to inform the reader of this uncertainty and present unknown future requirements as a *fait-accompli*.

Railroad Recommendation

Same as #2 above.

4. The Draft AQMP assumes that key measures will be implemented through a future Memorandum of Understanding (MOU) between the Railroads and CARB. AQMP measures should not be based on potential future voluntary actions that might not occur.

Both the CARB Plan and the Draft AQMP note the innovative 1998 MOU concluded between CARB and the Railroads and approved by the US EPA as a SIP-creditable measure. This fleet average agreement ensures that the average emissions level for the entire locomotive fleet operating in the South Coast Air Quality District in 2010 will be no greater than the US EPA's the most stringent locomotives emissions standards set in 2005. Essentially, the railroads between 2005 and 2010 will have to change-out or scrap a substantial portion of the units serving California to meet the requirements of the 1998 Fleet Average MOU. No other mobile source has implemented such an aggressive and effective agreement anywhere in California.

In fact, the railroads will invest at least $270 million between 2005 and 2010 to bring about air quality improvements in the South Coast Region to meet the requirements of the 1998 Fleet Average MOU and other mandates.

The CARB Plan and the Draft AQMP suggest that perhaps there could be a new voluntary agreement between CARB and the Railroads to accelerate the use of the next generation of locomotives in Southern California. However, until the next set of US EPA locomotive emissions standards is proposed and adopted, it is premature to speculate on the likelihood that efforts to reach such an agreement might be initiated between the CARB, the Railroads, and other interested parties. Accordingly, it is also premature to speculate on what fleet turnover rate might be achieved by what date or what percentage reductions might be available by what date, beyond those achieved by the 1998 MOU.

Railroad Recommendation

Same as #2 above.

5. The Draft AQMP makes claims about the availability and costs of locomotive emissions control technology that are inaccurate and unfounded.

The AQMP contains a discussion in Appendix IV-B on pages IV-B-70 through IV-B-74 concerning "*Further Emissions Reductions from Locomotives.*" There are several claims made in this section that are unsupported. For instance:

- "*Three technologies are currently available for controlling locomotive diesel engines: SCR, DPFs and DOCs.*" Page IV-B-72

- *"It is estimated that the additional cost for SCR and a DPF on new line-haul locomotives would cost about $200,000 to install. The annualized cost for such a unit would be approximately $42,000. This includes a 10 year housing life, a 5 year DPF and SCR element life and $8,000 per year for urea. The estimated cost to equip existing smaller switcher locomotives with diesel oxidation catalyst devices is about $50,000. The estimated cost to equip existing locomotives with a DPF is about $150,000 per locomotive."* Page IV-B-73

Retrofit SCR and DPF have never been demonstrated on line-haul freight applications; therefore, it is impossible to determine the cost effectiveness of these technologies. With regard to switch locomotives, only six low horsepower locomotives in Switzerland have been retrofit with DPF and these require the use of synthetic oil. The railroads are not aware of any independent cost estimates that attempt to establish or validate the range of retrofit costs. Furthermore, DPFs that could be retrofit onto turbocharged switch locomotives have not been developed; therefore, the Railroads do not believe it is possible to estimate installation or operating costs. In summary, for low and high horse power locomotives, the equipment is not yet commercially available, has not been tested for performance, and/or has unknown costs and cost effectiveness.

Over the last 4 years, the Association of American Railroads, Union Pacific, and BNSF Railway, with direction from CARB staff, have overseen the California Emissions Program (CEP) in which Southwest Research Institute (SwRI) in San Antonio, Texas is evaluating retrofit oxidation catalyst and DPF systems on a 2,000HP roots blown (i.e., non-turbo charged), 2-stroke, EMD 16-645E switcher locomotive engine.

Attachment A to these comments contains a summary of current applications of DPF technology to locomotives. While DPF may achieve reductions from older roots blown engines, the feasibility of applying DPF to newer turbo charged engines and to line haul locomotives is unknown.

Railroad Recommendation

Revise this section to include supporting claims with footnotes to the sources of the information or delete the claims.

6. The Draft AQMP fails to accurately and consistently describe the relative contribution of federal sources to the emissions inventory in the District.

In several instances, the Draft AQMP lumps all federal sources together and then provides a single emission level for the combined sources. This prevents the reader from determining the relative contribution of each category and inaccurately implies that all of the federal sources contribute relatively equally and are significant contributors.

