Appendices

Appendix FEIR-1

Draft EIR Comment Letters

Polonia Majas <polonia.majas@lacity.org>

SCH # 2019050010-8th, Grand and Hope

1 message

Lin, Alan S@DOT <alan.lin@dot.ca.gov> Mon, Jan 3, 2022 at 11:07 AM
To: OPR State Clearinghouse <State.Clearinghouse@opr.ca.gov>
Cc: Polonia Majas <polonia.majas@lacity.org>

Happy New Year!

Attached please find Caltrans comment letter.

Alan Lin, P.E.

Transportation Engineer, Civil

IGR, Division of Planning

State of California

Department of Transportation

Mail Station 16

100 South Main Street

Los Angeles, CA 90012

213-269-1124 Mobile

LA-2019-03770-8th Grand and Hope-DEIR.pdf
178K

DEPARTMENT OF TRANSPORTATION
DISTRICT 7
100 S. MAIN STREET, MS 16
LOS ANGELES, CA 90012
PHONE (213) 269-1124
FAX (213) 897-1337
TTY 711
www.dot.ca.gov

Making Conservation
a California Way of Life

January 3, 2022

Polonia Majas
City of Los Angeles, Department of City Planning
221 N. Figueroa Street Suite 1350
Los Angeles, CA 90012

RE: 8th, Grand and Hope
SCH # 2019050010
Vic. LA-110/PM 22.45, LA-10/PM 15.3,
LA-101/PM 1.32
GTS # LA-2019-03770-DEIR

Dear Polonia Majas:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced environmental document. The Project proposes to construct a 50-story mixed-use development comprised of 580 residential units and up to 7,499 square feet of ground floor commercial/retail/restaurant space on a 34,679-square-foot site. The Project would provide 636 vehicle parking spaces within three subterranean levels and eight above-grade levels and four vehicle parking spaces on the ground floor. To accommodate the Project, an existing surface parking lot and four-story parking structure would be demolished. Upon completion, the total building floor area would be 554,927 square feet with a maximum height of 592 feet and a Floor Area Ratio (FAR) of approximately 9.25:1.

The mission of Caltrans is to provide a safe and reliable transportation network that serves all people and respects the environment. Senate Bill 743 (2013) has codified into CEQA law and mandated that CEQA review of transportation impacts of proposed development be modified by using Vehicle Miles Traveled (VMT) as the primary metric in identifying transportation impacts for all future development projects. You may reference the Governor's Office of Planning and Research (OPR) for more information:

http://opr.ca.gov/ceqa/updates/guidelines/

As a reminder, VMT is the standard transportation analysis metric in CEQA for land use projects after July 1, 2020, which is the statewide implementation date.

Caltrans is aware of challenges that the region faces in identifying viable solutions to alleviating congestion on State and Local facilities. With limited room to expand vehicular capacity, all future developments should incorporate multi-modal and complete streets transportation elements that will actively promote alternatives to car use and better manage existing parking assets. Prioritizing and allocating space to efficient modes of travel such as bicycling and public transit can allow streets to transport more people in a fixed amount of right-of-way.

Caltrans supports the implementation of complete streets and pedestrian safety measures such as road diets and other traffic calming measures. Please note the Federal Highway Administration (FHWA) recognizes the road diet treatment as a proven safety countermeasure, and the cost of a road diet can be significantly reduced if implemented in tandem with routine street resurfacing. Overall, the environmental report should ensure all modes are served well by planning and development activities. This includes reducing single occupancy vehicle trips, ensuring safety, reducing vehicle miles traveled, supporting accessibility, and reducing greenhouse gas emissions.

For City's reference, we encourage the Lead Agency to evaluate the potential of Transportation Demand Management (TDM) strategies and Intelligent Transportation System (ITS) applications in order to better manage the transportation network, as well as transit service and bicycle or pedestrian connectivity improvements. For additional TDM options, please refer to the Federal Highway Administration's *Integrating Demand Management into the Transportation Planning Process: A Desk Reference* (Chapter 8). This reference is available online at:

http://www.ops.fhwa.dot.gov/publications/fhwahop12035/fhwahop12035.pdf

You can also refer to the 2010 *Quantifying Greenhouse Gas Mitigation Measures* report by the California Air Pollution Control Officers Association (CAPCOA), which is available online at:

http://www.capcoa.org/wp-content/uploads/2010/11/CAPCOA-Quantification-Report-9-14-Final.pdf

Also, Caltrans has published the VMT-focused Transportation Impact Study Guide (TISG), dated May 20, 2020 and the Caltrans Interim Land Development and Intergovernmental Review (LD-IGR) Safety Review Practitioners Guidance, prepared in On December 18, 2020. You can review these resources at the following links:

https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/sb-743/2020-05-20-approved-vmt-focused-tisg-a11y.pdf

https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/sb-743/2020-12-22-updated-interim-ldigr-safety-review-guidance-a11y.pdf

Caltrans encourages lead agencies to prepare traffic safety impact analysis for all future developments in the California Environmental Quality Act (CEQA) review process so that, through partnerships and collaboration, California can reach zero fatalities and serious injuries by 2050.

The Project Site is located in an area well-served by a variety of public transit options. The Project Site is transit accessible and is close to many bus transit-lines, rail lines, and local shuttle service. The Project Site is located approximately two blocks away from the Los Angeles County Metropolitan transportation Authority's (Metro's) 7th/Metro Center Metro Rail station. As a result, the Project is a pedestrian- and transit-oriented development, it would encourage ridesharing and the use of alternative mobility modes.

In addition, the Project Site located in an area with well-developed pedestrian facilities, including sidewalks on all streets and crosswalks at all intersections. There are signalized pedestrian crossings at the four closest intersections to the Project Site. Also, 8th Street has been identified in the High Injury Network. Therefore, the Project would support modifications to provide a safe and comfortable walking environment. The implementations are as follow:

- Streetscape amenities provided by the Project would include a row of street trees along 8th Street, Hope Street, and Grand Avenue as well as pedestrian-scale lighting fixtures and other streetscape elements such as public art, street furniture, infrastructure, and signage elements.
- An on-site porte-cochere located in the center of the site for pick-up and drop-off for visitors, taxis, and rideshare vehicles.
- The Project would comply with the LAMC and would provide 26 short-term and 224 long-term bicycle parking spaces.
- The Project proposes to install tactile warning strips on the street corners immediately adjacent to the site (northwest corner of Grand Avenue & 8th Street) and the northeast corner of Hope Street & 8th Street.

CEQA Analysis of Transportation Impacts (refer to Chapter 2 of Appendix G) identified that the Project would generate 1500 daily trips which is more than 250 new increased daily trips for threshold. As a result, a VMT analysis is required and it calculated that the Project's Household VMT per Capita would be 3.4 compared to the threshold of 6.0, and its Work VMT per Capita would be 0.0 compared to the threshold of 7.6. Therefore, it is concluded that the Project would not cause significant VMT impacts for both Household VMT and Work VMT.

As required by LADOT's Interim Guidance for Freeway Safety Analysis, if a development project adds 25 or more trips to any freeway off-ramp in either the morning or afternoon peak hour, then that ramp should be studied for potential queueing impacts following the identified steps in the guidelines. If the project is not expected to generate more than 25 or more peak-hour trips at any freeway off-ramps, then a freeway ramp analysis is not required. As shown Table 2.5 on page 62 of the 8th Grand & Hope Project Transportation Assessment revised in December 2020 by The Mobility Group, the Project would add fewer than 25 trips to the I-110, I-10, and US-101 freeway off-ramps in both the morning and afternoon peak hours. Therefore, further analysis is not required.

Transportation of heavy construction equipment and/or materials, which requires the use of oversized-transport vehicles on State highways, will require a transportation permit from Caltrans. It is recommended that large size truck trips be limited to off-peak commute periods.

If you have any questions, please feel free to contact Mr. Alan Lin the project coordinator at (213) 269-1124 and refer to GTS # LA-2019-03770-DEIR.

Sincerely,

MIYA EDMONSON
IGR/CEQA Branch Chief

Miya Edmonson

email: State Clearinghouse

Polonia Majas <polonia.majas@lacity.org>

8th Grand & Hope project - Metro DEIR comments

1 message

Ling, Shine <LingS@metro.net> Wed, Jan 5, 2022 at 9:12 AM
To: "polonia.majas@lacity.org" <polonia.majas@lacity.org>
Cc: "smorkun@msamerica.com" <smorkun@msamerica.com>, DevReview <DevReview@metro.net>

Polonia,

Please find Metro's comment letter on the DEIR for the 8th Grand & Hope Project, attached.

Best,

Shine

Shine Ling, AICP
LA Metro

Manager, Development Review Team
Transit Oriented Communities
213.547.4326 (NEW)
lings@metro.net

metro.net/devreview | facebook.com/losangelesmetro | @metrolosangeles
Metro's mission is to provide world-class transportation for all.

220105_754 Hope St_MTA.pdf
158K

Los Angeles County
Metropolitan Transportation Authority

One Gateway Plaza
Los Angeles, CA 90012-2952

213.922.2000 Tel
metro.net

Metro

January 5, 2022

Polonia Majas
Department of City Planning
City of Los Angeles
221 North Figueroa Street, Suite 1350
Los Angeles, CA 90012
Sent by Email: polonia.majas@lacity.org

RE: 8th, Grand and Hope Project– Draft Environmental Impact Report
754 S. Hope Street; 609 and 625 W. 8th Street
Case No. ENV-2017-506-EIR

Dear Ms. Majas:

Thank you for coordinating with the Los Angeles County Metropolitan Transportation Authority (Metro) regarding the proposed 8th, Grand and Hope (Project) located at 754 Hope Street and 609 and 625 West 8th Street in the City of Los Angeles (City). Metro is committed to working with local municipalities, developers, and other stakeholders across Los Angeles County on transit-supportive developments to grow ridership, reduce driving, and promote walkable neighborhoods. Transit Oriented Communities (TOCs) are places (such as corridors or neighborhoods) that, by their design, allow people to drive less and access transit more. TOCs maximize equitable access to a multi-modal transit network as a key organizing principle of land use planning and holistic community development.

Per Metro's area of statutory responsibility pursuant to sections 15082(b) and 15086(a) of the Guidelines for Implementation of the California Environmental Quality Act (CEQA: Cal. Code of Regulations, Title 14, Ch. 3), the purpose of this letter is to provide the City with specific detail on the scope and content of environmental information that should be included in the Environmental Impact Report (EIR) for the Project. In particular, this letter outlines topics regarding the Project's potential impacts on the Metro West Santa Ana Branch (WSAB) and Metro bus facilities and services which should be analyzed in the EIR, and provides recommendations for mitigation measures as appropriate. Effects of a project on transit systems and infrastructure are within the scope of transportation impacts to be evaluated under CEQA.[1]

In addition to the specific comments outlined below, Metro is providing the City and Mitsui Fudosan America (Applicant) with the Metro Adjacent Development Handbook (attached), which provides an

overview of common concerns for development adjacent to Metro right-of-way (ROW) and transit facilities, available at https://www.metro.net/devreview.

Project Description

The Project includes construction of a 50-story mixed-use development comprised of 580 residential units and up to 7,499 square feet of ground floor commercial/retail/restaurant space on a 34,679-square-foot site. The Project would provide 636 vehicle parking spaces within three subterranean levels and eight above-grade levels and four vehicle parking spaces on the ground floor.

Recommendations for EIR Scope and Content

Metro West Santa Ana Branch Transit Corridor Project Adjacency

The West Santa Ana Branch Transit Corridor (WSAB) project is a 19-mile corridor that Metro is evaluating for a new light rail transit (LRT) line that would connect southeast LA County to downtown Los Angeles. This new LRT line would traverse through or be immediately adjacent to the cities and communities of Artesia, Cerritos, Bellflower, Paramount, Downey, South Gate, Cudahy, Bell, Huntington Park, Vernon, unincorporated Florence- Firestone and LA (downtown).

Metro released a Draft Environmental Impact Statement/Environmental Impact Report (Draft EIS/EIR) for the WSAB project in July 2021. A project terminus and Locally Preferred Alternative (LPA) will be considered during Metro's Planning and Programming Committee meeting on January 19, 2022, and a final decision is expected during Metro's Board of Directors meeting on January 27, 2022.

Additional information on the WSAB project and the Draft EIS/EIR can be found on the WSAB Project webpage at https://www.metro.net/wsab.

Bus Stop Adjacency

1. Service: Metro Bus Line 66 operates on West 8th Street, adjacent to the Project. One Metro Bus stop is directly adjacent to the Project site at West 8th Street and South Grand Avenue. In December 2021, Metro completed implementation of the NextGen Bus Plan, a major update to the bus service network and stop locations. The DEIR's discussion of existing transit service should be updated as appropriate. Additional information may be found at https://www.metro.net/about/plans/nextgen-bus-plan/ and https://mybus.metro.net/. Other transit operators such as LADOT, Santa Monica Big Blue Bus, and Santa Clarita Transit may provide service in the vicinity of the Project and should be consulted.

2. Impact Analysis: The EIR should analyze potential effects on Metro Bus service and identify mitigation measures as appropriate. Potential impacts may include impacts to transportation services, stops, and temporary or permanent bus service rerouting. Specific types of impacts and recommended mitigation measures to address them include, without limitation, the following:

a. Bus Stop Condition: The EIR should identify all bus stops on all streets adjacent to the Project site. During construction, the Applicant may either maintain the stop in its current condition and location, or temporarily relocate the stop consistent with the needs of Metro Bus operations. Temporary or permanent modifications to any bus stop as part of the Project, including any surrounding sidewalk area, must be Americans with Disabilities Act (ADA)-compliant and allow passengers with disabilities a clear path of travel between the bus stop and the Project. Once the Project is completed, the Applicant must ensure any existing Metro bus stop affected by the Project is returned to its pre-Project location and condition, unless otherwise directed by Metro.

b. Driveways: Driveways accessing parking and loading at the Project site should be located away from transit stops, and be designed and configured to avoid potential conflicts with on-street transit services and pedestrian traffic to the greatest degree possible. Vehicular driveways should not be located in or directly adjacent to areas that are likely to be used as waiting areas for transit.

c. Bus Stop Enhancements: Metro encourages the installation of enhancements and other amenities that improve safety and comfort for transit riders. These include benches, bus shelters, wayfinding signage, enhanced crosswalks and ADA-compliant ramps, pedestrian lighting, and shade trees in paths of travel to bus stops. The City should consider requesting the installation of such amenities as part of the Project.

d. Bus Operations Coordination: The Applicant shall coordinate with Metro Bus Operations Control Special Events Coordinator at 213-922-4632 and Metro's Stops and Zones Department at 213-922-5190 not later than 30 days before the start of Project construction. Other municipal bus services may also be impacted and shall be included in construction outreach efforts.

Transit Supportive Planning: Recommendations and Resources

Considering the Project's proximity to the 7th Street/Metro Center Station, Metro would like to identify the potential synergies associated with transit-oriented development:

1. Transit Supportive Planning Toolkit: Metro strongly recommends that the Applicant review the Transit Supportive Planning Toolkit which identifies 10 elements of transit-supportive places and, applied collectively, has been shown to reduce vehicle miles traveled by establishing community-scaled density, diverse land use mix, combination of affordable housing, and infrastructure projects for pedestrians, bicyclists, and people of all ages and abilities. This resource is available at https://www.metro.net/about/funding-resources/.

2. Land Use: Metro supports development of commercial and residential properties near transit stations and understands that increasing development near stations represents a mutually

beneficial opportunity to increase ridership and enhance transportation options for the users of developments. Metro encourages the City and Applicant to be mindful of the Project's proximity to the 7th Street/Metro Center Station, including orienting pedestrian pathways towards the station.

3. Transit Connections and Access: Metro strongly encourages the Applicant to install Project features that help facilitate safe and convenient connections for pedestrians, people riding bicycles, and transit users to/from the Project site and nearby destinations. The City should consider requiring the installation of such features as part of the conditions of approval for the Project, including:
    a. Walkability: The provision of wide sidewalks, pedestrian lighting, a continuous canopy of shade trees, enhanced crosswalks with ADA-compliant curb ramps, and other amenities along all public street frontages of the development site to improve pedestrian safety and comfort to access the nearby bus stop and 7th Street/Metro Center Station.
    b. Transfer Activity: Given the Project's proximity to the Metro bus stop and rail station, the Project design should consider and accommodate transfer activity between bus and (bus or rail) lines that wil l occur along the sidewalks and public spaces. Metro has completed the Metro Transfers Design Guide, a best practices document on transit improvements. This can be accessed online at https://www.metro.net/about/station-design-projects/.
    c. Bicycle Use and Micromobility Devices: The provision of adequate short-term bicycle parking, such as ground-level bicycle racks, and secure, access-controlled, enclosed long-term bicycle parking for residents, employees, and guests. Bicycle parking facilities should be designed with best practices in mind, including highly visible siting, effective surveillance, ease to locate, and equipment installation with preferred spacing dimensions, so bicycle parking can be safely and conveniently accessed. Similar provisions for micro-mobility devices are also encouraged.
    d. First & Last Mile Access: The Project should address first-last mile connections to transit and is encouraged to support these connections with wayfinding signage inclusive of all modes of transportation. For reference, please review the First Last Mile Strategic Plan, authored by Metro and the Southern California Association of Governments (SCAG), available on-line at: http://media.metro.net/docs/sustainability_path_design_guidelines.pdf.

4. Parking: Metro encourages the incorporation of transit-oriented, pedestrian-oriented parking provision strategies such as the reduction or removal of minimum parking requirements and the exploration of shared parking opportunities. These strategies could be pursued to reduce automobile-orientation in design and travel demand.

5. Wayfinding: Any temporary or permanent wayfinding signage with content referencing Metro services or featuring the Metro brand and/or associated graphics (such as Metro Bus or Rail

pictograms) requires review and approval by Metro Signage and Environmental Graphic Design.

6. Transit Pass Programs: Metro would like to inform the Applicant of Metro's employer transit pass programs, including the Annual Transit Access Pass (A-TAP), the Employer Pass Program (E-Pass), and Small Employer Pass (SEP) Program. These programs offer efficiencies and group rates that businesses can offer employees as an incentive to utilize public transit. The A-TAP can also be used for residential projects. For more information on these programs, please visit the programs' website at https://www.metro.net/riding/eapp/.

If you have any questions regarding this letter, please contact me by phone at 213.547.4326, by email at DevReview@metro.net, or by mail at the following address:

Metro Development Review
One Gateway Plaza MS 99-22-1
Los Angeles, CA 90012-2952

Sincerely,

Shine Ling, AICP
Manager, Development Review Team
Transit Oriented Communities

Cc: Mitsui Fudosan America Inc., smorkun@msamerica.com

Attachments and links:

- Adjacent Development Handbook: https://www.metro.net/devreview

Polonia Majas <polonia.majas@lacity.org>

Re: Public Comments Not Uploaded Fwd: Request for Immediate Access to Documents Referenced in the Draft Environmental Impact Report – 8th, Grand and Hope Project (SCH No. 2019050010, Environmental Case No. ENV-2017-506-EIR)

1 message

Armando Bencomo <clerk.plumcommittee@lacity.org> Thu, Dec 2, 2021 at 8:12 AM
To: apember@adamsbroadwell.com
Cc: ssannadan@adamsbroadwell.com, Polonia Majas <polonia.majas@lacity.org>, Beatrice Pacheco <beatrice.pacheco@lacity.org>, CityClerk@lacity.org

Good Morning,

Your request for access to the referenced documents has been received. Please be advised that the Planning Case for SCH No. 2019050010, Environmental Case No. ENV-2017-506-EIR, has not been transmitted to the Office of the City Clerk; therefore, the requested documents are not within the possession of the Office of the City Clerk. Any documents to be transmitted to the Office of the City Clerk for the referenced Planning Case will be made available in the respective Council file through the Council File Management System (CFMS).

CFMS Webpage: https://cityclerk.lacity.org/lacityclerkconnect/

On Tue, Nov 30, 2021 at 1:31 PM Office of the City Clerk <cityclerk@lacity.org> wrote:

---------- Forwarded message ---------
From: **Alisha C. Pember** <apember@adamsbroadwell.com>
Date: Tue, Nov 30, 2021 at 1:20 PM
Subject: Request for Immediate Access to Documents Referenced in the Draft Environmental Impact Report – 8th, Grand and Hope Project (SCH No. 2019050010, Environmental Case No. ENV-2017-506-EIR)
To: vince.bertoni@lacity.org <vince.bertoni@lacity.org>, CityClerk@lacity.org <CityClerk@lacity.org>, polonia.majas@lacity.org <polonia.majas@lacity.org>
Cc: beatrice.pacheco@lacity.org <beatrice.pacheco@lacity.org>, Sheila M. Sannadan <ssannadan@adamsbroadwell.com>

Good afternoon,

Please see the attached correspondence.

If you have any questions, please contact Sheila Sannadan.

Thank you.

Alisha Pember

Alisha C. Pember
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080
(650) 589-1660 voice, Ext. 24
apember@adamsbroadwell.com

Polonia Majas <polonia.majas@lacity.org>

Comments on the Draft Environmental Impact Report for the 8th, Grand and Hope Project (SCH No. 2019050010, Environmental Case No. ENV-2017-506-EIR)

1 message

Alisha C. Pember <apember@adamsbroadwell.com> Wed, Jan 5, 2022 at 3:27 PM
To: Polonia Majas <polonia.majas@lacity.org>, "vince.bertoni@lacity.org" <vince.bertoni@lacity.org>
Cc: Christina Caro <ccaro@adamsbroadwell.com>, "Darien K. Key" <dkey@adamsbroadwell.com>

Good afternoon,

Please find attached **Comments on the Draft Environmental Impact Report for the 8th, Grand and Hope Project (SCH No. 2019050010, Environmental Case No. ENV-2017-506-EIR)** and **Attachments A-B**.

We are also providing a Dropbox link containing supporting references: https://www.dropbox.com/sh/c18dsopj8bx9u2b/AACO5PbjtjtBj4-Hl-My4MPBa?dl=0.

A hard copy of our Comments and Attachments A-B will be sent out today via overnight delivery.

If you have any questions, please contact Darien Key.

Thank you.

Alisha Pember

Alisha C. Pember
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080
(650) 589-1660 voice, Ext. 24
apember@adamsbroadwell.com

L5887-004acp - 8th St. DEIR Comments and Attachments A-B.pdf
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ADAMS BROADWELL JOSEPH & CARDOZO
A PROFESSIONAL CORPORATION
ATTORNEYS AT LAW
601 GATEWAY BOULEVARD, SUITE 1000
SOUTH SAN FRANCISCO, CA 94080-7037
TEL: (650) 589-1660
FAX: (650) 589-5062
dkey@adamsbroadwell.com

SACRAMENTO OFFICE
520 CAPITOL MALL, SUITE 350
SACRAMENTO, CA 95814-4721
TEL: (916) 444-6201
FAX: (916) 444-6209

KEVIN T. CARMICHAEL
CHRISTINA M. CARO
JAVIER J. CASTRO
THOMAS A. ENSLOW
KELILAH D. FEDERMAN
ANDREW J. GRAF
TANYA A. GULESSERIAN
KENDRA D. HARTMANN*
DARIEN K. KEY
RACHAEL E. KOSS
AIDAN P. MARSHALL
TARA C. RENGIFO

Of Counsel
MARC D. JOSEPH
DANIEL L. CARDOZO

*Not admitted in California.
Licensed in Colorado.*

January 5, 2021

VIA EMAIL AND OVERNIGHT MAIL
Polonia Majas, Planner
Vince Bertoni, Director of Planning
City of Los Angeles
Department of City Planning
221 N. Figueroa St., Suite 1350
Los Angeles, CA. 90012
Email: polonia.majas@lacity.org;
vince.bertoni@lacity.org

Re: Comments on the Draft Environmental Impact Report for the 8th, Grand and Hope Project (SCH No. 2019050010, Environmental Case No. ENV-2017-506-EIR)

Dear Ms. Majas:

On behalf of Coalition for Responsible Equitable Economic Development Los Angeles ("CREED LA"), we submit these comments on the Draft Environmental Impact Report ("DEIR") for the 8th, Grand and Hope Project (SCH No. 2019050010, Environmental Case No. ENV-2017-506-EIR) ("Project"), proposed by Mitsui Fudosan America ("Applicant"), and prepared pursuant to the California Environmental Quality Act ("CEQA")[1] by the City of Los Angeles ("the City").

The Project proposes to construct a 50-story mixed-use development comprised of 580 residential units and up to 7,499 square feet of ground floor commercial/retail/restaurant space on a 34,679-square-foot site. The Project would be located at 754 S. Hope Street and 609 and 625 W. 8th Street in the City of Los Angeles, California (Assessor's Parcel Numbers 5144-011-009 and 5144-011-016).

Our review of the DEIR demonstrates that the DEIR fails to comply with CEQA. As explained more fully below, the DEIR fails to accurately disclose the

[1] Public Resources Code § 21000 *et seq.*; 14 Cal. Code Regs. ("C.C.R.") §§ 15000 *et seq.*

extent of the Project's potentially significant impacts on air quality, public health, noise, and greenhouse gas ("GHG") emissions. The DEIR fails to support its significance findings with substantial evidence, and fails to mitigate the Project's significant impacts to the greatest extent feasible, in violation of CEQA. As a result of these deficiencies, the City also cannot make the requisite findings to approve the Project under the City's municipal codes or to adopt a statement of overriding considerations pursuant to CEQA.[2]

These comments were prepared with the assistance of environmental health, air quality, and GHG expert Dr. James Clark, Ph.D., and noise expert Derek Watry of Wilson Ihrig. Comments and curriculum vitae of Mr. Clark are attached to this letter as Attachment A.[3] Mr. Watry's comments and curriculum vitae are included as Attachment B.[4] Attachments A and B are fully incorporated herein and submitted to the City herewith. Therefore, the City must separately respond to the technical comments in Attachments A and B.

For the reasons discussed herein, and in the attached expert comments, CREED LA urges the City to remedy the deficiencies in the DEIR by preparing a legally adequate revised DEIR and recirculating it for public review and comment.[5]

I. STATEMENT OF INTEREST

CREED LA is an unincorporated association of individuals and labor organizations formed to ensure that the construction of major urban projects in the Los Angeles region proceeds in a manner that minimizes public and worker health and safety risks, avoids or mitigates environmental and public service impacts, and fosters long-term sustainable construction and development opportunities. The association includes the Sheet Metal Workers Local 105, International Brotherhood of Electrical Workers Local 11, Southern California

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[2] Pub. Res. Code § 21081; *Covington v. Great Basin Unified Air Pollution Control Dist.* (2019) 43 Cal.App.5th 867, 883.

[3] **Attachment A:** Comments on 8th, Grand and Hope Project (SCH No. 2019050010, Environmental Case No. ENV-2017-506-EIR) (Jan. 5, 2022) ("Clark Comments").

[4] **Attachment B:** 8th, Grand and Hope Project (SCH No. 2019050010, Environmental Case No. ENV-2017-506-EIR) (Jan. 5, 2022), Comments on Noise Section by Wilson Ihrig ("Watry Comments").

[5] We reserve the right to supplement these comments at later hearings on this Project. Gov. Code § 65009(b); Public Resources Code § 21177(a); *Bakersfield Citizens for Local Control v. Bakersfield* (2004) 124 Cal.App.4th 1184, 1199–1203; *see Galante Vineyards v. Monterey Water Dist.* (1997) 60 Cal.App.4th 1109, 1121.

Pipe Trades District Council 16, and District Council of Iron Workers of the State of California, along with their members, their families, and other individuals who live and work in the Los Angeles region.

Individual members of CREED LA include John Ferruccio, Gery Kennon, and Chris S. Macias. These individuals live in the City of Los Angeles, and work, recreate, and raise their families in the City and surrounding communities. Accordingly, they would be directly affected by the Project's environmental and health, and safety impacts. Individual members may also work on the Project itself. They will be first in line to be exposed to any health and safety hazards that exist on site.

CREED LA has an interest in enforcing environmental laws that encourage sustainable development and ensure a safe working environment for its members. Environmentally detrimental projects can jeopardize future jobs by making it more difficult and more expensive for business and industry to expand in the region, and by making the area less desirable for new businesses and new residents. Continued environmental degradation can, and has, caused construction moratoriums and other restrictions on growth that, in turn, reduce future employment opportunities.

CREED LA supports the development of commercial, mixed use, and medical office projects where properly analyzed and carefully planned to minimize impacts on public health, climate change, and the environment. These projects should avoid adverse impacts to air quality, public health, climate change, noise, and traffic, and must incorporate all feasible mitigation to ensure that any remaining adverse impacts are reduced to the maximum extent feasible. Only by maintaining the highest standards can commercial development truly be sustainable.

II. LEGAL BACKGROUND

CEQA requires public agencies to analyze the potential environmental impacts of their proposed actions in an EIR.[6] The EIR is a critical informational document, the "heart of CEQA."[7] "The foremost principle under CEQA is that the Legislature intended the act to be interpreted in such manner as to afford the

[6] Public Resources Code § 21100.
[7] *Friends of College of San Mateo Gardens v. San Mateo County Community College Dist.* (2016) 1 Cal.5th 937, 944 (citation omitted).

fullest possible protection to the environment within the reasonable scope of the statutory language."[8]

CEQA has two primary purposes. First, CEQA is designed to inform decision makers and the public about the potential, significant environmental effects of a project.[9] "Its purpose is to inform the public and its responsible officials of the environmental consequences of their decisions before they are made. Thus, the EIR 'protects not only the environment but also informed self-government.'"[10] The EIR has been described as "an environmental 'alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes before they have reached ecological points of no return."[11] As the CEQA Guidelines explain, "[t]he EIR serves not only to protect the environment but also to demonstrate to the public that it is being protected."[12]

Second, CEQA requires public agencies to avoid or reduce environmental damage when "feasible" by requiring consideration of environmentally superior alternatives and adoption of all feasible mitigation measures.[13] The EIR serves to provide agencies and the public with information about the environmental impacts of a proposed project and to "identify ways that environmental damage can be avoided or significantly reduced."[14] If the project will have a significant effect on the environment, the agency may approve the project only if it finds that it has "eliminated or substantially lessened all significant effects on the environment" to

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[8] *Laurel Heights Improvement Assn. v. Regents of University of California* (1988) 47 Cal.3d 376, 390 (internal quotations omitted).
[9] Public Resources Code § 21061; 14 C.C.R. §§ 15002(a)(1); 15003(b)–(e); *Sierra Club v. County of Fresno* (2018) 6 Cal.5th 502, 517 ("[T]he basic purpose of an EIR is to provide public agencies and the public in general with detailed information about the effect [that] a proposed project is likely to have on the environment; to list ways in which the significant effects of such a project might be minimized; and to indicate alternatives to such a project.").
[10] *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 564, *quoting Laurel Heights*, 47 Cal.3d at 392.
[11] *County of Inyo v. Yorty* (1973) 32 Cal.App.3d 795, 810; see also *Berkeley Keep Jets Over the Bay v. Bd. of Port Comm'rs.* (2001) 91 Cal.App.4th 1344, 1354 ("*Berkeley Jets*") (purpose of EIR is to inform the public and officials of environmental consequences of their decisions *before* they are made).
[12] 14 C.C.R. § 15003(b).
[13] 14 C.C.R. § 15002(a)(2), (3); *see also Berkeley Jets*, 91 Cal.App.4th at 1354; *Citizens of Goleta Valley*, 52 Cal.3d at 564.
[14] 14 C.C.R. § 15002(a)(2).
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the greatest extent feasible and that any unavoidable significant effects on the environment are "acceptable due to overriding concerns."[15]

While courts review an EIR using an "abuse of discretion" standard, "the reviewing court is not to 'uncritically rely on every study or analysis presented by a project proponent in support of its position. *A clearly inadequate or unsupported study is entitled to no judicial deference*."[16] As the courts have explained, a prejudicial abuse of discretion occurs "if the failure to include relevant information precludes informed decision-making and informed public participation, thereby thwarting the statutory goals of the EIR process."[17] "The ultimate inquiry, as case law and the CEQA guidelines make clear, is whether the EIR includes enough detail 'to enable who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project.'"[18]

III. THE EIR FAILS TO ADEQUATELY ANALYZE AND MITIGATE POTENTIALLY SIGNIFICANT IMPACTS

A. The DEIR Fails to Disclose and Analyze the Health Risk Posed by the Project's Air Emissions from Construction and Operation

The DEIR fails to disclose and analyze health risks from construction emissions and lacks a quantified health risk analysis ("HRA"), in violation of CEQA.

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[15] Public Resources Code § 21081(a)(3), (b); 14 C.C.R. §§ 15090(a), 15091(a), 15092(b)(2)(A), (B); *Covington v. Great Basin Unified Air Pollution Control Dist.* (2019) 43 Cal.App.5th 867, 883.
[16] *Berkeley Jets*, 91 Cal.App.4th 1344, 1355 (emphasis added), *quoting Laurel Heights*, 47 Cal.3d at 391, 409, fn. 12.
[17] *Berkeley Jets*, 91 Cal.App.4th at 1355; see also *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 722 (error is prejudicial if the failure to include relevant information precludes informed decision-making and informed public participation, thereby thwarting the statutory goals of the EIR process); *Galante Vineyards v. Monterey Peninsula Water Management Dist.* (1997) 60 Cal.App.4th 1109, 1117 (decision to approve a project is a nullity if based upon an EIR that does not provide decision-makers and the public with information about the project as required by CEQA); *County of Amador v. El Dorado County Water Agency* (1999) 76 Cal.App.4th 931, 946 (prejudicial abuse of discretion results where agency fails to comply with information disclosure provisions of CEQA).
[18] *Sierra Club v. County of Fresno* (2018) 6 Cal.5th 502, 516, *quoting Laurel Heights*, 47 Cal.3d at 405.

An agency must support its findings of a project's potential environmental impacts with concrete evidence, with "sufficient information to foster informed public participation and to enable the decision makers to consider the environmental factors necessary to make a reasoned decision."[19] In particular, a project's health risks must be 'clearly identified' and the discussion must include 'relevant specifics' about the environmental changes attributable to the Project and their associated health outcomes."[20]

Courts have held that an environmental review document must disclose a project's potential health risks to a degree of specificity that would allow the public to make the correlation between the project's impacts and adverse effects to human health.[21] In *Bakersfield*, the court found that the EIRs' description of health risks were insufficient and that after reading them, "the public would have no idea of the health consequences that result when more pollutants are added to a nonattainment basin."[22] Likewise in *Sierra Club*, the Supreme Court held that the EIR's discussion of health impacts associated with exposure to the named pollutants was too general and the failure of the EIR to indicate the concentrations at which each pollutant would trigger the identified symptoms rendered the report inadequate.[23] Some connection between air quality impacts and their direct, adverse effects on human health must be made. As the Court explained, "a sufficient discussion of significant impacts requires not merely a determination of whether an impact is significant, but some effort to explain the nature and magnitude of the impact."[24] CEQA mandates discussion, supported by substantial evidence, of the nature and magnitude of impacts of air pollution on public health.[25]

The failure to provide information required by CEQA makes meaningful assessment of potentially significant impacts impossible and is presumed to be prejudicial.[26] Challenges to an agency's failure to proceed in the manner required by CEQA, such as the failure to address a subject required to be covered in an EIR or

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[19] *Sierra Club v. County of Fresno* (2018) 6 Cal.5th 502, 516.
[20] *Id.* at 518.
[21] *Id.* at 518–520; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184.
[22] *Id.* at 1220.
[23] *Sierra Club*, at 521.
[24] *Id.* at 519, citing *Cleveland National Forest Foundation v. San Diego Assn. of Governments* (2017) 3 Cal.5th 497, 514–515.
[25] *Sierra Club*, 6 Cal.5th at 518–522.
[26] *Sierra Club v. State Bd. Of Forestry* (1994) 7 Cal.4th 1215, 1236–1237.

to disclose information about a project's environmental effects or alternatives, are subject to a less deferential standard than challenges to an agency's factual conclusions.[27] Courts reviewing challenges to an agency's approval of a CEQA document based on a lack of substantial evidence will "determine de novo whether the agency has employed the correct procedures, scrupulously enforcing all legislatively mandated CEQA requirements."[28]

The DEIR claims that emissions of toxic air contaminants ("TACs") will be less than significant without including a detailed or quantitative HRA to disclose the adverse health impacts that will be caused by exposure to TACs from the Project's construction and operational emissions. As a result, the DEIR fails to disclose the potentially significant health risk posed to nearby residents and children from TACs, and fails to mitigate it. Because the DEIR fails to include the necessary analysis disclosing the extent and severity of the Project's health risk, and fails to compare the Project's TAC emissions to applicable significance thresholds, the DEIR lacks substantial evidence to support its conclusion that the Project will not have significant health impacts from human exposure to diesel particulate matter ("DPM") emissions generated during Project construction and operation.

One of the primary emissions of concern regarding health effects for land development projects is DPM, which can be released during Project construction and operation. However, the DEIR failed to perform a quantitative assessment of the Project's DPM emissions, instead concluding that the Project's cancer risk from exposure to DPM would be less than significant based on the DEIR's conclusion that the Project's *criteria pollutant* emissions are less than significant.[29]

The DEIR's failure to quantify the health risk from DPM exposure is a failure to proceed in the manner required by law. CEQA expressly requires that an EIR discuss, inter alia, "health and safety problems caused by the physical changes" resulting from the project.[30] When a project results in exposure to toxic

[27] *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 435.
[28] *Id.* (internal quotations omitted).
[29] Clark Comments, pp. 4-5.; DEIR, p. IV.A-45.
[30] 14 C.C.R § 15126.2(a).

contaminants, this analysis requires a "human health risk assessment."[31] OEHHA[32] guidance also sets a recommended threshold for preparing an HRA of a construction period of two months or more.[33] Construction of the instant Project will last at least 36 months, as the DEIR puts forth a timeline for construction of 2022 through 2025.[34] A detailed health risk analysis is necessary to determine how significant those impacts will be and if mitigation measures are sufficient to avoid risks to public health.

1. The DEIR Fails to Evaluate the Project's TAC Emissions Against Applicable Significance Thresholds.

The DEIR relies on the South Coast Air Quality Management District's ("SCAQMD") cancer risk significance thresholds for TACs to evaluate the Project's health risk, which includes the following:

> Maximum incremental cancer risk 10 in 1 million
> Cancer Burden >0.5 excess cancer cases (in areas ≥1 in 1 million)
> Chronic and acute hazard index 1.0 (project increment).[35]

SCAQMD Rule 1401 health risk thresholds apply to operational impacts from the Project's diesel backup generator ("BUG"). Those thresholds provide that permits to operate may not be issued when emissions of TACs result in a maximum incremental cancer risk greater than 1 in 1 million without application of best available control technology for toxics ("T-BACT"), or a maximum incremental cancer risk greater than 10 in 1 million with the application of T-BACT, or if the cumulative cancer burden (i.e., increase in cancer cases in the population) from all

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[31] *Sierra Club,* 6 Cal.5th at 520; *Berkeley Keep Jets Over the Bay Com. v. Bd. of Port Comrs.* ("*Berkeley Jets*") (2001) 91 Cal.App.4th 1344, 1369; *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1219–1220 (CEQA requires that there must be some analysis of the correlation between the project's emissions and human health impacts).
[32] OEHHA is the organization responsible for providing recommendations and guidance on how to conduct health risk assessments in California. See OEHHA organization description, available at http://oehha.ca.gov/about/program.html.
[33] See "Risk Assessment Guidelines Guidance Manual for Preparation of Health Risk Assessments." OEHHA, February 2015, *available at:* http://oehha.ca.gov/air/hot_spots/hotspots2015.html ("OEHHA Guidance"), p. 8-18.
[34] DEIR, p. IV.A-52
[35] See DEIR Table IV.A-3 (SCAQMD Air Quality Significance Thresholds).

TACs emitted from a single piece of equipment exceeds 0.5, or a health hazard index (chronic and acute) greater than 1.0.[36]

The DEIR concludes that Project construction "would not result in any substantial emissions of acute or chronic TACs during construction activities,"[37] and regarding Project operation, concludes that "the proposed project would not release substantial TACs."[38] However, as discussed above, the DEIR failed to quantify the Project's DPM emissions from construction or operation.[39] The City also failed to perform the necessary step of comparing the Project's DPM emissions to the applicable significance thresholds to determine whether or not they exceed the thresholds, nor could it have because the DEIR lacks the emissions calculations with which to do so. The City, therefore, lacks any quantitative evidence demonstrating that the Project's DPM emissions will not exceed thresholds.

The DEIR also fails to address that the Applicant would be required to work with the SCAQMD to obtain permits to operate for the BUG, and does not address any of SCAQMD's future analysis to determine whether or not the BUG poses a significant health risk.[40] This approach is prohibited by CEQA. The lead agency may not completely defer analysis of potential environmental impacts to an outside regulatory scheme, as the City has done here.[41]

The DEIR must be revised and recirculated to accurately analyze the health risks from the Project, determine whether they exceed the applicable SCAQMD significance thresholds, and to incorporate binding mitigation to reduce potentially significant health risk impacts to less than significant levels.[42]

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[36] See DEIR Table IV.A-3 (SCAQMD Air Quality Significance Thresholds).
[37] DEIR, p. IV.A-57.
[38] DEIR, p. IV.A-61.
[39] The DEIR includes an assumption that the BUG will operate 12 hours/year for testing, but did not quantify any other operational use of the BUG, or any other operational emissions that may result in TAC emissions.
[40] DEIR IV.A.
[41] *See* Californians for Alternatives to Toxics v. Dep't of Food & Agric. (2005) 38 Cal. Rptr. 3d 638, 648; Oro Fino Gold Mining Corp. v. County of El Dorado (1990) 225 Cal.App.3d 872, 881–882 (court rejected assertion that noise level under proposed project would be insignificant simply by virtue of being consistent with general plan standards for zone in question).
[42] *Sierra Club,* 6 Cal.5th at 520.