For example, Page ES-13 states:

> "*In addition, considering the significant contribution of federal sources such as marine vessels, locomotives and aircraft in the Basin (i.e., 72% of SOx and 34% of NOx), it is imperative that…*"

The tables below illustrate the percent contribution from federal sources as indicated in Attachment A to Appendix 3 of the Draft AQMP.

2023 Federal Source Contribution to Basin Emissions

	% NOx	% SOx	% PM2.5
Aircraft	5.9%	2.9%	1.2%
Locomotives	5.4%	0.03%	0.8%
Ships & Commercial Boats	23.6%	75.5%	9.6%
Total Federal Sources	34.9%	78.4%	11.6%

This is a more accurate way to display the data for the reader. In fact, over the various years studied, the locomotive contribution to the Basin SOx inventory begins at 2.2% in 2005 and lowers to 0.02% in 2030. The locomotive contribution to the Basin NOx inventory ranges from a low of 2.5% in 2010 to 6.5% in 2030, but it appears the 2030 estimate will need to be adjusted to account for the reductions when the US EPA adopts its forthcoming emission standards for locomotives.

The railroads suggest that the District add a relative contribution table that more accurately presents federal source contributions. For instance, using data from Attachment A to Appendix 3 of the Draft AQMP, the 2010 breakdown would look like this:

2010 Federal Source Breakdown

	% NOx	% SOx	% PM2.5
Aircraft	15.9%	4.4%	12.1%
Locomotives	16.1%	0.4%	9.7%
Ships & Commercial Boats	68.0%	95.2%	78.2%
Total Federal Sources	100%	100%	100%

Railroad Recommendation

The Railroads' request that the next draft of the AQMP provide a series of in text tables, similar to those above, which include specific percentages for each of the federal sources over time for NOx, SOx and PM 2.5. See Appendix B of this letter for additional examples of how the Railroads believe the data should be displayed.

7. Backstop measures that affect mobile sources are the province of CARB and should not be a part of the AQMP.

While the railroads believe it is not inappropriate for the AQMP to address mobile sources or backstop measures, it is certainly inappropriate for the AQMP to assert the District has any authority over mobile sources or a backstop measure for mobile sources.

In addition, as the Railroads identified in comments on the San Pedro Ports Clean Air Action Plan (CAAP), the Draft AQMP purports to provide a backstop to the CAAP. However, as set out in the Railroad comments on the CAAP, many of the source specific performance standard proposed goals and control measure in the CAAP are not technologically feasible, and in many instances legally suspect.

8. The double asterisks text in Table 3-7 and Table 3-8 referencing "Trains" (AQMP page 3-23 and page 3-25) is inaccurate and the District does not have authority to implement its 3500 Rules.

The District indicates that it has not yet quantified into the AQMP the alleged emission reductions from AQMD Rules 3501 and 3502. It indicates it intends to perform this quantification in conjunction with CARB and for the SCAQMD staff to submit Rules 3501 and 3502 into the SIP. As to Rule 3501, the District has persistently contended that Rule 3501 –Recordkeeping for Locomotive Idling imposes a mere recordkeeping requirement and is not an underground regulation to require locomotive retrofits. In that context, it is difficult to discern how reporting and recordkeeping of idling events reduces emissions and can be included in a quantification of emission reductions. The requirement that the baseline emissions from the source and the control measure be quantifiable is the first fundamental principle of SIP approvability. For Rule 3502 – Minimization of Emissions from Locomotive Idling, the quantification of emission reductions should not be evaluated outside the context of the adverse impacts of Rule 3502 on emission growth from the disruption of rail operations, loss of train throughput capacity, and the resulting diversion of shipper traffic to trucks with associated emission increases.

A fundamental problem is that Rules 3501 and 3502 are not enforceable. The Railroads believe Rules 3501 and 3502 will be invalidated by the eventual decision in *Association of American Railroads, BNSF Railway Company, and Union Pacific Railroad Company v. South Coast Air Quality Management District; The Governing Board of South Coast Air Quality Management District.* When these Rules are invalidated, the corresponding SIP provisions would be rendered unenforceable as a matter of federal law and would invalidate any corresponding SIP provision.

Technical Concerns

1. Consistent use of the reference to "locomotives" rather than" trains."

There are several instances where we suggest that the word "train" be changed to "locomotive." Locomotives are the emissions source and trains are a combination of locomotives and cars. We have provided an initial list where such changes are needed in Appendix C of this letter.