2. The DEIR's Analysis of Emissions From the On-Site Back Up Generator Ignores Substantial Emissions that Are Reasonably Likely to Occur From Non-Testing Operational Periods

The DEIR's analysis of the air quality impacts from the BUG makes two improper assumptions. First, it assumes the BUG will be maintained and tested for no more than 12 hours per year even though SCAQMD permits up to 200 hours of testing per year.[43] As Dr. Clark explains, the "City's assumption that the BUG would operate at a substantially reduced rate ignores the legally acceptable threshold outlined in SCAQMD Rule 1470."[44] The City has therefore failed to properly measure the potential impact of DPM emissions from the BUG on the receptors nearby, and from BUG emissions of NOx. Thus, the DEIR's conclusion that there will be less than significant impacts from the BUG is unsupported.

Secondly, the DEIR fails to analyze all uses that stem from the reasonably foreseeable increase of generator use during Public Safety Power Shutoff ("PSPS") events and extreme heat events ("EHEs"). The recent rise of Extreme Heat Events in the State has increased the amount of PSPS events and thus increased the amount of time generators are being run.[45]

Dr. Clark explains that EHEs "are defined as periods where in the temperatures throughout California exceed 100 degrees Fahrenheit."[46] In 2021 alone, the Governor released one Executive Order regarding EHEs and one Proclamation for a State of Emergency with the intention to help avoid PSPS events.[47] CARB notes though that the number of Extreme Heat Events is likely to

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[43] SCAQMD Rule 1407.
[44] Clark Comments, p. 6.
[45] SCAQMD. 2020. Proposed Amendment To Rules (PARS) 1110.2, 1470, and 1472. Dated December 10, 2020. http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1110.2/1110-2_1470_1472/par1110-2_1470_wgm_121020.pdf?sfvrsn=6.
[46] Governor of California. 2021. Proclamation of a state of emergency. June 17, 2021; Clark Comments, pp. 6-7.
[47] Cal. Governor Executive Order N-11-21, https://www.gov.ca.gov/wp-content/uploads/2021/07/EO-N-11-21-Extreme-Heat-Event-07.10.21.pdf; Cal. Governor Proclamation of a State of Emergency, June 16, 2021, https://www.gov.ca.gov/wp-content/uploads/2021/06/6.17.21-Extreme-Heat-proclamation.pdf.

increase, and thereby PSPS events, with the continuing change in climate that the State is currently undergoing.[48]

According to the California Public Utilities Commission ("CPUC") de-energization report[49] in October 2019, there were almost 806 PSPS events that impacted almost 973,000 customers (~7.5% of households in California) of which ~854,000 of them were residential customers, and the rest were commercial/industrial/medical baseline/other customers. CARB's data also indicated that on average each of these customers had about 43 hours of power outage in October 2019.[50] Dr. Clark notes that CARB concluded that PSPS events in October of 2019 alone generated 126 tons of NOx, 8.3 tons of particulate matter, and 8.3 tons of DPM.[51]

Dr. Clark concludes that "power produced [from generators] during PSPS or extreme heat events is expected to come from [diesel] engines" and would result in increased DPM that the DEIR did not analyze.

While the City is not required to analyze the worst case scenarios, there is substantial evidence demonstrating that PSPS events and EHE are reasonably foreseeable events which will require the use of the BUG beyond mere testing operations. A detailed analysis of the emissions and noise from these additional hours of BUG operation should be included in a revised EIR, including the extra time the BUG will need to run to account for EHEs and PSPS.

B. The DEIR Fails to Accurately Disclose and Mitigate Significant GHG Impacts

CEQA requires the lead agency to use scientific data to evaluate GHG impacts directly and indirectly associated with a project.[52] The analysis must

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[48] CARB 2017 Scoping Plan, p. 6, https://ww2.arb.ca.gov/sites/default/files/classic/cc/scopingplan/scoping_plan_2017.pdf
[49] https://www.cpuc.ca.gov/deenergization/ as cited in CARB, 2020. Potential Emission Impact of Public Safety Power Shutoff (PSPS), Emission Impact: Additional Generator Usage associated With Power Outage.
[50] CARB, 2020. Potential Emission Impact of Public Safety Power Shutoff (PSPS), Emission Impact: Additional Generator Usage associated With Power Outage.
[51] Clark Comments p. 7.
[52] See 14 C.C.R. § 15064.4(a) (lead agencies "shall make a good-faith effort, based to the extent possible on scientific and factual data, to describe, calculate or estimate the amount of greenhouse gas emissions resulting from a project); 14 C.C.R. § 15064(d) (evaluating significance of the

"reasonably reflect evolving scientific knowledge and state regulatory schemes."[53] In determining the significance of GHG emissions impacts, the agency must consider the extent to which the project may increase GHG emissions compared to the existing environmental setting and the "extent to which the project complies with regulations or requirements adopted to implement a statewide, regional, or local plan for the reduction or mitigation of greenhouse gas emissions."[54]

The DEIR claims that GHG emissions impacts will be less than significant because the Project is consistent with the LA Green New Deal, the 2008 Climate Change Scoping Plan, and the 2020-2045 RTP/SCS.[55] Specifically, Appendix R1: CAP Consistency Checklist states that the Project's inclusion of bike parking, electric vehicle charging infrastructure, designated parking spaces, and a Transportation Demand Management Program satisfies CAP Strategy 3: Bicycling, Walking, Transit & Land Use.[56] However, as explained below, the Project is inconsistent with the CAP and Regional Transportation Plan in key ways and the DEIR's GHG analysis is also deficient for its failure to consider and mitigate significant long-term GHG impacts.

1. The City's Greenhouse Gas (GHG) Analysis Fails To Account For The Significant Increase in GHG Emissions That Will Be Realized With The Operation Of The BUGS Beyond 12 Hours Of Test Per Year.

The City's GHG analysis calculates that BUGs at the Project Site will generate 1.3757 tons per year of CO2 equivalent for each 12 hours of operation.

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environmental effect of a project requires consideration of reasonably foreseeable indirect physical changes caused by the project); 14 C.C.R. § 15358(a)(2) (defining "effects" or "impacts" to include indirect or secondary effects caused by the project and are "later in time or farther removed in distance, but are still reasonably foreseeable" including "effects on air"); CEQA Guidelines, Appendix G, § VIII: Greenhouse Gas Emissions (stating agencies should consider whether the project would "generate greenhouse gas emissions, ***either directly or indirectly***, that may have a significant impact on the environment.") (emphasis added).

[53] 14 C.C.R. § 15064.4(b); see also *Cleveland National Forest Foundation v. San Diego Assn. of Governments* (2017) 3 Cal.5th 497, 504 (holding that lead agencies have an obligation to track shifting regulations and to prepare EIRs in a fashion that keeps "in step with evolving scientific knowledge and state regulatory schemes").

[54] 14 C.C.R. § 15064.4(b)(1), (3).

[55] DEIR, p. IV.C-48

[56] DEIR, Appendix R1: Climate Action Plan Consistency Checklist ("CAP Checklist"), pp. 7–10, Attachment D.

Therefore, a revised DEIR must be written for the Project that includes an analysis of the additional operation of the BUG that will occur at the project site that is not accounted for in the current GHG analysis and then compare those results against the goals in the LA Green New Deal, the 2008 Climate Change Scoping Plan, and the 2020-2045 RTP/SCS.

2. The City's Greenhouse Gas Analysis Relies On An Unsupported Threshold

The City has not adopted a numerical significance threshold for assessing impacts related to GHG emissions and has not formally adopted a local plan for reducing GHG emissions. The DEIR concludes that the Project's GHG impacts would be less than significant based on the Project's consistency with the goals and actions to reduce GHG emissions found in the City's Green New Deal, and the 2017 California Climate Change Scoping Plan. While the City claims compliance with AB 32 Cap-and-Trade, the Project is not subject to Cap-and-Trade. Claims by the City that the compliance by third parties (those they are reliant on for energy) to reduce GHG emissions will reduce the Project's GHG emissions are unsupported and cannot be viewed as a reliable mitigation measure.[57] Furthermore, the City relies on "project design features" and credits when analyzing the Project's GHG impacts even though these measures are not legally enforceable like mitigation measures are.[58] The City must correct these assumptions regarding the GHG analysis in a revised EIR.

3. The DEIR Relies on Project Design Features to Reduce GHG Impacts and Fails to Adopt All Feasible Mitigation Measures to Reduce Significant GHG Impacts

The Project includes Project Design Feature GHG-PDF-1 which includes many measures to help reduce the overall GHG impact of the Project. As a Project design feature though, there is no requirement that the Project follows through with these designs once the proper permitting has been approved. The only way to make these features legally enforceable is to make them mitigation measures under CEQA.[59] This, combined with the unaccounted for GHG emissions above, places the

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[57] DEIR. 2021. Appendix IV.C. pg IV.C-78; IV.C-45; *Golden Door Properties, LLC v. County of San Diego* (2020) 50 Cal.App.5th 467.
[58] DEIR, p. IV.C-46.
[59] PRC § 21081.6(b); 14 C.C.R § 15126.4(a)(2); *Lotus v. Dep't of Transp*. (2014) 223 Cal. App. 4th 645, 651-52.

burden on the City to explain specifically why the proposed mitigation is not feasible.[60] All feasible mitigation should be adopted in a revised DEIR.

C. The DEIR Fails to Accurately Disclose and Mitigate Significant Noise Impacts

The CEQA Guidelines require an EIR to consider "whether a project would result in…[g]eneration of a substantial temporary or periodic increase in ambient noise levels in the vicinity of the project . . ."[61] The DEIR's noise analysis fails to accurately disclose the Project's noise impacts for several reasons.

1. The DEIR Fails to Require All Feasible Mitigation Measures to Reduce Significant Impacts

Mr. Watry concludes that the mitigation measures for construction noise offered by the DEIR may be insufficient. While Mr. Watry agrees that the temporary sound barriers would not reduce noise impacts to levels above the barrier.[62] Mr. Watry's analysis identified additional feasible mitigation that would further reduce the Project's construction noise impacts, which are not discussed in the DEIR. Mr. Watry recommends that the DEIR's mitigation measure be revised to provide either plexiglass barriers or sound blankets attached to scaffolding for each story of adjacent buildings during Project construction in order to further reduce noise above the DEIR's proposed noise barrier.[63]

The DEIR's failure to implement all feasible mitigation measures to reduce construction noise impacts before declaring them significant and unavoidable is a separate CEQA violation. The DEIR concludes that construction noise impacts are significant and unavoidable. Therefore, the DEIR must adopt all feasible mitigation measures to reduce construction noise impacts to the greatest extent feasible, including but not limited to those recommended by Mr. Watry.[64]

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[60] See *Covington*, 43 Cal.App.5th at 879–883 (holding that revised EIR was required where respondent failed to explain why the petitioners' proposed mitigation measure was not feasible).
[61] CEQA Guidelines, Appendix G, Sec. XII(d).
[62] Watry Comments, p. 2.
[63] Watry Comments, pp. 2-3.
[64] *Covington,* 43 Cal.App.5th at 883.

D. The DEIR Fails to Adequately Analyze the Project's Cumulative Impacts

CEQA requires the lead agency to include a reasonable and good faith analysis of cumulative impacts in an EIR.[65] The analysis must be sufficiently detailed to correspond to the severity of the impact and the likelihood that it will occur.[66] While an EIR may provide less detail in its cumulative impact analysis than for project-specific effects, the discussion must provide sufficient specificity to enable the agency to make findings that a project will, or will not, have a significant cumulative impact where the possible effects of the project are "individually limited but cumulatively considerable."[67]

The DEIR's cumulative impact analysis fails to comply with CEQA in at least two major ways. First, the DEIR fails to analyze the cumulative health risk of the Project with other nearby projects that are within 1000 feet of the Project site and may undergo concurrent construction, including the Arts Club Project and 9034 Sunset, both of which have pending CEQA documents before the City.[68]

1. The DEIR Fails to Evaluate Cumulative Air Quality Impacts

CEQA requires analysis of cumulative impacts, defined as "two or more individual effects which, when considered together, are considerable."[69] Such impacts may "result from individually minor but collectively significant projects taking place over a period of time."[70] Cumulatively considerable means that "the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects."[71] CEQA Guidelines section 15130(b)(1)

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[65] 14 §§ C.C.R 15130(a); 15065(a); 15355(b); *Cadiz Land Co., Inc. v. Rail Cycle, L.P.* (2000) 83 Cal.App.4th 74, 109.
[66] 14 C.C.R § 15130(b); *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 729 (EIR inadequate for failure to include "some data" on cumulative groundwater impacts).
[67] PRC § 21083(b)(2); 14 C.C.R §§ 15064(h)(1), 15065(a)(3); 14 C.C.R § 15130(b).
[68] See City environmental docs list: https://www.weho.org/city-government/city-departments/planning-and-development-services/current-and-historic-preservation-planning/environmental-documents.
[69] 14 C.C.R. § 15355.
[70] 14 C.C.R. § 15355(b).
[71] 14 C.C.R. § 15064(h)(1).

provides two options for analyzing cumulative impacts: (A) list "past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or" (B) summarize "projection contained in an adopted local, regional or statewide plan, or related planning document that describes or evaluates conditions contributing to the cumulative effect."[72] "When relying on a plan, regulation or program, the lead agency should explain how implementing the particular requirements in the plan, regulation or program ensure that the project's incremental contribution to the cumulative effect is not cumulatively considerable."[73]

The DEIR neglects to consider the amount of emissions associated with the cumulative projects in the vicinity of the Project. As a result, the DEIR fails to evaluate the severity of the Project's cumulative impacts on air quality, GHGs, or noise. These omissions are particularly glaring given that the DEIR itself identified 74 other related cumulative projects near the Project site.[74]

The DEIR similarly fails to evaluate the Project's cumulative impacts through its relationship with the LA Green New Deal or how compliance with the plan will ensure impacts are not cumulatively considerable. Thus, the DEIR fails to conduct the cumulative air quality, GHG, and noise impacts analysis as required by CEQA.

The law is clear that individually insignificant incremental contributions to air pollution are part of a cumulatively considerable impact requiring analysis in an EIR.[75] In *Kings County Farm Bureau v. City of Hanford*, the City of Hanford prepared an EIR for a 26.4-megawatt coal-fired cogeneration plant.[76] Notwithstanding the fact that the EIR found that the project region was out of attainment for PM_{10} and ozone, the City failed to incorporate mitigations for the project's cumulative air quality impacts from project emissions because it concluded that the Project would contribute "less than one percent of area emissions for all criteria pollutants."[77] The Court held that it was an error for the City to not take

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[72] 14 C.C.R. § 15130(b)(1).
[73] *Id.*; see *id.* § 15130(a) (stating that the lead agency shall describe its basis for concluding that an incremental effect is not cumulatively considerable).
[74] DEIR, p. III-7 to -13, Table III-1.
[75] *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692.
[76] *Id.* at 706.
[77] *Id.* at 719.

into account the nonattainment with air quality standards.[78] Regarding ozone, the Court reasoned that "[t]he relevant question to be addressed in the EIR is not the relative amount of [ozone] precursors emitted by the project when compared with preexisting emissions, but whether any additional amount of precursor emissions should be considered significant in light of the serious nature of the ozone problems in this air basin."[79] In addition, the Court generally held that the EIR improperly sidestepped the cumulative impacts analysis when it "focused on the individual project's relative effects and omitted facts relevant to an analysis of the collective effect this and other sources will have upon air quality."[80]

Here, the DEIR acknowledges that the SCAQMD is in nonattainment for state air quality standards for O_3, $PM_{2.5}$, and PM_{10}.[81] Given these background conditions, even marginal contributions of O_3, $PM_{2.5}$, and PM_{10} from the Project and other projects in the vicinity can have a significant cumulative effect of exacerbating the already serious nonattainment of air quality standards. Under *Kings County*, the Project's small and incremental contribution to air pollution in the SCAB must be understood in the context of poor air quality that currently exists.[82] Yet the DEIR does not even mention O_3, $PM_{2.5}$, and PM_{10} in its discussion of Cumulative Impacts.[83] The DEIR must be revised to consider the circumstances of the O_3, $PM_{2.5}$, and PM_{10} problem in the region in conjunction with the cumulatively considerable air quality effects from this source of O_3, $PM_{2.5}$, and PM_{10} emissions.

The DEIR must be revised and recirculated to analyze all cumulative projects in the City of Los Angeles and Los Angeles County generally which may have relevant cumulative air quality, health risk, GHGs, and noise impacts when combined with the Project's impacts.

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[78] *Id.* at 718–721.
[79] *Id.* at 718.
[80] *Id.* at 721.
[81] DEIR, p. IV.A-10.
[82] *Kings County*, 221 Cal.App.3d at 718–721.
[83] DEIR, p. IV.A-10.

IV. THE CITY LACKS SUBSTANTIAL EVIDENCE TO APPROVE THE PROJECT'S LOCAL LAND USE PERMITS AND THE VESTING TENTATIVE MAP

The Project requires a Specific Plan Adjustment.[84] This adjustment requires the City to make findings regarding land use consistencies and/or environmental factors. As discussed throughout this letter, the DEIR fails to disclose the Project's potentially significant, unmitigated impacts on air quality, health risk, and noise. These impacts create inconsistencies with the Specific Plan Project Permit adjustment and the VTTM which the DEIR fails to disclose and mitigate. As a result of these impacts, the City is unable to make the necessary findings under the City's municipal codes and State land use laws to approve the Project's local land use permits.

A. The City Cannot Make the Required Findings for a Specific Plan Project Permit Adjustment

In order to approve the Project's conditional use permits, the City's Municipal Code requires the City to make a finding that the permit sought will "incorporate mitigation measures, monitoring of measures when necessary, or alternatives identified in the environmental review which would mitigate the negative environmental effects of the project, to the extent physically feasible."[85]

As discussed herein, the Project has potentially significant, unmitigated impacts on air quality, health risk, and noise that are likely to harm public health and welfare if not fully mitigated. In particular, the DEIR's proposed finding that the Project will result in significant and unavoidable construction noise impacts[86] demonstrates that the Project's construction noise will constitute an ongoing menace to local sensitive receptors from noise throughout the Project's 3-year construction period. Furthermore, as Mr. Watry notes, existing ambient noise levels at two receptors near the Project will move from "conditionally acceptable" to "normally unacceptable" due to noise emanating from the Project. As such the City should not approve the Specific Plan Project Permit unless those noise levels can be mitigated to conditionally acceptable levels.[87]

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[84] DEIR, p. II-36.
[85] LAMC Section 12.22-A,30(e)
[86] DEIR, p. IV.E-42.
[87] Watry Comments, pp. 3-4.

These unmitigated impacts render the Project inconsistent with the use permit standards set forth in the Municipal Code. The City therefore cannot make the necessary findings under the Code to approve the Project's Specific Plan Project Permit adjustment until these deficiencies in the DEIR are corrected, and until these impacts are fully mitigated.

B. The City Cannot Make the Required Findings for a Vesting Tentative Map Due to the Substantial Environmental Damage Caused By the Project

The Subdivision Map Act ("SMA") provides guidance as to the findings that the agency must make when approving a tentative map, and requires agencies to deny map approval if the project would result in significant environmental or public health impacts.

Government Code, section 66474, provides:

> A legislative body of a city or county shall deny approval of a tentative map, or a parcel map for which a tentative map was not required, if it makes any of the following findings:
>
> (a) That the proposed map is not consistent with applicable general and specific plans as specified in Section 65451.
>
> (b) That the design or improvement of the proposed subdivision is not consistent with applicable general and specific plans.
>
> (c) That the site is not physically suitable for the type of development.
>
> (d) That the site is not physically suitable for the proposed density of development.
>
> (e) That the design of the subdivision or the proposed improvements are likely to cause substantial environmental damage or substantially and avoidably injure fish or wildlife or their habitat.
>
> (f) That the design of the subdivision or type of improvements is likely to cause serious public health problems.

> (g) That the design of the subdivision or the type of improvements will conflict with easements, acquired by the public at large, for access through or use of, property within the proposed subdivision. In this connection, the governing body may approve a map if it finds that alternate easements, for access or for use, will be provided, and that these will be substantially equivalent to ones previously acquired by the public. This subsection shall apply only to easements of record or to easements established by judgment of a court of competent jurisdiction and no authority is hereby granted to a legislative body to determine that the public at large has acquired easements for access through or use of property within the proposed subdivision.

(Emphasis added.)

Furthermore, where an EIR has been prepared, and demonstrates that there will be significant and unavoidable environmental impacts, a Vesting Tentative Map ("VTM") can be certified only if the decision makers issue a statement of overriding considerations, per Government Code, section 66474.01:

> Notwithstanding subdivision (e) of Section 66474, a local government may approve a tentative map, or a parcel map for which a tentative map was not required, if an environmental impact report was prepared with respect to the project and a finding was made pursuant to paragraph (3) of subdivision (a) of Section 21081 of the Public Resources Code that specific economic, social, or other considerations make infeasible the mitigation measures or project alternatives identified in the environmental impact report.[88]

Government Code, section 66474, subsections (e) and (f) implicate CEQA, and prohibit decision makers from approving a tract map where the project is "likely to cause substantial environmental damage" or "cause serious public health problems."[89] And the City is unable to make a statement of overriding considerations for the Project under CEQA because the City has not mitigated the Project's construction noise impacts to the greatest extent feasible, and has not

[88] Gov. Code, § 66474.01.
[89] Gov. Code, § 66474, subds. (e), (f).

demonstrated that the Project's benefits outweigh its costs, including providing employment opportunities for highly trained workers.[90]

Here, approval of the project is likely to cause substantial impacts to air quality, public health, and noise. The City's decision makers therefore cannot make the necessary SMA findings based on the record before it. The City must correct the errors in the DEIR, adopt adequate mitigation measures to reduce impacts to less than significant levels, and must provide substantial evidence supporting the Project's proposed statement of overriding considerations to address the Project's outstanding, unmitigated significant impacts before the City can approve the VTTM.

V. CONCLUSION

For the reasons discussed above, the DEIR for the Project remains wholly inadequate under CEQA. It must be thoroughly revised to provide legally adequate analysis of, and mitigation for, all of the Project's potentially significant impacts. These revisions will necessarily require that the DEIR be recirculated for public review. Until the DEIR has been revised and recirculated, as described herein, the City may not lawfully approve the Project.

Thank you for your attention to these comments. Please include them in the record of proceedings for the Project.

Sincerely,

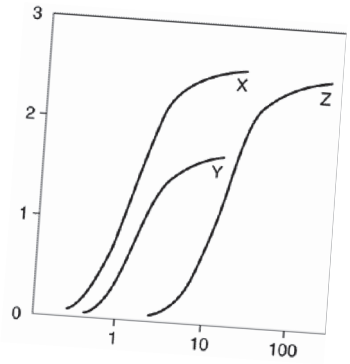
Darien Key

DKK:acp

Attachments

[90] Pub. Res. Code § 21081(a)(3), (b).

ATTACHMENT A



Clark & Associates
Environmental Consulting, Inc.

OFFICE
12405 Venice Blvd
Suite 331
Los Angeles, CA 90066

PHONE
310-907-6165

FAX
310-398-7626

EMAIL
jclark.assoc@gmail.com

January 5, 2022

Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

Attn: Mr. Darien Key

Subject: Comments On Draft Environmental Impact Report (DEIR) For 8th, Grand, and Hope Street Project (ENV-2017-506-EIRP)

Dear Mr. Key:

At the request of Adams Broadwell Joseph & Cardozo (ABJC), Clark and Associates (Clark) has reviewed materials related to the 2021 City of Los Angeles Mitigated Draft Environmental Impact Report (DEIR) of the above referenced project.

Clark's review of the materials in no way constitutes a validation of the conclusions or materials contained within the plan. If we do not comment on a specific item this does not constitute acceptance of the item.

Project Description:

The Project involves the construction of a 50-story mixed-use development comprised of 580 residential units and up to 7,499 square feet of ground floor commercial/retail/restaurant space on a 34,679-square-foot site. The Project would provide 636 vehicle parking spaces within three subterranean levels and eight above-grade levels and four vehicle parking spaces on the ground floor. To accommodate the Project, an existing surface parking lot and four-story parking structure would be demolished. Upon completion, the total building floor area would be 554,927 square feet with a maximum height of 592 feet and a Floor Area Ratio (FAR) of approximately 9.25:1.

The Project is located at 754 South Hope Street and 609 and 625 West 8th street in the City of Los Angeles. The parcels that comprise the Project Site are rectangular in share and the site is comprised of two tax assessor parcels (APNs: 5144-011-009 and 5144-011-016), which encompass a total of approximately 34,679 square feet of lot area (0.83 acre). The Project Site is currently developed with a low-rise four-story parking structure and a surface parking lot that is entirely paved and devoid of landscaping. The currently existing commercial parking structure provides 324 parking spaces.

The maximum depth of the subterranean levels (parking) for the Project would be approximately 63 feet below ground level. The building would include levels 1 through 50 with a maximum height of 592 feet above grade to the top of the parapet. The ground floor of the new building would be occupied by a residential lobby on 8th Street, as well as commercial/retail/restaurant uses, which will be located on the corner of Hope Street and 8th Street and at the corner of Grand Avenue and 8th Street.

Construction of the Project would commence with site clearance and demolition of the existing parking structure and parking lot, resulting in approximately 15,000 cubic yards of demolition debris, followed by grading and excavation for the subterranean levels. Construction is anticipated to occur over a 36-month period and is anticipated to be completed in 2025. Approximately 89,750 cubic yards of soil would be exported and hauled away from the Project Site during the excavation phase.

According to the City's DEIR, the Project would result in significant and unavoidable impacts related to on-site noise during construction and on-site vibration during construction (pursuant to the threshold for human annoyance). Cumulative impacts with respect to off-site construction traffic noise would also be significant and unavoidable. All other potential impacts would be less than significant or mitigated to less-than-significant levels. The assessment from the City provided in the DEIR misses the significant impacts associated with air quality that have been ignored by the City.

Table I-2
Summary of Impacts Under the Project

Environmental Issue	Proposed Project Impact
A. AIR QUALITY	
Construction	
Regional Emissions	Less Than Significant
Localized Emissions	Less Than Significant
Toxic Air Contaminants	Less Than Significant
Operation	
Regional Emissions	Less Than Significant
Localized Emissions	Less Than Significant
Toxic Air Contaminants	Less Than Significant
B. ENERGY	
Wasteful, Inefficient, or Unnecessary Consumption of Energy Resources	
Construction	Less Than Significant
Operation	Less Than Significant
Conflict with Plans for Renewable Energy or Energy Efficiency	Less Than Significant
C. GREENHOUSE GAS EMISSIONS	Less Than Significant
D. LAND USE	
Physical Division of a Community	Less Than Significant
Conflict with Land Use Plans	Less Than Significant
E. NOISE	
Construction	
On-Site Noise	**Significant and Unavoidable**[4]
Off-Site Noise	Less Than Significant[5]
On-Site Vibration (Building Damage)	Less Than Significant with Mitigation
On-Site Vibration (Human Annoyance)	**Significant and Unavoidable**
Off-Site Vibration (Building Damage)	Less Than Significant
Off-Site Vibration (Human Annoyance)	**Significant and Unavoidable**[6]
Operation	
On-Site Noise	Less Than Significant
Off-Site Noise	Less Than Significant
Vibration	Less Than Significant

Specific Comments:

1. The City's Air Quality Analysis Fails To Include A Quantitative Health Risk Analysis Of The Impacts Of Toxic Air Contaminants From The Construction Phase And Operational Phase Of The Project For The Nearest Sensitive Receptor(s)

The City has failed to conduct a numerical health risk analysis (HRA) for Project. The DEIR states that, for the purposes of assessing pollution concentrations upon sensitive receptors, the SCAQMD has developed LSTs that are based on the number of pounds of emissions per day that can be generated by a project that would cause or contribute to adverse localized air quality impacts. [1] For the Criteria Pollutants assessed under CEQA, this is correct. For toxic air contaminants (TACs), there are no LSTs, nor levels of significance based on the pounds per day. Instead, the determination of a significance threshold is based on a ***quantitative risk analysis*** that requires the City to perform a multistep, quantitative health risk analysis.

TACs, including diesel particulate matter (DPM)[2], contribute to a host of respiratory impacts and may lead to the development of various cancers. Failing to quantify those impacts places the community at risk for unwanted adverse health impacts. *Even brief exposures to the TACs could lead to the development of adverse health impacts over the life of an individual*.

Diesel exhaust contains nearly 40 toxic substances, including TACs and may pose a serious public health risk for residents in the vicinity of the facility. TACs are airborne substances that are capable of causing short-term (acute) and/or long-term (chronic or carcinogenic, i.e., cancer causing) adverse human health effects (i.e., injury or illness). TACs include both organic and inorganic chemical substances. The current California list of TACs includes approximately 200 compounds, including particulate emissions from diesel-fueled engines.

[1] City of Los Angeles. 2021. DEIR of 8th, Grand, and Hope Project. Pg IV.A-58

[2] Because DPM is a TAC, it is a different air pollutant than criteria particulate matter (PM) emissions such as PM10, PM2.5, and fugitive dust. DPM exposure causes acute health effects that are different from the effects of exposure to PM alone.

Diesel exhaust has been linked to a range of serious health problems including an increase in respiratory disease, lung damage, cancer, and premature death.[3,4,5] Fine DPM is deposited deep in the lungs in the smallest airways and can result in increased respiratory symptoms and disease; decreased lung function, particularly in children and individuals with asthma; alterations in lung tissue and respiratory tract defense mechanisms; and premature death.[6] Exposure to DPM increases the risk of lung cancer. It also causes non-cancer effects including chronic bronchitis, inflammation of lung tissue, thickening of the alveolar walls, immunological allergic reactions, and airway constriction.[7] DPM is a TAC that is recognized by state and federal agencies as causing severe health risk because it contains toxic materials, unlike $PM_{2.5}$ and PM_{10}.[8]

The inherent toxicity of the TACs requires the City to first quantify the concentration released into the environment at each of the sensitive receptor locations through air dispersion modeling, calculate the dose of each TAC at that location, and quantify the cancer risk and hazard index for each of the chemicals of concern. Following that analysis, then the City can make a determination of the relative significance of the emissions.

There are several sensitive receptors in the direct vicinity of the Project site, including residences and businesses located near the Project site. The two closest residential/sensitive receptors to the Project Site are located at the Eighth and Grand development (a mid-rise residential complex with a ground floor market at 788 S. Grand Avenue) and the 8th and Hope Apartments (located at 801 South

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[3] California Air Resources Board, Initial Statement of Reasons for Rulemaking, Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Staff Report, June 1998; see also California Air Resources Board, Overview: Diesel Exhaust & Health, https://ww2.arb.ca.gov/resources/overview-diesel-exhaust-and-health#:~:text=Diesel%20Particulate%20Matter%20and%20Health&text=In%201998%2C%20CARB%20identified%20DPM,and%20other%20adverse%20health%20effects.

[4] U.S. EPA, Health Assessment Document for Diesel Engine Exhaust, Report EPA/600/8-90/057F, May 2002.

[5] Environmental Defense Fund, Cleaner Diesel Handbook, Bring Cleaner Fuel and Diesel Retrofits into Your Neighborhood, April 2005; http://www.edf.org/documents/4941_cleanerdieselhandbook.pdf, accessed July 5, 2020.

[6] California Air Resources Board, Initial Statement of Reasons for Rulemaking, Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant, Staff Report, June 1998.

[7] Findings of the Scientific Review Panel on The Report on Diesel Exhaust as adopted at the Panel's April 22, 1998 Meeting.

[8] Health & Safety Code § 39655(a) (defining "toxic air contaminant" as air pollutants "which may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health. A substance that is listed as a hazardous air pollutant pursuant to subsection (b) of Section 112 of the federal act (42 U.S.C. Sec. 7412 (b)) is a toxic air contaminant.")

Hope Street). Both receptors are less than 200 feet (61 meters) from the Project Site location. The nearest commercial receptors are located across 8th Avenue (approximately 80 feet or 25 meters).

These receptors would be exposed to TACs released during Project construction and operation, including DPM. No effort is made in the DEIR to quantify the potential health impacts from DPM generated by construction activities or operational activities from the Project on these sensitive receptors. The DEIR incorrectly states that it is not necessary to evaluate long-term cancer impacts from construction activities which occur over a relatively short duration. [9] The City's failure to perform such an analysis is clearly a major flaw in the DEIR and may be placing the residents of the adjacent structures at risk from the construction and operational phases of the Project.

2. The Air Quality Analysis For The Project Fails To Include The Impacts From The Emergency Generator That Will Be Installed Onsite.

In Appendix B to City's DEIR of Project, the air quality analysis assumes that the back up generator (BUG) on site will only be operated for 12 hours a year (testing and maintenance). According to SCAQMD Rules 1110.2, 1470, back-up generators (BUGs) are allowed to operate for up to 200 hours per year and maintenance cannot exceed more than 50 hours per year. The City must revise its air quality analysis to include the use of BUGs onsite in a EIR.

In addition to the testing emissions the air quality analysis must include the substantial increase in operational emissions from BUGs in the Air Basin due to unscheduled events, including but not limited to Public Safety Power Shutoff (PSPS) events and extreme heat events. Extreme heat events are defined as periods where in the temperatures throughout California exceed 100 degrees Fahrenheit.[10] From January, 2019 through December, 2019, Southern California Edison reported 158 of their circuits underwent a PSP event[11]. In Los Angeles County two circuits had 4 PSPS events during that period lasting an average of 35 to 38 hours. The total duration of the PSPS events in Los Angeles lasted between 141 hours to 154 hours in 2019. In 2021, the Governor of California declared that during extreme heat events the use of stationary generators shall be deemed an emergency use under California Code of Regulations (CCR), title 17, section 93115.4 sub. (a) (30) (A)(2). The

[9] City of Los Angeles. 2021. DEIR of 8th, Grand, and Hope Project. Pg IV.A-57

[10] Governor of California. 2021. Proclamation of a state of emergency. June 17, 2021.

[11] SCAQMD. 2020. Proposed Amendement To Rules (PARS) 1110.2, 1470, and 1472. Dated December 10, 2020. http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1110.2/1110-2_1470_1472/par1110-2_1470_wgm_121020.pdf?sfvrsn=6.

number of Extreme Heat Events is likely to increase in California with the continuing change in climate the State is currently undergoing.

Power produced during PSPS or extreme heat events is expected to come from engines regulated by CARB and California's 35 air pollution control and air quality management districts (air districts). [12] Of particular concern are health effects related to emissions from diesel back-up engines. DPM has been identified as a toxic air contaminant, composed of carbon particles and numerous organic compounds, including over forty known cancer-causing organic substances. The majority of DPM is small enough to be inhaled deep into the lungs and make people more susceptible to further injury.

According to the California Public Utilities Commission (CPUC) de-energization report[13] in October 2019, there were almost ***806 PSPS events*** (emphasis added) that impacted almost 973,000 customers (~7.5% of households in California) of which ~854,000 of them were residential customers. CARB's data also indicated that on average each of these customers had about 43 hours of power outage in October 2019. [14] Using the actual emission factors for each diesel BUG engines in the air district's stationary BUGs database, CARB staff calculated that the 1,810 additional stationary generators (like those proposed for the Project) running during a PSPS in October 2019 generated 126 tons of NOx, 8.3 tons or particulate matter, and 8.3 tons of DPM.

For every PSPS or Extreme Heat Event (EHE) triggered during the operational phase of the project, significant concentrations of DPM will be released that are not accounted for in the City's analysis. In 2021, two EHEs were declared. For the June 17, 2021 EHE, stationary generator owners were allowed to use their BUGs for 48 hours. For the July 9, 2021 EHE, the stationary generator owners were allowed to use their BUGs for 72 hours. These two events would have increased 10 fold the calculated DPM emissions from the Project if only the 12 hours of testing claimed in the DEIR were to be true. An EIR must be written for the Project that includes an analysis of the additional operation of the BUG that will occur at the project site that is not accounted for in the current air quality analysis.

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[12] CARB. 2019. Use of Back-up Engines For Electricity Generation During Public Safety Power Shutoff Events. October 25, 2019.

[13] https://www.cpuc.ca.gov/deenergization/ as cited in CARB, 2020. Potential Emission Impact of Public Safety Power Shutoff (PSPS), Emission Impact: Additional Generator Usage associated With Power Outage..

[14] CARB, 2020. Potential Emission Impact of Public Safety Power Shutoff (PSPS), Emission Impact: Additional Generator Usage associated With Power Outage.

3. Using the South Coast Air Quality Management District's Rule 1401 the City's emissions estimates for criteria pollutants do not substitute for a health risk analysis of the cancer risk posed by exposure to TACs, in particular DPM, released during Project construction and operation. This broad-brushed, non-quantitative approach ignores the substantial health impacts from criteria pollutants and TACs that will be emitted from the Project's BUG. **Given The Proximity Of Sensitive Receptors To The Site And The Nature of The Toxic Air Contaminants Emitted, The Operational Emissions From The Back Up Generator Will Cause A Significant Health Risk To Residents Near The Project Site.**

According to the DEIR[15], the proposed project would not result in non-permitted stationary sources that would emit substantial air pollutants or TACs. Routine testing and maintenance of the diesel emergency generator would result in emissions of DPM. However, the applicant would be required to work with the SCAQMD in order to obtain permits to operate. As part of the permit process, the SCAQMD will evaluate compliance with Rule 1401, New Source Review of Toxic Air Contaminants, and Rule 1401.1, Requirements for New and Relocated Facilities Near Schools. Rule 1401.1 identifies acceptable risk levels and emissions control requirements for new and modified facilities that may emit additional TACs. Under Rule 1401, permits to operate may not be issued when emissions of TACs result in a maximum incremental cancer risk greater than 1 in 1 million without application of best available control technology for toxics (TBACT), or a maximum incremental cancer risk greater than 10 in 1 million with application of T-BACT, or if the cumulative cancer burden (i.e., increase in cancer cases in the population) from all TACs emitted from a single piece of equipment exceeds 0.5, or a health hazard index (chronic and acute) greater than 1.0 (SCAQMD 2017b).

According to the DEIR, the proposed emergency generator would be operated for a limited time (12 hours or less per year for testing and maintenance) and would be required to meet the required emissions rates for DPM at the time of installation, and must be demonstrated to meet the requirements of all applicable rules before the SCAQMD can issue the permits to operate stationary source equipment.

[15] City of Los Angeles. 2021. DEIR of 8th, Grand, and Hope Project. Pg IV.A-58

Using the SCAQMD's Rule 1401 Risk Assessment Programs Risk Tool V1.103 software, it is possible to generate a site-specific screening level HRA for emissions from the back-up generator (BUG). Assuming the system is restricted to maintenance and testing for 12 hours per year or less, the model calculates emissions of DPM of approximately 1.07 lbs per year. This value is the same as the amount reported in the DEIR for the operational analysis of the site.

Assuming the generator's emissions will be vented at the ground level, the vent to the generator would be approximately 14 feet above grade level. For the Risk Tool inputs, the stack height (exit point of the generator) was set to 14 feet above grade.

Based on the emission of 1.07 lbs per year of DPM, the SCAQMD Risk Tool calculates a risk of 3.08 in 1,000,000 for residents living within 180 feet (60.96 meters) of the Project Site. Commercial workers located within 80 feet (25 meters) of the site face a potential health risk of 6.26 in 1,000,000. The model was set to assume T-BACT controls were in place for the generator.

Assuming the system is maintained and operated for 200 hours per year or less, the model calculates emissions of DPM of approximately 17.8 lbs per year.

Based on the emission of 17.8 lbs per year of DPM, the SCAQMD Risk Tool calculates a risk of 51.4 in 1,000,000 for residents living within 180 feet (60.96 meters) of the Project Site. Commercial workers located within 80 feet (25 meters) of the site face a potential health risk of 104 in 1,000,000. The model was set to assume T-BACT controls were in place for the generator.

All of the results for this analysis are presented in Exhibit B to this letter. The City must address this significant error in their air quality analysis in a revised EIR.

4. The City's Greenhouse Gas (GHG) Analysis Fails To Account For The Significant Increase in GHG Emissions That Will Be Realized With The Operation Of The BUGS Beyond 12 Hours Of Test Per Year.

The City's GHG analysis calculates that BUGs at the Project Site will generate 1.3757 tons per year of CO2 equivalent for each 12 hours of operation. As is demonstrated in Comment 3, operation of the BUGs is likely to exceed 17 times the number assumed in the DEIR (12 hours). Therefore a revised DEIR must be written for the Project that includes an analysis of the additional operation of the BUG that will occur at the project site that is not accounted for in the current GHG analysis.

5. The City's Greenhouse Gas Analysis Relies On An Unsupported Threshold

The City has not adopted a numerical significance threshold for assessing impacts related to GHG emissions and has not formally adopted a local plan for reducing GHG emissions. The DEIR concludes that the Project's GHG impacts would be less than significant based on the Project's consistency with the goals and actions to reduce GHG emissions found in the City's Green New Deal, and the 2017 California Climate Change Scoping Plan. While the City claims compliance with AB 32 Cap-and-Trade, the Project is not subject to Cap-and-Trade. Claims by the City that the compliance by third parties (those they are reliant on for energy) to reduce GHG emissions will reduce the Project's GHG emissions are unsupported and cannot be viewed as a reliable mitigation measure.[16] The City must correct these assumptions regarding the GHG analysis in a revised EIR.

Conclusion

The facts identified and referenced in this comment letter lead me to reasonably conclude that the Project could result in significant unmitigated impacts if the draft environmental impact report is approved. The City must re-evaluate the significant impacts identified in this letter by requiring the preparation of a revised environmental impact report.

Sincerely,

JAMES J. J. CLARK, Ph.D.

[16] DEIR. 2021. Appendix IV.C. pg IV.C-78.

Fac Name: 8th Hope and Grand A/N: 0

TAC Code	Compound	Emission Rate (lbs/hr)	Molecular Weight	R1 - Uncontrolled (lbs/hr)	Efficiency Factor (Fraction range 0-1)	R2-Controlled (lbs/hr)
P1	Particulate Emissions from Diesel-Fueled Engines	9.91E-02	350	9.91E-02	0.09990	0.089200009

TIER 1 SCREENING RISK ASSESSMENT REPORT

(Procedure Version 8.1 & Package N, September 1, 2017)

Application deemed complete date: 10/1/2017

A/N , 8th Hope and Grand

Equipment Type	Other	No T-BACT
Nearest Receptor Distance (actual)	25	meters
Receptor Distance (Table 1 Emission look up)	25	meters

Tier 1 Results	
Cancer/Chronic ASI	**Acute ASI**
3.69E+02	
FAILED	PASSED

APPLICATION SCREENING INDEX CALCULATION

Compound	Average Annual Emission Rate (lbs/yr)	Max Hourly Emission Rate (lbs/hr)	Cancer/Chronic Pollutant Screening Level (lbs/yr) from Table 1	Acute Pollutant Screening Level (lbs/hr) from Table 1	Cancer/Chronic Pollutant Screening Index (PSI)	Acute Pollutant Screening Index (PSI)
Particulate Emissions from Diesel-Fueled Engines	1.78E+01	8.92E-02	4.83E-02		3.69E+02	
TOTAL (APPLICATION SCREENING INDEX)					**3.69E+02**	

EMISSIONS ARE ENTERED ON THE EMISSIONS WORKSHEET OR ON ONE OF EQUIPMENT WORKSHEETS

INPUT PARAMETERS ENTERED ON THE EMISSIONS SHEET ARE USED FOR TIERS 1 AND TIER 2 ANALYSES

TIER 2 SCREENING RISK ASSESSMENT REPORT

(Procedure Version 8.1 & Package N, September 1, 2017) - Risk Tool V1.103

A/N: _____ **Fac:** 8th Hope and Grand **Application deemed complete date:** 10/1/2017

1. Stack Data

Equipment Type	Generator	
Combustion Eff	0.0	
	No T-BACT	
Operation Schedule	2	hrs/day
	2	days/week
	50	weeks/year
Stack Height	14	ft
Distance to Residential	60.96	m
Distance to Commercial	25	m
Meteorological Station	USC/Downtown L.A.	

2. Tier 2 Data

Dispersion Factors tables	Point Source
For Chronic X/Q	Table 6
For Acute X/Q max	Table 6.4

Dilution Factors

Receptor	X/Q (µg/m³)/(tons/yr)	X/Qmax (µg/m³)/(lbs/hr)
Residential	7.73	234.66
Commercial - Worker	45.34	676.64

Intake and Adjustment Factors

	Residential	Worker
Year of Exposure	30	
Combined Exposure Factor (CEF) - Table 4	677.40	55.86
Worker Adjustment Factor (WAF) - Table 5	1	4.20

A/N: ______________ **Application deemed complete date:** 10/01/17

3. Rule 1401 Compound Data

Compound	R1 - Uncontrolled (lbs/hr)	R2 - Controlled (lbs/hr)	CP $(mg/kg\text{-}day)^{-1}$	MP MICR Resident	MP MICR Worker	MP Chronic Resident	MP Chronic Worker	REL Chronic (µg/m³)	REL 8-hr Chronic (µg/m³)	REL Acute (µg/m³)	MWAF
Particulate Emissions from Diesel-Fueled Eng	9.91E-02	8.92E-02	1.10E+00	1.00	1.00	1.00	1.00	5.00E+00			1

A/N: _____ Application deemed complete date: 10/01/17

4. Emission Calculations

Compound	R1 (lbs/hr)	R2 (lbs/hr)	R1 (lbs/day)	R2 (lbs/day)	R2 (lbs/yr)	R2 (tons/yr)
Particulate Emissions from Diesel-Fueled Eng	9.91E-02	8.92E-02	1.98E-01	1.78E-01	1.78E+01	8.92E-03
Total	**9.91E-02**	**8.92E-02**	**1.98E-01**	**1.78E-01**	**1.78E+01**	**8.92E-03**

TIER 2 RESULTS

A/N: _____ Application deemed complete date: 10/01/17

5a. MICR

MICR Resident = CP (mg/(kg-day))^-1 * Q (ton/yr) * (X/Q) Resident * CEF Resident * MP Resident * 1e-6 * MWAF

MICR Worker = CP (mg/(kg-day))^-1 * Q (ton/yr) * (X/Q) Worker * CEF Worker* MP Worker* WAF Worker* 1e-6 * MWAF

Compound	Residential	Commercial
Particulate Emissions from Diesel-Fueled Eng	5.14E-05	1.04E-04
Total	**5.14E-05**	**1.04E-04**
	FAIL	**FAIL**

5b. Is Cancer Burden Calculation Needed (MICR >1E-6)?	**YES**
New X/Q at which $MICR_{70yr}$ is one-in-a-million [(µg/m³)/(tons/yr)]:	4.34E-01
New Distance, interpolated from X/Q table using New X/Q (meter):	227.31
Zone Impact Area (km²):	1.62E-01
Zone of Impact Population (7000 person/km²):	1.14E+03
Cancer Burden:	**1.19E-01**
Cancer Burden is less than or equal to 0.5	**PASS**

6. Hazard Index Summary **A/N:** _____ **Application deemed complete date:** 10/01/17

HIA = [Q(lb/hr) * (X/Q)max * MWAF]/ Acute REL
HIC = [Q(ton/yr) * (X/Q) * MP * MWAF] / Chronic REL
HIC 8-hr= [Q(ton/yr) * (X/Q) * WAF * MWAF] / 8-hr Chronic REL

Target Organs	Acute	Chronic	8-hr Chronic	Acute Pass/Fail	Chronic Pass/Fail	8-hr Chronic Pass/Fail
Alimentary system (liver) - AL			N/A	Pass	Pass	Pass
Bones and teeth - BN			N/A	Pass	Pass	Pass
Cardiovascular system - CV			N/A	Pass	Pass	Pass
Developmental - DEV			N/A	Pass	Pass	Pass
Endocrine system - END			N/A	Pass	Pass	Pass
Eye			N/A	Pass	Pass	Pass
Hematopoietic system - HEM			N/A	Pass	Pass	Pass
Immune system - IMM			N/A	Pass	Pass	Pass
Kidney - KID			N/A	Pass	Pass	Pass
Nervous system - NS			N/A	Pass	Pass	Pass
Reproductive system - REP			N/A	Pass	Pass	Pass
Respiratory system - RESP		8.09E-02	N/A	Pass	Pass	Pass
Skin			N/A	Pass	Pass	Pass

A/N: _____ Application deemed complete date: 10/01/17

6a. Hazard Index Acute - Resident

HIA = [Q(lb/hr) * (X/Q)max resident * MWAF] / Acute REL

	HIA - Residential									
Compound	AL	CV	DEV	EYE	HEM	IMM	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng										
Total										

6a. Hazard Index Acute - Worker **A/N:** _____ **Application deemed complete date:** 10/01/17

HIA = [Q(lb/hr) * (X/Q)max Worker * MWAF] / Acute REL

	HIA - Commercial									
Compound	AL	CV	DEV	EYE	HEM	IMM	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng										
Total										

A/N: _____ Application deemed complete date: 10/01/17

6b. Hazard Index Chronic - Resident

HIC = [Q(ton/yr) * (X/Q) Resident * MP Chronic Resident * MWAF] / Chronic REL

	HIC - Residential												
Compound	AL	BN	CV	DEV	END	EYE	HEM	IMM	KID	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng												1.38E-02	
Total												1.38E-02	

A/N: _____ Application deemed complete date: 10/01/17

6b. Hazard Index Chronic - Worker

HIC = [Q(ton/yr) * (X/Q) * MP Chronic Worker * MWAF] / Chronic REL

	HIC - Commercial												
Compound	AL	BN	CV	DEV	END	EYE	HEM	IMM	KID	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng												8.09E-02	
Total												8.09E-02	

6c. 8-hour Hazard Index Chronic - Resident **A/N:** _____ **Application deemed complete date:** 10/01/17

HIC 8-hr = [Q(ton/yr) * (X/Q) Resident * WAF Resident * MWAF] / 8-hr Chronic REL

	HIC - Residential												
Compound	AL	BN	CV	DEV	END	EYE	HEM	IMM	KID	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng													
Total													

DIESEL ENGINE DATA

A/N , 8th Hope and G

(Procedure Version 8.1 & Package N, September 1, 2017) - Risk Tool V1.103

Engine Horse Power	300	bhp
Engine Year Built	2022	
Generator Engine ?	YES	
Emission Factor from applicant or engine manufacturer's specification (*)		g/bhp-hr
EPA's PM non-road exhaust emission standards (**)	0.15	g/bhp-hr

Compound	R1 (Uncontrolled) (lbs/hr) (***)	Efficiency	R2 (Controlled) (lbs/hr)
Particulate Emissions from Diesel-Fueled Engines	9.91E-02	0.1	8.92E-02

(*) From applicant or engine manufaturer's specifications.

(**) From EPA non-road engine exhaust emission standards for Diesel ICE based on engine HP, engine year built and engine type. (http://www.arb.ca.gov/msprog/offroad/offroad.htm & http://www.epa.gov/otaq/standards/nonroad/nonroadci.htm)

(***) Uncontrolled emission R1 is calculated as followed:

R1 = Engine Power [BHP] x Emission Factor [g/BHP-hr] x 1 lb/454 g

6c. 8-hour Hazard Index Chronic - Worker

HIC 8-hr = [Q(ton/yr) * (X/Q) Worker * WAF Worker * MWAF] / 8-hr Chronic REL

	HIC - Commercial												
Compound	AL	BN	CV	DEV	END	EYE	HEM	IMM	KID	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng													
Total													

Fac Name: 8th Hope and Grand A/N: 0

TAC Code	Compound	Emission Rate (lbs/hr)	Molecular Weight	R1 - Uncontrolled (lbs/hr)	Efficiency Factor (Fraction range 0-1)	R2-Controlled (lbs/hr)
P1	Particulate Emissions from Diesel-Fueled Engines	9.91E-02	350	9.91E-02	0.09990	0.089200009

TIER 1 SCREENING RISK ASSESSMENT REPORT

(Procedure Version 8.1 & Package N, September 1, 2017)

Application deemed complete date: 10/1/2017

A/N , 8th Hope and Grand

Equipment Type	Other	No T-BACT
Nearest Receptor Distance (actual)	25	meters
Receptor Distance (Table 1 Emission look up)	25	meters

Tier 1 Results	
Cancer/Chronic ASI	**Acute ASI**
2.22E+01	
FAILED	PASSED

APPLICATION SCREENING INDEX CALCULATION

Compound	Average Annual Emission Rate (lbs/yr)	Max Hourly Emission Rate (lbs/hr)	Cancer/Chronic Pollutant Screening Level (lbs/yr) from Table 1	Acute Pollutant Screening Level (lbs/hr) from Table 1	Cancer/Chronic Pollutant Screening Index (PSI)	Acute Pollutant Screening Index (PSI)
Particulate Emissions from Diesel-Fueled Engines	1.07E+00	8.92E-02	4.83E-02		2.22E+01	
TOTAL (APPLICATION SCREENING INDEX)					**2.22E+01**	

EMISSIONS ARE ENTERED ON THE EMISSIONS WORKSHEET OR ON ONE OF EQUIPMENT WORKSHEETS

INPUT PARAMETERS ENTERED ON THE EMISSIONS SHEET ARE USED FOR TIERS 1 AND TIER 2 ANALYSES

TIER 2 SCREENING RISK ASSESSMENT REPORT

(Procedure Version 8.1 & Package N, September 1, 2017) - Risk Tool V1.103

A/N: _____ **Fac:** 8th Hope and Grand **Application deemed complete date:** 10/1/2017

1. Stack Data

Equipment Type	Generator	
Combustion Eff	0.0	
	No T-BACT	
Operation Schedule	1	hrs/day
	1	days/week
	12	weeks/year
Stack Height	14	ft
Distance to Residential	60.96	m
Distance to Commercial	25	m
Meteorological Station	USC/Downtown L.A.	

2. Tier 2 Data

Dispersion Factors tables	Point Source
For Chronic X/Q	Table 6
For Acute X/Q max	Table 6.4

Dilution Factors

Receptor	X/Q (µg/m³)/(tons/yr)	X/Qmax (µg/m³)/(lbs/hr)
Residential	7.73	234.66
Commercial - Worker	45.34	676.64

Intake and Adjustment Factors

	Residential	Worker
Year of Exposure	30	
Combined Exposure Factor (CEF) - Table 4	677.40	55.86
Worker Adjustment Factor (WAF) - Table 5	1	4.20

A/N: ______________ **Application deemed complete date:** 10/01/17

3. Rule 1401 Compound Data

Compound	R1 - Uncontrolled (lbs/hr)	R2 - Controlled (lbs/hr)	CP $(mg/kg\text{-}day)^{-1}$	MP MICR Resident	MP MICR Worker	MP Chronic Resident	MP Chronic Worker	REL Chronic (µg/m³)	REL 8-hr Chronic (µg/m³)	REL Acute (µg/m³)	MWAF
Particulate Emissions from Diesel-Fueled Eng	9.91E-02	8.92E-02	1.10E+00	1.00	1.00	1.00	1.00	5.00E+00			1

A/N: _____ Application deemed complete date: 10/01/17

4. Emission Calculations

Compound	R1 (lbs/hr)	R2 (lbs/hr)	R1 (lbs/day)	R2 (lbs/day)	R2 (lbs/yr)	R2 (tons/yr)
Particulate Emissions from Diesel-Fueled Eng	9.91E-02	8.92E-02	9.91E-02	8.92E-02	1.07E+00	5.35E-04
Total	**9.91E-02**	**8.92E-02**	**9.91E-02**	**8.92E-02**	**1.07E+00**	**5.35E-04**

TIER 2 RESULTS

A/N: _____ Application deemed complete date: 10/01/17

5a. MICR

MICR Resident = CP (mg/(kg-day))^-1 * Q (ton/yr) * (X/Q) Resident * CEF Resident * MP Resident * 1e-6 * MWAF

MICR Worker = CP (mg/(kg-day))^-1 * Q (ton/yr) * (X/Q) Worker * CEF Worker* MP Worker* WAF Worker* 1e-6 * MWAF

Compound	Residential	Commercial
Particulate Emissions from Diesel-Fueled Eng	3.08E-06	6.26E-06
Total	**3.08E-06**	**6.26E-06**
	FAIL	**FAIL**

5b. Is Cancer Burden Calculation Needed (MICR >1E-6)?	**YES**
New X/Q at which $MICR_{70yr}$ is one-in-a-million [(µg/m³)/(tons/yr)]:	7.24E+00
New Distance, interpolated from X/Q table using New X/Q (meter):	63.46
Zone Impact Area (km²):	1.27E-02
Zone of Impact Population (7000 person/km²):	8.86E+01
Cancer Burden:	**5.55E-04**
Cancer Burden is less than or equal to 0.5	**PASS**

6. Hazard Index Summary **A/N:** _____ **Application deemed complete date:** 10/01/17

HIA = [Q(lb/hr) * (X/Q)max * MWAF]/ Acute REL
HIC = [Q(ton/yr) * (X/Q) * MP * MWAF] / Chronic REL
HIC 8-hr= [Q(ton/yr) * (X/Q) * WAF * MWAF] / 8-hr Chronic REL

Target Organs	Acute	Chronic	8-hr Chronic	Acute Pass/Fail	Chronic Pass/Fail	8-hr Chronic Pass/Fail
Alimentary system (liver) - AL			N/A	Pass	Pass	Pass
Bones and teeth - BN			N/A	Pass	Pass	Pass
Cardiovascular system - CV			N/A	Pass	Pass	Pass
Developmental - DEV			N/A	Pass	Pass	Pass
Endocrine system - END			N/A	Pass	Pass	Pass
Eye			N/A	Pass	Pass	Pass
Hematopoietic system - HEM			N/A	Pass	Pass	Pass
Immune system - IMM			N/A	Pass	Pass	Pass
Kidney - KID			N/A	Pass	Pass	Pass
Nervous system - NS			N/A	Pass	Pass	Pass
Reproductive system - REP			N/A	Pass	Pass	Pass
Respiratory system - RESP		4.85E-03	N/A	Pass	Pass	Pass
Skin			N/A	Pass	Pass	Pass

6a. Hazard Index Acute - Resident

HIA = [Q(lb/hr) * (X/Q)max resident * MWAF] / Acute REL

	HIA - Residential									
Compound	AL	CV	DEV	EYE	HEM	IMM	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng										
Total										

6a. Hazard Index Acute - Worker **A/N:** _____ **Application deemed complete date:** 10/01/17

HIA = [Q(lb/hr) * (X/Q)max Worker * MWAF] / Acute REL

	HIA - Commercial									
Compound	AL	CV	DEV	EYE	HEM	IMM	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng										
Total										

A/N: _____ **Application deemed complete date:** 10/01/17

6b. Hazard Index Chronic - Resident

HIC = [Q(ton/yr) * (X/Q) Resident * MP Chronic Resident * MWAF] / Chronic REL

	HIC - Residential												
Compound	AL	BN	CV	DEV	END	EYE	HEM	IMM	KID	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng												8.28E-04	
Total												8.28E-04	

A/N: _____ Application deemed complete date: 10/01/17

6b. Hazard Index Chronic - Worker

HIC = [Q(ton/yr) * (X/Q) * MP Chronic Worker * MWAF] / Chronic REL

	HIC - Commercial												
Compound	AL	BN	CV	DEV	END	EYE	HEM	IMM	KID	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng												4.85E-03	
Total												4.85E-03	

6c. 8-hour Hazard Index Chronic - Resident **A/N:** _____ **Application deemed complete date:** 10/01/17

HIC 8-hr = [Q(ton/yr) * (X/Q) Resident * WAF Resident * MWAF] / 8-hr Chronic REL

	HIC - Residential												
Compound	AL	BN	CV	DEV	END	EYE	HEM	IMM	KID	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng													
Total													

6c. 8-hour Hazard Index Chronic - Worker

HIC 8-hr = [Q(ton/yr) * (X/Q) Worker * WAF Worker * MWAF] / 8-hr Chronic REL

	HIC - Commercial												
Compound	AL	BN	CV	DEV	END	EYE	HEM	IMM	KID	NS	REP	RESP	SKIN
Particulate Emissions from Diesel-Fueled Eng													
Total													

DIESEL ENGINE DATA

A/N , 8th Hope and G

(Procedure Version 8.1 & Package N, September 1, 2017) - Risk Tool V1.103

Engine Horse Power	300	bhp
Engine Year Built	2022	
Generator Engine ?	YES	
Emission Factor from applicant or engine manufacturer's specification (*)		g/bhp-hr
EPA's PM non-road exhaust emission standards (**)	0.15	g/bhp-hr

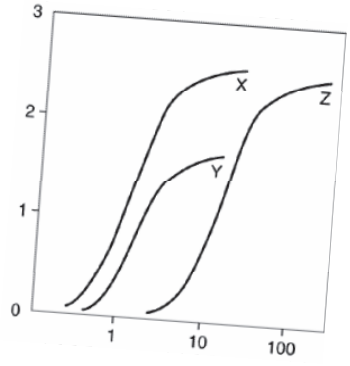
Compound	R1 (Uncontrolled) (lbs/hr) (***)	Efficiency	R2 (Controlled) (lbs/hr)
Particulate Emissions from Diesel-Fueled Engines	9.91E-02	0.1	8.92E-02

(*) From applicant or engine manufaturer's specifications.

(**) From EPA non-road engine exhaust emission standards for Diesel ICE based on engine HP, engine year built and engine type. (http://www.arb.ca.gov/msprog/offroad/offroad.htm & http://www.epa.gov/otaq/standards/nonroad/nonroadci.htm)

(***) Uncontrolled emission R1 is calculated as followed:

R1 = Engine Power [BHP] x Emission Factor [g/BHP-hr] x 1 lb/454 g



Clark & Associates
Environmental Consulting, Inc

OFFICE
12405 Venice Blvd.
Suite 331
Los Angeles, CA 90066

PHONE
310-907-6165

FAX
310-398-7626

EMAIL
jclark.assoc@gmail.com

James J. J. Clark, Ph.D.

Principal Toxicologist

Toxicology/Exposure Assessment Modeling

Risk Assessment/Analysis/Dispersion Modeling

Education:

Ph.D., Environmental Health Science, University of California, 1995

M.S., Environmental Health Science, University of California, 1993

B.S., Biophysical and Biochemical Sciences, University of Houston, 1987

Professional Experience:

Dr. Clark is a well recognized toxicologist, air modeler, and health scientist. He has 20 years of experience in researching the effects of environmental contaminants on human health including environmental fate and transport modeling (SCREEN3, AEROMOD, ISCST3, Johnson-Ettinger Vapor Intrusion Modeling); exposure assessment modeling (partitioning of contaminants in the environment as well as PBPK modeling); conducting and managing human health risk assessments for regulatory compliance and risk-based clean-up levels; and toxicological and medical literature research.

Significant projects performed by Dr. Clark include the following:

LITIGATION SUPPORT

Case: James Harold Caygle, et al, v. Drummond Company, Inc. Circuit Court for the Tenth Judicial Circuit, Jefferson County, Alabama. Civil Action. CV-2009

Client: Environmental Litgation Group, Birmingham, Alabama

Dr. Clark performed an air quality assessment of emissions from a coke factory located in Tarrant, Alabama. The assessment reviewed include a comprehensive review of air quality standards, measured concentrations of pollutants from factory, an inspection of the facility and detailed assessment of the impacts on the community. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Rose Roper V. Nissan North America, et al. Superior Court of the State Of California for the County Of Los Angeles – Central Civil West. Civil Action. NC041739

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to multiple chemicals, including benzene, who later developed a respiratory distress. A review of the individual's medical and occupational history was performed to prepare an exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to respiratory irritants. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: O'Neil V. Sherwin Williams, et al. United States District Court Central District of California

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to petroleum distillates who later developed a bladder cancer. A review of the individual's medical and occupational history was performed to prepare a quantitative exposure assessment. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Summary judgment for defendants.

Case: Moore V., Shell Oil Company, et al. Superior Court of the State Of California for the County Of Los Angeles

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to chemicals while benzene who later developed a leukogenic disease. A review of the individual's medical and occupational history was performed to prepare a quantitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to refined petroleum hydrocarbons. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Raymond Saltonstall V. Fuller O'Brien, KILZ, and Zinsser, et al. United States District Court Central District of California

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to benzene who later developed a leukogenic disease. A review of the individual's medical and occupational history was performed to prepare a quantitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to refined petroleum hydrocarbons. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Richard Boyer and Elizabeth Boyer, husband and wife, V. DESCO Corporation, et al. Circuit Court of Brooke County, West Virginia. Civil Action Number 04-C-7G.

Client: Frankovitch, Anetakis, Colantonio & Simon, Morgantown, West Virginia.

Dr. Clark performed a toxicological assessment of a family exposed to chlorinated solvents released from the defendant's facility into local drinking water supplies. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to chlorinated solvents. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: JoAnne R. Cook, V. DESCO Corporation, et al. Circuit Court of Brooke County, West Virginia. Civil Action Number 04-C-9R

Client: Frankovitch, Anetakis, Colantonio & Simon, Morgantown, West Virginia.

Dr. Clark performed a toxicological assessment of an individual exposed to chlorinated solvents released from the defendant's facility into local drinking water supplies. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to chlorinated solvents. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Patrick Allen And Susan Allen, husband and wife, and Andrew Allen, a minor, V. DESCO Corporation, et al. Circuit Court of Brooke County, West Virginia. Civil Action Number 04-C-W

Client: Frankovitch, Anetakis, Colantonio & Simon, Morgantown, West Virginia.

Dr. Clark performed a toxicological assessment of a family exposed to chlorinated solvents released from the defendant's facility into local drinking water supplies. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to chlorinated solvents. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Michael Fahey, Susan Fahey V. Atlantic Richfield Company, et al. United States District Court Central District of California Civil Action Number CV-06 7109 JCL.

Client: Rose, Klein, Marias, LLP, Long Beach, California

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to refined petroleum hydrocarbons who later developed a leukogenic disease. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the known outcomes in published literature to exposure to refined petroleum hydrocarbons. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Settlement in favor of plaintiff.

Case: Constance Acevedo, et al., V. California Spray-Chemical Company, et al., Superior Court of the State Of California, County Of Santa Cruz. Case No. CV 146344

Dr. Clark performed a comprehensive exposure assessment of community members exposed to toxic metals from a former lead arsenate manufacturing facility. The former manufacturing site had undergone a DTSC mandated removal action/remediation for the presence of the toxic metals at the site. Opinions were presented regarding the elevated levels of arsenic and lead (in attic dust and soils) found throughout the community and the potential for harm to the plaintiffs in question.

Case Result: Settlement in favor of defendant.

Case: Michael Nawrocki V. The Coastal Corporation, Kurk Fuel Company, Pautler Oil Service, State of New York Supreme Court, County of Erie, Index Number I2001-11247

Client: Richard G. Berger Attorney At Law, Buffalo, New York

Dr. Clark performed a toxicological assessment of an individual occupationally exposed to refined petroleum hydrocarbons who later developed a leukogenic disease. A review of the individual's medical and occupational history was performed to prepare a qualitative exposure assessment. The exposure assessment was evaluated against the

known outcomes in published literature to exposure to refined petroleum hydrocarbons. The results of the assessment and literature have been provided in a declaration to the court.

Case Result: Judgement in favor of defendant.

SELECTED AIR MODELING RESEARCH/PROJECTS

Client – Confidential

Dr. Clark performed a comprehensive evaluation of criteria pollutants, air toxins, and particulate matter emissions from a carbon black production facility to determine the impacts on the surrounding communities. The results of the dispersion model will be used to estimate acute and chronic exposure concentrations to multiple contaminants and will be incorporated into a comprehensive risk evaluation.

Client – Confidential

Dr. Clark performed a comprehensive evaluation of air toxins and particulate matter emissions from a railroad tie manufacturing facility to determine the impacts on the surrounding communities. The results of the dispersion model have been used to estimate acute and chronic exposure concentrations to multiple contaminants and have been incorporated into a comprehensive risk evaluation.

Client – Los Angeles Alliance for a New Economy (LAANE), Los Angeles, California

Dr. Clark is advising the LAANE on air quality issues related to current flight operations at the Los Angeles International Airport (LAX) operated by the Los Angeles World Airport (LAWA) Authority. He is working with the LAANE and LAX staff to develop a comprehensive strategy for meeting local community concerns over emissions from flight operations and to engage federal agencies on the issue of local impacts of community airports.

Client – City of Santa Monica, Santa Monica, California

Dr. Clark is advising the City of Santa Monica on air quality issues related to current flight operations at the facility. He is working with the City staff to develop a comprehensive strategy for meeting local community concerns over emissions from flight operations and to engage federal agencies on the issue of local impacts of community airports.

Client: Omnitrans, San Bernardino, California

Dr. Clark managed a public health survey of three communities near transit fueling facilities in San Bernardino and Montclair California in compliance with California Senate Bill 1927. The survey included an epidemiological survey of the effected communities, emission surveys of local businesses, dispersion modeling to determine potential emission concentrations within the communities, and a comprehensive risk assessment of each community. The results of the study were presented to the Governor as mandated by Senate Bill 1927.

Client: Confidential, San Francisco, California

Summarized cancer types associated with exposure to metals and smoking. Researched the specific types of cancers associated with exposure to metals and smoking. Provided causation analysis of the association between cancer types and exposure for use by non-public health professionals.

Client: Confidential, Minneapolis, Minnesota

Prepared human health risk assessment of workers exposed to VOCs from neighboring petroleum storage/transport facility. Reviewed the systems in place for distribution of petroleum hydrocarbons to identify chemicals of concern (COCs), prepared comprehensive toxicological summaries of COCs, and quantified potential risks from carcinogens and non-carcinogens to receptors at or adjacent to site. This evaluation was used in the support of litigation.

Client – United Kingdom Environmental Agency

Dr. Clark is part of team that performed comprehensive evaluation of soil vapor intrusion of VOCs from former landfill adjacent residences for the United Kingdom's Environment

Agency. The evaluation included collection of liquid and soil vapor samples at site, modeling of vapor migration using the Johnson Ettinger Vapor Intrusion model, and calculation of site-specific health based vapor thresholds for chlorinated solvents, aromatic hydrocarbons, and semi-volatile organic compounds. The evaluation also included a detailed evaluation of the use, chemical characteristics, fate and transport, and toxicology of chemicals of concern (COC). The results of the evaluation have been used as a briefing tool for public health professionals.

EMERGING/PERSISTENT CONTAMINANT RESEARCH/PROJECTS

Client: Ameren Services, St. Louis, Missouri

Managed the preparation of a comprehensive human health risk assessment of workers and residents at or near an NPL site in Missouri. The former operations at the Property included the servicing and repair of electrical transformers, which resulted in soils and groundwater beneath the Property and adjacent land becoming impacted with PCB and chlorinated solvent compounds. The results were submitted to U.S. EPA for evaluation and will be used in the final ROD.

Client: City of Santa Clarita, Santa Clarita, California

Dr. Clark is managing the oversight of the characterization, remediation and development activities of a former 1,000 acre munitions manufacturing facility for the City of Santa Clarita. The site is impacted with a number of contaminants including perchlorate, unexploded ordinance, and volatile organic compounds (VOCs). The site is currently under a number of regulatory consent orders, including an Immanent and Substantial Endangerment Order. Dr. Clark is assisting the impacted municipality with the development of remediation strategies, interaction with the responsible parties and stakeholders, as well as interfacing with the regulatory agency responsible for oversight of the site cleanup.

Client: Confidential, Los Angeles, California

Prepared comprehensive evaluation of perchlorate in environment. Dr. Clark evaluated the production, use, chemical characteristics, fate and transport, toxicology, and remediation of perchlorate. Perchlorates form the basis of solid rocket fuels and have recently been detected in water supplies in the United States. The results of this research

were presented to the USEPA, National GroundWater, and ultimately published in a recent book entitled *Perchlorate in the Environment*.

Client – Confidential, Los Angeles, California

Dr. Clark is performing a comprehensive review of the potential for pharmaceuticals and their by-products to impact groundwater and surface water supplies. This evaluation will include a review if available data on the history of pharmaceutical production in the United States; the chemical characteristics of various pharmaceuticals; environmental fate and transport; uptake by xenobiotics; the potential effects of pharmaceuticals on water treatment systems; and the potential threat to public health. The results of the evaluation may be used as a briefing tool for non-public health professionals.

PUBLIC HEALTH/TOXICOLOGY

Client: Brayton Purcell, Novato, California

Dr. Clark performed a toxicological assessment of residents exposed to methyl-tertiary butyl ether (MTBE) from leaking underground storage tanks (LUSTs) adjacent to the subject property. The symptomology of residents and guests of the subject property were evaluated against the known outcomes in published literature to exposure to MTBE. The study found that residents had been exposed to MTBE in their drinking water; that concentrations of MTBE detected at the site were above regulatory guidelines; and, that the symptoms and outcomes expressed by residents and guests were consistent with symptoms and outcomes documented in published literature.

Client: Confidential, San Francisco, California

Identified and analyzed fifty years of epidemiological literature on workplace exposures to heavy metals. This research resulted in a summary of the types of cancer and non-cancer diseases associated with occupational exposure to chromium as well as the mortality and morbidity rates.

Client: Confidential, San Francisco, California

Summarized major public health research in United States. Identified major public health research efforts within United States over last twenty years. Results were used as a briefing tool for non-public health professionals.

Client: Confidential, San Francisco, California

Quantified the potential multi-pathway dose received by humans from a pesticide applied indoors. Part of team that developed exposure model and evaluated exposure concentrations in a comprehensive report on the plausible range of doses received by a specific person. This evaluation was used in the support of litigation.

Client: Covanta Energy, Westwood, California

Evaluated health risk from metals in biosolids applied as soil amendment on agricultural lands. The biosolids were created at a forest waste cogeneration facility using 96% whole tree wood chips and 4 percent green waste. Mass loading calculations were used to estimate Cr(VI) concentrations in agricultural soils based on a maximum loading rate of 40 tons of biomass per acre of agricultural soil. The results of the study were used by the Regulatory agency to determine that the application of biosolids did not constitute a health risk to workers applying the biosolids or to residences near the agricultural lands.

Client – United Kingdom Environmental Agency

Oversaw a comprehensive toxicological evaluation of methyl-*tertiary* butyl ether (M*t*BE) for the United Kingdom's Environment Agency. The evaluation included available data on the production, use, chemical characteristics, fate and transport, toxicology, and remediation of M*t*BE. The results of the evaluation have been used as a briefing tool for public health professionals.

Client – Confidential, Los Angeles, California

Prepared comprehensive evaluation of *tertiary* butyl alcohol (TBA) in municipal drinking water system. TBA is the primary breakdown product of M*t*BE, and is suspected to be the primary cause of M*t*BE toxicity. This evaluation will include available information on the production, use, chemical characteristics, fate and transport in the environment, absorption, distribution, routes of detoxification, metabolites, carcinogenic potential, and remediation of TBA. The results of the evaluation were used as a briefing tool for non-public health professionals.

Client – Confidential, Los Angeles, California

Prepared comprehensive evaluation of methyl *tertiary* butyl ether (MTBE) in municipal drinking water system. MTBE is a chemical added to gasoline to increase the octane

rating and to meet Federally mandated emission criteria. The evaluation included available data on the production, use, chemical characteristics, fate and transport, toxicology, and remediation of MTBE. The results of the evaluation have been were used as a briefing tool for non-public health professionals.

Client – Ministry of Environment, Lands & Parks, British Columbia

Dr. Clark assisted in the development of water quality guidelines for methyl tertiary-butyl ether (MTBE) to protect water uses in British Columbia (BC). The water uses to be considered includes freshwater and marine life, wildlife, industrial, and agricultural (e.g., irrigation and livestock watering) water uses. Guidelines from other jurisdictions for the protection of drinking water, recreation and aesthetics were to be identified.

Client: Confidential, Los Angeles, California

Prepared physiologically based pharmacokinetic (PBPK) assessment of lead risk of receptors at middle school built over former industrial facility. This evaluation is being used to determine cleanup goals and will be basis for regulatory closure of site.

Client: Kaiser Venture Incorporated, Fontana, California

Prepared PBPK assessment of lead risk of receptors at a 1,100-acre former steel mill. This evaluation was used as the basis for granting closure of the site by lead regulatory agency.

RISK ASSESSMENTS/REMEDIAL INVESTIGATIONS

Client: Confidential, Atlanta, Georgia

Researched potential exposure and health risks to community members potentially exposed to creosote, polycyclic aromatic hydrocarbons, pentachlorophenol, and dioxin compounds used at a former wood treatment facility. Prepared a comprehensive toxicological summary of the chemicals of concern, including the chemical characteristics, absorption, distribution, and carcinogenic potential. Prepared risk characterization of the carcinogenic and non-carcinogenic chemicals based on the exposure assessment to quantify the potential risk to members of the surrounding community. This evaluation was used to help settle class-action tort.

Client: Confidential, Escondido, California

Prepared comprehensive Preliminary Endangerment Assessment (PEA) of dense non-aqueous liquid phase hydrocarbon (chlorinated solvents) contamination at a former printed circuit board manufacturing facility. This evaluation was used for litigation support and may be used as the basis for reaching closure of the site with the lead regulatory agency.

Client: Confidential, San Francisco, California

Summarized epidemiological evidence for connective tissue and autoimmune diseases for product liability litigation. Identified epidemiological research efforts on the health effects of medical prostheses. This research was used in a meta-analysis of the health effects and as a briefing tool for non-public health professionals.

Client: Confidential, Bogotá, Columbia

Prepared comprehensive evaluation of the potential health risks associated with the redevelopment of a 13.7 hectares plastic manufacturing facility in Bogotá, Colombia The risk assessment was used as the basis for the remedial goals and closure of the site.

Client: Confidential, Los Angeles, California

Prepared comprehensive human health risk assessment of students, staff, and residents potentially exposed to heavy metals (principally cadmium) and VOCs from soil and soil vapor at 12-acre former crude oilfield and municipal landfill. The site is currently used as a middle school housing approximately 3,000 children. The evaluation determined that the site was safe for the current and future uses and was used as the basis for regulatory closure of site.

Client: Confidential, Los Angeles, California

Managed remedial investigation (RI) of heavy metals and volatile organic chemicals (VOCs) for a 15-acre former manufacturing facility. The RI investigation of the site included over 800 different sampling locations and the collection of soil, soil gas, and groundwater samples. The site is currently used as a year round school housing approximately 3,000 children. The Remedial Investigation was performed in a manner

that did not interrupt school activities and met the time restrictions placed on the project by the overseeing regulatory agency. The RI Report identified the off-site source of metals that impacted groundwater beneath the site and the sources of VOCs in soil gas and groundwater. The RI included a numerical model of vapor intrusion into the buildings at the site from the vadose zone to determine exposure concentrations and an air dispersion model of VOCs from the proposed soil vapor treatment system. The Feasibility Study for the Site is currently being drafted and may be used as the basis for granting closure of the site by DTSC.

Client: Confidential, Los Angeles, California

Prepared comprehensive human health risk assessment of students, staff, and residents potentially exposed to heavy metals (principally lead), VOCs, SVOCs, and PCBs from soil, soil vapor, and groundwater at 15-acre former manufacturing facility. The site is currently used as a year round school housing approximately 3,000 children. The evaluation determined that the site was safe for the current and future uses and will be basis for regulatory closure of site.

Client: Confidential, Los Angeles, California

Prepared comprehensive evaluation of VOC vapor intrusion into classrooms of middle school that was former 15-acre industrial facility. Using the Johnson-Ettinger Vapor Intrusion model, the evaluation determined acceptable soil gas concentrations at the site that did not pose health threat to students, staff, and residents. This evaluation is being used to determine cleanup goals and will be basis for regulatory closure of site.

Client –Dominguez Energy, Carson, California

Prepared comprehensive evaluation of the potential health risks associated with the redevelopment of 6-acre portion of a 500-acre oil and natural gas production facility in Carson, California. The risk assessment was used as the basis for closure of the site.

Kaiser Ventures Incorporated, Fontana, California

Prepared health risk assessment of semi-volatile organic chemicals and metals for a fifty-year old wastewater treatment facility used at a 1,100-acre former steel mill. This evaluation was used as the basis for granting closure of the site by lead regulatory agency.

ANR Freight - Los Angeles, California

Prepared a comprehensive Preliminary Endangerment Assessment (PEA) of petroleum hydrocarbon and metal contamination of a former freight depot. This evaluation was as the basis for reaching closure of the site with lead regulatory agency.

Kaiser Ventures Incorporated, Fontana, California

Prepared comprehensive health risk assessment of semi-volatile organic chemicals and metals for 23-acre parcel of a 1,100-acre former steel mill. The health risk assessment was used to determine clean up goals and as the basis for granting closure of the site by lead regulatory agency. Air dispersion modeling using ISCST3 was performed to determine downwind exposure point concentrations at sensitive receptors within a 1 kilometer radius of the site. The results of the health risk assessment were presented at a public meeting sponsored by the Department of Toxic Substances Control (DTSC) in the community potentially affected by the site.

Unocal Corporation - Los Angeles, California

Prepared comprehensive assessment of petroleum hydrocarbons and metals for a former petroleum service station located next to sensitive population center (elementary school). The assessment used a probabilistic approach to estimate risks to the community and was used as the basis for granting closure of the site by lead regulatory agency.

Client: Confidential, Los Angeles, California

Managed oversight of remedial investigation most contaminated heavy metal site in California. Lead concentrations in soil excess of 68,000,000 parts per billion (ppb) have been measured at the site. This State Superfund Site was a former hard chrome plating operation that operated for approximately 40-years.

Client: Confidential, San Francisco, California

Coordinator of regional monitoring program to determine background concentrations of metals in air. Acted as liaison with SCAQMD and CARB to perform co-location sampling and comparison of accepted regulatory method with ASTM methodology.

Client: Confidential, San Francisco, California

Analyzed historical air monitoring data for South Coast Air Basin in Southern California and potential health risks related to ambient concentrations of carcinogenic metals and volatile organic compounds. Identified and reviewed the available literature and calculated risks from toxins in South Coast Air Basin.