The California freight railroad industry looks forward to the next draft of the AQMP. Should you have any questions, or need further clarifications, please contact Peter Okurowski any time at 925-339-3500 or at peter@okurowski.com

Sincerely,

Peter Okurowski
On behalf of the California Railroad Industry

cc: Catherine Witherspoon, California Air Resources Board

Appendix A
Summary of Current DPF Technology for Locomotive Applications in the United States and Europe

Overview

Development of Diesel Particulate Filter (DPF) technology for the on-road and mobile non-road sectors has led to logical attempts to adapt that technology to diesel locomotives. Work has begun in both the US and in Europe, particularly Switzerland, to apply DPF technology to both new and existing in-use switching locomotives. To date, DPF's manufactured by Hug Engineering (Hug) are in various stages of adaptation to 4 different locomotive models, including:

1. The California Emissions Program (CEP) is retrofitting Hug filters to two existing 1,500 HP, 2-stroke EMD MP15DC locomotives in 2006;
2. Hug DPF's have been installed by the locomotive OEM on 73 new 2,000HP locomotives operating in Switzerland;
3. The retrofit of six (6) Hug DPF's on existing 1,200HP locomotives in Switzerland; and
4. One (1) Hug DPF has been installed by the locomotive OEM on a demonstration 3,600HP locomotive in Germany.

This appendix looks at the details of these 4 applications and provides information on additional emission reduction technologies that are currently being developed and/or evaluated in the U.S. and Europe.

1. California Emissions Program (CEP)

In 2001, the California Air Resources Board (CARB) and the two Class 1 Freight Railroads operating in California, Union Pacific Railroad (UP) and BNSF Railway (BNSF), entered into a voluntary agreement to invest up to $5M to test the feasibility of applying DPF technology to locomotives. Over the last 4 years, the Association of American Railroads (funded by UP and BNSF), with direction from CARB, has overseen the California Emissions Program (CEP) whereby Southwest Research Institute (SwRI) in San Antonio, Texas has led an effort to evaluate candidate retrofit oxidation catalyst and DPF systems on a 2,000HP roots blown (i.e., non-turbo charged), 2-stroke, EMD 16-645E switcher locomotive engine. This engine size and locomotive type were chosen for the following reasons.

- Essentially all switcher locomotives in the U.S. and Canada use this EMD roots-blown (i.e., non-turbo charged) engine in either a 12-cylinder 1,500HP configuration or a 16-cylinder 2,000HP configuration.
- EPA Tier 0 emission standards are mainly focused on NOx emissions. Retrofitting switch locomotives with DPF could supplement EPA's standards by reducing PM emissions.
- Roots-blown EMD switch engines are some of the oldest engines in the fleet and have some of the highest g/bhp-hr PM emissions.

- Development of retrofit technology for the older set of roots blown engines was not likely to occur by the OEM's since the number of these units in the fleet is small (low return on investment). Therefore, the railroads would likely need to fund development of the technology if this set of locomotives were to be retrofitted.
- It was generally agreed that a retrofit DPF could not be installed on existing turbo-charged locomotives due to carbody space constraints (there simply is no room for the DPF on the locomotive) and there would likely be problems with excessive exhaust back-pressure.
- Development of retrofit DPF technology could provide important supplementary data that could be then used by OEMs for the development of locomotives meeting future EPA emissions standards.
- The OEMs, not the railroads, have historically been responsible for development of new technologies for new locomotives.

Summary of SwRI work to date.

- SwRI has spent more than 2 years screening commercially available cylinder kits (pistons, cylinder liners and piston ring sets) to identify those that offered the lowest lubricating oil consumption. Rebuilding these EMD engines with cylinder kits that use less lubricating oil will result in lower engine-out PM emissions, will reduce the burden on any aftertreatment system, and will reduce the lubricating oil ash loading on the aftertreatment system. Seven different cylinder kit configurations were tested on a 2,000 HP EMD 16-645E engine installed specifically for the CEP at SwRI.
- CEP focused on evaluating oxidation catalyst and DPF systems for locomotives using conventional non-synthetic lubricating oil and low oil-consumption power assemblies (Swiss DPF applications use only synthetic oil).
- SwRI screened more than 14 oxidation catalyst and DPF candidates on the 2-stroke EMD engine. Each of the suppliers' first attempts effectively failed some or all of test criteria. Some of the technologies had catastrophic (destructive) failures, and all of the supplier packages required some subsequent re-testing.
- SwRI tested for engine performance and 500-hour system durability for 3 candidate aftertreatment systems in an engine test cell.
- SwRI performed emissions testing in a test cell and will perform in-use emissions testing as well. (There is no in-use testing in Europe – see footnote 4.)
- The CEP screening tests showed that the Hug DPF technology was the best currently available candidate (same technology used in Switzerland)
- The first 1,500HP switcher, UPY 1378, started working in a yard in Oakland on December 5, 2006 and is retrofitted with Hug DPF. A second similar switcher is scheduled for testing in Los Angeles in the first quarter of 2007. Assuming a successful testing of the first 2 retrofits,