IT Corporation, North Carolina

Prepared comprehensive evaluation of potential exposure of workers to air-borne VOCs at hazardous waste storage facility under SUPERFUND cleanup decree. Assessment used in developing health based clean-up levels.

Professional Associations

American Public Health Association (APHA)
Association for Environmental Health and Sciences (AEHS)
American Chemical Society (ACS)
California Redevelopment Association (CRA)
International Society of Environmental Forensics (ISEF)
Society of Environmental Toxicology and Chemistry (SETAC)

Publications and Presentations:

Books and Book Chapters

Sullivan, P., **J.J. J. Clark,** F.J. Agardy, and P.E. Rosenfeld. (2007). *Synthetic Toxins In The Food, Water and Air of American Cities*. Elsevier, Inc. Burlington, MA.

Sullivan, P. and **J.J. J. Clark**. 2006. *Choosing Safer Foods, A Guide To Minimizing Synthetic Chemicals In Your Diet*. Elsevier, Inc. Burlington, MA.

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Clark, J.J.J. 2000. "Toxicology of Perchlorate" in *Perchlorate in the Environment.* Edward Urbansky, Ed. Kluwer/Plenum: New York.

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Baker, J.; **Clark, J.J.J.**; Stanford, J.T. 1994. Ex Situ Remediation of Diesel Contaminated Railroad Sand by Soil Washing. Principles and Practices for Diesel Contaminated Soils, Volume III. P.T. Kostecki, E.J. Calabrese, and C.P.L. Barkan, eds. Amherst Scientific Publishers, Amherst, MA. pp 89-96.

Journal and Proceeding Articles

Tam L. K.., Wu C. D., Clark J. J. and **Rosenfeld, P.E.** (2008) A Statistical Analysis Of Attic Dust And Blood Lipid Concentrations Of Tetrachloro-p-Dibenzodioxin (TCDD) Toxicity Equialency Quotients (TEQ) In Two Populations Near Wood Treatment Facilities. Organohalogen Compounds, Volume 70 (2008) page 002254.

Tam L. K.., Wu C. D., Clark J. J. and **Rosenfeld, P.E.** (2008) Methods For Collect Samples For Assessing Dioxins And Other Environmental Contaminants In Attic Dust: A Review. Organohalogen Compounds, Volume 70 (2008) page 000527

Hensley A.R., Scott, A., Rosenfeld P.E., **Clark, J.J.J.** (2007). "Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility." *Environmental Research.* 105:194-199.

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Hensley A.R., Scott, A., Rosenfeld P.E., **Clark, J.J.J.** 2006. "Dioxin Containing Attic Dust And Human Blood Samples Collected Near A Former Wood Treatment Facility." The 26th International Symposium on Halogenated Persistent Organic Pollutants – DIOXIN2006, August 21 – 25, 2006. Radisson SAS Scandinavia Hotel in Oslo Norway.

Rosenfeld, P.E., **Clark, J. J.** and Suffet, I.H. 2005. "The Value Of An Odor Quality Classification Scheme For Compost Facility Evaluations" The U.S. Composting Council's 13th Annual Conference January 23 - 26, 2005, Crowne Plaza Riverwalk, San Antonio, TX.

Rosenfeld, P.E., **Clark, J. J.** and Suffet, I.H. 2004. "The Value Of An Odor Quality Classification Scheme For Urban Odor" WEFTEC 2004. 77th Annual Technical Exhibition & Conference October 2 - 6, 2004, Ernest N. Morial Convention Center, New Orleans, Louisiana.

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Clark, J.J.J.; Corbett, G.E.; Kerger, B.D.; Finley, B.L.; Paustenbach, D.J. 1996. Dermal Uptake of Hexavalent Chromium In Human Volunteers: Measures of Systemic Uptake From Immersion in Water At 22 PPM. Toxicologist. 30(1):14.

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ATTACHMENT B

WILSON IHRIG
ACOUSTICS, NOISE & VIBRATION

CALIFORNIA
WASHINGTON
NEW YORK

WI #21-092.20

4 January 2022

Darien K. Keys, Esq.
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, CA 94080

Subject: *8th, Grand and Hope Project, Los Angeles, California*
Draft Environmental Impact Report
Review and Comment on Noise Analysis

Dear Mr. Keys,

As requested, we have reviewed the information and noise impact analyses in the following document:

8th, Grand and Hope Project, Los Angeles, California
Draft Environmental Impact Report ("DEIR")
November 2021

This letter reports our comments on the noise analysis in the subject document.

Wilson, Ihrig & Associates, Acoustical Consultants, has practiced exclusively in the field of acoustics since 1966. During our 56 years of operation, we have prepared hundreds of noise studies for Environmental Impact Reports and Statements. We have one of the largest technical laboratories in the acoustical consulting industry. We also utilize industry-standard acoustical programs such as Environmental Noise Model (ENM), Traffic Noise Model (TNM), SoundPLAN, and CADNA. In short, we are well qualified to prepare environmental noise studies and review studies prepared by others.

Adverse Effects of Noise[1]

Although the health effects of noise are not taken as seriously in the United States as they are in other countries, they are real and, in many parts of the country, pervasive.

Noise-Induced Hearing Loss. If a person is repeatedly exposed to loud noises, he or she may experience noise-induced hearing impairment or loss. In the United States, both the Occupational Health and Safety Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH) promote standards and regulations to protect the hearing of people exposed to high

[1] More information on these and other adverse effects of noise may be found in *Guidelines for Community Noise*, eds B Berglund, T Lindvall, and D Schwela, World Health Organization, Geneva, Switzerland, 1999. (https://www.who.int/docstore/peh/noise/Comnoise-1.pdf)

levels of industrial noise.

Speech Interference. Another common problem associated with noise is speech interference. In addition to the obvious issues that may arise from misunderstandings, speech interference also leads to problems with concentration fatigue, irritation, decreased working capacity, and automatic stress reactions. For complete speech intelligibility, the sound level of the speech should be 15 to 18 dBA higher than the background noise. Typical indoor speech levels are 45 to 50 dBA at 1 meter, so any noise above 30 dBA begins to interfere with speech intelligibility. The common reaction to higher background noise levels is to raise one's voice. If this is required persistently for long periods of time, stress reactions and irritation will likely result. The problems and irritation that are associated with speech disturbance have become more pronounced during the COVID-19 pandemic because many people find themselves and the people they live with trying to work and learn simultaneously in spaces that were not designed for speech privacy.

Sleep Disturbance. Noise can disturb sleep by making it more difficult to fall asleep, by waking someone after they are asleep, or by altering their sleep stage, e.g., reducing the amount of rapid eye movement (REM) sleep. Noise exposure for people who are sleeping has also been linked to increased blood pressure, increased heart rate, increase in body movements, and other physiological effects. Not surprisingly, people whose sleep is disturbed by noise often experience secondary effects such as increased fatigue, depressed mood, and decreased work performance.

Cardiovascular and Physiological Effects. Human's bodily reactions to noise are rooted in the "fight or flight" response that evolved when many noises signaled imminent danger. These include increased blood pressure, elevated heart rate, and vasoconstriction. Prolonged exposure to acute noises can result in permanent effects such as hypertension and heart disease.

Impaired Cognitive Performance. Studies have established that noise exposure impairs people's abilities to perform complex tasks (tasks that require attention to detail or analytical processes) and it makes reading, paying attention, solving problems, and memorizing more difficult. This is why there are standards for classroom background noise levels and why offices and libraries are designed to provide quiet work environments. While sheltering-in-place during the COVID-19 pandemic, many people are finding working and learning more difficult because their home environment is not as quiet as their office or school was.

Comments on Construction Noise Mitigation

The construction noise analysis in the DEIR is thorough, transparent, and reasonable. The DEIR correctly includes that, *sans* mitigation, the on-site construction noise impacts would be significant under CEQA at five nearby noise-sensitive receptors. [DEIR at p. IV.E-30] In Mitigation Measure NOI-MM-1, the DEIR commits to erecting a number of sound barriers around the site to reduce construction noise to levels less than the threshold of significance at ground-level receptors. However, the DEIR preparers recognize that these walls will not provide any noise relief to residents on the upper floors of neighboring buildings:

> However, the temporary sound barriers would not be effective in reducing the construction-related noise levels for the upper levels of these residential buildings, including the 7-story apartment building at receptor location R1, the 33-story apartment building at receptor location R2, the 9-story apartment building at receptor location R4, the 24-story apartment building at receptor location R5, and the 22-story apartment building at receptor location R6. [DEIR at p. IV.E-42]

The DEIR states that it is infeasible to build sound barriers at the edge of the Project site that are tall enough to block the construction noise at the higher elevations, and that it is also infeasible to use "movable noise barriers". I concur with the infeasibility of both of these noise control methods, however, there are two other options not discussed in the DEIR which may be feasible.

The first is to erect scaffolding to support construction noise control blankets at the façades of impacted receptors (R1, R2, R4, R5, and R6). R1, R5, and R6 are literally across the street from the Project site. Because scaffolding attaches directly to the buildings for lateral support, it is reasonably economical to erect tall "sound barrier" walls. The light and aesthetic issues may be somewhat ameliorated by using clear vinyl for at least some of the "panels". This was done (using standard construction noise control blankets) in San Francisco some years ago to shield the headquarters of a major financial company from noise during construction of a large project nearby. The financial building is 8-stories high. R1 is 9-stories high, which is similar, and it may not be necessary for the scaffolding to extend the full height of the R5 (24-story) or R6 (22-story) buildings.

A second option which may be feasible would be to install heavy Plexiglass or other clear panels around the edges of balconies that face the Project site to act as sound barriers without much affecting the light or view. As the photographs in Figure 1 below show, the balconies at R1 and R6 already have glass in the parapets, so it would simply be a matter of fitting Plexiglass on the upper portions. Because noise would reflect off the bottom of the balcony above, the panels would likely need to extend from the existing parapet to the balcony floor above with only a small opening for ventilation. The panels would need to be able to withstand wind loads, and there may be other code requirements. Determining the exact number of balconies that would require treatment would require a detailed noise analysis.

Comments on Relativistic Threshold of Significance

Beginning on page IV.E-38, the DEIR presents the "composite" noise level impact analysis from Project operations. This analysis, all too often not done, considers the summation of noise from all of the individual operational noises that had previously been analyzed: traffic, mechanical, parking, loading, trash compacting, and outdoor spaces. The results of the analysis are presented in Table IV.E-20 of the DEIR [p. IV.E-40]. A footnote in the table explains that

> Significance criteria are equivalent to the existing ambient plus 3 dBA if the estimated noise levels (ambient plus Project) fall with the "normally unacceptable" or "clearly unacceptable" land use categories or ambient plus 5 dBA if the estimated noise levels fall with the "normally acceptable"

or "conditionally acceptable" land use categories, per the City of Los Angeles Noise Element. [DEIR at p. IV.E-40, Table IV.E-20]

The obvious problem with this relativistic approach is that there is effectively no limit to noise exposure. For example, this approach would allow three successive projects that each add 2.9 dBA (the baseline resetting to the new post-project noise level after each), resulting in a total increase of 9.7 dBA which is clearly unacceptable. This illustrates how the relativistic threshold of significance utilized in the DEIR is incapable of preventing the continual degradation of the noise environment because it is always relative to the then-existing environment.

The obvious solution to this problem is to also incorporate absolute thresholds, and the City of Los Angeles Guidelines for Noise Compatible Land Use are ideal for this use. [The Guidelines are presented in Table IV.E-2 of the DEIR at p. IV.E-7]. Currently, the existing ambient noise levels in the Project area are "conditionally acceptable" (60 ≤ CNEL < 70) at five of the receptors analyzed and "normally unacceptable" (70 ≤ CNEL < 75) at the other four as seen in the excerpt from DEIR Table IV.E-20 below (Figure 2).[2] Also seen in Figure 2, the composite noise from the Project will cause two of the receptors (R5 and R9) to crossover from the "conditionally acceptable" category (yellow) to the "normally unacceptable" category (red). The very fact that these receptors have been pushed from a category that is fundamentally "acceptable" to one that is fundamentally "unacceptable" should in and of itself be a threshold of significance. Incorporating an absolute threshold of significance is the only way to identify the indefinite degradation of the noise environment in Los Angeles.

Conclusion

The DEIR correctly identifies that Project construction will cause a significant noise impact to residents in the area, but claims that there is no feasible mitigation. I suggest that either scaffolding-supported noise control blankets/panels or temporary Plexiglass barriers on individual balconies may be feasible options. Either of these would certainly work from a technical standpoint.

The DEIR follows the Los Angeles CEQA Threshold Guidelines which, for composite operational noise, is a relativistic standard based on the existing ambient. The repeated use of a relativistic standard means, effectively, there is no limit to how loud an area can become. Meanwhile, the Los Angeles General Plan Noise Element has absolute guidelines for land use compatibility given the noise exposure, and the Project noise would cause the noise environments at one residential building and one hotel to degrade from an "acceptable" category to an "unacceptable" category. Despite the fact that the relative increases fail to exceed the adopted relative threshold of significance, this absolute degradation should be a separate and distinct threshold. As such, the Project noise should be identified as significant.

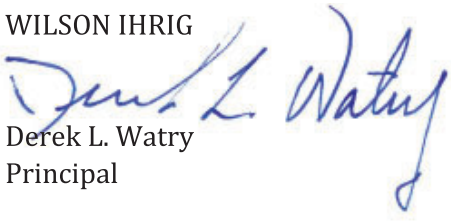
♦ ♦ ♦ ♦ ♦

[2] These are the values for "Residential – Multi-Family" buildings. "Conditionally acceptable" levels are highlighted in yellow; "normally unacceptable" levels are highlighted in red.

Please contact me if you have any question about this review of the noise analysis in the *8th, Grand and Hope Project DEIR*.

Very truly yours,

WILSON IHRIG



Derek L. Watry
Principal

2022-01-04 - 8th-grand-hope - noise - d watry.docx

FIGURE 1 BALCONIES AT RESIDENTIAL RECEPTORS R1 AND R6

Receptor Location	Existing Ambient Noise Levels (CNEL (dBA)) (A)	Calculated Project-Related Noise Sources (CNEL (dBA))					Project Composite Noise Levels (CNEL (dBA)) (G=B+C+D+E+F)[b]	Ambient Plus Project Composite Noise Levels (CNEL (dBA)) (H=A+G)[b]	Increase in Noise Levels due to Project (CNEL (dBA)) (H-A)
		Traffic (B)	Mechanical (C)	Parking (D)	Loading & Trash Compactor (E)	Outdoor Spaces[c] (F)			
R1	70.7	57.4	49.0	43.3	51.8	55.4	60.6	71.1	0.4
R2	70.2	44.1	52.8	40.7	25.8	52.6	56.1	70.4	0.2
R3	68.4	54.8	44.2	32.3	24.7	45.7	55.6	68.6	0.2
R4	69.5	54.8	45.1	45.5	44.6	51.9	57.4	69.8	0.3
R5	69.4	~~45.2~~	~~49.9~~	~~48.3~~	~~28.6~~	~~68.4~~	~~68.5~~	72.0	2.6
R6	71.5	45.7	52.2	46.8	23.1	67.3	67.5	73.0	1.5
R7	72.4	47.7	47.4	51.1	19.6	63.4	63.9	73.0	0.6
R8	67.8	53.0	51.3	46.1	27.4	52.0	57.3	68.2	0.4
R9	69.4	~~44.1~~	~~50.7~~	~~44.6~~	~~40.7~~	~~61.3~~	~~61.9~~	70.1	0.7

FIGURE 2 EXCERPT OF DEIR TABLE IV.E-20: COMPOSITE NOISE IMPACTS

DEREK L. WATRY

Principal

Since joining Wilson Ihrig in 1992, Derek has gained experienced in many areas of practice including environmental, construction, forensic, architectural, and industrial. For all of these, he has conducted extensive field measurements, established acceptability criteria, and calculated future noise and vibration levels. In the many of these areas, he has prepared CEQA and NEPA noise technical studies and EIR/EIS sections. Derek has a thorough understanding of the technical, public relations, and political aspects of environmental noise and vibration compliance work. He has helped resolve complex community noise issues, and he has also served as an expert witness in numerous legal matters.

Education

- M.S. Mechanical Engineering, University of California, Berkeley
- B.S. Mechanical Engineering, University of California, San Diego
- M.B.A. Saint Mary's College of California

Project Experience

12th Street Reconstruction, Oakland, CA
Responsible for construction noise control plan from pile driving after City received complaints from nearby neighbors. Attendance required at community meetings.

525 Golden Gate Avenue Demolition, San Francisco, CA
Noise and vibration monitoring and consultation during demolition of a multi-story office building next to Federal, State, and Municipal Court buildings for the SFDPW.

911 Emergency Communications Center, San Francisco, CA
Technical assistance on issues relating to the demolition and construction work including vibration monitoring, developing specification and reviewing/recommending appropriate methods and equipment for demolition of Old Emergency Center for the SFDPW.

Central Contra Costa Sanitary District, Grayson Creek Sewer, Pleasant Hill, CA
Evaluation of vibration levels due to construction of new sewer line in hard soil.

City of Atascadero, Review of Walmart EIR Noise Analysis, Atascadero, CA
Review and Critique of EIR Noise Analysis for the Del Rio Road Commercial Area Specific Plan.

City of Fremont, Ongoing Environmental Services On-Call Contract, Fremont, CA
Work tasks primarily focus on noise insulation and vibration control design compliance for new residential projects and peer review other consultant's projects.

City of Fremont, Patterson Ranch EIR, Fremont, CA
Conducted noise and vibration portion of the EIR.

City of King City, Silva Ranch Annexation EIR, King City, CA
Conducted the noise portion of the EIR and assessed the suitability of the project areas for the intended development. Work included a reconnaissance of existing noise sources and receptors in and around the project areas, and long-term noise measurements at key locations.

Conoco Phillips Community Study and Expert Witness, Rodeo, CA
Investigated low frequency noise from exhaust stacks and provided expert witness services representing Conoco Phillips. Evaluated effectiveness of noise controls implemented by the refinery.

Golden Gate Park Concourse Underground Garage, San Francisco, CA
Noise and vibration testing during underground garage construction to monitor for residences and an old sandstone statue during pile driving for the City of San Francisco.

Laguna Honda Hospital, Clarendon Hall Demolition, San Francisco, CA
Project manager for performed vibration monitoring during demolition of an older wing of the Laguna Honda Hospital.

Loch Lomond Marina EIR, San Rafael, CA
Examined traffic noise impacts on existing residences for the City of San Rafael. Provided the project with acoustical analyses and reports to satisfy the requirements of Title 24.

Mare Island Dredge and Material Disposal, Vallejo, CA
EIR/EIS analysis of noise from planned dredged material off-loading operations for the City of Vallejo.

Napa Creek Vibration Monitoring Review, CA
Initially brought in to peer review construction vibration services provided by another firm, but eventually was tapped for its expertise to develop a vibration monitoring plan for construction activities near historic buildings and long-term construction vibration monitoring.

San Francisco DPW, Environmental Services On-Call, CA
Noise and vibration monitoring for such tasks as: Northshore Main Improvement project, and design noise mitigation for SOMA West Skate Park.

San Francisco PUC, Islais Creek Clean Water Program, San Francisco, CA
Community noise and vibration monitoring during construction, including several stages of pile driving. Coordination of noise and ground vibration measurements during pile driving and other construction activity to determine compliance with noise ordinance. Coordination with Department of Public Works to provide a vibration seminar for inspectors and interaction with Construction Management team and nearby businesses to resolve noise and vibration issues.

San Francisco PUC, Richmond Transport Tunnel Clean Water Program, San Francisco, CA
Environmental compliance monitoring of vibration during soft tunnel mining and boring, cut-and-cover trenching for sewer lines, hard rock tunnel blasting and site remediation. Work involved long-term monitoring of general construction activity, special investigations of groundborne vibration from pumps and bus generated ground vibration, and interaction with the public (homeowners).

Santa Clara VTA, Capitol Expressway Light Rail (CELR) Bus Rapid Transit (BRT) Update EIS, CA
Reviewed previous BRT analysis and provide memo to support EIS.

Shell Oil Refinery, Martinez, CA
Identified source of community noise complaints from tonal noise due to refinery equipment and operations. Developed noise control recommendations. Conducted round-the-clock noise measurements at nearby residence and near to the property line of the refinery and correlated results. Conducted an exhaustive noise survey of the noisier pieces of equipment throughout the refinery to identify and characterize the dominant noise sources that were located anywhere from a quarter to three-quarters of a mile away. Provided a list of actions to mitigate noise from the noisiest pieces of refinery equipment. Assisted the refinery in the selection of long-term noise monitoring equipment to be situated on the refinery grounds so that a record of the current noise environment will be documented, and future noise complaints can be addressed more efficiently.

Tyco Electronics Corporation, Annual Noise Compliance Study, Menlo Park, CA
Conducted annual noise compliance monitoring. Provided letter critiquing the regulatory requirements and recommending improvements.

University of California, San Francisco Mission Bay Campus Vibration Study, CA
Conducted measurements and analysis of ground vibration across site due to heavy traffic on Third Street. Analysis included assessment of pavement surface condition and propensity of local soil structure.

Cleaner Diesel Handbook

BRING CLEANER FUEL AND DIESEL RETROFITS INTO YOUR NEIGHBORHOOD

APRIL 2005

ENVIRONMENTAL DEFENSE
finding the ways that work

Cleaner Diesel Handbook

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AUTHORS

Janea Scott

Isabelle Silverman

Stephanie Tatham

ENVIRONMENTAL DEFENSE

finding the ways that work

Cover images: Courtesy of Johnson Matthey (left), Environmental Defense (right).

Our mission
Environmental Defense is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

The complete report is available online at www.environmentaldefense.org.

Contents

Executive summary

Cost-effective steps to reducing diesel pollution

Environmental Defense's *Cleaner Diesel Handbook* is designed to empower the private sector, public officials and ordinary citizens with the means to reduce harmful pollution from diesel engines. This handbook focuses on methods of reducing pollution created by diesel engines, especially those used in construction and other nonroad sectors. The nonroad sector includes vehicles not typically found on roads, such as agricultural equipment, locomotives, ferries, snowmobiles and airplanes. Construction equipment is part of the nonroad sector. Collectively, nonroad engines discharge more dangerous fine sooty particles than any other source in the transportation sector. The solutions described here can reduce these harmful emissions by up to 90% and are a cost-effective response to the challenge of improving local air quality.

The health imperative: half of Americans live with unhealthy air

Diesel engines emit nearly 40 toxic substances, smog-forming oxides of nitrogen and fine particulate matter, and they contribute to a laundry list of adverse health effects including: asthma, cardiovascular and respiratory problems, strokes, heart attacks, lung cancer and premature death. Diesel exhaust is estimated to contribute to more than 75% of the added cancer risk from air toxics in the United States. Of special concern are two main pollutants: fine particulate matter, which lodges deep in the lungs, and oxides of nitrogen (NO_x), which are precursors to smog. Both can be reduced substantially with the tools described in this handbook.

Recent data from the U.S. Environmental Protection Agency (EPA) shows that about half of all Americans live in places that fail to meet basic health standards for ozone (smog), fine particulates (soot) or both. On April 15, 2004, EPA found 474 counties—home to 159 million Americans—out of full compliance with the health-based eight-hour ozone standard. NO_x is a significant precursor in the formation of ground-level ozone and nonroad engines, as a vehicle class, emit almost one-fifth (more than 4 million tons) of the total national NO_x emissions from all sources.

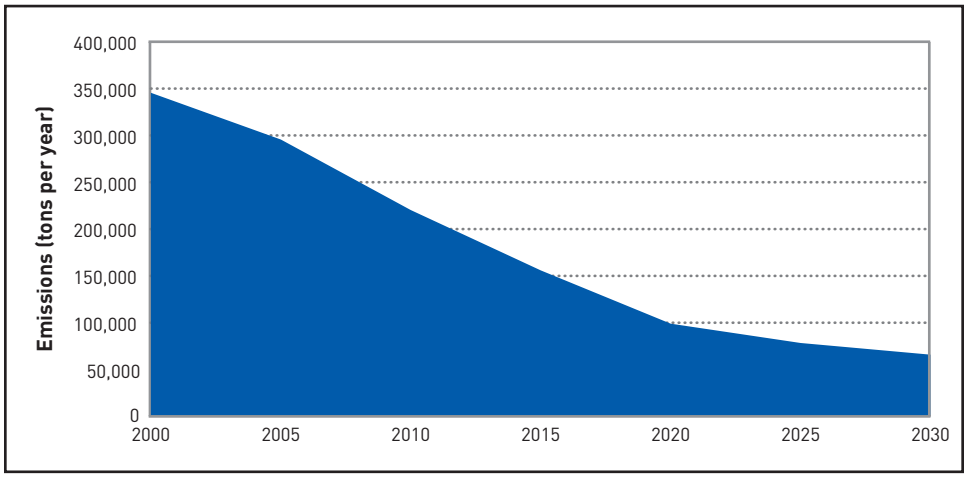
As of April 2005, EPA classified 208 counties spanning 20 states as being out of full compliance with the health-based fine particulate ($PM_{2.5}$) standard. More than 57 million Americans live in counties that are not meeting the health-based particulate pollution standard. For the states and local communities that are struggling to trim every possible ton of pollution to meet federal health-based air quality standards and protect the health of their community, reducing pollution from existing diesel vehicles and equipment now is vitally important.

Cleaner air: bridging the 25-year gap

On May 10, 2004, EPA announced new air pollution regulations that will significantly lower pollution from new nonroad diesel engines used in construction, agriculture, manufacturing and services. As old diesel equipment is replaced over the coming years, this rule will deliver important public health benefits to communities across America. But the full pollution reductions and

FIGURE 1

Particulate pollution under phase-in of federal standards for diesel trucks, buses, and machinery



National $PM_{2.5}$ emissions under phase-in of federal standards for onroad diesel trucks and buses, and nonroad diesel equipment. (Estimated from EPA, 2000 and EPA, 2004a)

public health benefits of this rule will not be realized for more than 20 years due to the lag in time before the emissions standards come into effect and because of the long life spans of heavy-duty diesel engines. Many nonroad engines, like those used on construction or marine vehicles, may have life spans of several decades. A child born today may still be breathing soot from a backhoe in her neighborhood when she graduates from college—unless that backhoe is replaced with a clean one or retrofit with emissions controls.

Figure 1 shows national particulate pollution under the phase-in of the federal emissions standards for diesel trucks, buses and nonroad machinery.

While the health benefits from full implementation of EPA national diesel emissions standards are extremely important, the incremental phase-in of these benefits indicates that thousands of premature deaths each year could be prevented by speeding the cleanup of diesel engines. The shaded area under the curve represents the pollution a retrofit program could prevent.

Cost-effective diesel pollution reduction

This handbook demonstrates that cleaning up diesel engines is a cost-effective way to reduce the adverse health effects of diesel pollution and outlines some simple steps, like enforcing idling laws and using clean fuels—like ultra-low sulfur diesel (ULSD)—with best available retrofit technologies that can cut diesel emissions by up to 90%.

The three "Rs" of emissions reduction

Repower. Replace the engine, or entire vehicle, with newer, cleaner technologies that meet or exceed EPA's newest standards and/or uses alternative fuels.

Refuel. Alternative fuels, ultra-low sulfur diesel fuel and other clean fuels or additives are important first steps.

Retrofit. Reduce diesel exhaust with best available pollution control technology.

The handbook describes the "3Rs" of engine operations, as well as the use of best practices in equipment management. It gives particular attention to the subjects of cleaner fuels and retrofit technologies. The main goal is to reduce emissions of both fine particulate matter and NO_x. Appendices to the handbook will include some information on the manufacturers of retrofit technology and distributors of cleaner fuels. Together, this information is meant to serve as a starting point for anyone seeking to cut harmful diesel pollution.

Right now, there are a variety of cleaner fuels and demonstrated retrofit technologies available to reduce emissions of particulate matter (PM), oxides of nitrogen (NO_x), hydrocarbons (HC), carbon monoxide (CO), smoke and odor from existing diesel engines. It is important to remember that not all technologies and fuels target the same pollutants, and that appropriate technologies or fuels may vary in different contexts. Generally, a combination of multiple technologies and emissions control strategies is necessary for maximum emissions reduction.

In addition to describing the tools available for diesel pollution reduction, this handbook examines a variety of methods for implementing successful retrofit programs. The handbook provides examples of successful programs such as government and private sector efforts, contract specifications, voluntary retrofit programs, and economic or market incentive programs that provide financial support for cleaner technology or fuels.

Ultimately, the handbook demonstrates the need to reduce diesel engine emissions and presents the means to design and implement measures to clean up diesel technology. Together, these tools can be used to build a successful retrofit program in any community.

CHAPTER 1

Introduction: achieving cleaner, healthier air today

Science is very clear that air pollution from diesel engines endangers human health. Fortunately, cost-effective and practical technologies exist to substantially reduce diesel pollution. Across the country, we find successful diesel emissions-reduction programs, from school buses and trucks to construction equipment and ferries. Such programs can cut diesel pollution from targeted fleets by up to 90%. Yet far too many communities still have not taken advantage of these opportunities to win healthier air. This handbook is a guide to how to bring that success to your community, your company and your local government.

The purpose of this handbook is to provide practical information for decision-makers in the public and private sectors to use in creating and implementing effective emissions-reduction projects for construction and other nonroad diesel fleets.[1] Because the nonroad sector is so dirty, and because the emissions-reduction solutions are not yet widely disseminated for this sector, this handbook focuses attention on construction fleets and other nonroad applications. The handbook's basic concepts, however, are applicable across the diesel sector.

This handbook sets forth:

- the health imperative for reducing diesel pollution today;
- an overview of technologies and fuels that can reduce diesel pollution, with detailed follow-up information;
- information about successful retrofit programs;
- examples of contract specifications and other incentives for cleaning diesel engines.

Together, these tools can be used by any citizen concerned about diesel pollution to inform local policymakers and contractors about the benefits of, and the steps involved in, implementing a successful retrofit program.

This handbook focuses on how to reduce pollution from vehicles, engines and equipment used for construction. Construction vehicles are classified as "mobile sources" because they move. Mobile sources are divided into the "onroad" and "nonroad" sectors. The onroad sector includes vehicles used on roads for transportation of passengers or freight.

The nonroad sector includes vehicles that are not typically found on roads, such as agricultural equipment, locomotives, ferries, snowmobiles and airplanes. Construction equipment is part of the nonroad sector. However, the technologies, fuels, and techniques found herein are frequently applicable across the diesel sector (onroad engines and other nonroad engines) as well. For more information, visit the EPA Mobile Source web site at: http://www.epa.gov/otaq/invntory/overview/examples.htm.

Since 1996, EPA has required new nonroad diesel engines to meet specific emissions levels. Until 1996, those standards were not very strong, and as a result they allowed for high levels of pollution. On May 10, 2004, EPA announced air pollution regulations that will lower pollution from *new* nonroad diesel engines used in construction, agriculture, manufacturing and services by more than 90%.

To meet this rigorous emissions standard, EPA requires a combination of cleaner engines, pollution control technology and cleaner fuel. Based on

EPA estimates, when the full inventory of older nonroad engines has been replaced, the nonroad diesel program will annually prevent up to 12,000 premature deaths, one million lost work days, 15,000 heart attacks and 6,000 children's asthma-related emergency room visits.[2] According to EPA, the overall benefits of the nonroad diesel program outweigh the costs by a ratio of 40 to 1.[3]

But the full pollution reduction and public health benefits of the nonroad rule will not be realized for more than 20 years due to the lag in time before the emissions standards come into effect and because of the long life spans of heavy-duty diesel engines. EPA estimates that by 2030 the entire inventory of nonroad vehicles covered by this new rule should be upgraded.[4]

Given that nonroad engines remain in use for a very long time, even decades, strategies to retrofit existing machinery and the use of ultra-low sulfur diesel (ULSD) fuel are extremely important to win public health gains now. Figure 1 (page v) shows the national particulate pollution under the phase-in of the federal emissions standards for diesel trucks and buses, and nonroad machinery.

The public health benefits will likewise be phased in over time. EPA estimates, for example, that only about 30% of the ultimate level of annual benefits under its recently announced standards for nonroad diesel engines will be realized by 2015; just over 50% will be realized by 2020. While the health benefits from full implementation of EPA national diesel emissions standards are extremely important, the incremental phase-in of these benefits indicates that thousands of premature deaths each year, occurring now, could be prevented by accelerating the cleanup of diesel engines.

Right now, there are a variety of demonstrated retrofit technologies available to reduce particulate matter (PM), oxides of nitrogen (NO_x), hydrocarbon (HC), carbon monoxide (CO), smoke and odor created by existing diesel engines. Therefore, programs to reduce pollution from existing diesel engines are critical. This handbook explores a variety of methods for implementing successful retrofit programs.

Children are particularly vulnerable to the harmful health effects of diesel exhaust.

ENVIRONMENTAL DEFENSE

CHAPTER 2

The dangers of diesel emissions

According to recent EPA data, about half of all Americans now live in counties that fail to meet basic healthy air standards. On April 15, 2004, EPA found 474 counties, home to 159 million Americans, out of full compliance with the health-based eight-hour ozone standard.[5] In April 2005, EPA also found 208 counties representing more than 57 million Americans out of full compliance with the health-based particulate pollution standard.[6]

For the states and local communities that are struggling to trim every possible ton of pollution to meet federal health-based air quality standards, reducing pollution from existing diesel vehicles and equipment now is vitally important. Retrofits and the use of clean fuels are one of the most cost-effective ways to reduce diesel emissions and restore healthy air.

Diesel engines, including the construction engines that are the focus of this handbook, emit nearly 40 toxic substances (Table 1), smog-forming oxides of nitrogen and fine particulate matter ($PM_{2.5}$), which can penetrate the lungs and enter the bloodstream. Due to their small size, particulates are easily inhaled and reach deep into the lungs where they can trigger an inflammatory response. Exposure to particulate matter is associated with heart attacks, irregular heartbeat, asthma attacks, reduced lung function and bronchitis.

Several organizations, including EPA, have designated diesel exhaust as a probable or potential human carcinogen (Table 2). It is estimated that diesel exhaust contributes more than 70% of the cancer risk from air toxics in the United States.[7] Diesel emissions are also estimated to be the hazardous air pollutant with the highest contribution to cancer risk in many areas across the country;[8] according to Environmental Defense's Scorecard, this is true in New York, Los Angeles, Houston, Denver, Chicago and Atlanta.[9]

Smog-forming nitrogen oxides

Nitrogen oxides (NO_x) and volatile organic compounds (VOCs) that are created by diesel exhaust are precursors to ground-level ozone, or smog. Nonroad engines, as a vehicle class, also emit more than 4 million tons of NO_x each year—this is approximately 19% of the total national NO_x emissions from all sources (22,349,000 tons).[10] As well as being significant contributors to ground-level ozone or smog, nitrogen oxides are also significant contributors to acid deposition, eutrophication of coastal bodies of water, fine particulate emissions and haze.

Fine particulate matter

There is a well-researched body of epidemiological studies from around the world that documents the serious threats associated with exposure to $PM_{2.5}$. These studies have linked $PM_{2.5}$ to adverse health effects, such as asthma, cardiovascular and respiratory problems, strokes, heart attacks[11] and lower birth weight[12] leading to increased use of asthma medications, doctor visits, emergency room visits, hospital admissions, school absenteeism and premature death.[13] Researchers estimate that as many as 60,000 Americans die prematurely each year because of exposure to fine particles.[14] Children, the elderly and the ill are particularly vulnerable. National $PM_{2.5}$ emissions from mobile sources totaled approximately 452,000 short

tons in 2001. Nonroad vehicles created the majority of those emissions, 64%, and almost 50% of total $PM_{2.5}$ emissions originated from nonroad diesel sources (221,000 short tons). Construction and surface mining equipment was the largest contributor (30%) to nonroad diesel source $PM_{2.5}$ emissions.

Asthma

People working at and living near construction sites are especially affected by nonroad vehicles' emissions. In urban areas, overall asthma prevalence has increased dramatically over the past two decades, rising 75% between 1980 and the average in 1993–4. While the highest prevalence of asthma is in children ages 5 to 14, the greatest increase in asthma prevalence has occurred in children ages 0 to 4 which increased 160% over the 15-year period.[15] For example, New York City residents suffer from alarmingly high asthma rates (1 out of every 8 adults has been diagnosed with asthma at some point in their lives[16]) and New York City air fails to meet many basic health standards. To learn about air quality conditions in your area, visit Environmental Defense's Scorecard web site at: http://www.scorecard.org/.

TABLE 1
Toxic air contaminants and hazardous air pollutants found in diesel exhaust

Acetaldehyde*	Chlorine	Methyl ethyl ketone
Acrolein	Chlorobenzene	Naphthalene*
Aluminum	Chromium compounds*	Nickel*
Ammonia	Cobalt compounds*	4-nitrobiphenyl*
Aniline*	Copper	Phenol
Antimony compounds*	Cresol	Phosphorus
Arsenic*	Cyanide compounds	POM (including PAHs)
Barium	Dibenzofuran	Propionaldehyde
Benzene*	Dibutylphthalate compounds*	Selenium
Beryllium compounds*	Ethyl benzene	Silver
Biphenyl	Formaldehyde*	Styrene*
Bis [2-ethylhexyl} phthalate*	Hexane	Sulfuric acid
Bromine	Lead compounds*	Toluene*
1,3-butadiene*	Manganese compounds	Xylene isomers and mixtures
Cadmium*	Mercury compounds*	Zinc
Chlorinated dioxins*	Methanol	

*This compound or class of compounds is known by the state of California to cause cancer or reproductive toxicity. See California EPA, Office of Environmental Health Hazard Assessment, "Chemicals Known to the State to Cause Cancer or Reproductive Toxicity," May 31, 2002.

Note: Toxic air contaminants on this list either have been identified in diesel exhaust or are presumed to be in the exhaust, based on observed chemical reactions or presence in the fuel or oil. See California Air Resources Board, "Toxic Air Contaminant Identification List Summaries, Diesel Exhaust," September 1997, available online at http://www.arb.ca.gov/toxics/tac/factshts/diesex.pdf.

TABLE 2
History of determinations of the carcinogenicity of diesel exhaust

Year	Agency	Determination
1988	National Institute for Occupational Safety and Health (NIOSH)	Potential occupational carcinogen
1989	International Agency for Research on Cancer (IARC)	Probable human carcinogen
1990	State of California (under provisions of Proposition 65)	Known by the state to cause cancer
1995	Health Effects Institute (HEI)	Potential to cause cancer
1996	World Health Organization International Programme on Chemical Safety (WHO-IPCS)	Probable human carcinogen
1998	California Air Resources Board (CARB)	Toxic air contaminant (determination based substantially on the cancer risk to humans)
2000	U.S. Department of Health and Human Services National Toxicology Program (U.S. DHHS/NTP)	Reasonably anticipated to be human carcinogen
2001	American Council of Government Industrial Hygienists (ACGIH) (proposed)	Suspected human carcinogen
2002	U.S. Environmental Protection Agency (EPA)	Probable human carcinogen

Sources:

National Institute for Occupational Safety and Health, "Carcinogenic Effects of Exposure to Diesel Exhaust," Current Intelligence Bulletin 50. August 1988. Available online at http://www.cdc.gov/niosh/88116_50.html . Last accessed August 13, 2004.

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California Environmental Protection Agency, Chemicals Known to the State to Cause Cancer or Reproductive Toxicity (Proposition 65, 1997), revised May 31, 2002.

Health Effects Institute, Diesel Exhaust: A Critical Analysis of Emissions, Exposure and Health Effects. Cambridge, MA: Health Effects Institute, 1995. Online resource, available at: http://www.healtheffects.org/Pubs/diesum.htm Last accessed on August 13, 2004.

American Conference of Governmental Industrial Hygienists, "Documentation of the Threshold Limit Values and Biological Exposure Limits, Notice of Intended Changes," 2001.

International Programme on Chemical Safety, World Health Organization, "Diesel Fuel and Exhaust Emissions," Environmental Health Criteria 171 (1996).

"The Toxic Air Contaminant Identification Process: Toxic Air Contaminant Emissions from Diesel-fueled Engines," fact sheet. Online resource, available at: http://www.arb.ca.gov/toxics/dieseltac/factsht1.pdf Last accessed on August 13, 2004.

U.S. Environmental Protection Agency, Draft Health Assessment Document for Diesel Exhaust, July 2000, EPA/600/8-90/057E.

California Air Resources Board, "Statewide Portable Equipment Registration Program." Online resource, available at: http://www.arb.ca.gov/perp/perp.htm Last accessed on August 13, 2004.