an 2 additional units will retrofitted in 2007. Initial emissions testing on the UPY 1378 using ultra ULSD fuel shows a roughly 80% reduction in particulate matter.

2. DPF Applications for New and Retrofit Locomotives in Switzerland and Europe

Switzerland has embarked on a program to install DPF technologies on its relatively small fleet of diesel-hydraulic freight locomotives. Over 95 percent of the locomotives in Switzerland are electric powered using overhead catenary wires. Unlike the CEP, which is focusing on retrofit of DPF technology, the primary focus in Switzerland was the application of DPF filters for new low horsepower (2,000HP) switcher locomotives. Switzerland also has retrofit 6 existing 1,200HP units with DPF systems in the last year. While new conventional switchers have not been built or purchased in the U.S. for over 20 years,[4] the Swiss railroad system still demands new locomotives of this type.

Swiss rail freight is moved by a company named SBB, which has two divisions – SBB Cargo and SBB Infrastructure. SBB operates a combined fleet of approximately 450 high power (2,500HP-10,000HP) electric road locomotives, 73 low horsepower (2,000HP) new diesel units equipped with Hug DPFs, 40 low horsepower (1,200HP) existing diesel units (6 of which have been retrofit with Hug DPFs) and 40 electric switchers (1,200HP). Thus, of the 603 total locomotives used to move freight in Switzerland, 113 are diesel powered. Of those, 73 new low HP units are fitted with DPFs, while 6 of the 40 existing low HP units have been retrofitted with DPFs.

SBB also operates approximately 200 maintenance-of-way diesel powered non-road vehicles which are capable of running on rail. 50 of these low horsepower (approximately 600HP) diesel maintenance units have been retrofit with DPFs. Over 99% of all train-miles in Switzerland are handled by electric locomotives. Diesel locomotives are used only for secondary yard switching and occasional (tunnel rescue) work.

a. Vossloh 1700 Series Locomotive (Am843 in Switzerland)

Vossloh Locomotive Gmbh (Vossloh) (formerly Krupp Mak Maschinenbau Gmbh) is the major diesel-hydraulic locomotive manufacturer in Europe and produces the MaK1700 series locomotive (in Switzerland, this locomotive is identified as an Am843) that is powered by a Caterpillar 3512 4-stroke diesel engine (1,500kW/2,000HP). In 2004, SBB began to receive 73 new Am843 locomotives and required that all locomotives in this series be equipped with DPFs. The Swiss Caterpillar dealer worked with Vossloh and Hug Engineering to integrate the DPF into the locomotive. No in-use

[4] Mass-manufacture of diesel switching locomotives in the U.S. essentially ended around 1982. The exception has been a small number of Cat-powered switchers for CIT (now leased by UP) around 1999-2000 and the recent construction of hybrids and genset switchers.

exhaust emissions testing was performed[5] or was required; thus it is difficult to assess actual emissions reductions achieved (although the general consensus is that the PM emissions will be quite low as the Hug DPF system was VERT approved). The DPFs increased the acquisition cost per locomotive by approximately CHF 100,000 (~$76,000 US). The same Vossloh units being sold in Switzerland with DPFs are also being sold throughout the rest of Europe without DPFs, largely due to the fact that the Caterpillar engine meets applicable exhaust emission regulations without a DPF.

b. Vossloh Am841 Locomotives

The 1,200HP Am841 locomotive is Vossloh's smaller predecessor to the Am843. The Am841 locomotives are equipped with MTU 396 engines, were built without DPFs, and there are 40 such units currently operating in Switzerland and many more elsewhere in Europe. SBB recently retrofit 6 of their 40 units with Hug Filters, with the first three as prototypes where the DPF was added to the roof of the locomotive, downstream of the existing muffler. For the next three retrofits, the HUG DPF was packaged within the carbody, replacing the mufflers. SBB does not have sufficient funding to pay for more retrofits which have an estimated cost of 100,000 CHF/unit (~$76,000 US).

For both the Am841 and the Am843:

- Only synthetic engine lube oil (low ash) can be used. (This will not be the case for the CEP locomotive.) It is our understanding that only the Swiss use synthetic oil in locomotive applications, which makes their locomotives unique in Europe and in the world.
- Low-sulfur (<300ppm) diesel fuel is used.
- SBB has no DPF maintenance responsibility until the manufacturer's warranty expires. Upon expiration of the warranty, SBB plans to purchase a full service contract with Hug to continue to maintain the DPFs.
- In-service DPF exhaust emissions testing has not been performed and is not planned for either the new Am843 or the retrofitted Am841 locomotives.

c. New Vossloh 2000 Prototype Locomotive

The MaK2000BB is a prototype new high horsepower (3,600HP) locomotive equipped with an MTU 20V-4000 engine that was developed with a Hug DPF integrated into the carbody. Vossloh replaced the muffler with a DPF integrated into the original design. Two burners are used to regenerate the filter. The DPF is offered as an option on this new locomotive in selected European markets. To date, none have been ordered or delivered. There are no emission test results for this engine/DPF package.

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[5] Almost all diesel-powered locomotives in Europe use a hydro-mechanical transmission between the diesel engine and the wheels, a configuration that does not allow for testing. In contrast, North American locomotives are all diesel-electric powered and capable of electrically-loading the diesel engine for "load testing" purposes.

d. Vossloh Euro 4000

The Vossloh Euro 4000 is scheduled for introduction in Europe in 2006. This locomotive is a joint product between EMD and Vossloh. It will utilize a 4,000HP EMD engine and it is targeted for markets in Germany, Holland, Belgium, etc. It will be powered by an EMD 16-710G3C engine (similar to US EMD SD70M and SD70ACe units) to meet the newest European Standards (UIC 2), which are roughly equivalent to current US EPA Tier 2 standards, and as such, it will not be required to be equipped with a DPF.

3. The US Freight Railroad Focus for the Future

The US freight railroads are making significant changes in their approach to the development and implementation of new technology. While DPF is certainly a technology to be explored, there are other exciting opportunities as well. Several are discussed below.

a. Developments For Road Power (≥3,000)

EMD and GE have both indicated that they are investigating DPF technology for new locomotives and utilizing data and findings from the CEP. There is general consensus that there is not enough room in the carbody (engine housing) to accommodate DPF technology as a retrofit application.

In addition, oxidation catalytic converters (oxycats) are now being developed which will also reduce particulate emissions. US EPA, SwRI and UP are currently evaluating an oxycat that is located within the exhaust manifold on a 3,800HP EMD SD60 which is now moving towards the Los Angeles basin for a 1 year test.

b. Developments For Local Power (≤3,000HP)

Unlike in Switzerland and Europe, new locomotives of this size are no longer being ordered or manufactured in the US. There is also general consensus that there is not enough room in the carbody to accommodate DPF technology as a retrofit application.

c. Developments For Switch Power (1,200HP – 2,000HP)

The U.S. focus for this class of locomotive has changed significantly, and new conventional switcher locomotives are not being ordered or manufactured. The development of new technology hybrids and genset switchers, which both utilize Tier 3 non-road low-emission truck-derivative diesel engines, appears to be a better investment than the conventional switcher design. It is expected that this will lead to significant emission reductions and CARB has designated them as ULELs. Both UP and BNSF have made a significant commitment to these new genset and hybrid switcher locomotives, with 108 planned for Texas and 75 planned for California.

Regarding retrofit of existing switcher locomotives, as noted above, the CEP will test up to 4 Hug DPF retrofits in 2006-07 on 1,500HP EMD MP15 locomotives on both BNSF and UP.

4. Summary

The DPF technologies being utilized and tested in Europe are the same as those being studied and implemented in the United States. Furthermore, new technologies such as hybrids and genset switchers, which are not being utilized in Europe, are currently being developed and implemented in the US. In total, the US Freight Railroads are purchasing more of the cleaner genset and hybrid switch locomotives when compared to the low horsepower DPF locomotives in Europe. The US Railroads believe that the European DPF switchers probably cannot reduce emissions lower than gensets or hybrids switch locomotives.