FIGURE 2

National NO_x emissions by source category, 2001 (22.3 million short tons)

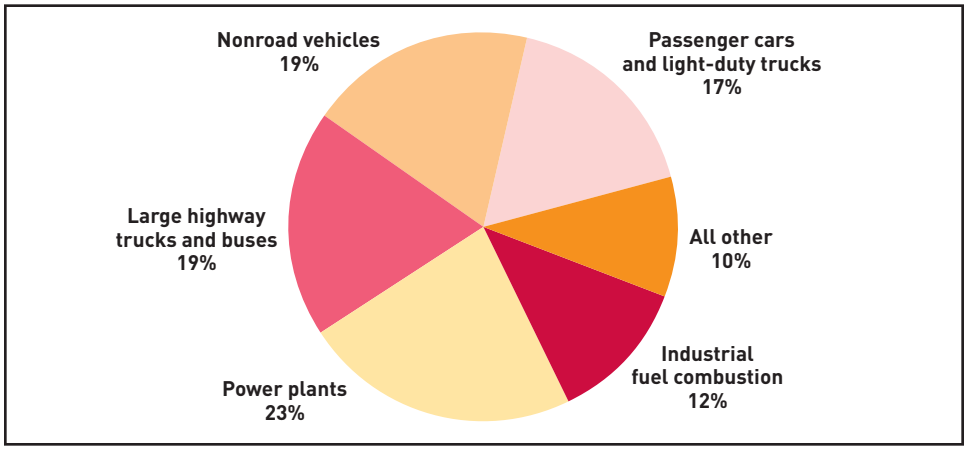
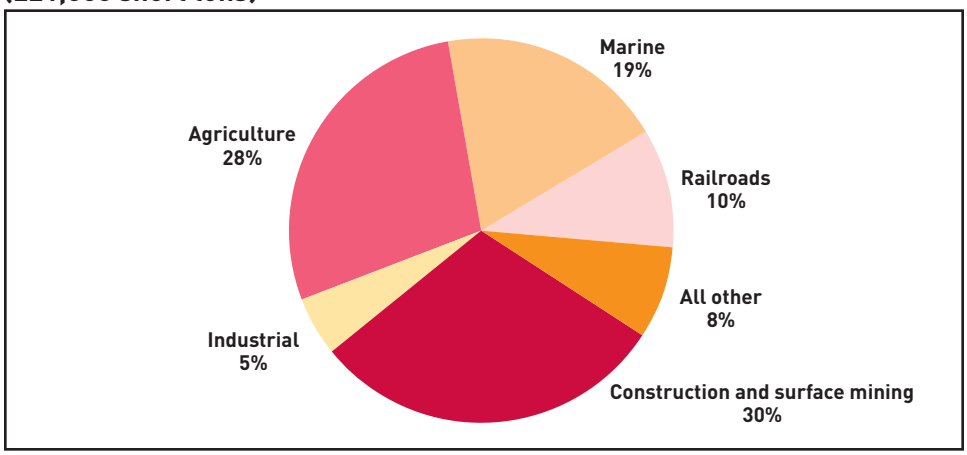


FIGURE 3

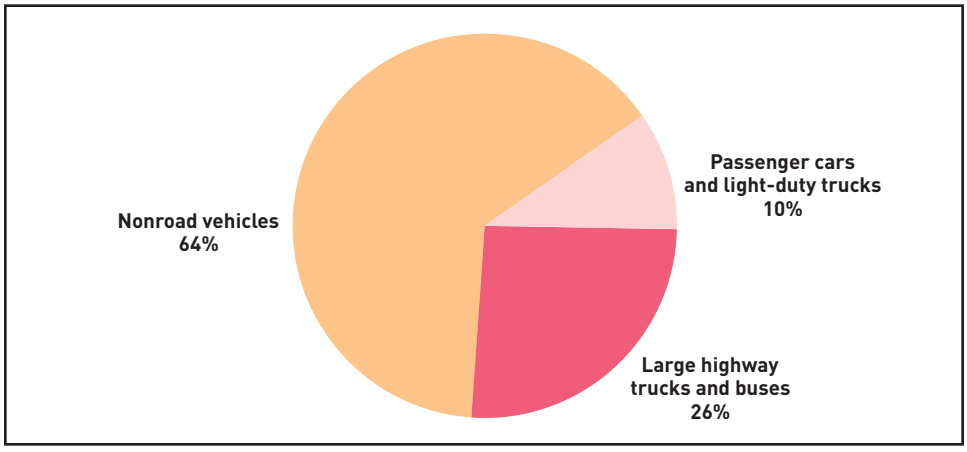
National $PM_{2.5}$ emissions from all nonroad diesel sources, 2001 (221,000 short tons)



Source (Figures 2, 3, 4): National Emission Inventory (NEI): Air Pollutant Emission Trends. 1999 Online resource, available at: http://www.epa.gov/ttn/chief/net/1999inventory.html Last accessed 03/01/05.

FIGURE 4

National $PM_{2.5}$ emissions from all mobile sources, 2001 (452,000 short tons)



CHAPTER 3

Cost-effective ways to reduce health threats

There are many options for reducing pollution from diesel engines in use today. This section describes, first, the "3 R's" for cleaning up diesel engines and, second, behavioral solutions that can help reduce pollution from diesel exhaust. For existing engines, our goal is to substantially reduce pollution today and, as soon as feasible, bring the pollution level down so that it is at least equivalent to the standards for new engines. Until old engines have been replaced with new and regulated technology, these measures are a cost-effective means of reducing diesel pollution.

A systems approach is the most effective way to curb diesel engine pollution. A systems approach takes into account all aspects of engine operations—from fuel type used, to retrofit technologies, to best practices such as anti-idling and proper maintenance practices—all of which are discussed in detail in the next few chapters of the handbook.

Fleet operators should note that, before undertaking any engine modifications, they should determine what effects retrofitting may have on equipment warranties and resolve any issues. Major engine manufacturers have now issued letters and other guidance with respect to warranty implications of cleaner fuels and retrofits, and "in most cases, engine manufacturers will continue to honor engine warranties if emissions control systems are sized, installed and maintained properly."[17]

The "3 R's" for cleaning up diesel engines

The "3 R's" listed below can be used to substantially reduce air pollutant emissions from construction equipment. Environmental Defense strongly encourages combinations of the 3 R's in order to maximize emissions reductions. Neither repowering nor refueling alone can achieve the PM reductions that a retrofit can and, similarly, retrofitting alone cannot achieve the NO_x reductions that many repowers can. Repowering or replacing in addition to retrofitting can maximize reductions in PM and NO_x pollution. In addition, refueling with ULSD fuel can result in even more reductions.

1. REPOWER (OR REPLACE)

One way of ensuring emissions reductions is to replace an entire piece of old construction equipment with a model that meets EPA 2008 standards. Another, less costly, strategy to reduce emissions from older, higher-polluting equipment is the replacement of the in-use engine (i.e., repower) with an emissions-certified engine instead of rebuilding the existing engine to its original specifications. Significant NO_x and PM benefits may be achievable due to the high emissions levels of the uncontrolled engine being replaced.

Depending on the engine and rating of older, higher polluting equipment, average emissions reductions may vary from 25% up to 75%.[18] In some instances, higher emissions reductions may be achievable. For example, replacing a 475 horsepower engine in a MY 1975–1986 Caterpillar 631-D Scraper with a Caterpillar engine meeting EPA Tier One standards[19] would produce a 40% reduction in NO_x and a 62% reduction in PM. Replacing the same engine with one meeting Tier Two standards would produce a 62% reduction in NO_x and an 81% reduction in PM.[20] It is important to note, that while

Environmental Defense strongly encourages repowering where possible, there are significant technical issues that may make it impossible for some older, higher polluting engines (Tier 0 and Tier 1) to be repowered with newer, cleaner engines (Tier 2 and Tier 3).

2. REFUEL

Using alternative fuels or cleaner petroleum-based fuels can also help reduce diesel engine pollution. Alternative fuels are defined in this handbook as any fuel other than petroleum-based fuels such as gasoline or diesel fuel. Emissions reductions can also be achieved by using diesel fuels with very low levels of sulfur, for example ULSD with a maximum sulfur content of 15 parts per million. Fuel emulsifiers, or fuel-borne catalysts are fuel additives that can be added to ULSD to cut emissions even further. In many cases, use of ULSD at 15 parts per million (ppm) of sulfur or less is a prerequisite to effective use of advanced retrofit technologies. Generally, it is not the fuel itself that is "clean", it is the engineered system (i.e. fuel, combustion engineering and exhaust after-treatment). Therefore, to achieve the greatest emissions reductions, a combination of repowered or replaced engines, retrofit technology and cleaner fuels must be used.

3. RETROFIT

"Retrofitting" is incorporating a device into a piece of diesel equipment to reduce pollution.[21] A wide range of pollution-control, or "retrofit" technologies exist today, and can be used in combination with each other and with cleaner fuels to achieve powerful emissions reductions. Different technologies fit different engine operating needs—the key is to select the combination that achieves maximum clean air benefits for a given machine and use.

For example, a retrofit could be a Diesel Particulate Filter (DPF), which traps particles from engine exhaust until the trap becomes loaded to the point that a regeneration cycle is implemented to burn off the trapped particulate matter.[22] DPFs are normally built with a porous ceramic, metal mesh or silicon

A delivery of ultra low sulfur diesel fuel to New York's World Trade Center site. In late 2006, ULSD will be widely available across the United States.

ENVIRONMENTAL DEFENSE

carbide filter housed in a metal container similar to a muffler. However, DPFs are just one of many technologies available to retrofit diesel engines, and many of these technologies serve different in-use functions. There are other examples of retrofit technologies, in addition to more detail about DPFs, in other sections of this handbook.

A combination of clean fuels and retrofits can reduce some hazardous diesel emissions by up to 90%, improving both environmental conditions and public health. Retrofits are remarkably cost-effective when compared to other means of reducing air pollution. For example, the average cost for most applications of a diesel oxidation catalyst (DOC) is approximately $2,500[23] (excluding installation) and for a DPF between $7,000–12,000[24] (excluding installation). The California Air Resources Board estimates that the average cost of retrofitting an engine of 275 horsepower with a catalyzed diesel particulate filter ranges between $6,900–$9,000.[25] By comparison, the average base price for a 200 to 300 horsepower wheel loader is $275,000.[26] Retrofitting an engine with a catalyzed DPF in this price range or with a $2,500 DOC costs only a small fraction (2.5 to 3.2% and less than 1%, respectively) of the cost of replacing the entire vehicle with one that pollutes less.

Moreover, the use of diesel fuel with 15 ppm of sulfur or less can benefit engine operation and maintenance by reducing wear and tear on heavy equipment. This translates into prolonged engine life and less frequent replacement of parts like pistons and cylinder liners.[27] Fleet operators using ULSD may therefore realize a dividend in avoided maintenance.[28] EPA expects these benefits to be equivalent to reducing the cost of the fuel by 3.3 cents per gallon.[29]

Environmental Defense recommends that construction fleet operators who have decided to take steps towards reducing harmful emissions from their construction vehicles contact their Original Equipment Manufacturer (OEM) or other appropriate technology experts to determine the most effective way to reduce diesel emissions from specific machine models in their fleet. Retrofit technology manufacturers and OEMs will probably need information about the fleet in order to advise construction fleet operators on which retrofit solutions will work best for their individual needs. It is always advisable for construction fleet operators to maintain a full inventory of construction machinery (including model and serial number of equipment, year of manufacture, engine displacement, horsepower and serial number of engine, and engine certification for post-1996 engines) working at a given site. This inventory should also include all machinery used to transport debris and construction material to and from a construction site.

Fleet operators who wish to install retrofit technology should also seek information from manufacturers about the proper monitoring, maintenance and operation of retrofit technology.[30] Finally, fleet operators should check with both OEMs and retrofit technology manufacturers about how installing retrofit equipment or using alternative fuels will affect equipment warranties. Most manufacturers have provided guidance to ensure that warranties are not threatened by any use of clean fuels or retrofits.

Equipment management and behavioral solutions to emissions reductions

In addition to the “3 R’s” above, there are fleet management and behavioral solutions that can be implemented to reduce pollution. These common sense practices can be implemented immediately

and can be a good first step in any retrofitting/diesel emissions reduction plan.

Stop engine idling. Users of heavy-duty diesel equipment (both onroad and nonroad) often keep their engines idling when their equipment is not in use. Reducing or eliminating unnecessary idling can save fuel, and therefore money, as well as reduce emissions. According to EPA, a typical heavy-duty truck or bus can burn approximately one gallon of diesel fuel for each hour it idles, generating significant amounts of pollution, wasting fuel, and causing excessive engine wear.[31] Instead of idling, vehicle owners can purchase small generators or auxiliary power units specifically designed for trucks and buses that provide heat, air conditioning and/or power while a vehicle is not in motion.[32] These devices substantially reduce the fuel consumed and emissions generated during long-duration idling. Many communities across the county have anti-idling rules, but there is a need for enforcement and compliance with these rules and a need to develop and enforce worksite specific rules to govern idling.

Improve equipment maintenance and inspection. Proper maintenance, engine tuning and emissions testing is critical to success. This includes replacing worn out parts, cleaning, tuning and generally maintaining the engine. Whether a retrofit device is installed and/or cleaner fuel is being used, it is always important to ensure that the engine is properly tuned and maintained. This is essential not only for the engines to operate efficiently, but also to ensure that emissions reduction technologies can be used effectively. As with onroad vehicles, nonroad equipment should have regular inspections, including smoke testing. Proper maintenance will ensure complete fuel combustion and as a result PM exhaust is minimized. Proper maintenance can also improve fuel economy and extend engine life.

In addition to reducing idling time and instituting inspection and maintenance programs, the following measures can also help reduce exposure to diesel pollution:

- establishing a staging zone for trucks that are waiting to load or unload material at the work zone in a location where diesel emissions from the trucks will have minimum impact on abutters and the general public; and
- locating construction equipment away from sensitive receptors such as fresh air intakes to buildings, air conditioners and operable windows.

The remainder of this handbook focuses on using cleaner fuel and retrofits to reduce pollution from construction equipment. Reducing pollution from existing nonroad diesel equipment is vital to protecting the public from the health and environmental harms caused by hazardous diesel emissions. Even a relatively new engine can reduce pollution by installing a retrofit and using a cleaner fuel. The goal of these retrofit or emissions control technologies is to reduce emissions, up to and beyond what is required by EPA regulation[33] without negatively impairing the performance of the machine for its intended use.

CHAPTER 4

Successes and regional programs

A variety of regional programs have proven successful at reducing harmful diesel pollution. This section of the handbook provides examples of voluntary government or private sector leadership in retrofitting construction equipment, including: New York City's efforts at the World Trade Center and through Local Law 77, Boston's Big Dig Project, Connecticut's New Haven Harbor Crossing Corridor Improvement Program, the Port of Houston Retrofit Program and retrofits at Washington's Puget Sound. Additionally, this section examines examples of successful economic or market incentive programs that provide financial support for cleaner technologies or fuels, such as the Texas Emissions Reduction Plan, the Carl Moyer Program in California, or the EPA Voluntary Diesel Retrofit Program. The diversity of programs described reflects the varying needs of individual projects with respect to equipment, location, fuel availability and other related factors. When planning a retrofit project, it is always important to take individual situation characteristics into account.

"Best available retrofit technologies": New York City

New York City has demonstrated a strong commitment to reducing pollution from diesel engines. This case study discusses three NYC projects:

- the 7 World Trade Center Diesel Emission Reduction project,
- lower Manhattan redevelopment construction commitments, and
- NYC's Local Law 77.

7 WORLD TRADE CENTER SITE[34]

The Clean Air Communities Diesel Emissions Reduction Project at 7 World Trade Center is the first public-private endeavor of its kind in the city. As former Northeast States for Coordinated Air Use Management (NESCAUM) Executive Director, Ken Colburn stated, "through the application of advanced emission control technology and the use of ultra low sulfur diesel fuel, this Clean Air Communities initiative demonstrates that innovative, clean air progress is possible even at large-scale urban construction sites across the nation."[35]

In October of 2002, the site converted to ULSD for all equipment. Six pieces of construction equipment have already been retrofitted, and one electric crane is being used in lieu of the typical diesel engine crane technology. It is important to note that these strategies target PM, HC, and CO reductions, not NO_x.

LOWER MANHATTAN REDEVELOPMENT[36]

Lower Manhattan is a thriving mix of apartments, art galleries, shops and restaurants. More than 4,000 children live throughout lower Manhattan in neighborhoods as diverse as TriBeCa, Chinatown and Battery Park City. With the rebuilding of the World Trade Center site, lower Manhattan will become one of the nation's largest construction sites, teeming with diesel engines. These engines will be operating just steps from school, playgrounds, parks, homes and offices.

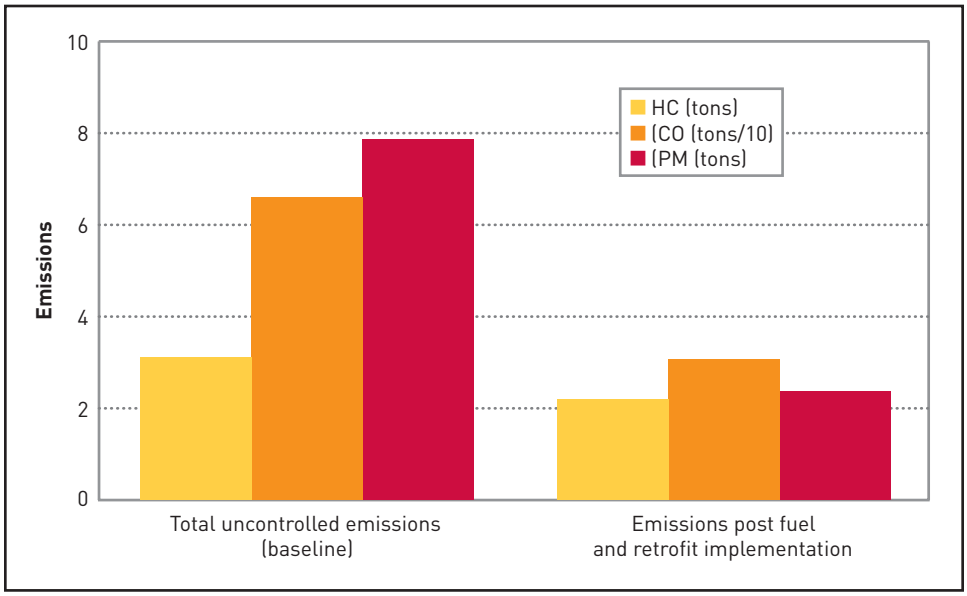
Governor Pataki and New York City have pledged to use the best available retrofits and cleaner diesel fuel in all of the reconstruction efforts. In 2002,

TABLE 3
7 World Trade Center retrofits

Date	Equipment	Retrofit technology
March 2003	Stationary Generator Excavator (CAT 245D, 14.7 l) Excavator (Komatsu PC200, 5.9 l)	DOC DOC DOC
January 2004	Stationary Generator (Rudox, 125 kw, 6.8 l)	Active DPF (Rypos RT500)
May and June 2004	A two-stroke and a four-stroke crane	Metallic High Performance DOC Clean Cat® known by the trade name of "diesel particulate reactors" (by Environmental Solutions Worldwide, Inc.)
Pending	The site has plans to retrofit one more piece of equipment, a concrete pump, with a DOC. Rather than purchasing a new DOC, the retrofit will reuse a high-efficiency DOC from one of the cranes after crane use is finished.	

Source:Information provided by Glenn Goldstein at NESCAUM.

FIGURE 5
Total emissions reductions for 7 World Trade Center project



Courtesy of NESCAUM. Includes emissions from equipment that was not retrofit.

Governor Pataki committed to the use of ULSD and best-available retrofits in all state-controlled lower Manhattan construction projects, including at the World Trade Center site. The New York State Assembly and Senate followed Governor Pataki's lead and passed legislation on June 22, 2004 codifying Governor Pataki's commitment.[37] The law was unanimously approved in both the House and the Senate and was recently signed into effect by the governor.[38] It requires contractors and subcontractors using diesel-powered nonroad vehicles with an engine horsepower rating of 60 HP and above to use only ULSD and to retrofit, where practicable, their equipment with oxidation catalysts, particulate filters or technology with "comparable or better effectiveness."[39]

The pollution reduction efforts at 7 World Trade Center have been paralleled at other redevelopment sites in lower Manhattan. In the PATH reconstruction project, for example, three pieces of construction equipment were chosen for retrofits: a Caterpillar XQ2000 Genset and two Caterpillar 966G TG-22 Loaders. Caterpillar, the original manufacturer of all of the pieces of equipment, was chosen to perform the retrofits.

Caterpillar chose to utilize a passive DPF, the CRT™, manufactured by Johnson Matthey. The CRT™ particulate filter is a patented emissions control technology that contains both a platinum oxidation catalyst and a particulate filter. Caterpillar specifies the minimum exhaust temperature must be at least 260°C for at least 40% of the operating time. Though loaders met these minimum requirements, a detailed engineering analysis on the generator's exhaust temperature found that it was an unsuitable candidate for a DPF. The generator was only being used consistently at approximately 20% of its rate and thus lacked sufficient exhaust temperature.

In August of 2003, H.O. Penn (Caterpillar's local dealership) and Caterpillar design engineers installed the DPFs on the two 966G Loaders. The installation process took eight to ten hours, which was approximately double the expected installation time. This delay can probably be attributed to these retrofits being the first installations of this kind performed by H.O. Penn as well as the need to modify several brackets/components during installation. During the emissions testing, the time required to remove the original muffler and replace it with the DPF was cut in half.

One concern about using DPF technology is failure of the DPF to regenerate, which could lead to excessive engine backpressure. Backpressure must be checked so that it does not increase to levels that may ultimately damage the engine. For this reason, Caterpillar decided to provide an integrated exhaust backpressure alarm with the retrofits to alert the driver if the backpressure is too much. The alarm, mounted in the cab of the loader, is both visual and audible. If a pre-specified backpressure is exceeded for more than a set time interval the alarm lights up.

The installed cost of the DPFs for the wheel loaders was approximately $15,000 each. This cost is probably higher than the future cost of retrofits of this type because this was the first installation on a Caterpillar 966G loader for both Caterpillar and H.O. Penn. After the first few installations, labor efficiencies are typically realized, as evidenced by the decreased installation time from the initial installation to the emissions testing installation. Further, as market demand increases, capital costs are expected to decrease. Additional project costs came from the April 2005 price premium of $0.01–$0.18 per gallon of ULSD in the New York City area. The use of ULSD is not expected to change maintenance schedules or cost, however, using DPFs is expected to slightly increase maintenance responsibilities and cost. Specifically, the filter technology must be cleaned to maintain emissions reduction benefits. A cleaning contract was not negotiated for this project, but other negotiated contract prices in the New York City area range from $300 to $500 per cleaning event. The DPFs have not yet been in service for a year, and have experienced no operational problems.

To establish the emissions reduction potential of the different strategies (ULSD vs. ULSD/DPF), emissions testing was performed using two different types of portable emissions monitoring systems: the Clean Air Technologies

Construction at the World Trade Center site.

ENVIRONMENTAL DEFENSE

International Montana system and the Environment Canada DOES2 system. Emissions testing was conducted for two weeks between September and October of 2003; significant PM emissions reductions were documented. Both monitoring systems identified PM emissions reductions of 15 to 20% for the use of ULSD alone, and of greater than 90% when ULSD was combined with the DPF. Additionally, the use of the DPF also produced significant CO emissions reductions. The switch to ULSD alone produced CO emissions reductions in the range of 1 to 10%, and more than 85% reductions were achieved when the DPF technology was used with ULSD.[40]

NEW YORK CITY LOCAL LAW 77

Recently, New York City committed to emissions reduction measures for all city-funded construction. New York City Local Law 77 calls on New York City to use clean fuels and advanced emissions-control technologies in all city construction fleets and contracts. The law requires two fundamental steps.[41] First, it requires the use of ULSD with a maximum sulfur content of 15 ppm in all city contracts, on a schedule set forth in the law. Second, it requires use of "best available" emissions control technology for any class of engine to which the law applies.

Local Law 77 provides a high standard for what shall constitute best available technology, calling on the City to use technologies that reduce both fine particulate matter (PM) and oxides of nitrogen (NO_x). Specifically, Local Law 77 requires that agencies use technologies that "shall be primarily based on the reduction in emissions of particulate matter and secondarily based upon the reduction in emissions of nitrogen oxides."[42] The DEP recently promulgated rules defining "best available technology."[43]

Retrofits and ULSD have been tested at the 7 World Trade Center site, incorporated into Lower Manhattan Development Corporation design guidelines, and now every Environmental Impact Statement for major reconstruction projects in lower Manhattan, from the Fulton Street transit center to Route

Even private NY contractors have joined the diesel retrofit effort. After Pavarini-McGovern Construction Company was found in violation of a local emissions regulation, they retrofit a 1971 380 HP crane with a DOC and committed to using the fuel-borne catalyst Platinum Plus.

9A, has committed to using advanced retrofits in their environmental impact statements. For example, the Fulton Street Transit Center draft environmental impact statement requires the use of Tier 2 compliant equipment with PM emissions reductions at 85%.[44] Additionally, many projects in lower Manhattan are already moving ahead with emissions-reduction strategies based on a wide range of technologies.

The Big Dig[45]

The Central Artery Project in Boston, also known as the "Big Dig," has built 161 lane miles of highway in a 7.5-mile corridor directly through the middle of densely populated downtown. The project, which began in September 1991 and is currently scheduled to be substantially completed by the end of 2005,[46] presented an historic opportunity to test and demonstrate the feasibility of pollution control retrofits. Use of these retrofits helps to minimize the impact of such a large-scale project by reducing air pollution and lessening the health impact of a major construction project on workers, neighborhoods and regional air quality.

The Massachusetts Turnpike Authority (MTA) in collaboration with the Massachusetts Department of Environmental Protection (DEP) and NESCAUM, chose to retrofit construction equipment with diesel oxidation catalysts. Although other technologies achieve higher particulate reduction rates than DOCs, the MTA preferred DOCs for several reasons—primarily because the very clean diesel fuel (15 ppm of sulfur or less) needed to operate other technologies was not available at the time the Big Dig began.

Retrofit requirements were incorporated into Big Dig construction contracts.

MASSACHUSETTS TURNPIKE AUTHORITY

The Big Dig retrofit project has resulted in the installation of DOCs on approximately 200 pieces of construction equipment—this includes small in-tunnel cranes,[47] lifts, excavators, bulldozers, generators and compressors. This effort will achieve air emissions reductions that are the equivalent of removing 1,300 diesel buses off of Boston streets for a full year.[48]

The Big Dig retrofit project is a true success: **No adverse operational problems or additional maintenance costs have been experienced by Big Dig construction equipment retrofitted with DOCs.**[49] Additionally, preliminary estimates of area-wide emissions reductions from the retrofitted equipment amount to approximately 36 tons per year for carbon monoxide, 12 tons per year of hydrocarbons, and 3 tons per year of PM.[50]

The Massachusetts Highway Department provided funding to contractors to purchase the emissions control devices. According to Alex Kasprak, Environmental Engineer, Massachusetts Turnpike Authority, one of the lessons learned from the Big Dig project is that it is best to include the requirement for emissions control equipment as part of the contract's bid package. By doing so, the cost of the retrofit equipment can be included as part of the overall contract cost. This will also ensure that the maximum number of offroad pieces of equipment can be retrofitted.[51] Overall, the Big Dig retrofit program is now being used as a model by regulatory agencies to encourage other construction projects to utilize retrofitted diesel equipment.[52]

I-95 New Haven Harbor Crossing Corridor Improvement (NHCC Project)[53]

Eighty-three diesel oxidation catalysts have successfully been installed at the Connecticut NHCC project. In addition, construction contractors have volunteered to use low sulfur diesel (500 ppm sulfur content) on all their nonroad equipment. The NHCC project is part of Connecticut's Clean Air Construction Initiative and was launched to protect laborers as well as residents from harmful construction emissions along a densely populated corridor. Construction began in 2001.

The Connecticut Clean Air Initiative was a mutual effort of the Connecticut Department of Transportation (ConnDOT), the Connecticut Department of Environmental Protection, the Connecticut Department of Motor Vehicles, and the Connecticut Construction Industry Association to come up with real-world solutions to air quality problems. With compromise, a contract specification was evolved from the above mentioned agencies to improve the quality of life through this long duration construction project.

ConnDOT is requiring all contractors and subcontractors to take part in the Connecticut Clean Air Construction Initiative. The cost to purchase the DOCs and the cleaner fuels was included in the overall contract cost, as bid by each contractor. At present, all contractors have decided to install DOCs. Although other technologies achieve higher particulate reduction rates than DOCs, they were preferred primarily because low sulfur diesel fuel

"The Big Dig diesel construction retrofit program has proven that retrofitting construction equipment with DOCs is very feasible, and provides beneficial air quality improvements in terms of emission reduction and odor control."

—Alex Kasprak, Environmental Engineer, Massachusetts Turnpike Authority, CA/T Project

"I am very proud of Connecticut's success in this Clean Air Construction Initiative. The State of Connecticut's various Departments and the Connecticut Construction Industry Association (CCIA) worked and are still working to benefit the people of Connecticut by trying to improve the quality of life in locations where transportation projects are occurring. We are sensitive to those that live or work in an area were construction is going on, day after day, and how it affects those people's lives. This Initiative is a step in the right direction. As technologies improve, greater air quality can be achieved."

—Donna Weaver, Transportation Planner, Office of Environmental Planning, Connecticut Department of Transportation

(500 ppm sulfur content), rather than the ULSD (15 ppm of sulfur or less) needed to operate other technologies, was used for the project. Estimates for reduced emissions from the program are 20 tons per year for carbon monoxide, 2 tons per year for fine particulate matter (with clean fuels or oxidation catalysts) and 8 tons per year for hydrocarbons (with oxidation catalysts only).[54]

Because of the success of the Connecticut Clean Air Initiative on ConnDOT projects, other agencies such as the Connecticut Department of Public Works and the Connecticut Department of Economic and Community Development are also requiring their construction contractors to follow the ConnDOT specification. Three or four diesel oxidation catalysts have been installed on two projects as a result.

Port of Houston[55]

The Port of Houston is the sixth largest port in the world,[56] and a significant contributor to NO_x emissions in the eight counties of the Houston-Galveston area. All eight counties in this region fail to comply with EPA's health-based eight-hour ozone standards.[57] Although the Port of Houston Authority is not the largest contributor to emissions in the area, they have become the region's leader in emissions reduction activities and commitments.

Through demonstration testing of the alternative fuel PuriNOx™ on rubber-tire gantry crane with a 550 horse-power engine, the Port of Houston Authority (PHA) has reduced NO_x emissions by 25% and PM emissions by 50%.[58] In September of 2003, the Port Authority converted 39 yard tractors and yard cranes to PuriNOx and enacted the requirement that any new equipment purchased be able to use the technology.[59] Approximately 49 pieces of cargo-handling equipment are currently operating on PuriNOx for a NO_x emissions reduction of approximately 21 tons per year at a total cost of $216,000. According to Roger Guenther, container facilities manager at Barbours Cut Container Terminal, "It's just a different fuel, nothing special has to be done to the equipment. I could put diesel back in any of the offroad vehicles and they would run just fine. I can't tell any difference from one to the other."[60]

The PHA also applied for and received $337,000 in state funding (see the Texas Emissions Reduction Program section below) to replace two Fireboat FARNSWORTH propulsion engines with engines that produced 5.6 tons less NO_x per year.[61] Additionally, the PHA has purchased several new yard tractors and container handlers with clean engine technology, resulting in NO_x emissions reductions of 6.9 tons per year at a cost of $21,500.[62] Further, the PHA purchased 33 ultra-low emissions vehicles or propane vehicles for their onroad fleet.[63] The PHA plans to extend its retrofit program (which involves either retrofitting vehicles with oxidation catalysts,

PORT AUTHORITY OF HOUSTON

New equipment purchased by the Port of Houston Authority must run on PuriNox, an alternative fuel that reduces NO_x emissions.

switching their fuel use to PuriNOx, or both) to between 50 and 250 vehicles.[64] In total, the PHA has reduced NO_x emissions by 33.5 tons per year with the assistance of $574,000 in TERP funding.

Puget Sound in Washington[65]

Washington State's Puget Sound Clean Air Agency has formed a coalition, known as Diesel Solutions®, to dramatically reduce diesel engine pollution in the region. The first step in this program was to work with Conoco/Phillips and U.S. Oil to ensure that ULSD was locally available. Since ULSD was made available, 800 school buses have been retrofit, mostly with DOCs.

Approximately two dozen pilot projects used DPFs for the retrofits. The average retrofit cost has been between $1,200 and $8,000 per vehicle, and projects are financed through a statewide retrofit program developed as part of the EPA Voluntary Diesel Retrofit Program. The next step in the program is to retrofit diesel engine construction equipment with pollution control technology. As part of this effort, the Puget Sound Clean Air Agency has requested retrofits in their comments on local project environmental impact statements, and has been speaking with a number of construction companies.[66]

The Texas Emissions Reduction Program[67]

In 2001, the Texas State Legislature established the Texas Emissions Reduction Program, enacted through Senate Bill (SB) 5. The goals of the TERP, as stated in SB 5, are to: "assure that the air in the state is safe to breathe and meets minimum federal standards established under the Federal Clean Air Act (42. U.S.C. Section 4707); develop multi-pollutant approaches to solving the state's environmental problems; and adequately fund research and development that will make the state a leader in new technologies that can solve the state's environmental problems while creating new business and industry in the state."[68]

The TERP covers 41 counties in the state where air quality violates or is close to violating EPA standards.[69] Projects are eligible for financial assistance through a number of programs, including: the Emissions Reduction Initiative Grants Program, which offers incremental funding for NO_x emissions reduction activities; the Small Business Program, which offers grants to small businesses for pollution reduction measures; the Heavy-Duty Motor Vehicle Purchase or Lease Incentive Program, which allows the Texas Com-

mission on Environmental Quality to reimburse a purchaser or lessee of a new onroad heavy-duty vehicle for the difference in price between that vehicle or a higher-emitting diesel-powered vehicle; and the Light-Duty Motor Vehicle Purchase or Lease Incentive Program, which (though currently unfunded) is intended to provide financial incentives for the purchase of light-duty motor vehicles that are EPA-certified at a lower NO_x emissions standard than regular light-duty motor vehicles.

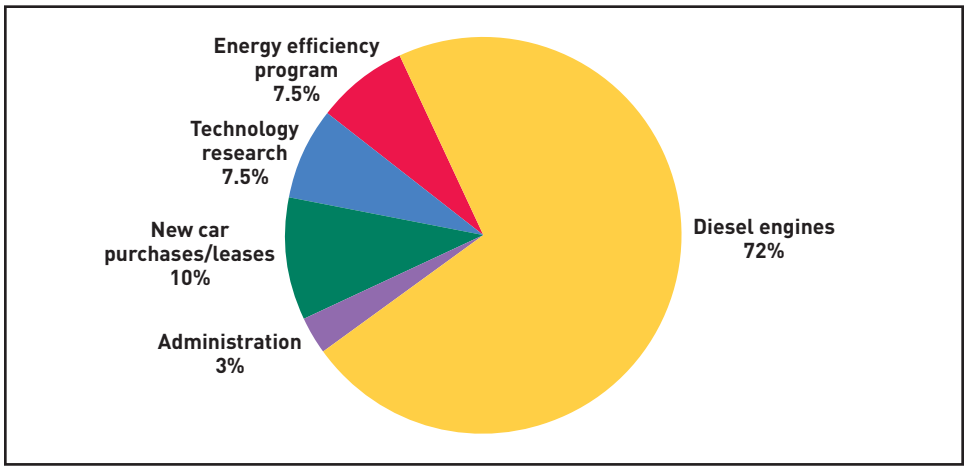
TERP will offer a total of approximately $130 million in funding for emissions reductions programs each year over the next three years.[70]

In the 2004 grant application period, the Texas Commission on Environmental Quality had approximately $127.5 million available for grant programs. Eligible projects include new purchases, replacements, retrofits, repowers, and refueling projects.[71] The projects from the first round of grants are expected to reduce NO_x emissions by over 3,500 tons over their lifetime, at an average cost of about $5,175 per ton reduction.[72] The projects funded by the second round of these grants are expected to reduce NO_x emissions by almost 13,600 tons over the life of the projects, at an average cost of $5,960 per ton reduction.[73] In 2004, the average cost per ton reduction of NO_x emissions was approximately $5,800. This represents a lower average cost per ton NO_x emissions reduction than achieved by 2002-2003 grants funds, which offered over $28 million in funding to reduce NO_x emissions by over 4,100 tons over the life of the projects at an average cost of approximately $8,362 per ton.[74] The Emissions Reduction Grant Incentive Program NO_x cost-effective criteria will be capped at $7,000 per ton reduction in 2005.[75] Grant award details are available at: http://www.tnrcc.state.tx.us/oprd/sips/terp.html and more information can be found at: http://www.tnrcc.state.tx.us/oprd/sips/terp.html.

California's Carl Moyer Program[76]

The Carl Moyer Memorial Air Quality Standards Attainment Program

FIGURE 6
TERP funding distribution, 2001 (approximately $130 million)



When the Texas Emissions Reduction Plan is fully implemented, the majority of funds will go toward replacing older diesel engines with cleaner-burning models.
Source: TNRCC. "Clean Air Incentives." Natural Outlook, Fall 2001. Online resource, available at: http://www.tceq.state.tx.us/assets/public/comm_exec/pubs/pd/020/01-04/clean_air.pdf Last accessed 04/12/05.

provides funds on an incentive basis for the incremental cost of cleaner than required engines and equipment. Funding is available for nonroad equipment 50 hp or greater. Eligible projects include cleaner onroad, offroad, marine, locomotive and stationary agricultural pump engines, as well as forklifts, airport ground support equipment, and auxiliary power units. The program achieves near-term reductions in NO_x emissions, which are necessary for California to meet its clean air commitments under the State Implementation Plan. In addition, local air districts use these NO_x emissions reductions to meet commitments in their conformity plans, thus preventing the loss of federal funding for local areas throughout California. The program also seeks to reduce particulate matter (PM) and hydrocarbons.

The California Air Resources Board (CARB) is responsible for the development and oversight of the majority of the Carl Moyer Program. CARB distributes Carl Moyer funding to California's 35 local air districts, which then screen applications and distribute the funding to diesel engine owners. The program has provided grants for projects such as repowering nonroad equipment, agricultural irrigation pumps, sweepers, tractors and marine vessels. It has also helped to fund the purchase of new natural gas refuse trucks and buses.

Governor Schwarzenegger recently signed AB923, which authorized increasing motor vehicle registration fees and tire fees to support programs, such as the Carl Moyer Program, that reduce air pollution. Through year six of the Carl Moyer Program, it had received approximately $154 million dollars in total funding.[77] With its recent reauthorization, up to $140 million a year of incentive funding is available for air pollution mitigation technologies.[78] More information is available on the Carl Moyer Program web site at: http://www.arb.ca.gov/msprog/moyer/moyer.htm.

The EPA Voluntary Diesel Retrofit Program

The Environmental Protection Agency, through the Office of Transportation and Air Quality, has developed a program to encourage voluntary diesel retrofits. This program uses economic incentives, which can be applied at the federal, regional, state, and local levels, to produce emissions reductions through the use of pollution control technology. One tool used by this program is grants, which have been awarded to various parties to help fund the cost of retrofit projects. Information on recent grants is available on the EPA Voluntary Diesel Retrofit Program web site.

EPA is also in the process of developing a policy to allow diesel engine retrofits to count as credits that can be traded or used to offset stationary source emissions. As a corollary to this program, EPA has developed a verification program to ensure that pollution control technology providers advertised emissions reductions. More information on the EPA verification process is available in the "Onroad and Nonroad EPA/CARB Verification" section of this handbook. Further information on the Voluntary Diesel Retrofit Program, verified technologies, and financial incentives for the use of pollution control technology can be found on the EPA Voluntary Diesel Retrofit web site, at: http://www.epa.gov/otaq/retrofit/index.htm.

CHAPTER 5

Fueling a cleaner tomorrow

Ultra-low sulfur diesel fuel (ULSD)

The sulfur in diesel fuel directly contributes to the amount of pollution emitted, such as engine-out PM emissions[79] and secondary emissions of SO_4.[80] Currently, the EPA standard for onroad diesel fuel is 500 ppm (also referred to as No. 2 Diesel). The current nonroad standard for diesel fuel is 5,000 ppm, but sulfur levels are generally around 3,400 ppm. As of September 2006, 15 ppm sulfur content (ULSD) will become mandatory for all onroad diesel engines[81] and in 2010, 15 ppm sulfur content fuel will become mandatory for many nonroad engines.[82]

Because ULSD is not required nationally until September 2006, its current availability and costs vary depending on location, whether ULSD has to be specially trucked in for a project, and the quantities needed. The map below shows areas within a 250-mile radius of where ULSD is refined,[83] or areas where ULSD should be available as of August 2004. Once ULSD becomes mandatory for the onroad sector in 2006, it will be readily available across the United States and cost differentials between low sulfur diesel (500 ppm) and ULSD should be minimal.

ULSD reduces harmful emissions, allows for aggressive retrofit devices, and reduces maintenance costs. EPA states: "While the estimated added cost for low-sulfur fuel is about seven cents per gallon, the net cost is projected to average about four cents per gallon because the use of ULSD could significantly reduce engine maintenance expenses."[84] The maintenance dividend for low sulfur fuel in large onroad vehicles (e.g. trucks and buses) is about $600 over the life of the engine or a fuel cost savings of about 1 cent per gallon.[85] The cost savings for nonroad equipment may be higher, because baseline sulfur levels in nonroad fuel are up to six times higher than onroad fuel.

The program has been a tremendous success. In the short period from October 1, 2004 to February 1, 2005, the Lane Clean Diesel Project received commitments from its partners to purchase over 2 million gallons of ULSD.

By switching from onroad diesel fuel (500 ppm) or from nonroad diesel fuel (about 2000 ppm-3000 ppm) to ULSD, particulate matter, smoke and sulfate emissions will be reduced.[86] ULSD used in combination with advanced retrofit technology allows for dramatic reductions of up to 90% of the PM, HC and CO found in diesel exhaust. Those who wish to design a retrofit program should talk with local fuel providers to determine whether ULSD is available in their market, and if it is not yet available, the timeline within which it will be

An Oregon success story

Sharon Banks of the Lane Regional Air Pollution Authority (LRAPA), Oregon successfully built a market for ULSD fuel in Lane County, Oregon. The objective was to bring ULSD fuel to Lane County at an affordable price ahead of the September 2006 mandate.

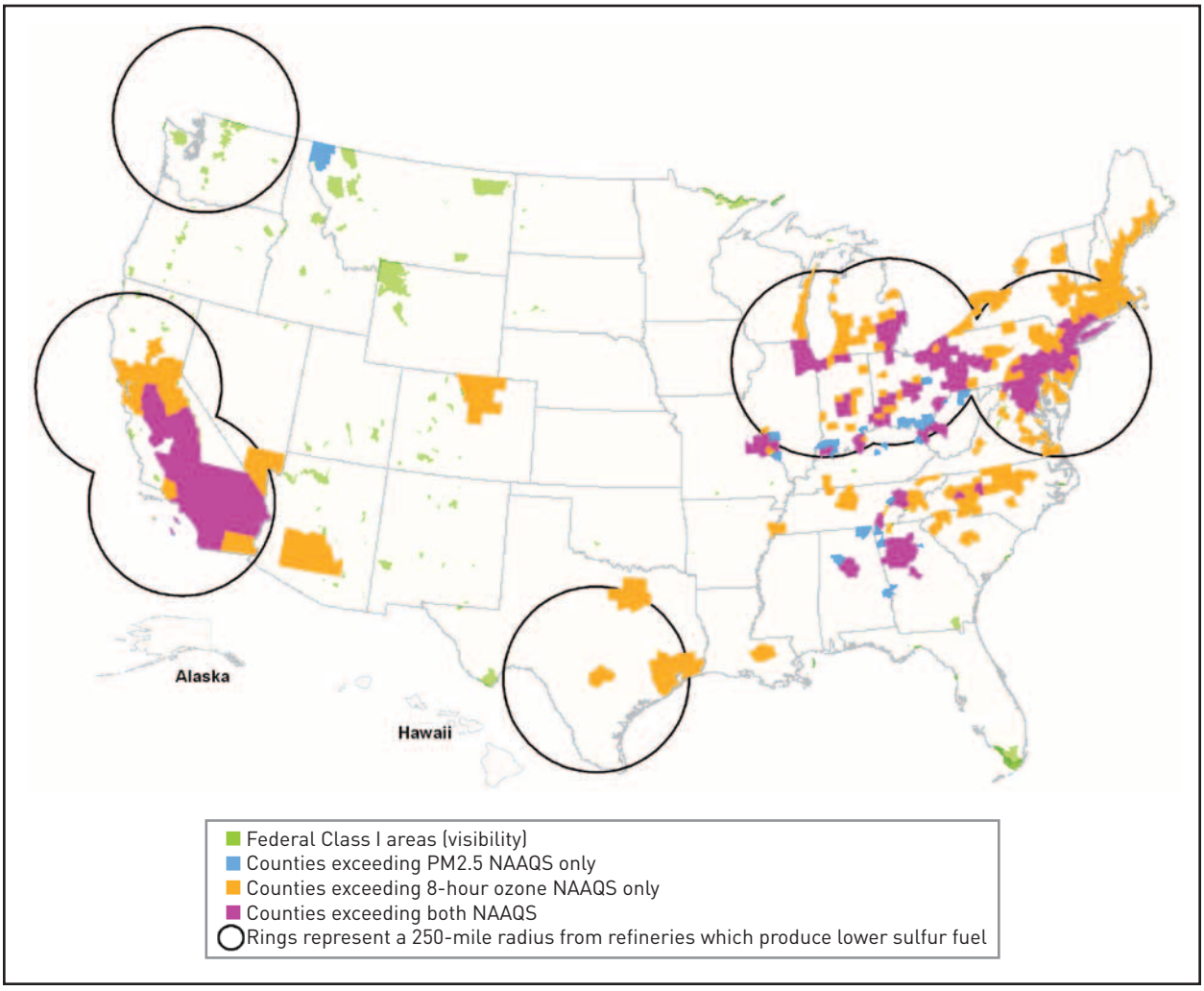
To bring the price of ULSD fuel down to a competitive level, Ms. Banks built enough demand in Lane County to make ULSD fuel attractive to users. City managers, County administrators, school districts, transit authorities, municipal waste haulers, large private fleets, fuel distributors and public utilities were all involved in the endeavor.

available. EPA rules mandate that all new onroad diesel vehicles use ULSD by 2006, at which point the fuel will be widely available nationwide.[87] New EPA rules do not require the use of ULSD in the nonroad sector before 2010, but the widespread availability of the fuel by September 2006 makes it easy for any nonroad fleet to begin using the fuel ahead of the EPA nonroad schedule.[88]

Emulsified diesel fuel

Emulsified diesel fuel is diesel fuel (LSD or ULSD) blended with up to 20% water and a proprietary additive. The water emulsion has to be stirred regularly when kept in a stationary tank to ensure that the water molecules are completely enclosed by fuel molecules. Stirring is important to avoid separation, which could cause engine corrosion and decreased lubricity. Storage tanks can be equipped with stirring devices such as circulation pumps. Though the timeframe for recirculation needs may vary based on individual product specifications, Lubrizol's PuriNOx can be stored at room temperature

FIGURE 7
Ultra low sulfur diesel fuels availability



Source: http://www.epa.gov/otaq/retrofit/fuelsmap.htm

for 3–4 weeks before recirculation becomes necessary.[89]

Emulsified diesel fuels generally do not require engine modifications. However, fleet operators should check with OEMs before using a fill-and-go system like emulsified diesel and fleet operators should confirm warranty compatibility with the equipment/engine manufacturer before using emulsified fuels. Emulsified fuels have been tested for many onroad and nonroad diesel engines, although only Lubrizol's PuriNOx summer blend has received EPA verification. Summer blend PuriNOx cannot be used when ambient temperatures fall below 20 degrees Fahrenheit.[90] EPA has verified PuriNOx for both on and nonroad use and has confirmed a 16.8–23.3% reduction in PM and a 17–20.2% reduction in NO_x for nonroad applications.[91]

CARB has verified PuriNOx for onroad engines model years 1988-2003 at 50% PM (Level 2) reduction and 15% NO_x reduction.[92] In addition, CARB has verified PuriNOx and AZ Purimuffler or AZ Purifier System for 1996 through 2002 diesel engines used in off-road applications specifically at the ports, railway yards and other intermodal/freight handling operation applications only. The PuriNOx and AZ Purimuffler or AZ Purifier System uses a diesel oxidation catalyst and an emulsified diesel fuel to achieve a 50% reduction in PM emissions, qualifying it for a Level 2 CARB verification. The system also achieves a 20% reduction in NO_x emissions.[93]

Using retrofit technology in conjunction with emulsified fuels significantly reduces both PM and NO_x. For example, use of an emulsified fuel with a DPF produces PM emissions reductions of 95%, HC reductions of 85%, CO reductions of 75% and NO_x reductions of 25%. Use of emulsified diesel fuel in conjunction with a DOC produces PM emissions reductions of 65%, HC reductions of 60%, CO reductions of 70% and NO_x reductions of 25%.[94] Thus, Environmental Defense recommends that if emulsified fuel is used, it be used in conjunction with a retrofit device whenever possible to maximize emissions reductions.

While many applications have been successful, some have raised concerns regarding fuel separation in equipment that is not being used regularly, loss of power, slower hydraulic movement, injector pump failure in newer engines and acceleration.[95] When considering the emissions reduction rates of emulsified fuel, possible loss of engine power and fuel efficiency should be taken into consideration. Fuel efficiency depends highly on the duty cycle, and Lubrizol reports that a typical loss is between 5 and 10%.[96] Since water does not contribute energy, emulsified diesel fuel can decrease engine power by approximately 10–13%[97] depending on how much water has been added.[98] Engine power is also highly dependent on the duty cycle and current engine sizing of the vehicle. PuriNOx has successfully been used in a variety of both low and high horsepower offroad engines, from small little John Deere Gators (all terrain vehicles) to tractors, loaders, scalars, dozers, haul trucks, cranes, marine vessels, etc.[99]

Availability and cost of emulsified fuel should be addressed with the local fuel distributor. If a centralized fuel storage tank is available on site, the emulsified fuel can be blended on site, which may be less expensive than when it has to be trucked in. According to Lubrizol, for example, PuriNOx prices vary by distributor, but a good approximation of cost nationwide is $0.25 per gallon over diesel fuel.[100] However, depending on where PuriNOx is sold and depending

on the price of regular diesel fuel, it can also be the same price or less expensive than regular diesel fuel.[101]

Fuel-borne catalyst

A fuel-borne catalyst (FBC) is a liquid fuel additive that conditions diesel fuel, improving combustion and reducing emissions. An FBC can either be added to bulk fuel or directly to the construction vehicle's fuel tank. An FBC typically contains small amounts of precious metals such as platinum, cerium, or iron compounds. Use of an FBC product can also improve fuel economy by up to 10% and increase horsepower by up to 5%.[102]

EPA has verified only one FBC, called Platinum Plus®, so far.[103] EPA verified reduction rates for the FBC used in conjunction with a DOC are 25-50% for PM, 16-50% for CO and 0–5% for NOx. According to Platinum Plus' manufacturer, only about 2% of the platinum gets into the environment because the platinum bonds with the hot surfaces of the engine.[104] Platinum in the environment has a limited potential to produce allergy-like symptoms for sensitive populations, such as: conjunctivitis, coughing, wheezing or asthma attacks.[105] However, a recent study by the United Kingdom's Committee on Toxicity of Chemicals in Food, Consumer Products, and the Environment reported: "platinum emissions from the platinum based fuel catalyst were unlikely to be in an allergenic form."[106]

To address the amount of platinum released into the environment and to achieve the maximum possible emissions reductions, Environmental Defense recommends that an FBC be used in conjunction with retrofit equipment, such as a DPF or the catalyzed wire mesh filter mentioned in the technology section.[107]

Alternative fuels

To reduce emissions of hazardous pollutants, construction fleet operators can use an alternative fuel. The use of alternative fuels provides not only environmental benefits, but also can reduce dependency on foreign petroleum and improve energy security through supply diversification. As with all vehicles and equipment, to achieve the maximum possible environmental benefits, alternatively fueled vehicles must be properly maintained.

This section of the handbook explores the specific advantages of biodiesel, compressed natural gas, liquefied natural gas and propane fuels. It is important to note that alternative fuels might be right for some fleets but not for others, especially because, at this time, alternative fuels do not have the same easily accessible infrastructure that diesel fuel does. Information on the availability of these, and other, alternative fuels is available from the Department of Energy's Alternative Fuels Data Center, which can be accessed online at: http://afdcmap.nrel.gov/locator/LocatePane.asp.

Additionally, federal and state tax incentives may be available to help defray increased purchasing costs for alternative fuel vehicles. More information on tax and other financial incentives for alternative fuel use is available from the Department of Energy's Alternative Fuels Data Center at: http://www.eere.energy.gov/cleancities/afdc/laws/incen_laws.html.

BIODIESEL

Biodiesel is a renewable, biodegradable, low-sulfur fuel that is produced from many types of feedstocks including vegetable oils (soybeans, rapeseeds, canola oil) or animal fat. Biodiesel is high in oxygen content (oxygenates) which leads to lower PM emissions.

Typically, biodiesel is blended with conventional diesel in a 20% biodiesel to 80% conventional diesel solution (B20). At B20, most of the potential PM benefits have been achieved while minimizing potential NO_x emissions increases. Biodiesel can also be blended with ULSD fuel, and in fact, makes up for ULSD's low lubricity. For example, using a 1% biodiesel and 99% ULSD blend increases lubricity 65% over pure ULSD, which is essentially equivalent to regular diesel fuel.[108]

EPA has statistically determined that PM, HC and CO emissions decrease and NO_x emissions increase slightly with B20 mixtures, when compared with conventional diesel. B20 increases NO_x by about 2%, decreases PM by approximately 10%, decreases HC by around 21% and decreases CO by approximately 11%.[109] Thus, biodiesel helps decrease emissions of some air pollutants, but it slightly increases NO_x emissions.[110] Due to the slight NO_x increase, biodiesel may only be appropriate for use in areas that are attaining the public health based standards for ozone—and even then, only in combination with other NO_x reduction strategies. B20 may also be appropriate for areas that have achieved their air quality standards but must work actively to maintain that status (maintenance areas).[111]

Biodiesel may also be used alone (B100) rather than blended with conventional or ULSD fuel. EPA has verified Biodiesel blends ranging from B1 to B100 for use in voluntary retrofit initiatives.[112] According to EPA, B100 is 5–11% less fuel efficient than conventional diesel.[113] Specifically, B100 reduces emissions of hydrocarbons by an average of 67%, carbon monoxide by an average of 48%, and particulate matter by an average of 47%.[114] On average, B100 emits about 10% more NO_x than conventional diesel fuels do.[115]

COMPRESSED NATURAL GAS AND LIQUEFIED NATURAL GAS

Compressed natural gas (CNG) is a colorless, tasteless, and non-toxic fuel that is mostly derived from methane. Although naturally odorless, an odorant is frequently added to CNG supplies to warn of its presence, a precaution made necessary by its flammability.[116] CNG is extracted from extensive underground reserves in gas wells or in conjunction with crude oil production and is commonly used to power water heaters, stoves, and laundry machines. However, CNG's utility is not limited to the household—it can also be an excellent and clean alternative fuel for mobile sources and has been used in the heavy-duty onroad sector.[117]

The U.S. Department of Energy describes CNG as "clean burning" producing significantly fewer harmful emissions than reformulated gasoline or diesel when used in natural gas vehicles. According to the U.S. Department of Energy, commercially available medium- and heavy-duty natural gas engines have demonstrated over 90% reductions of CO and PM and more than 50% reduction in NO_x relative to commercial diesel engines.[118] To use CNG, one must purchase a vehicle designed specifically for CNG use. At this time, CNG is not commercially available for nonroad use, although several hand-built demonstration units exist.

Liquefied natural gas (LNG) is natural gas that has been cooled to temperatures of 260 degrees below zero, but it is typically kept at high pressure so that it does not have to be so cold. The fuel's freezing temperatures increase the need for safety training by those operating LNG fueled vehicles. Skin contact with the fuel must be avoided, and machines that use LNG can vent a flammable gas mixture when not in use and parked in-

doors. Additionally, LNG must be used in a context where the LNG facility or terminal meets all applicable state or local government safety and siting rules. Similar to compressed natural gas, LNG has been used in the heavy-duty onroad sector,[119] but is not commercially available for the nonroad sector at this time.

PROPANE

Propane, known also as Liquefied Petroleum Gas, is a colorless and non-toxic fuel produced as a byproduct of natural gas processing or crude oil refining. Application of moderate pressure can convert the gas into a liquid, increasing the ease with which it is stored and transported. Although propane is less fuel efficient than gasoline, its higher octane rating means that engines run more smoothly and efficiently. Propane also produces less pollution than gasoline, and it can lower carbon dioxide, carbon monoxide and non-methane hydrocarbon emissions.[120] Additionally, propane is readily available—fueling stations are found in all 50 states. This fuel is widely used in the onroad sector, and has been successfully used by non-road vehicles such as forklifts or loaders.[121]

According to the U.S. Department of Energy, propane vehicles can produce fewer ozone-forming emissions than vehicles powered by reformulated gasoline. In addition, tests on light-duty, bi-fuel vehicles have demonstrated a 98% reduction in the emissions of toxics, including benzene, 1,3 butadiene, formaldehyde, and acetaldehyde, when the vehicles were running on propane rather than gasoline.[122]

CHAPTER 6

Filtering out pollutants

One of the most effective ways to reduce diesel pollution from existing equipment is to combine the cleaner fuels, discussed previously, with retrofit technology. In this handbook, the term *retrofit* is defined as incorporating any device into diesel equipment to reduce pollution. The term *retrofit technology* is used interchangeably with *emissions control technology*, *pollution control technology* and/or *after-treatment technology*.

There are a variety of demonstrated retrofit technologies available to significantly reduce PM, HC, CO, NO_x, toxics and odor emissions from existing heavy-duty diesel vehicles. Many technologies to reduce diesel PM are commercially available today and have been used for more than 25 years on nonroad diesel engines in construction equipment.[123] A number of NO_x control technologies that can significantly reduce pollution are still in development, although some are currently available.[124] Additionally, companies are making substantial investments to develop and commercialize diesel exhaust emissions control technologies. In fact, just 12 of the over 40 member companies that make up the Manufacturers of Emission Controls Association (MECA) have invested more than $1.8 *billion* in R&D and capital expenditures to help reduce pollution from the onroad and offroad diesel sectors.[125]

Thus, available retrofit technologies and applications are expanding rapidly and the industry is working aggressively to pursue solutions to address heavy-duty diesel emissions control.[126] Hundreds of scientists and engineers across the country are contributing to key developments to speed the evolution of diesel emissions control technology[127] and EPA has already formed partnerships with state, local and industry stakeholders in numerous states and the District of Columbia to reduce pollution from existing diesel engines.[128]

This part of the handbook introduces some of the many different options available for retrofitting.[129] It also provides information on the verification status of each technology:

- *Verified* means that the technology has been approved for use in either the onroad or the nonroad sector by the Environmental Protection Agency or the California Air Resources Board;
- *In development* means that the technology has not yet been verified, but may currently be in use in the onroad or nonroad sector, undergoing field testing, or in development.

Retrofit technologies can be geared towards PM or NO_x reduction, though many also reduce CO and HC emissions as well. Most advanced pollution control technologies require diesel fuels with very low levels of sulfur (15 parts per million of sulfur or less) to work properly and many can be combined for even deeper pollution cuts. Please talk to your fleet managers and Original Equipment Manufacturers (OEM) to determine the best options to meet your air quality goals.

Particulate matter reduction

DIESEL PARTICULATE FILTERS (VERIFIED)[130]

A diesel particulate filter (DPF) is an emissions control technology that traps diesel particulate matter from engine exhaust until the trap becomes loaded to the point that a regeneration cycle is implemented to

DPF in-use reduction numbers	
NO_x	0%
PM	Up to 90%
HC	Up to 90%
CO	Up to 90%

burn off the trapped particulate matter.[131] DPFs are normally built with a porous ceramic and metal mesh or silicon carbide filter housed in a metal container similar to a muffler. There are two main categories of DPFs: active and passive. The difference between the two is in the methods used to regenerate the filters. Passive systems rely on a catalyst to lower the temperature at which the collected soot will burn and, therefore, rely solely on the duty-cycle of the vehicle and resulting exhaust gas temperatures to ensure that regeneration occurs as frequently as required. Active systems use supplemental heat to supply the necessary energy to burn the collected particulate matter. The heat is provided by either onboard or offboard burners or electrical heaters. The type of DPF suitable for a specific application depends, in addition to other factors, upon the exhaust gas temperature, the daily duty cycle of the subject construction equipment and the availability of ULSD. Passive DPFs require the use of ULSD fuel to facilitate regeneration and prevent catalyst poisoning that would render them inoperable.[132] Active DPFs do not require ULSD fuel.

Active filter systems can be used on a broader range of vehicles because regeneration is accomplished by supplemental means that do not rely on the operation of the vehicle and the resulting duty-cycle. However, an active system can cost more than a passive system.

Although DPFs work by forcing the exhaust through porous walls, PM is collected without obstructing the flow of exhaust gases or damaging the engine or vehicle. Diesel particulate filters can reduce $PM_{2.5}$, PM_{10}, HC, and CO emissions by up to 90% and significantly reduce emissions of other toxics, including aldehydes.[133] However, DPFs do not remove NO_x.

Prior to installing DPFs, engines must be data-logged to ensure timely and consistent regeneration and tested to determine whether the required exhaust gas temperature is achievable for the necessary amount of time during the daily duty cycle. In addition, a back-pressure monitor must also be installed

Construction equipment retrofit with a diesel particulate filter.

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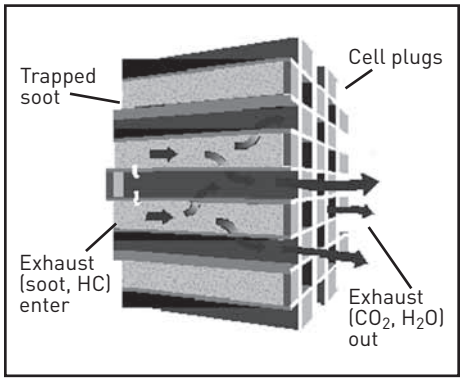
FIGURE 8
Schematic of a diesel particulate filter



MECA, "Minimizing NO2 Emissions from Catalyst-Based Diesel Particulate Filters." IDRAC Meeting, February 6, 2002. Online resource, available at: http://www.arb.ca.gov/diesel/presentations/020602/mecano2resolution.pdf Last accessed 03/03/05

to allow real-time monitoring of DPF performance and to ensure consistent in-use regeneration. If there is insufficient regeneration, the DPF will become plugged with soot, increasing exhaust gas backpressure levels beyond engine manufacturer specifications.

Particulate filters can be installed on new or existing equipment, sometimes as muffler replacements, to trap particulate matter in the exhaust.[134] Because DPFs tend to be larger and heavier than a diesel oxidation catalyst or a regular muffler, DPFs require some engineering to be properly installed on construction equipment. Installation of a DPF is more complex, time consuming and costly than the installation of a DOC. However, the installation of a DPF is worthwhile, because DPFs reduce PM, HC, and CO by up to 90%, whereas DOCs only reduce PM by approximately 20–30%, and HC and CO by approximately 50–70%. According to retrofit manufacturers, installation of a DPF takes about 5–7 hours and a DOC can be installed by the equipment operator in about 1–2 hours.

Depending on the application and size of the equipment, most DPF applications cost between $7,000 and $12,000 excluding installation.[135] Because DPFs are currently more effective at reducing particulate matter than other technologies, Environmental Defense strongly encourages the use of DPFs whenever possible.

Although DPFs are not as common as DOCs, an increasing number of DPFs are already being used at a number of construction sites. Worldwide, DPFs have been installed on over 70,000 heavy-duty vehicles, primarily trucks and buses.[136] Over 20,000 DPFs have been installed on nonroad engines worldwide.[137]

PASSIVE DIESEL PARTICULATE FILTER (VERIFIED)[138]

There are two different types of passive DPFs: catalyzed and regular. A catalyzed DPF will remove the soluble organic

TABLE 4
Examples of nonroad DPF installations

Type of equipment	Type of DPF	Location
Generator (600 kw)	Active DPF (by Rypos)	World Trade Center 7, NYC
Wheel Loader (CAT966)	Passive DPF (by Johnson Matthey)	World Trade Center 7, NYC
Wheel Loader (CAT 966GII)	Passive DPF (by Johnson Matthey)	American Asphalt, CA
Dump Trucks (Cummins, CAT and ITEC engines)	Passive DPF (by Johnson Matthey)	LA and surrounding areas, Seattle, Riverside County, San Diego

fraction (SOF) portion of the PM emissions in addition to regenerating the elemental carbon (soot) fraction of the PM.[139] In addition, the exhaust gas temperature required to ensure proper regeneration is slightly lower for the catalyzed passive DPF than for the regular passive DPF. The catalyzed DPF requires a temperature of approximately 210°C, depending on the catalyst used. The catalyst can also be added to the fuel as a fuel-borne catalyst. CARB staff has evaluated the catalyzed DPF as the most effective control technology because it can reduce PM emissions by over 85%.[140]

A regular DPF typically requires a greater than 260–320°C operating temperature for a significant portion of the duty cycle and has found limited application because of this.[141] If the necessary exhaust gas temperature cannot be achieved for the required portion of the daily duty cycle, an active DPF (see below) should be considered.

ACTIVE DIESEL PARTICULATE FILTER (VERIFIED)[142]

Active filters are used when the engine exhaust temperature is too low for a passive DPF and for older and dirtier engines. Because these systems do not rely on exhaust gas temperatures for regeneration, but rather on heat addition to the exhaust gas stream by use of burners or other means, an active DPF can successfully operate at low exhaust gas temperature. To increase the exhaust temperature for efficient regeneration, some commercial filter systems have incorporated burners, electrical heaters or fuel injection into the exhaust stream. These burners or electric heaters use about 1% of the total fuel consumption.[143]

Although emissions reductions are maximized with the use of ULSD, an active DPF typically does not require the use of ULSD fuel.[144] Like passive DPFs, an active DPF can be used alone or in conjunction with a DOC to reduce gaseous hydrocarbons and carbon monoxide. The California Air Resources Board has verified Lubrizol's actively regenerated DPF, the Combifilter™, for off-road applications in 1996–2004 diesel engines. The Combifilter system is verified for an 85% reduction in PM emissions.[145]

FLOW-THROUGH FILTERS (VERIFIED)[146]

There are three types of flow-through filters: 1) the catalyzed wire mesh filter; 2) the pertubated path metal foil filter; and 3) the catalytic particulate oxidizer. Flow-through filters can be comprised of wire mesh or pertubated path metal foils. Like other filter materials they can be used with active systems or be catalyzed and perform as a passive system.

CWMF EPA verified reduction numbers (when used with FBC)

NO_x	0–9%
PM	55–76%
HC	75–89%
CO	50–66%

First, the catalyzed wire mesh filter (CWMF) is a new technology that has been EPA-verified for onroad use in conjunction with a fuel-borne catalyst.[147] A CWMF requires an exhaust gas temperature of 225°C for at least 25% of the daily duty cycle, which is lower than a DPF typically requires.[148] Thus, if a certain application does not allow for a DPF due to low exhaust gas temperatures, a CWMF might work. A CWMF weighs about the same as a DPF. EPA has verified the following emissions reduction rates for Clean Diesel Technologies, Inc.'s CWMF when used with a fuel borne catalyst: 0–9% for NO_x, 55-76% for PM, 75–89% for HC and 50–66% for CO.[149]

Generally, CWMFs should be visually inspected once per year, and in the event that the back pressure monitor signals an unreversed back pressure buildup,

the CWMF should be returned to an authorized dealer for thermal cleaning.[150] However, several CWMF units that have been in operation for over a year have been essentially maintenance free.[151] Currently, with limited quantities in production, the price range for a CWMF is $5,500 to $7,000.[152] As with all emerging technologies, prices could decline as demand for the technology grows.

Second, the pertubated path metal foil flow-through filter is an emerging technology of similar performance. It can also be catalyzed both for emissions control performance and regeneration characteristics.

Third, a Catalytic Particulate Oxidizer (CPO)[153] is a new technology developed for heavy and medium duty onroad and offroad diesel engines. The CPO has recently begun the CARB verification process but, as of February 16, 2005, has not been EPA or CARB verified.[154] The CPO has been certified[155] in Europe and is currently undergoing another verification process in Switzerland.[156] The technology does not trap or filter particulates but oxidizes them continuously. Oxidization is the process of adding oxygen to break down pollutants.[157] The chemical reaction between catalyst material and exhaust gases, according to the manufacturer's data, results in over 90% reduction of HCs, CO and PM. The CPO requires a minimum exhaust temperature of 190°C. According to the manufacturer's specifications, the CPO does not store ash, eliminating the need to open and clean the filter regularly. The CPO typically creates less backpressure than a DPF. CPOs costs range between $6,000–$8,000, depending on the size of the equipment.[158]

DIESEL OXIDATION CATALYSTS (VERIFIED)[159]

A diesel oxidation catalyst (DOC) is a type of catalyst (catalytic converter), which chemically converts HC, CO, soluble organic fraction (SOF) and polycyclic aromatic hydrocarbons (PAH) to water vapor and carbon dioxide. A DOC is a flow-through metal or ceramic substrate coated with a precious metal catalyst (e.g. platinum). The outside of the DOC is metal and looks similar to an exhaust muffler. DOCs are a "bolt on" application and they can be easily installed, typically as a direct muffler replacement. DOCs do not require engine modifications and generally are maintenance free. Although ULSD fuel is not required, PM emissions reductions are increased with the use of low sulfur or ultra-low sulfur diesel fuel. DOCs can be installed on old and new pieces of equipment; for example, some new Caterpillar equipment already comes with a DOC.

DOC in-use reduction numbers

NO_x	0%
PM	20–30%
HC	50–90%
CO	70–90%

A DOC is a proven and efficient technology that destroys large fractions of toxic emissions. Typically, DOCs reduce approximately 50–90% HC and 70-90% CO.[160] As to PM reduction, DOCs are effective for reducing the SOF component of the particulate matter.[161] The SOF portion of PM is composed of organic material from engine fuel and lube oil that forms on the surface of elemental carbon (black soot).[162] The SOF part of the particulate matter is often referred to as *wet PM*.[163] As a result, depending on the SOF concentrations in the particulate matter of diesel exhaust, DOCs reduce approximately 20–30% of PM.[164] SOF concentrations tend to decrease with newer engines.[165] If the reduction of black soot (solid fraction) is the goal, a DPF or a CWMF are more effective technologies than a DOC.

DOCs also cut down on aldehyde, smoke and odor.[166] However, DOCs do

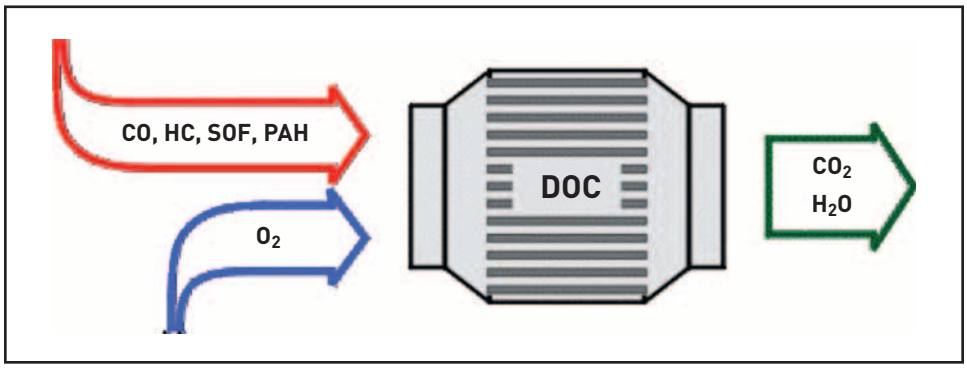
Construction equipment retrofit with a diesel oxidation catalyst.

COURTESY OF DONNA WEAVER, CONNECTICUT DEPARTMENT OF TRANSPORTATION

not remove NO_x. To increase emissions reductions, DOCs can be combined with other after-treatment technologies, including particulate filters. DOCs have already enjoyed widespread use in the onroad and nonroad sector. In fact, over 250,000 DOCs have been installed in new and retrofitted nonroad engines worldwide.[167] The cost of an oxidation catalyst is about 1–2% of the cost of new construction equipment. For example, the average cost for a DOC at the Boston Big Dig was about $2,500 per piece of construction equipment.[168] (See also the section on "Successes and Regional Programs.") Costs vary depending on the size of the equipment. Retrofit manufacturers will be able to give accurate cost estimates for each piece of equipment.

Overall, if a high number of construction vehicles should be retrofitted but funds are limited, DOCs might be an attractive option. DOCs might also be an attractive option if ULSD fuel is not available in the area. If ULSD fuel is not available, Environmental Defense encourages the use of low sulfur diesel (500 ppm) instead of typical nonroad diesel.

FIGURE 9
Schematic of a diesel oxidation catalyst



CRANKCASE EMISSIONS FILTRATION SYSTEMS WITH DOC (VERIFIED)

Crankcase emissions, on average, make up between 10–25% of total engine emissions over a prescribed test cycle but become very high (50–80%) on a relative basis when idling.[169] Targeting these emissions with pollution control technology can reduce overall engine exhaust pollution.

Crankcase filter with DOC in-use reduction numbers

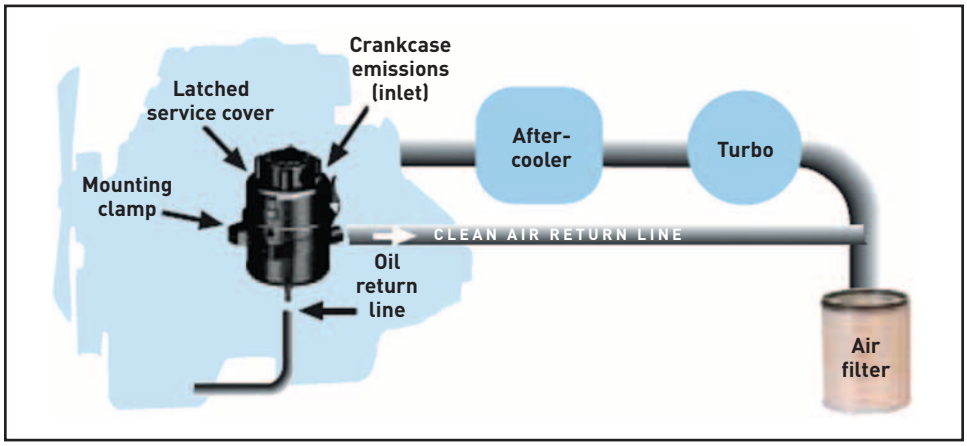
NO_x	0%
PM	25–33%
HC	12–34%
CO	42–52%

One example of a crankcase emissions filtration system is the Donaldson Spiracle™ crankcase filter. According to Donaldson, the filter eliminates 100% of all crankcase emissions and also eliminates under-hood fumes, reduces oil consumption by about 2–6 gallons/year and provides for a cleaner engine compartment. Donaldson reports that the Spiracle crankcase filter can be used alone, without other pollution control technologies, but EPA and CARB verification only apply the Spiracle when used with a DOC.

When combined with tailpipe pollution reduction technology, such as a DOC or a DPF, crankcase emissions filtration systems can achieve even greater emissions reductions. The Donaldson Spiracle crankcase filter is the only crankcase emissions reduction system that has been verified for use, when used with a DOC, by both EPA and CARB. The overall system reductions are based on the tailpipe reductions. Donaldson has approval for two different catalysts, depending upon the fuel sulfur level.[170] The use of a DOC with a Spiracle filter has been verified to reduce PM emissions by 25–33%, HC emissions by 12–34%, and CO emissions by 42–52%.[171] According to Donaldson, a DPF could be combined with the Spiracle filter in lieu of a DOC for a total engine emissions reduction of 89%. Neither EPA nor CARB have verified use of the Spiracle crankcase filter with a DPF.

The Spiracle system has a broad range of applications such as medium-duty and heavy-duty trucks, buses, off-road equipment and industrial generator sets.[172] For the retrofit market, the Spiracle system is available in two different sizes. For medium-duty applications, the end-user price for the system is approximately $325. For heavy-duty

FIGURE 10
Schematic of a crankcase emissions filtration system



Source: http://www.donaldson.com/en/engine/datalibrary/002509.pdf

applications, the end-user price is approximately $435.[173]

Nitrogen oxides reduction

In general, the retrofits discussed above do not reduce NOx, a key precursor to ozone/smog. Thus, to achieve NO_x emissions reductions, additional strategies must be used. There are a number of ways to reduce NO_x pollution, but not all are retrofit devices. NO_x pollution control technology includes: Selective Catalytic Reduction (SCR), NO_x adsorbers, lean NO_x catalysts, exhaust gas recirculation and fuel emulsifiers. The California Air Resources Board has determined that NO_x removal is cost effective at a cost of up to $13,600 per ton of NO_x reduced.[174] The Texas Emissions Reduction Program follows a similar standard of $13,000 per ton of NO_x reduced.[175]

SELECTIVE CATALYTIC REDUCTION (IN DEVELOPMENT)[176]

SCR systems add a reductant[177] (usually ammonia or urea) to diesel exhaust to convert NO_x to N_2. The exhaust and reductant are processed by a catalyst to reduce PM, HC and NO_x. Initial results from SCRs being used in combination with other technologies, such as a DOC, show the following possible reduction rates: 60%–80% NO_x, 25% PM, 50–70% HC and CO.[178] SCR systems must maintain a careful balance of proper urea injection and exhaust temperature. Typically, a mobile SCR needs to reach an exhaust gas temperature of 200–250˚C to work. As soon as the required exhaust gas temperature is reached, NO_x is being reduced. Thus, unlike a DPF, no minimal daily duty cycle is necessary for the SCR to function properly. However, if too much urea is injected, ammonia slip (ammonia being emitted through exhaust pipe) may occur. Also, low exhaust temperatures can actually increase NO_x formation.[179] To avoid ammonia slip, proper control of the correct amount of urea injection is needed. For that reason, some mobile SCRs have a NO_x sensor before and a NO_x sensor after the urea injector to remotely record data.[180]

SCR combined with DOC in-use reduction numbers

NO_x	60–80%
PM	25%
HC	50–90%
CO	70–90%

While aided by the use of ULSD fuel, SCRs can be used with low sulfur fuel (500 ppm).[181] SCR's high NO_x reduction potential makes them an attractive option for NO_x emissions reduction. SCRs can be combined with a DOC or a DPF. SCRs can be used in stationary (i.e. generator set, compressors and pumps) as well as mobile applications. Marine vessels, ferries and trains have successfully installed SCRs.[182] Mobile SCRs are currently being used in a number of construction pilot programs.[183] As of February 11, 2005, the only SCR system that EPA/CARB have verified is Extengine's ADEC system. Another verification of a mobile SCR system for onroad engines is expected by the end of 2005.[184]

Urea, the reductant that is typically used in SCR systems, is a substance that is contained in agricultural fertilizer. Thus, urea is plentiful in the United States and while supply should not cause a problem, lack of infrastructure sometimes does. If a fleet of several vehicles is being retrofitted with SCRs, a urea dispenser can be set up at the construction site. Infrastructure problems sometimes occur if only one or two vehicles are being retrofitted because of the small quantities of urea needed. Urea distribution costs range between $0.70 and $35 per gallon.[185] The amount of urea needed per engine is a function of engine-out NO_x levels, which differ depending on the year the engine was built, and vehicle

size.[186] For every gallon of diesel fuel, about 5–10 ounces of urea are needed.[187]

The cost range for SCR systems varies greatly depending on the engine horsepower and the application. Mobile SCR systems in the 200–750 hp range cost between $12,500 and $15,000 for small quantities of SCR units.[188] These mobile SCR units are similar to an automotive type of system. Large stationary power generating SCR systems in the 750–2000 hp range can cost up to $80,000.[189]

NO_X ADSORBERS (IN DEVELOPMENT)

A NO_x adsorber, also sometimes referred to as a NO_x trap, works in two stages to remove NO_x from diesel exhaust. First, it uses a catalyst to adsorb NO_x emissions during lean operation.[190] Adsorb means to accumulate liquids or gases on a surface and "lean operation" occurs when the air-to-fuel ratio is high (perhaps 50 parts air to one part fuel), for example when a vehicle is going downhill or has a light load. Then, after the adsorber has been fully saturated with NOx, the system is regenerated (cleans itself) when the engine runs rich.[191] An engine runs "rich" when the air-to-fuel ratio is low (perhaps 29 parts air to one part fuel), for example when a vehicle is going uphill or has a heavy load. Also the exhaust gas temperature is very hot when an engine runs rich, which helps burn off the NO_x.

Unlike the other pollution controls discussed in this section, NO_x adsorbers are *not retrofittable,* i.e. they are not muffler replacements like diesel oxidation catalysts or diesel particulate filters and they can not be "added-on" like SCR. Instead they must be incorporated into the engine/vehicle design by the original equipment manufacturer. Although adsorbers have a high potential for NO_x emissions reductions, when sulfur-rich fuel is used the NO_x adsorption process is rapidly deactivated and rendered ineffective.[192] According to MECA, "To make this technology a commercial reality, low sulfur fuel is a requirement."[193] Near zero sulfur levels (less than 15 ppm sulfur) enable the application of catalyst and adsorption technology to run without interference.[194]

According to MECA, NO_x adsorber systems (in a low sulfur fuel environment) have the potential to provide "a high level of NO_x reduction across a wide range of operation conditions (temperature and NO_x concentration)—conditions which are consistent with the diversity in engine-out exhaust associated with both light- and heavy-duty diesel applications."[195] In fact, one manufacturer, Catalytica Energy Systems, states: "while still in early-stage development, our after-treatment approach is designed to offer a continuous production of a reactive reductant across a broad operating range to enable up to a 50% reduction in NO_x."[196] The operating temperature windows for NO_x adsorber technology ranges from 200 to 550°C.[197] At the present time, only prototypes of NO_x adsorbtion systems are available, so this technology is not yet commercially available or ready for CARB and/or EPA verification.