For new high horsepower locomotives, there is only one (1) prototype new locomotive with DPF in Europe. However, it does not appear that this prototype will be produced as the largest European manufacturer is now partnering with EMD to use a US Tier 2 type engine without DPF.

For existing high-horsepower locomotives, DPF retrofits are not being investigated in Europe or the US as there is general agreement that there is not sufficient space on the locomotive. In the U.S., an oxycat retrofit is being tested on a 3,800HP road locomotive in Los Angeles starting mid-December 2006. No such tests are planned in Europe to our knowledge.

For existing low-horsepower locomotives, DPF's have been retrofitted on 6 locomotives in Switzerland, and will be retrofit on up to 4 in the U.S. in 2007.

The US freight railroads are continuously looking to develop or partner in the development of technologies for reducing locomotive emissions as demonstrated by testing and development of gensets and hybrids – both of which are designated ULELs. They are also closely following the advancements occurring throughout the world and analyzing whether technologies developed abroad can be applied to US operations.

Appendix B
Clearer Information on the Federal Sources Category

2005 Federal Source Contribution to Basin Emissions

	% NOx	% SOx	% PM2.5
Aircraft	1.5%	2.5%	0.8%
Locomotives	3.1%	2.2%	0.8%
Ships & Commercial Boats	7.1%	50.6%	5.1%
Total Federal Sources	11.7%	55.2%	6.7%

2010 Federal Source Contribution to Basin Emissions

	% NOx	% SOx	% PM2.5
Aircraft	2.4%	2.8%	1.0%
Locomotives	2.5%	0.2%	0.8%
Ships & Commercial Boats	10.5%	60.4%	6.3%
Total Federal Sources	15.4%	63.4%	8.0%

2014 Federal Source Contribution to Basin Emissions

	% NOx	% SOx	% PM2.5
Aircraft	3.4%	3.1%	1.0%
Locomotives	3.4%	0.03%	0.8%
Ships & Commercial Boats	13.4%	68.3%	7.0%
Total Federal Sources	20.2%	71.4%	8.9%

2020 Federal Source Contribution to Basin Emissions

	% NOx	% SOx	% PM2.5
Aircraft	5.1%	3.0%	1.1%
Locomotives	4.8%	0.02%	0.8%
Ships & Commercial Boats	20.0%	73.1%	8.6%
Total Federal Sources	29.9%	76.1%	10.6%

2023 Federal Source Contribution to Basin Emissions

	% NOx	% SOx	% PM2.5
Aircraft	5.9%	2.9%	1.2%
Locomotives	5.4%	0.03%	0.8%
Ships & Commercial Boats	23.6%	75.5%	9.6%
Total Federal Sources	34.9%	78.4%	11.6%

2030 Federal Source Contribution to Basin Emissions

	% NOx	% SOx	% PM2.5
Aircraft	7.2%	2.7%	1.2%
Locomotives	6.5%	0.02%	0.8%
Ships & Commercial Boats	21.0%	80.2%	12.6%
Total Federal Sources	44.7%	83.0%	14.7%

2010 Federal Source Breakdown

	% NOx	% SOx	% PM2.5
Aircraft	15.9%	4.4%	12.1%
Locomotives	16.1%	0.4%	9.7%
Ships & Commercial Boats	68.0%	95.2%	78.2%
Total Federal Sources	100%	100%	100%

Appendix C
Changing "train" to "locomotive" in AQMP Text

We suggest changing the word train(s) to locomotive(s) on the following pages.

Page ES-6: Figure ES-3 – Change "trains" to "locomotives."

Page ES-7: Figure ES-5

Page ES-7: First paragraph under Figure ES-5

Page 1-1: First sentence of third paragraph

Page 3-3: Last full paragraph

Page 3-4: First full paragraph

Page 3-8: Third paragraph, last sentence

Page 3-23: On this page, both Table 3-7 and the NOx Annual average chart below Table 3-7

Page 3-24: Both NOx charts

Page 3-25: Table 3-8

Page 3-26: The First SOx Annual Average figure

Page 4-2: Second full paragraph

Page 4-22: First Paragraph under "District's Mobile Source Control Measures"

Page 4-23: First full paragraph

Page 4-29: First full paragraph

Page 7-1: Second paragraph under "Responsible Agencies"

Page 7-2: Table 7-1 (2 locations)