LEAN NO_X CATALYSTS (IN DEVELOPMENT)[198]

Lean NO_x catalyst technology can achieve a 10-40% reduction in NO_x emissions.[199]

Lean NOx catalyst in-use reduction numbers

NO_x	10–40%

This technology is more effective when a supplemental hydrocarbon reductant is injected into the exhaust stream.[200] The hydrocarbons facilitate the conversion of NO_x to nitrogen and water vapor in the catalyst.[201] Lean NO_x catalysts are attractive because the technology requires no core engine modifications or

additional infrastructure and can be used to retrofit older machines.[202]

Like NO_x adsorbtion technology, lean NO_x catalysts require low sulfur fuel; however, this technology has a higher tolerance for sulfur, requiring fuel with a sulfur content of less than 250 ppm versus the less than 15 ppm required for adsorbtion technology.[203] Additionally, this technology imposes a fuel efficiency penalty of 4–7%.[204]

Combinations of different retrofit devices

Retrofit devices as well as fuel additives can be combined to maximize emissions reductions. Some retrofit devices combine, PM, HC, CO with NO_x reduction in one unit.[205] Three examples follow:

SCR SYSTEM COMBINED WITH PM EMISSIONS CONTROL (VERIFIED)[206]

Extengine's ADEC system combines NO_x and PM control technology in one unit. The NO_x is reduced with an SCR system, and the PM control is achieved with a DOC.[207] This technology has been verified by CARB as achieving a 25% reduction in particulate matter emissions, and an 80% reduction in NO_x emissions.[208] The City of Houston has successfully retrofitted two excavators with the ADEC system and has praised the emissions benefits.[209] The ADEC system can also be incorporated with other DPFs for even higher PM reductions, although each individual retrofit application would require evaluation.[210] With a DOC, and SCR with Ammonia Slip Catalyst,[211] the cost of the ADEC System is $14,500 before installation.[212]

ADEC (SCR/DOC system) verified reduction numbers	
NO_x	80%
PM	25%

Johnson Matthey is developing a technology that combines NO_x and PM control technology in one unit, the SCRT™ system (not verified as of February 2005) in which NO_x is reduced with an SCR and PM is reduced with a DPF. The SCRT system virtually eliminates HC and CO emissions and reduces PM and NO_x by 75–90%.[213] To date, approximately 100 SCRTs have been installed on heavy-duty diesel engines for field testing.[214] Johnson Matthey estimates that the SCRT will be commercially available by mid-2005.

Johnson Matthey (SCRT) field-testing reduction numbers (not verified as of February 2005)	
NO_x	75–90%
PM	75–90%
HC	Over 90%
CO	Over 90%

LEAN NO_X CATALYST WITH PM EMISSIONS CONTROL (VERIFIED)[215]

Cleaire Advanced Emission Control's Longview™ diesel emissions control system is a CARB and EPA onroad verified NO_x reducing technology.[216] The Longview system reduces smoke, odors and NO_x by 25%, PM by 85%, and HC and CO by 90%.[217] The Longview system integrates a NO_x reducing catalyst (Lean NO_x Catalyst) and a catalyzed DPF. The Longview is a muffler replacement system. The use of ULSD fuel and an exhaust gas temperature of 260°C for at least 25% of the daily duty cycle are required.[218]

Cleaire's Longview Filter CARB verified reduction numbers	
NO_x	25%
PM	85%
HC	90%
CO	90%

Longview systems have been successfully installed in onroad applications including refuse, transit, school bus, vocational work trucks, delivery trucks and line haul trucks. They have also been installed on nonroad mobile equipment such as motor graders, bucket loaders, agricultural tractors, agricultural water pumps and generators, some dating back to 1988.[219] The Longview needs regular maintenance; the maintenance interval

depends on the number of hours of operation. Cleaire has developed maintenance procedures and equipment that are available through local Cleaire distributors. Pre-installation data logging is typically not required.[220] The cost range[221] is between $18,500-$20,500 (including installation and tax) for 6–11 liter engines and about $21,000 (including installation and tax) for 12–15 liter engines.[222]

Cleaire's Lonestar system achieves about a 25–30% NO_x, a 50–70% PM, and a 40–60% HC and CO emissions reduction.[223] The Lonestar is a combination of a Lean NO_x catalyst and a high-performance DOC.[224] The Lonestar is currently undergoing CARB's verification process[225] and Cleaire is expecting verification by the end of 2005.[226] The Lonestar costs about $12,500 (including tax and installation) for 6–12 liter engines and about $15,000 (including tax and installation) for 12–15 liter engines.[227]

Cleaire's Lonestar system in-use reduction numbers (not verified as of February 2005)	
NO_x	25–30%
PM	50–70%
HC	40–60%
CO	40–60%

LOW PRESSURE EXHAUST GAS RECIRCULATION (IN DEVELOPMENT)[228]

Retrofitting exhaust gas recirculation (EGR) on a diesel engine offers an effective means of reducing NO_x emissions from the engine. Both low-pressure and high-pressure EGR systems exist, but low-pressure EGR is most suitable for retrofit applications because it does not require engine modifications.

As the name implies, EGR involves recirculating a portion of the engine's exhaust back to the charger inlet or intake manifold, in the case of naturally aspirated engines. In most systems, an intercooler lowers the temperature of the recirculated gases. The cooled recirculated gases, which have a higher heat capacity than air and contain less oxygen than air, lower combustion temperature in the engine and reduce NO_x formation. Diesel particulate filters are an integral part of any low-pressure EGR system, ensuring that large amounts of particulate matter are not recirculated to the engine.[229]

EGR systems are capable of achieving NO_x reductions of more than 40%. More than 1,500 EGR systems have been installed worldwide. EGR retrofit systems are now being installed in the U.S. on solid waste collection vehicles, buses and some city-owned vehicles. The cost of retrofitting EGR with a DPF on a typical bus or truck engine is about $13,000–15,000.

Currently, there is one low-pressure EGR system available commercially: STT Emtec's DNOx® system. SST Emtec is currently pursuing CARB onroad verification for this technology, and intends to pursue nonroad verification in the future.[230] STT Emtec has stated that though this technology has "not yet been used with nonroad engines, it can be," and the technology is commercially available for nonroad applications.[231]

Further details of the costs involved in replacing, refueling, and retrofitting diesel vehicles are available from EPA and MECA at http://www.epa.gov/otaq/retrofit/documents/meca1.pdf.

Using cleaner diesel fuels or pollution control technologies on diesel engines powering construction equipment provides substantial public health benefits and improvements in air quality, but may also require investments in these fuels or technologies. Fortunately, state and local governments, fleet operators and vehicle owners have a number of options for financing cleaner diesel programs. This section of the *Cleaner Diesel Handbook* describes some programs on which state and local governments could model their own funding programs, followed by a discussion of funding available through federal sources.

State and local retrofit financing program models

CARL MOYER MEMORIAL AIR QUALITY STANDARDS ATTAINMENT PROGRAM

Both the state government of California and local air quality management districts play a substantial role in funding California's Carl Moyer Memorial Air Quality Standards Attainment Program (described in detail in the Success Stories section of this handbook). More information on the Carl Moyer Program is available on the California Air Resources Board web site, at: http://www.arb.ca.gov/msprog/moyer/moyer.htm.

In 1998/1999, the years of the program's inception, the legislature and the governor appropriated $25 million in funding for engine projects. Local air quality districts matched every two dollars of state money with a dollar contribution. In the third year of the program, state funding rose to $45 million for engine projects, and the district match was reduced to an average of one dollar per every $3.68 received. "In-kind" contributions, such as administrative costs, comprised up to 15% of match funds.[232]

In 2002, California voters approved Proposition 40, the Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act, which included approximately $40 million for Carl Moyer implementation.[233] These funds sustained the program through its fifth and sixth years. Carl Moyer's seventh year funding, approved through the 2004/2005 budget, was approximately $30.5 million.[234] The 2004/2005 budget also authorized an adjustment to Smog Check fees, establishing a continuous source of funding ($61 million/year) for the program.[235]

Assembly Bill 923, approved by the governor in September of 2004, authorized two additional sources of funding for the Carl Moyer program. The first was an increase in funding from tire fees, $25 million in 2005/2006 and $16 million in subsequent years. This brought state funding of the program to a total of approximately $86 million in 2005/2006 and $77 million thereafter.[236] The second increased the allowed surcharge on district-levied motor vehicle registration fees from $4 to $6.[237] Revenue from this program is expected to provide up to $55 million in local funding for Carl Moyer implementation in 2004/2005 and ensuing years.[238] Of the allowed $6 charge, $2 is to be used specifically for the Carl Moyer Program, for the new purchase, retrofit, repower, or add-on of equipment for previously unregulated agricultural sources, for the new purchase of schoolbuses pursuant to the Lower-Emission School Bus Progam, or for accelerated vehicle retirement or repair programs. The remaining $4 will continue to be used to "implement reductions in emissions from

vehicular pollution sources."[239] The district collecting the surcharge may use only 5% of the surcharge for administration of the program. Emissions reductions achieved through this program may not be used to offset emissions reductions obligations, nor are they tradable (i.e. available for sale/purchase) in a marketable pollution permit system. Rather, credits resulting from this funding must be "retired."[240]

NORTH CAROLINA'S MOBILE SOURCE EMISSIONS REDUCTION GRANT PROGRAM

The North Carolina Department of Natural Resources, through its Division of Air Quality, sponsors the Mobile Source Emissions Reduction Grant program in order to provide economic incentives for actual emissions reductions from on and off-road mobile sources. More information on the Mobile Source Emissions Reduction Grant Program is available on the NC Department of Natural Resources web site, at http://daq.state.nc.us/motor/ms_grants/

Funded by a 1/64-cent per gallon tax on gasoline sold in North Carolina, the program has awarded 78 grants totaling $5.74 million statewide since 1995. In 2004, $350,000 was awarded to area school districts to install diesel oxidation catalysts on school buses.[241]

THE TEXAS EMISSIONS REDUCTION PLAN (TERP)

The Texas Emissions Reduction Plan (TERP) combines incentive programs, research, and technology development aimed at improving air quality in Texas. The centerpiece of the program provides grants to eligible projects in nonattainment areas and other, TERP-designated, counties to offset the incremental cost associated with the activities to reduce emissions of NO_x from high-emitting mobile diesel sources.[242] More information on the TERP program is available in the Success Stories section of this handbook, and on the Texas Natural Resources Conservation Commission's web site, at: http://www.tnrcc.state.tx.us/oprd/sips/terp.html.

The Texas Commission on Environmental Quality (TCEQ) administers the TERP program. The Legislature established the TERP in 2001 through Senate Bill 5, and amended it through House Bill 1365 in 2003.[243] Total 2004 revenue was $141.7 million, $127.5 million of which was used for grant programs. The program was extended through 2010 by the Texas Legislature in the 79th regular session.[244]

For more specific information on funding sources, please refer to the "Texas Emissions Reductions Plan: Biennial Report to the Legislature": http://www.tceq.state.tx.us/assets/public/comm_exec/pubs/sfr/079_04.pdf

In addition, your State or local community may have funding available. Fleet owners should contact their local and state air quality and transportation agencies to learn more about available funding.

Federal grant funding

Construction companies, fleet operators or individuals operating construction equipment in states or local communities without funding programs such as those described above may find federal grant programs an option for assisting with the cost of retrofitting vehicles or purchasing clean fuels. EPA and the Diesel Technology Forum have compiled lists of funding sources that may be available in your area. Please visit, http://www.epa.gov/otaq/retrofit/retrofunding.htm and http://www.dieselforum.org/factsheet/programs.html for further details.

CHAPTER 8

Onroad and nonroad EPA/CARB verification

Both EPA and CARB operate onroad and nonroad retrofit technology verification programs. These verification programs test retrofit devices in order to assign PM and/or NO_x emissions reduction values to specific devices. Recently, EPA or CARB have verified new retrofit technologies for the nonroad sector.[245]

There is now a Memorandum of Agreement (MOA) between the Environmental Protection Agency and the California Air Resources Board for coordination and reciprocity in diesel retrofit device verification. This MOA is intended to expedite the verification and introduction of innovative emissions reduction technologies. Additionally, this MOA should reduce the effort needed for retrofit technology manufacturers to complete verification. In the near future, EPA and ARB will provide guidance on how this agreement will be implemented. Please see http://www.epa.gov/otaq/retrofit/documents/epa-arb_moa.pdf for additional detail.

The objective of the EPA Voluntary Diesel Retrofit Program Verification Process is to introduce verified technologies to the market in a cost-effective manner, while providing customers with confidence that verified technologies will provide emissions reductions as advertised.[246] This verification process will evaluate the emissions reduction performance of retrofit technologies, including their durability, and identify engine operating criteria and conditions that must exist for these technologies to achieve those reductions.[247] According to the CARB web site:

> ...the ARB has several programs relating to sale, use, or modification of emission control systems. The programs are specific to the type of device as well as the market for which it was designed. The CARB Verification Procedure provides a way to thoroughly evaluate the PM emission reduction capabilities and durability of a variety of diesel emission control strategies as part of a retrofit in-use program. It ensures that emission reductions achieved by a control strategy are both real and durable and that production units in the field are achieving emission reductions consistent with their verification. The verification procedure requires a minimum PM reduction of at least 25%. Although not a requirement at this time, if a diesel emission control strategy also reduces NO_x emissions by at least 15%, that reduction can also be verified. CARB has established a tiered verification plan which is illustrated in the table below...[248]

In-use testing

In addition to verifying pollution control technologies at certain levels of

TABLE 5
CARB verification classifications for diesel emissions control strategies

Pollutant	Reduction	Classification
PM	< 25%	Not verified
	> 25%	Level 1
	> 50%	Level 2
	> 85%, or ← 0.01 g/bhp-hr	Level 3

Source: http://www.arb.ca.gov/diesel/verdev/background.htm

emissions reductions, it is also very important to have rigorous in-use testing procedures. In-use testing—the process of testing a technology during real world operating conditions—yields the most accurate picture of emissions from a piece of equipment. By using a portable emissions testing system, researchers can get a better understanding of what is happening to emissions throughout the lifecycle of a piece of equipment. This procedure will ensure that technologies are performing at intended levels for the duration of use for a piece of equipment. For more details on EPA in-use testing requirements for manufacturers, please visit: http://www.epa.gov/otaq/retrofit/retrotesting.htm. More information about CARB's verification procedure and in-use compliance requirements is available at: http://www.arb.ca.gov/regact/dieselrv/dieselrv.htm.

Monitoring

While EPA and CARB in-use testing programs are designed for manufacturers of retrofit technologies, Environmental Defense believes that monitoring at a retrofit site can be a valuable part of a retrofit program because it allows all involved to see the actual pollution-control benefits of various retrofit strategies. This type of information can be invaluable to citizens and policy makers advocating on behalf of retrofit programs. We strongly encourage inclusion of good in-use monitoring procedures for all retrofit programs.

CHAPTER 9

Retrofit programs in State Implementation Plans

One way a state may be able to achieve emissions reductions that can be factored into its State Implementation Plan (SIP) is by including a rigorous retrofit program. A State Implementation Plan is a federally enforceable plan that describes a state's strategy for achieving and maintaining the public health based National Ambient Air Quality Standards (NAAQS).[249]

Recent EPA data shows that about half of all Americans live in places that fail to meet public health based standards for ozone and/or fine particulates. On April 15, 2004, EPA found 474 counties—home to 159 million Americans—out of compliance with the health-based eight-hour ozone standard.[250] In December 2004, EPA found that 224 counties in 20 different states are not meeting the nation's first $PM_{2.5}$ air quality standards.[251]

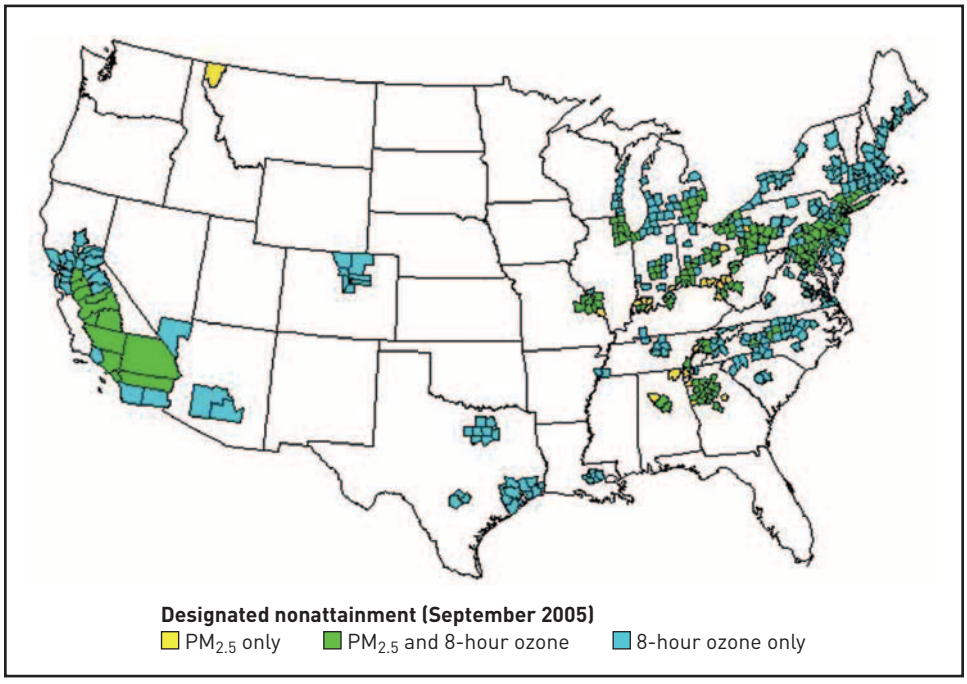
- To find out whether or not you live in a county that is meeting the public health based standards for ozone go to: http://www.epa.gov/ozonedesignations/statedesig.htm.
- To find out whether or not you live in a county that is meeting the federal $PM_{2.5}$ standards go to: http://www.epa.gov/pmdesignations/finaltable.htm.

Because more than half of the U.S. population lives in areas with unhealthy air, Environmental Defense believes that retrofit programs for all diesel equipment currently in use are critical components of any SIP.

If an area does want to quantify the benefits of a retrofit program, it may be able to do so by incorporating the benefits into the SIP, and it may also be able to use the benefits to demonstrate

FIGURE 11

Counties designated nonattainment for $PM_{2.5}$ and/or 8-hour ozone standard



Several counties have only a portion designated nonattainment. These counties are represented as whole counties on the map. Source: http://www.epa.gov/oar/oaqps/greenbk/mappm25o3.html

conformity to its SIP. Areas with large retrofit programs should work with the appropriate EPA Regional Office[252] regarding SIP credits.[253] EPA encourages early consultation between project sponsors, planners, and EPA Regional Offices during the development of a SIP and the calculation of SIP credits. Including a program in a federally enforceable document should be done carefully as legal action can be taken if the program is not carried out as described.

Additionally, project sponsors should work with their state air quality and transportation agencies as well as federal DOT and EPA regarding inclusion of a retrofit program in a SIP or conformity determination and the credits of that program. The state air pollution agency should assume primary responsibility for the calculation of retrofit credits and incorporation into the SIP. With the guidance of the appropriate EPA Regional Office, the state should work with areas, sponsors, planners, fleets, etc. in implementing retrofit projects and programs for this purpose.

To learn more about calculating SIP credits from retrofit projects, please refer to the EPA web page at: http://www.epa.gov/otaq/retrofit/aqsipcalc.htm ("Guidelines For States On Establishing SIP Credits From Heavy-Duty Engine Retrofit Projects"). A NESCAUM report, prepared for EPA in 1999, is a good resource for more information on how these types of calculations are made.[254] EPA is expected to issue additional guidance on how to calculate SIP credits for retrofits in Spring of 2005.[255]

CHAPTER 10

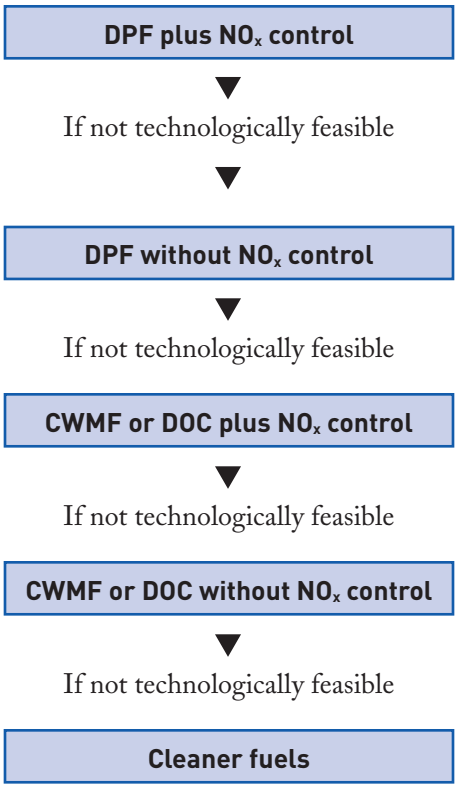
Tools for spurring retrofits

In this section of the handbook, Environmental Defense offers a framework for implementing retrofits and best management practices to help protect public health and ensure clarity for the construction industry and others who wish to reduce the pollution from *existing* diesel construction equipment. Local and state governments seeking to employ clean diesel fuels and technologies in construction projects have a number of options to encourage contractors to retrofit their existing diesel vehicles, use clean fuels or enact other best management practices, such as anti-idling measures. Environmental Defense believes these commitments to cleaner, healthier air can be incorporated in several different ways. The ideas outlined below could be used as: (1) an administrative or legislative commitment; (2) a contract specification, as a preference in the bidding process; (3) in an environmental impact statement, (4) in an executive order; or (5) in a Community Benefit Agreement.

To reduce diesel emissions from existing nonroad vehicles, Environmental Defense recommends both the installation of best available technology and the use of cleaner fuels, including diesel fuel that has 15 ppm of sulfur or less (ULSD). In Environmental Defense's view, "best available" technology is that which achieves maximum emissions reduction of fine particulate matter and NO_x for a given particular engine type and application. Because specific emissions control technologies require different engine performance characteristics (temperature, duty cycles, etc.), each application has to be reviewed to determine the appropriate retrofit technology. Some flexibility and combinations of different technologies will be needed to achieve maximum emissions reductions for each application. Therefore, we suggest a cascading series of emissions-control choices, ranked according to emissions-reduction performance. In this way, states, local agencies, fleet operators and contractors will be able to match best technologies to the specific engine and application, and will be required to achieve the maximum possible clean air benefit.

To begin, there should be an overarching, central commitment to using DPFs in combination with a NO_x control. DPFs can achieve particle reductions of up to 90%. If no NO_x control is available, then the DPF can be used alone. If it is not possible to use a DPF, then Environmental Defense suggests using a DOC or a CWMF in combination with NO_x control. Diesel oxidation catalysts can achieve particle reductions of 20–30%, and CWMFs can reduce PM by more than 50%. If no NO_x control is available, then the DOC or CWMF can be used alone. Lastly, if no pollution control technology can be used, then Environmental Defense suggests using the cleanest possible fuels. Switching from onroad diesel fuel (500 ppm sulfur content) or from nonroad diesel fuel (about 2000-3000 ppm sulfur content) to ULSD (15 ppm sulfur content or less) can reduce particulate matter, smoke and sulfate emissions.[256]

Environmental Defense advises using only technologies that are on or in the queue for EPA's or CARB's verified lists to ensure that you are installing a high quality product on your diesel engine. However, states and local governments should include pilot or demonstration products if they wish to investigate promising new emissions control technologies.



Sample legislation regarding green contracting (retrofits and clean fuels)

According to the federal Clean Air Act, only EPA may set emissions standards for new nonroad engines and vehicles. EPA sets emissions standards for *new* nonroad engines and *new* nonroad vehicles. In May of 2004, EPA issued a rule setting emissions standards for new nonroad engines as well as regulating the amount of sulfur allowed in diesel fuel for the nonroad sector.[257] For more information on this new nonroad rule, please refer to: http://www.epa.gov/nonroad-diesel/. EPA has addressed new nonroad vehicles, but there are many older vehicles on the road today. Therefore, Environmental Defense recommends that states and local municipalities encourage retrofits and the use of cleaner fuels for *existing* nonroad vehicles. Cleaning up older diesel engines will be an important piece for reducing air pollution while the new nonroad rule phases in.

To encourage retrofits on existing nonroad equipment and the use of cleaner fuels, Environmental Defense suggests that state and local municipalities pass regulations (also sometimes referred to as "green contracting laws") regarding the use of retrofit technology on state/local municipality owned nonroad diesel vehicles as well as nonroad diesel vehicles used when contracting with state/local municipalities. Environmental Defense also suggests including the use of ULSD fuel (15 parts per million of sulfur or less) as one of the contract specifications.

NEW YORK CITY'S LOCAL LAW 77

New York City's Local Law 77 requires the City to use ULSD fuel and retrofits on city-owned nonroad equipment.[258] Local Law 77 also includes use of retrofits and ULSD as a contract specification in public works contracts.

Excerpts from New York City's Local Law 77, Section 1:[259]

b. (1) Any diesel-powered nonroad vehicle that is owned by, operated by or on behalf of, or leased by a city agency shall be powered by ultra low sulfur diesel fuel.

(2) Any diesel-powered nonroad vehicle that is owned by, operated by or on behalf of, or leased by a city agency shall utilize the best available technology for reducing the emission of pollutants.

c. (1) Any solicitation for a public works contract and any contract entered into as result of such solicitation shall include a specification that all contractors in the performance of such contract shall use ultra low sulfur diesel fuel in diesel-powered nonroad vehicles and all contractors in the performance of such contract shall comply with such specification.

(2) Any solicitation for a public works contract and any contract entered into as

a result of such solicitation shall include a specification that all contractors in the performance of such contract shall utilize the best available technology for reducing the emission of pollutants for diesel-powered nonroad vehicles and all contractors in the performance of such contract shall comply with such specification.

NEW YORK STATE ASSEMBLY LAW ON CONSTRUCTION IN LOWER MANHATTAN

The Coordinated Construction Act for Lower Manhattan, passed by both the New York State Senate and Assembly, commits New York State construction projects in lower Manhattan to control emissions by requiring that nonroad vehicles be powered with ULSD and retrofit with technologies such as oxidation catalysts, particulate filters or an emissions control technology that achieves the lowest particulate matter emissions.[260]

Excerpts from Section 4 of the Coordinated Construction Act for Lower Manhattan:

e. Notwithstanding any general, special or local law or rule or regulation to the contrary, a public agency shall require contractors and subcontractors to *use only ultra-low sulfur diesel fuel* to power the diesel-powered non-road vehicles with engine horsepower (HP) rating of 60 HP and above used on lower Manhattan redevelopment projects and, where practicable, to reduce the emission of pollutants by retrofitting such non-road vehicles with oxidation catalysts, particulate filters, or technology with comparable or better effectiveness. (emphasis added)

SACRAMENTO'S OZONE SUMMIT MODEL "GREEN CONTRACTING" ORDINANCE

The Sacramento Ozone Summit, a gathering of agency heads and elected officials from around the Sacramento federally designated Ozone Nonattainment Area, led to the design of a green contracting model ordinance by the Sacramento Metropolitan Air Quality Management District's Mobile Source Division. This ordinance offers a voluntary and flexible approach to reducing construction site emissions that would certify rental firms/construction firms as "green contractors." Being "green" would entail curtailing activities on "spare the air" days, mitigating emissions using ULSD or emulsified fuel, and replacing/retrofitting engines using Carl Moyer incentive funds or Sacramento Emergency Clean Air Transportation Funds (SECATF), which at one point totaled $28 million. "Green contractors" would then receive bidding bonuses that would give them a competitive advantage in the contract bidding process. "Green contractors" would also be subject to detailed monitoring of construction equipment.[261]

Excerpts from Section 3. of the Model "Green Contracting" Ordinance:

Within 90 days of adoption of this Chapter, the *(insert name of local agency)* shall designate a Program Manager *(such as the agency's manager responsible for procurement)* and shall develop and implement a Green Contracting Program. The Green Contracting Program must include a description of the plan to encourage contractors operating within the (*insert name of local agency*) to procure and to operate low-emission vehicles and to obtain low-emission fleet status for off-road equipment fleets and heavy-duty on-road vehicle fleets. The (insert name of local agency)'s Green Contracting Program must focus on fleet owners that have contracts for (insert name of local agency) business.

The (insert name of local agency) must include contract bid language that would

implement the following Green Contracting Program requirements. See (c) for the exception to this requirement.

Sample contract specifications

BOSTON BIG DIG

Excerpt from Section 721.562 of the Big Dig Contract Specifications.

Methods that shall be used by the Contractor to control nuisance odors associated with diesel emissions from construction equipment include:

Turning off diesel combustion engines on construction equipment not in active use and on dump trucks that are idling while waiting to load or unload material for 5 minutes or more.

Establishing a staging zone for trucks that are waiting to load or unload material at the contract area, in a location where the diesel emissions from the trucks will not be noticeable to the public.

Locating combustion engines away from sensitive receptors such as fresh air intakes, air conditioners, and windows. *In addition to the above diesel emission control measures, all off-road diesel powered equipment used for this contract shall contain oxidation catalyst emission control equipment on the exhaust system side of the equipment.* (emphasis added)

Please note that when the Boston Big Dig contract specifications were drafted, ULSD fuel (sulfur content of 15 ppm) was not available in the Boston region. For that reason, DPFs could not be used as retrofit technology and DOCs only were used.

CONNECTICUT I-95 NEW HAVEN HARBOR CROSSING CORRIDOR IMPROVEMENT PROGRAM (NHCC PROJECT)

Connecticut's Department of Transportation (ConnDOT), the Connecticut Department of Environmental Protection, the Connecticut Department of Motor Vehicles, and the Connecticut Construction Industry Association worked together to create a contract specification to improve quality of life during the long-lasting I-95 New Haven Harbor Crossing Corridor Improvement Program.

Notice To Contractors (NTC)—Diesel Vehicle Emission Controls

All diesel powered construction equipment with engine horsepower (HP) ratings of 60 HP and above, that are on the project or are assigned to the contract for a period in excess of 30 days ***shall be retrofitted with Emission Control Devices and/or use Clean Fuels*** in order to reduce diesel emissions. In addition, all motor vehicles and/or construction equipment shall comply withal pertinent State and Federal regulations relative to exhaust emission controls and safety. (emphasis added)

Truck staging zones

The contractor shall establish truck-staging zones that are waiting to load or unload material at the contract area. Such zones shall be located where the diesel emissions from the trucks will have minimum impact on abutters and the general public.

Idling

Idling of delivery and/or dump trucks, or other diesel powered equipment shall not be permitted during periods of non-active use, and it should be limited to three minutes in accordance with the Regulations of Connecticut State Agencies Section 22a-174-18(a)(5).[262]

Environmental performance commitments in environmental impact statements

An Environmental Impact Statement (EIS) is a document required for major

federal actions (or regional, state, or local actions funded with substantial federal monies) that may significantly affect the environment. Describing the positive and negative effects of the major project and citing alternative actions, an EIS serves as a tool for decision-making.

When a governmental agency plans a construction project, Environmental Defense strongly encourages the use of the cleanest possible fuel and pollution control technology in the Environmental Performance Commitments (EPC) section of the project's Environmental Impact Statement (EIS). This puts interested parties on notice that there will probably be future contract specifications that follow the guidelines established in the EIS. Thus, requirements for clean diesel equipment and clean diesel fuel can come out of the EIS and bidding process. Although the following two examples include the type of language that a government seeking cleaner diesel fuel and technology use might include in an Environmental Impact Statement's EPC section, Environmental Defense also recommends that:

- Emissions-reductions steps such as the use of ULSD or best available reductions technologies (BART) should be extended to onroad trucks servicing the construction site and all stationary diesel generators used in connection with construction.
- Emissions standards should cover nonroad vehicles of 50 HP and greater.
- Anti-idling measures include a powerful enforcement plan and mechanism.
- Regular emissions testing be conducted at construction sites, and that the results of these tests be made publicly available, to ensure compliance and accountability.
- Trucks and construction equipment be marked with a label or sticker that certifies that they are using ULSD fuel as well as retrofit technology.
- Truck staging zones should be established for diesel-powered vehicles waiting to load or unload materials. The zones should be located where diesel emissions will have the least impact on abutters and the general public.
- Idling should limited to three minutes for delivery and dump trucks and other diesel-powered equipment (with some exceptions).
- All work should be conducted to ensure that no harmful effects are caused to adjacent sensitive receptors, such as schools, hospitals, and elderly housing.
- Diesel-powered engines should be located away from fresh air intakes, air conditioners, and windows.

New York's Route 9A Draft Supplemental Environmental Impact Statement[263] can serve as a sample for how diesel emissions impacts can be mitigated and addressed in an EIS.

Excerpt from New York's Route 9A Draft Supplemental EIS, page 10:

All diesel construction engines—excluding trucks—would use ultra low-sulfur diesel (ULSD) fuel; where practicable, engines larger that 60 horsepower (HP) would include emissions reduction measures to reduce emissions of PM and volatile organic compounds (VOCs). For the purpose of this study, it was assumed that PM emissions from all such engines would be reduced by 40 percent—the average reduction achieved by using diesel oxidation catalysts (DOC). PM emissions may be further reduced in cases where diesel particle filters (DPF) would be used—85 percent reductions or higher can be achieved with this technology. Since it is uncertain at this time what emission reduction technologies would be most efficient with each equipment type,

and since DOCs reduce more VOCs, which are ozone precursors and are of regional concern, the environmental performance commitments (EPCs) provide the flexibility to utilize either DOC or DPF control technologies. Therefore, the minimum PM emissions reduction of DOCs was assumed for the local impact analyses.[264]

Similarly, the Fulton Street Transit Center Draft EIS[265] also contains language suggesting the use of ULSD fuel and retrofit technology to mitigate the impact of unhealthy diesel emissions.

Excerpts from the Fulton Street Transit Center Draft EIS, page 2:

The Build Alternatives would be implemented with incorporation of Environmental Performance Commitments (EPCs). The EPCs consist of onsite measures that would include the use of ultra-low sulfur diesel (ULSD), with sulfur content less than 15–30 parts per million (ppm) fuel and retrofit technology in heavy-duty engines and off-road construction vehicles operating during the construction of the FSTC, including during year 2005/2006, the peak period of construction. Other EPCs include a dust control plan for the construction site including a soil erosion sediment control plan which would be part of the Construction Environmental Protection Program (CEPP). The dust control plan could include: spraying of a (non-hazardous, biodegradable) suppressing agent on disturbed soil and other surfaces; containment of fugitive dust; and adjustment of work practices to reflect meteorological conditions as appropriate.[266]

Community Benefit Agreements

Community Benefit Agreements (CBAs) can also serve as a tool to improve air quality. CBAs are project-specific contracts between developers of a major project and community organizations. CBAs are safeguards to ensure that local community residents share in the benefits of major developments. They allow community groups to have a voice in shaping a project, press for community benefits that are tailored to their particular needs, and enforce developer's promises.

The CBA process begins with interested members of the community, who identify how a proposed development project can benefit residents and workers. Once a list of potential benefits is determined, community members meet with the developer and/or representatives of the city to negotiate a CBA. Each CBA is unique, reflecting the needs of a particular community.

The first full-fledged CBA came in 2001, when a large coalition of community groups negotiated a far-reaching agreement with the developer of the Staples Center for the Los Angeles Sports and Entertainment District. This was followed by four more CBAs on projects across Los Angeles. A dozen additional projects in Los Angeles have community benefits provisions incorporated into their respective development agreements.

Many communities across the country are now using the community benefits model. In San Jose, two projects have incorporated community benefits provisions into the development agreements, while groups in at least six cities—Denver, Seattle, Milwaukee, Miami, New York and New Haven—are actively pursuing community benefits.[267]

In 2004, community groups, environmental organizations, and labor unions joined together and reached a CBA with Los Angeles World Airports (LAWA), the government entity that operates LAX.

Excerpts from the LAX CBA regarding reducing harmful diesel emissions via cleaner fuels and retrofits:

F. Construction Equipment.

1. Best Available Emissions Control Devices Required. LAWA shall require that all diesel equipment used for construction related to the LAX Master Plan Program be outfitted with the *best available emission control devices primarily to reduce diesel emissions of PM, including fine PM, and secondarily, to reduce emissions of NO_x.* This requirement shall apply to diesel-powered off-road equipment (such as construction machinery), on-road equipment (such as trucks) and stationary diesel engines (such as generators). The emission control devices utilized for the equipment at the LAX Master Plan Program construction shall be: (i) verified or certified for use by CARB for on-road or off-road vehicles or engines; or (ii) verified for use by EPA for on-road or off-road vehicles or engines. Devices certified or verified for mobile engines may be effective for stationary engines and that technology from EPA/CARB on-road verification lists may be used in the off-road context. (emphasis added)

5. ULSD and Other Fuels.

a. ULSD and Other Fuel Requirements. All construction equipment used for construction related to the LAX Master Plan Program *shall use only Ultra-Low Sulfur Diesel fuel (15 ppm or lower), so long as there are adequate supplies of ULSD* in the Southern California area. If adequate supplies of ULSD are not available in the Southern California area, then other fuels may be used, provided that the other fuels do not result in an greater emissions of fine PM or nitrogen oxides than that which would be produced by use of ULSD at 15 ppm or lower. Cost of ULSD shall not be a consideration in determining "adequate supplies." (emphasis added)

For more information on the LAX CBA go to: http://www.environmentaldefense.org/documents/4174_LAX_CBA_Summary.pdf. For the exact language of the LAX CBA go to: http://www.environmentaldefense.org/documents/4201_LAX_CBA_full.pdf.

APPENDIX A

Acronyms

BART Best Available Retrofit Technology

CARB California Air Resources Board

CA/T Project Central Artery Tunnel Project (Big Dig, Boston)

CCIA Connecticut Construction Industries Association

CNG Compressed Natural Gas

CO Carbon monoxide

CIAQC Construction Industry Air Quality Coalition

CPO Catalytic Particulate Oxidizer

CCRT Catalyzed Continuous Regenerating Technology

CRT Continuous Regenerating Technology

CWMF Catalyzed Wire Mesh Filter

DMV Department of Motor Vehicles

DOC Diesel Oxidation Catalyst

DOT Department of Transportation

DPF Diesel Particulate Filter

DTF Diesel Technology Forum

EGR Exhaust Gas Recirculation

EIS Environmental Impact Statement

EPA United States Environmental Protection Agency

EPC Environmental Performance Commitments

FBC Fuel Borne Catalyst

HC Hydrocarbon

LNG Liquefied Natural Gas

LSD Low sulfur diesel fuel (500 ppm)

MECA Manufacturers of Emissions Control Association

MOA Memorandum of Agreement

MTA Massachusetts Turnpike Authority

NAAQS National Ambient Air Quality Standards

NESCAUM Northeast States for Coordinated Air Use Management

NO_x Nitrogen oxides

OEM Original Equipment Manufacturer

OTAQ Office of Transportation and Air Quality

PHA Port of Houston Authority

PM Particulate matter

$PM_{2.5}$ Particulate matter smaller than 2.5 microns

PM_{10} Particulate matter smaller than 10 microns

SCAQMD South Coast Air Quality Management District

SCR Selective Catalytic Reduction

SIP State Implementation Plan

SOF Soluble Organic Fraction

TCEQ Texas Commission on Environmental Quality

TERP Texas Emission Reduction Program

TNRCC Texas Natural Resource Conservation Commission

ULSD Ultra low sulfur diesel fuel (15 ppm)

VOC Volatile organic compound

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APPENDIX B

Retrofit manufacturers contact information

Manufacturer	PM, HC, CO control	NO_x control	Contact information
Argillon LLC http://www.argillon.com	SCR	SCR	Mr. Gary D. Keefe Argillon 5895 Shiloh Rd. Suite 101 Alpharetta, GA 30005 678.341.7532 404.409.3492 (Mobile) 678.341.7509 (Fax) gary.keefe@argillon.com
Caterpillar, Inc. http://www.caterpillar.com EPA Verified Technology for Heavy Duty Highway Use http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm	DOC (CCM: Catalyzed Converter Muffler DPF	SCR	Mr. Steve Hurd Mos 10 PO Box 610 Mossville, IL 61552-0610 309.578.6088 309.578.7152 (Fax) hurd_stephen_s@cat.com
Cleaire Advanced Emission Controls, LLC http://www.cleaire.com Longview® CARB and EPA Verified Technology for Heavy Duty Highway Use	Longview® Lonestar™	Longview® Lonestar™	John Egan 14775 Wicks Blvd. San Leandro, CA 94577 510.347.6163 800.308.2111 510.347.6181 (Fax) john.egan@cleaire.com Tim Taylor Director of Strategic Market Development 916.296.7049 707.220.7260 (Fax) tim.taylor@cleaire.com
Clean Air Power, Inc. www.cleanairpower.com	Catalytic Particulate Oxidizer (CPO)	Mobile SCR DOX SCAT (reduces NO-)	Frits Tan 9837 Whithorn Drive Houston, TX 77095 832-731-7372 (mobile) 281-463-8883 281-463-8951 fax ftan@cleanairpower.com
Clean Diesel Technologies Inc. http://www.cdti.com EPA Verified Technology for Heavy Duty Highway Use[a]	SCR FBC Platinum Plus® Purifier System (fuel borne catalyst plus DOC) FBC Platinum Plus® Purifier System and Catalyzed Wire Mesh Filter (FBC/CWMF) System	SCR	Mr. Glen Reid 300 Atlantic Street, Ste 702 Stamford, CT 06901 203.327.7050 203.323.0461 greid@cdti.com

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Manufacturer	PM, HC, CO control	NO_x control	Contact information
Combustion Components Associates Inc. http://www.combustioncomponents.com	Mobile SCR		Mr. T.J. Tarabulski 884 Main Street Monroe, CT 06468 203.268.3139 203.223.8246 (Mobile) 203.261.7697 (Fax) tarabulski@cca-inc.net
DCL International Inc. http://www.dcl-inc.com	DOC, DPF (active and passive)		Gerry Wilson P.O. Box 90 Concord Ontario, Canada L4K1B2 905.660.6450, ext. 292 gwilson@dcl-inc.com
Donaldson Company, Inc. http://www.donaldson.com EPA Verified Technology for Heavy Duty Highway Use[b]	DOC, DPF (also offers crankcase emissions filtration system)		Mr. Fred Schmidt 1400 West 94th Street Minneapolis, MN 55440 952.887.3835 952.887.3008 (Fax) fschmidt@mail.donaldson.com
Engelhard Corporation http://www.engelhard.com EPA Verified Technology for Heavy Duty Highway Use[c]	DOC, DPF		Mr. Barry Bambo 101 Wood Avenue Iselin, NJ 08830 732.205.7277 732.205.5687 (Fax) Barry.Bambo@engelhard.com
Engine Control Systems, a Division of Lubrizol http://www.lubrizol.com/enginecontrol EPA Verified Technology for Heavy Duty Highway Use[d]	DOC AZ Purimuffler™, DPF Purifilter™		Ms. Michelle Bellamy 165 Pony Drive Newmarket, Ontario L3Y 7V1 800-661-9963 or 905-853-5800 (customer service) 905-853-5801 (Fax) ecs@lubrizol.com
Environmental Solutions Worldwide, Inc. Catalyst Division http://www.cleanerfuture.com/products/ EPA and CARB verification pending	Metallic (high performance— 50% plus PM reduction) DOC[e]		Mr. Frank Haas 571 Chrislea Rd. #5 Woodbridge, Ontario, Canada L4L8A2 905.850.9970 905.850.9925 Fax fhaas@cleanerfuture.com

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Manufacturer	**PM, HC, CO control**	**NO_x control**	**Contact information**
Extengine Transport Systems, LLC http://www.extengine.com/index.html	Mobile and Stationary SCR (ADEC System) DOC Hybrid DPF-C (Diesel Particulate Filter and Catalyst) DPF (passive and active)	Mobile and Stationary SCR (ADEC System)	Mr. Phillip Roberts 1370 S. Acacia Ave Fullerton, CA 92831 714.774.3569 714.774.4036 (Fax) roberts@extengine.com
Fleetguard Emission Solutions	DOC (50% pm reduction), DPF		Western U.S.: Rob Ferguson 2931 Elm Hill Pike Nashville, TN 37214 615.366.9855 812.377.7137 (Fax) rob.r.ferguson@fleetguard.com Eastern U.S.: Jennifer Kain 2931 Elm Hill Pike Nashville, TN 37214 812-377-3132 812-377-7137 (Fax) jennifer.kain@fleetguard.com
International Truck and Engine Corporation http://www.greendieseltechnology.com	DOC, DPX	Green Diesel Technology	Mr. Peter Reba International Truck and Engine Corporation 4201 Winfield Road Warrenville, IL 60555 630-753-6537 (Office) 630-753-6537 (FAX) peter.reba@nav-international.com

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Manufacturer	**PM, HC, CO control**	**NO_x control**	**Contact information**
Johnson Matthey – Environmental Catalysts and Technologies http://www.jmcsd.com/html/crt.html http://www.matthey.com/divisions/catalytic.html EPA Verified Technology for Heavy Duty Highway Use[f]	DOC, DPF (CRT or CCRT) SCRT(tm) systems (SCR+DPF) EGRT(tm) systems (EGR+DPF).	SCR SCRT(tm) systems (SCR+DPF) EGRT(tm) systems (EGR+DPF).	Mr. Brett Alkins 380 Lapp Road Malvern, PA 19355 610.341.8356 484.354.8159 (Mobile) 610.971.3116 (Fax) alkinbd@jmusa.com or Mr. Jim Hale 380 Lapp Road Malvern, PA 19355 610.476.0161 (Mobile) 717.246.6049 (Home Office) 610.971.3116 (Fax) halejr@jmusa.com or Marty Lassen 434 Devon Park Drive Wayne, PA 19087 610.341.3404 610.971.3116 (F) 610.476.0131 (M) lassen@jmusa.com
Nett Technologies, Inc. http://www.nett.ca	DOC: D-Series (low temperature DOC) M-Series (high performance, very low back pressure) NETT Series (standard DOC) DPF: SF Catalyzed SK Catalyzed (lower temperatures) SE Catalyzed (sulfur tolerant) SJ Catalyzed (lower temperature, sulfur tolerant)		For technical information: Mr. Wayne Borean 6707 Goreway Drive Mississauga, Ontario 800.361.6388 905.672.5949 (Fax) sales@nett.ca or Ms. Laura McBurney or Mr. Jorge Santos 800.631.6388
PuriNOx	PuriNOx	PuriNOx	Ron O. Dunfee 29400 Lakeland Blvd. Wickliffe, Ohio 44092 Office: (440) 347-6116 Fax: (440) 347-6978 Cell: (440) 463-2038 Email: rod@lubrizol.com

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Manufacturer	PM, HC, CO control	NO_x control	Contact information
RYPOS Inc. http://www.rypos.com/html/index.html	Regular or catalyzed DPF Active DPF (Rypos Trap™)		Mr. Frank DePetrillo 3 Industrial Park Road Medway, MA 02053 Phone: 508.533-9655 Fax: 508.533-9656 Sales: fd@rypos.com

Engine Manufacturer Contacts
http://www.epa.gov/otaq/retrofit/cont_engmfrs.htm

EPA Verified Retrofit Technologies
http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm

CARB Verified Retrofit Technologies
http://www.arb.ca.gov/diesel/verdev/verdev.htm

[a] EPA, "Verified Products." August 11, 2004. Online resource, available at: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm Last accessed 03/01/05.
[b] Ibid.
[c] Ibid.
[d] Ibid.
[e] DOC specifically designed for use on small compression ignition engines. Examples of these are small generators and construction equipment such as mixers and concrete floats. Environmental Technology Verification (ETV) Canada Inc. "Current Program Graduates and Licenses." Online resource, available at: http://www.etvcanada.com/English/e_progGrad.htm Last accessed 03/01/05.
[f] EPA, "Verified Products." August 11, 2004. Online resource, available at: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm Last accessed 03/01/05.

DISCLAIMER: Environmental Defense does not endorse any particular fuel or fuel additive supplier. This is not a comprehensive list of fuel suppliers and is intended to serve only to illustrate that there is a wide variety of choices available.This list was last updated in April 2005.

APPENDIX C

Distributors of ultra low sulfur diesel fuel, emulsified fuels, fuel additives, and synthetic engine oil

Please check with your local Ultra Low Sulfur Diesel (ULSD) fuel distributor whether your fleet needs ULSD fuel No. 1 or No. 2. For example, if a fleet has been using Low Sulfur Diesel (500 ppm) No. 1 then ULSD No. 1 is needed. If only ULSD No. 2 is available and Low Sulfur Diesel No. 1 has been previously used, the engine needs to be tuned accordingly.

1. ULSD Fuel Brokerage

Ultra Low Sulfur Diesel Fuel Brokerage
Ultraco LLC
Mr. Timothy J. Niles
101 Farren Ct, Suite 100
Cary, NC 27511-4559
866.857.3487 or 919.380.0778
http://ultraco.us

2. ULSD Distributors

Northeast

Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Washington, D.C.

Mr. David Wright, ConocoPhillips
600 North Dairy Ashford (77079-1175)
P.O. Box 2197
Houston, TX 77252-2197
Phone 281.293.1544
Fax 281.293.6113
David.W.Wright@conocophillips.com
http://www.conocophillips.com/products/ultralowsulfur/index.htm

or

Mr. Steven J. Levy, Sprague
4 New King Street
White Plains, NY 10604
Phone 914.328.6770 Fax 914.701.2819
914.284.2188 (Pager)
slevy@radenergy.com
www.spragueenergy.com

or

Ms. Debbie McNeal, Sunoco
Ten Penn Center
1801 Market Street
Philadelphia, PA 19103
800.842.0339 Ext. 1
Phone 215.977.3000
Fax 215.246.8119
DLMCNEAL@sunocoinc.com
http://www.sunocoinc.com/

Midwest, West Coast

Oregon, Washington, California, Arizona (Phoenix area), all Midwest States, Chicago area, Detroit area, Toledo area, Cleveland and Columbus area.

Ms. Renee Marchese, BP America Inc.a
28100 Torch Parkway 4th Fl.
Warrenville, IL 60555
Phone: 630.836.5504
Fax 630.836.5500
marcher2@bp.com

Pacific Northwest

Washington State, California.
Mr. David Wright, ConocoPhillips
600 North Dairy Ashford (77079-1175)
P.O. Box 2197
Houston, TX 77252-2197
Phone 281.293.1544
Fax 281.293.6113
David.W.Wright@conocophillips.com
http://www.conocophillips.com/products/ultralowsulfur/index.htm

South and Southwest

Texas, Colorado, Oklahoma, (southern) California, New Mexico, Kansas, Louisiana, Georgia, and Florida.

Mr. Ray Hernandez
Valero Energy Corporation
One Valero Place
San Antonio, TX 78212
Phone 210.345.2757
Fax 210.345.5930
Raymond.Hernandez@valero.com
http://www.valero.com/About+Valero/

3. Distributors of emulsified fuel

For further information or to purchase emulsified fuel, contact your local fuel distributor.

Mr. Thomas M. Sopko
The Lubrizol Corporation
29400 Lakeland Boulevard
Wickliffe, OH 44092-2298
Phone 440.943.4200
Fax 440.943.5337
tms@lubrizol.com

To purchase PuriNOx™ in the California and Texas area you may also contact:

Mr. Bill Alford
J.A.M. Distributing[b]
711 W.Bay Area Blvd Suite 310
Webster, Texas 77598
800.228.3848
Phone 713.844.7788
Fax 713.844.7789
jam@jamdistributing.com

or

Ms. Debbie McNeal
Sunoco[c]
800.842.0339 Ext. 1
Phone 215.977.3000
Fax 215.246.8119

4. Fuel additives

Mr. Glen Reid
Clean Diesel Technologies, Inc.[d]
300 Atlantic Street, Ste 702
Stamford, CT 06901
Phone 203.327.7050
Fax 203.323.0461
greid@cdti.com

or

Mr. Jim Baumert
AMSOIL Inc.[e]
AMSOIL Building
Superior, WI 54880-1527
Phone 631.587.5896 Fax 715.392.5225
http://www.lubedealer.com/baumert

or

The Stricklin Companies[f]
1415 Stratford Crt.
Del Mar, CA 92014
Phone 858-794-5700 Fax 848-794-2666
stricklin@worldnet.att.net

[a] BP America Inc. offers the users of BP's ULSD fuel (ECD®) risk management solutions enabling construction companies to manage their annual budget while reducing emissions at the same time. Construction companies can set a fixed fuel price over a set time period avoiding the risk of increasing fuel prices. For more information go to: http://www.ecdiesel.com/business/contruction.asp and http://www.bpdirect.com/products/risk.html

[b] J.A.M. Distributing also provides assistance with the installation of filters (EMISSION CONTROL TECHNOLOGY) to help further reduce emissions.

[c] AquaMix(tm) is Sunoco's emulsified fuel which has been verified by the EPA as an emission reduction diesel fuel. AquaMix™ emulsified diesel fuel is blended with Lubrizol's PuriNOx™ additive technology. AquaMix™ has been verified to reduce diesel particulate matter typically by 50% and NO_x emissions by 20%.

[d] Clean Diesel Technologies, Inc. sells a fuel borne catalyst called Platinum Plus.

[e] Amsoil Diesel Fuel Additive. AMSOIL also sells synthetic motor oil for heavy duty diesel engines (SAE 15W-40 or SAE 5W-30). Please contact Mr. Baumert for more information.

[f] Stricklin sells fuel additive called Blue Marble™. Please contact Stricklin for more information.

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APPENDIX D

Summary of retrofit technology status

Status	CARB or EPA verified for onroad use	CARB or EPA verified for nonroad use	In use in nonroad engines*	Known to be pursuing onroad verification	Known to be pursuing nonroad verification	In development
Retrofit technologies						
PM control						
Diesel Particulate Filter (DPF)	●		●	Verified		
Active DPF		●	●		Verified	
Flow-through filters (including CWMF)	●		●	Verified	●	●
Diesel Oxidation Catalyst (DOC)	●	●	●	Verified	Verified	
Closed Crankcase Filter System with DOC—Donaldson Spiracle with DOC Muffler	●	●	●	Verified	Verified	
NO_x control						
Selective Catalytic Reduction (SCR)			●		●	●
NO_x Adsorbers						●
Lean NO_x Catalysts	● (w/ DPF)		●	Verified		
PM and NO_x control						
Low Pressure Exhaust Gas Recirculation (EGR)				●		
SCR System with PM Emission Control		●	●		Verified	
Lean NO_x Catalyst with DPF—Cleaire Longview	●		●	Verified	●	
Lean NO_x Catalyst with DOC—Cleaire Lonestar			●	●		
Retrofit technologies and cleaner fuels						
Fuel Borne Catalyst (FBC) with DOC—Platinum Plus	●		●	Verified	●	
FBC with Catalyzed Wire Mesh Filter (CWMF)—Platinum Plus	●			Verified		
Emulsified Diesel Fuel with DOC		●	●		Verified	
Cleaner fuels and additives						
Emulsified Diesel Fuel—PuriNOx	●	●	●	Verified	Verified	
Biodiesel	●		●	Verified		

*In order for a technology to be considered "in use," it must: 1) be commercially available, and 2) have been used in at least 2 projects with varying locations.

APPENDIX E

Retrofit technology cost and emissions reductions summary

	Cost (excluding installation)	NO_x	PM	HC	CO
Retrofit technologies and emissions reductions					
PM control					
Diesel Particulate Filter (DPF)	$7,000–$12,000	0%	Up to 90%	Up to 90%	Up to 90%
Active DPF	$10,000–$30,000	0%	85%	0%	0%
Flow-through Filters (including CWMF)	$5,000–$7,000	0-9%	55–76%	75–89%	50–66%
Diesel Oxidation Catalyst (DOC)	$1,200–$2,500	0%	20–30%	50–90%	70–90%
Closed Crankcase Filter System with DOC—Donaldson Spiracle with DOC Muffler	$1,900	0%	25–33%	12–34%	42–52%
NO_x control					
Selective Catalytic Reduction (SCR)	Mobile: $12,500–$15,000 Stationary: up to $80,000	60–80%	25%	50–90%	70–90%
NO_x adsorbers	In development	90% or more	10–30%	90%	90%
Lean NO_x Catalysts	$6,500–$15,000+	10–40%	Up to 80%	0%	0%
PM and NO_x control					
Low Pressure Exhaust Gas Recirculation (EGR)	$13,000–$15,000	40% or more	90% or more	90% or more	90% or more
SCR System with PM Emission Control	$14,500	80%	25%	50–90%	50–90%
Lean NO_x Catalyst with DPF - 90%	Cleaire Longview	$18,500–$21,000	25%	85%	90%
Lean NOx Catalyst with DOC—Cleaire Lonestar	$12,500	25–30%	50–70%	40–60%	40–60%
Retrofit technologies and cleaner fuels					
Fuel Borne Catalyst (FBC) with DOC—Platinum Plus	Cost of DOC. Fuel economy gains from use of Platinum Plus are expected to outweigh its incremental cost.	0–5%	25–50%	16–50%	25–50%
FBC with Catalyzed Wire Mesh Filter (CWMF)—Platinum Plus	Cost of CWMF. Fuel economy gains from use of Platinum Plus are expected to outweigh its incremental cost.	0–9%	55–76%	75–89%	50–66%
Emulsified Diesel Fuel with DOC	$0.25 per gallon + $1,500–$2,500	25%	95%	85%	75%
Cleaner fuels and additives					
Emulsified Diesel Fuel—PuriNOx	$0.25 per gallon	9–20%	16.8–58%	(35%)–33%	(20–120%)
Biodiesel (20)	$0.15 per gallon	(2%)	10%	21%	11%
Biodiesel (100)	$0.50 per gallon	(10%)	47%	67%	48%

Emissions reductions data derived from CARB or EPA verified reduction levels where possible.
(Parenthesis denote increase)

APPENDIX F

Examples of nonroad retrofit technology use

Status	In use in nonroad engines*	Two projects/sites in which the technology/fuel has been used
Retrofit technologies		
PM control		
Diesel Particulate Filter (DPF)	●	1. World Trade Center, NYC, NY—Caterpillar 966 Wheel loaders 2. American Asphalt, CA—Caterpillar 966GII Wheel loader
Active DPF	●	1. World Trade Center, NYC, NY—Rypos trap installed on a diesel 600 kW electrical generator 2. Riverside, CA—three Caterpillar backup generators (100, 225, and 350 kw) retrofit with Rypos trap
Flow-through Filters (including CWMF)	●	1. Nationwide . many non-metal mining applications on Deutz and Caterpillar engines, 100-275 hp 2. World Trade Center Site, NYC, NY—Two cranes retrofit with an ESW particulate reactor
Diesel Oxidation Catalyst (DOC)	●	1. World Trade Center, NYC, NY—Komatsu PC200 5.9 liter engine Excavator 2. Big Dig, Boston, MA—more than 200 pieces of equipment successfully retrofit
Closed Crankcase Filter System with DOC—Donaldson Spiracle with DOC Muffler	●	Between the Port of Los Angeles and the Port of Long Beach in CA, this system has been successfully installed on approximately 400 yard hustlers, top picks/side picks, and rubber tired gantry-cranes.
NO_x control		
Selective Catalytic Reduction (SCR)	●	1. Richmond, CA—Caterpillar modular SCR installed on a gas power module, model G3516B LE 2. Palm Desert, CA—Mobile SCRs installed on seven construction vehicles
NO_x Adsorbers		Not in commercial use for non-road engines
Lean NO_x Catalysts	●	See Lean NO_x Catalyst with DOC, below.
PM and NO_x control		
Low Pressure Exhaust Gas Recirculation (EGR)	●	Not in commercial use for non-road engines
SCR System with PM Emission Control	●	1. Houston, TX—Houston City has retrofit Cummins 6BTA 5.9L engines on 6 Gradall excavators 2. Port of Houston, TX—GR Birdwell has retrofit several pieces of construction equipment
Lean NO_x Catalyst with DPF—Cleaire Longview	●	1. Fresno, CA—Case IH STX 375 wheel lower and a Komatsu WA450 wheel loader 2. CADOT, California - John Deere672 CH motor grader
Lean NO_x Catalyst with DOC—Cleaire Lonestar	●	1. Concord, CA—Onan stationary 300 DGFC generator 2. Sacramento, CA—Caterpillar 8W2517 (16G) motor grader
Retrofit technologies and cleaner fuels		
Fuel Borne Catalyst (FBC) with DOC—Platinum Plus	●	1. Q-Bridge Project, CT—Starr construction excavator, Samsung 280LC 2. New York City, NY—Vergona crane, unknown model
FBC with Catalyzed Wire Mesh Filter (CWMF)—Platinum Plus		Not in commercial use for non-road engines

Status	In use in nonroad engines[a]	Two projects/sites in which the technology/fuel has been used
Emulsified Diesel Fuel with DOC	●	Between the Port of Los Angeles and the Port of Long Beach in CA, approximately 250 yard hustlers, top picks/side picks, and rubber tired gantry-cranes, etc have DOCs and use PuriNOx.
Cleaner fuels and additives		
Emulsified Diesel Fuel—PuriNOx	●	1. Port of Houston, TX—approximately 50+ pieces of cargo-handling equipment use PuriNOx 2. Extensive, multi-engine/model testing conducted by USEPA and by Air Improvement Resources
Biodiesel	●	1. Hutchinson Salt Co, KA—uses B100 in all underground diesel machinery, 32,000 gallons/year 2. Pioneer Hi-Bred Intl., Charlotte, NC—uses biodiesel on all farm and tractor equipment

*In order for a technology to be considered "in use," it must: 1) be commercially available, and 2) have been used in at least 2 projects with varying locations.

APPENDIX G

Sample action letter

Dear [Decision Maker].

I write to direct your attention to the growing health and environmental impacts associated with diesel engines, and to encourage you to address this problem. Diesel engines, the workhorses of America's economy, are a significant source of air pollution in many communities across the country. Fortunately, cost-effective technology exists to reduce harmful diesel emissions by as much as 90%. Your help is needed to ensure that this technology is taken advantage of.

Emissions from diesel engines contain almost 40 toxic substances and contribute to a laundry list of adverse health effects including: asthma, cardiovascular and respiratory problems, strokes, heart attacks, lung cancer and premature death. Of special concern are two main pollutants: fine particulate matter, which lodges deep in the lung, and oxides of nitrogen (NO_x), which are precursors to smog. Diesel engines are a significant source of fine particulates and NO_x, and recent EPA data shows that about half of all Americans live in places that fail to meet basic health standards for one or both of these pollutants.

Nonroad diesel engines are, quite literally, engines that power vehicles that do not normally operate on roads. They include, for example, locomotives, agricultural equipment (i.e., tractors), construction and mining equipment (i.e., graders and back hoes), and ships. Collectively, nonroad engines discharge more dangerous fine sooty particles than any other source in the transportation sector.

The EPA recently established rigorous emissions standards for new nonroad diesel engines. Unfortunately, the full pollution reduction and public health benefits of the non-road rule will not be realized for decades because they only apply to new non-road diesel engines and not to older, dirtier diesel engines, which have a long life span. A child born today may still be breathing soot from a backhoe in her neighborhood when she graduates from college—unless that backhoe is replaced with a newer, cleaner one, or is retrofit with emissions controls.

Public and private leadership is needed to ensure that dirty diesel engines in our community are replaced or retrofit to reduce their polluting potential. As a community leader, I am asking you to implement programs to reduce pollution from dangerous diesel engine exhaust from vehicles in use in our community. Environmental Defense's Cleaner Diesel Handbook, available at: www.environmentaldefense.org/go/dieselhandbook, is a good starting point. The handbook shows that there is a cost-effective way to reduce the adverse health effects of diesel pollution.

The Cleaner Diesel Handbook outlines some simple ways to reduce diesel pollution, like enforcing idling laws, using clean fuels (like ultra-low sulfur diesel), and best available retrofit technologies that can reduce diesel emissions by up to 90%. It also offers a variety of methods for implementing successful diesel retrofit programs. With your leadership, these tools can reduce air pollution from diesel engines and protect public health in our community. Thank you.

Sincerely,
[Your name]
[Your address]

Notes

[1] Environmental Defense is a national nonprofit environmental organization, headquartered in New York City, with 400,000 members around the country and over 50,000 members and activists in New York. The Living Cities program at Environmental Defense is focused specifically on actions that will help to improve water and air quality, clean up contaminated lands, support sound transportation investments and will reduce greenhouse gases (GHGs). Environmental Defense is not affiliated with any manufacturer or supplier identified in this handbook, and Environmental Defense does not endorse any particular supplier, retrofit or fuel technology manufacturer. This handbook provides only a general overview of commercialized nonroad retrofit technology and cleaner fuel technology options. We provide information about specific companies or suppliers for informational purposes only, but inclusion in, or omission from, this handbook should not be interpreted as a judgment about a particular technology or company. Questions about specific products, applications, emerging technologies, or next steps should be taken up directly with appropriate private sector companies or consultants.

[2] EPA, "Clean Air Nonroad Diesel Rule Summary." June 8, 2004. Office of Transportation and Air Quality. Online resource, available at: http://www.epa.gov/otaq/regs/nonroad/equip-hd/2004fr/420f04029.htm Last accessed 03/01/05.

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[6] EPA, "Fine Particle (PM 2.5) Designations." Online resource, available at: http://www.epa.gov/pmdesignations/regions/region2desig.htm Last accessed 03/01/05.

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[11] California Office of Environmental Health Hazard Assessment, Air Toxicology and Epidemiology Section, "Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant," *Health Risk Assessment for Diesel Exhaust* app. III, part B, as approved by the Scientific Review Panel, April 22, 1998. Online resource, available at: ftp://ftp.arb.ca.gov/carbis/regact/diesltac/partb.pdf Last accessed 03/01/05.

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[18] Based on email correspondence with Roger Suter of Detroit Diesel, Inc. on August 4, 2004.

[19] EPA Tier 0 standards refer to unregulated diesel engines. Tier 1 standards refer to the nonroad diesel engine emissions control regulations adopted by EPA in 1994. The regulations came into effect for new nonroad diesel engines greater than 37 kilowatts (50 horsepower) between 1996 and 2000. Tier 2 standards refer to stricter regulations that were phased in between 1999 and 2000. Tier 3 standards applied to engines between 37 kilowatts and 560 kilowatts (50 and 750 hp), and will be phased in between 2006 and 2008. Source: EPA, "Reducing Air Pollution From Nonroad Engines." April 2003. Online resource, Last accessed 09/11/05. Available at: http://www.epa.gov/otaq/cleaner-nonroad/f03011.pdf

[20] (Using California's Carl Moyer Program assumptions for an unregulated engine's replacement with a Tier One engine, NO_x emissions would go from 11 grams per brake horsepower-hour (g/bph-hr) to 6.6 g/bph-hr and PM emissions would go from 0.53 g/bph-hr to 0.1 g/bph-hr. For a Tier Two replacement, NMHC + NO_x emissions would decrease to 4.2 g/bph-hr and PM would decrease to 0.1 g/bph-hr.) Based on email correspondence with Stephen Hurd of Caterpillar Inc. on August 30, 2004.

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[22] EPA, "Voluntary Diesel Retrofit Program: Glossary" Office of Transportation and Air Quality. Online resource, available at http://www.epa.gov/otaq/retrofit/glossary.htm Last accessed 03/01/2005.

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[53] For more information, please contact: Donna Weaver via email at Donna.Weaver@po.state.ct.us or by phone at 860-594-2082.

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[55] For more information on the Port of Houston Authority's use of cleaner diesel fuels and/or technology, please contact:

Shari Baldridge by phone at 713-670-2428 or via email at sbaldridge@poha.com.

[56] EPA, "Region 6: State Designations." Online resource, available at: http://www.epa.gov/ozonedesignations/regions/region6desig.htm Last accessed 09/11/05.

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[65] More information on the Puget Sound Clean Air Agency, with contact information, is available at: http://www.pscleanair.org

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[76] For more information about CARB, please contact: Scott Rowland, the CARB Manager of its Retrofit Assessment Section via email at srowland@arb.ca.gov or by phone at 626-575-6972.

[77] Based on phone correspondence with Edie Chang of the California Air Resources Board on September 3, 2004. Or CARB, "The Carl Moyer Program Annual Status Report." February 2004. Online resource, available at: http://www.arb.ca.gov/msprog/moyer/moyer_2004_report.pdf Last accessed 03/23/05.

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[91] *Ibid.*

[92] CARB, "Diesel Emissions Control Strategies, Verification Level 2, Verified Technologies. February 23, 2005. Online resource, available at: http://www.arb.ca.gov/diesel/verdev/level2/level2.htm Last accessed 03/01/05.

[93] CARB Diesel Emission Control Strategies Verifications: Online resource, available at: http://www.arb.ca.gov/diesel/verdev/verdev.htm Last accessed 03/01/05. CARB has also verified PuriNOx for 1988 through 2003 model year diesel engines used in on-road applications. PuriNOx is an emulsified diesel fuel which, according to CARB verification, achieves at least 50% reduction in PM and 15% reduction of NO_x. http://www.arb.ca.gov/diesel/verdev/level2/level2.htm Last accessed 03/01/05.

[94] Information provided by Engine Control Systems (ECS). Numbers are based on the use of PuriNOx and ECS's DPF (Purifilter) and DOC (Purimuffler). EPA has verified that ECS's Purifilter reduces PM emission by 90%, HC emissions by 85% and CO emissions by 75%. EPA has verified that ECS's Purimuffler reduces PM emissions by 20%, HC emissions by 50% and CO emissions by 40%. http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm

[95] For more information regarding different applications and test results of emulsified fuels please refer to reports No. 4576-1 (Emulsified Diesel Fuels: Literature Review and Consolidation of Lubrizol Recommendations), 4576-2 (Emulsified Diesel Emission Testing, Performance Evaluation, and Operational Assessment) and 4576-3 (TxDOT Emulsified Diesel Final Report) listed on the webpage of the Center For Transportation Research. http://www.utexas.edu/research/ctr/pdf_reports/index.html#4177-1

[96] Based on e-mail correspondence with Ron Dunfee, of Lubrizol Corporation, on August 30, 2004.

[97] Number provided by Lubrizol manufacturer of PuriNOx.

[98] Lubrizol, "PuriNOx Questions and Answers." Online resource, available at: http://www.lubrizol.com/purinox/purinoxcd/lzquestions.htm Last accessed 03/01/05.

[99] Based on e-mail correspondence with Ron Dunfee, of Lubrizol Corporation, on August 30, 2004.

[100] *Ibid.*

[101] *Ibid.*

[102] Information taken from a fact sheet about Platinum Plus DFX by Clean Diesel Technologies, Inc.

[103] FBC called Platinum Plus® sold by Clean Diesel Technologies, Inc. Please refer to Appendix A for contact information. EPA, "Verified Products." August 11, 2004. Online resource, available at: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm Last accessed 03/01/05.

[104] Based on phone conversation with Glen Reid of Clean Diesel Technologies, Inc. on July 6, 2004.

[105] World Health Organization. "Air Quality Guidelines: Chapter 6.11 Platinum." Second Edition, 2000. Online resource, available at: http://www.euro.who.int/document/aiq/6_11platinum.pdf Last accessed 03/01/05.

[106] United Kingdom Department of Health. "1996 Report of the Committees on Toxicity, Mutagenicity, Carcinogenicity of Chemicals in Food, Consumer Products, and the Environment." January 29, 1998. Online resource, available at: http://www.archive.official-documents.co.uk/document/doh/toxicity/chap-1b.htm Last accessed 03/01/05.

[107] Stricklin Company offers a FBC called Blue Marble(tm). However, Blue Marble(tm) has not yet been EPA verified. According to the Strickling webpage, Blue Marble™ products contain Phosfamid™, an advanced metal treatment that causes metal, according to Stricklin, to become smoother, shinier and resistant to carbon buildup. Distributed by The Stricklin Companies, 1415 Stratford Crt., Del Mar, CA 92014, Ph: 858-794-5700, Fax: 848-794-2666, email: stricklin@worldnet.att.net See also: The Stricklen Companies, "Blue Marble Applications/Engine Test Results." Online resource, available at: http://www.phosfamid.com/html/applications/index.html#HongKongPolytechnicUniversity Last accessed 03/01/05.

[108] National Biodiesel Board. "Biodiesel 2001." 2001. Online resource, available at: http://www.investingdd.com/pdfs/backgrounder.pdf Last accessed 03/01/05.

[109] EPA, "Draft Technical Report: A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions." *EPA-420-P-02-001, October 2002.*

[110] In a study of the effects of Biodiesel on greenhouse gas emissions, the U.S. EPA reports: "we cannot confidently conclude the Biodisel increases or decreases CO_2 emissions." Environmental Protection Agency. "A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions." *EPA-420-P-02-001*, October 2002. Page 50. Online resource, available at: http://www.epa.gov/otaq/models/analysis/biodsl/p02001.pdf Last accessed 03/01/05.

[111] See also *Ibid.*

[112] EPA, "Retrofit Technologies - Biodiesel." June 10, 2004. Online resource, available at: http://www.epa.gov/otaq/retrofit/techlist-biodiesel.htm Last accessed 03/01/05.

[113] *Ibid,* page 46.

[114] National Biodeisel Board, "Biodeisel Emissions." Online resource, available at: http://www.biodiesel.org/pdf_files/emissions.pdf Last accessed 03/01/05.

[115] *Ibid.*

[116] EPA, "Clean Alternative Fuels: Compressed Natural Gas." EPA 420-F-00-033. March 2002. Online resource, available at: http://www.epa.gov/otaq/consumer/fuels/altfuels/420f00033.pdf Last accessed 03/01/05.

[117] In fact, Waste Management Inc. operates approximately 125 CNG fueled heavy-duty trucks. U.S. Dept. of Energy, "Waste Management, Inc." August 25, 2003. Online resource, available at: http://www.eere.energy.gov/cleancities/progs/new_success_ddown.cgi?110 Last accessed 03/01/05.

[118] U.S. Department of Energy: Alternative Fuel Data Center. Online resource, available at: http://www.eere.energy.gov/afdc/altfuel/natural_gas.html Last accessed 03/01/05.

[119] For example, Waste Management Inc. in California is currently converting old Mack MR trucks to run on LNG and is also buying new LNG-fueled vehicles. Waste Management's fleet includes more than 235 heavy-duty trucks powered by LNG. U.S. Dept. of Energy, "Waste Management, Inc." August 25, 2003. Online resource, available at: http://www.eere.energy.gov/cleancities/progs/new_success_ddown.cgi?110 Last accessed 03/01/05.

[120] EPA, "Clean Alternative Fuels: Propane." March 2002. EPA 420-F-00-039. Online resource, available at: http://www.epa.gov/otaq/consumer/fuels/altfuels/420f00039.pdf Last accessed 03/01/05.

[121] U.S. DOE, "Propane Vehicles." July 21, 2004. Online resource, available at: http://www.eere.energy.gov/afdc/afv/prop_vehicles.html Last accessed 03/04/05.

[122] U.S. Department of Energy: Alternative Fuel Data Center. Online resource, available at: http://www.eere.energy.gov/afdc/altfuel/prop_benefits.html Last accessed 03/01/05.

[123] MECA, "MECA supports U.S. EPA Proposal to Reduce Emissions from Nonroad Diesel Engines and Equipment." April 15, 2003. Online resource, available at: http://www.meca.org/jahia/Jahia/engineName/filemanager/pid/226/EPAnonroadNPRMpr

041503.pdf?actionreq=actionFileDownload &fileItem=500 Last accessed 03/03/05.

[124] *Ibid.*

[125] *Ibid.*

[126] Timothy V. Johnson, "Is there a simple solution for the diesel emission control challenge?" *Environmental Technologies,* January 2004. Volume 25 No. 2. Online resource, available at: http://www.corning.com/environmentaltechnologies/emissions_control_technology_magazine/article2.asp Last accessed 03/03/05.

[127] *Ibid.*

[128] EPA, "Voluntary Diesel Retrofit Program" Office of Transportation and Air Quality. Online resource, available at http://www.epa.gov/otaq/retrofit Last accessed 03/03/05.

[129] For an overview of different retrofit devices, please also refer to: Joe Kubsch. *Retrofit Emission Control Technologies for Diesel Engine,* MECA, November 4, 2003. Online resource, available at: http://www.4cleanair.org/JoeKubsh.pdf Last accessed 08/13/04.

[130] "Verified" means that either the EPA or the California ARB have verified this type of technology. However, please refer to http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm and http://www.arb.ca.gov/diesel/verdev/verdev.htm for detailed information regarding the different types of verified emission control technologies and the different manufacturers whose technologies have been verified.

[131] EPA, "Voluntary Diesel Retrofit Program: Glossary" Office of Transportation and Air Quality. Online resource, available at http://www.epa.gov/otaq/retrofit/glossary.htm Last accessed 03/03/05.

[132] EPA, "Diesel Particulate Matter (PM) Filter Overview." Office of Transportation and Air Quality, February 13, 2004. Online resource, available at: http://www.epa.gov/otaq/retrofit/documents/bigdig_case_08.htm Last accessed 03/03/05.

[133] EPA's verified level of reduction for Johnson Matthey Continuously Regenerating Technology (CRT). EPA, "Verified Products." August 11, 2004. Online resource, available at: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm Last accessed 03/03/05.

[134] Kodjak et al., Attachment D, "The Clean Air Construction Initiative, Diesel Particulate Filters Technology Description and Overview of Operational Issues"

[135] Information provided by Johnson Matthey.

[136] Joe Kubsch. *Retrofit Emission Control Technologies for Diesel Engine,* MECA, November 4, 2003. Online resource, available at: http://www.4cleanair.org/JoeKubsh.pdf Last accessed 03/03/05.

[137] *Ibid.*

[138] "Verified" means that either the EPA or the California ARB have verified this type of technology. However, please refer to http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm and http://www.arb.ca.gov/diesel/verdev/verdev.htm for detailed information regarding the different types of verified emission control technologies and the different manufacturers whose technologies have been verified.

[139] Block, Michael. *Retrofit Primer—Emission Reduction Technologies and Strategies.* NESCAUM, October 2003. Page 10. Online resource, available at: http://bronze.nescaum.org/retrofitworkshop/folder/Primer.pdf Last accessed 03/03/05.

[140] California Air Resource Board, "Risk Reduction Plan to Reduce Particulate Matter Emissions from Diesel-Fueled Engines and Vehicles", October 2000, p. 19.

[141] Johnson Matthey's CRT and CCRT. For more information, visit the Johnson Matthey Catalyst web site at: http://www.jmcatalysts.com Last accessed 03/03/05.

[142] "Verified" means that either the EPA or the California ARB have verified this type of technology. However, please refer to http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm and http://www.arb.ca.gov/diesel/verdev/verdev.htm for detailed information regarding the different types of verified emission control technologies and the different manufacturers whose technologies have been verified.

[143] Rypos Inc., "Company Info." Online resource, available at: http://www.rypos.com/html/companyinfo.html Last accessed 03/03/05. For examples where Rypos' DPF (Rypos Trap) have been used, visit the Rypos web site at: http://www.rypos.com/html/index.html. DCL International Inc. also sells active DPFs.

[144] Rypos Inc.s' Active DPF does not require the use of ULSD. Online resource, available at: http://www.rypos.com/html/products.html Last accessed 03/03/05.

[145] California Air Resources Board, "Diesel Emission Control Strategies Verification:

Level 3 Verified Technologies." 01.25.2005. Online resource, available at: URL: http://www.arb.ca.gov/diesel/verdev/level3.htm Last accessed 03/03/05.

[146] "Verified" means that either the EPA or the California ARB have verified this type of technology. However, please refer to http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm and http://www.arb.ca.gov/diesel/verdev/verdev.htm for detailed information regarding the different types of verified emission control technologies and the different manufacturers whose technologies have been verified.

[147] FBC called Platinum Plus(r) and CWMF both sold by Clean Diesel Technologies, Inc. Please refer to Appendix A for contact information. EPA, "Verified Products." August 11, 2004. Online resource, available at: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm Last accessed 08/13/04.

[148] Based on phone conversation with Glen Reid of Clean Diesel Technologies, Inc. on July 6, 2004.

[149] EPA, "Verified Products." June 21, 2005. Online resource, available at: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm Last accessed 08/03/05.

[150] Based on phone conversation with Glen Reid of Clean Diesel Technologies, Inc. on July 6, 2004.

[151] Based on email correspondence with Glen Reid of Clean Diesel Technologies, Inc. on August 3, 2004.

[152] Based on email correspondence with Glen Reid of Clean Diesel Technologies, Inc. on August 27, 2004.

[153] Sold in the U.S. by Clean Air Power (see Appendix A for contact information).

[154] Based on phone conversation with Clean Air Power. 08/25/04.

[155] The certification was done by AVL, an engine testing center in Sweden. The AVL web site is available at: http://www.mtc.se/eng/content/aboutmtc.htm

[156] The Swiss verification is referred to as "VERT" verification. For more information, please visit: http://www.umwelt-schweiz.ch/buwal/eng/fachgebiete/fg_luft/vorschriften/industrie_gewerbe/filter/index.html

[157] EPA, "Terms of Environment." Online resource, available at: http://www.epa.gov/OCEPAterms/oterms.html Last accessed 03/03/05.

[158] Information provided by Clean Air Power by e-mail.

[159] "Verified" means that either the EPA or the California ARB have verified this type of technology. However, please refer to http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm and http://www.arb.ca.gov/diesel/verdev/verdev.htm for detailed information regarding the different types of verified emission control technologies and the different manufacturers whose technologies have been verified.

[160] Block, Michael. *Retrofit Primer—Emission Reduction Technologies and Strategies.* NESCAUM, October 2003. Page 5. Online resource, available at: http://bronze.nescaum.org/retrofitworkshop/folder/Primer.pdf Last accessed 03/03/05.

[161] Philadelphia Diesel Difference, Diesel Oxidation Catalyst. Online resource, available at: http://www.cleanair.org/dieseldifference/retrofits/ Last accessed 03/03/05.

[162] Diesel Emission Evaluation Program, DEEP. Online resource, available at: http://www.deep.org/reports/sum_gloss.pdf. Last accessed 03/03/05. Also refer to DieselNet. Online resource, available at: http://www.dieselnet.com/gl-s.html Last accessed 03/03/05.

[163] Block, Michael. *Retrofit Primer—Emission Reduction Technologies and Strategies.* NESCAUM, October 2003. Page 5. Online resource, available at: http://bronze.nescaum.org/retrofitworkshop/folder/Primer.pdf Last accessed 03/03/05.

[164] *Ibid.*

[165] *Ibid.*

[166] EPA's verified level of reduction for numerous suppliers of catalyst muffler products. EPA, "Verified Products." August 11, 2004. Online resource, available at: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm Last accessed 03/03/05.

[167] Joe Kubsch. *Retrofit Emission Control Technologies for Diesel Engine,* MECA, November 4, 2003. Online resource, available at: http://www.4cleanair.org/JoeKubsh.pdf. Last accessed 03/03/05.

[168] Information based on phone conversation with Alex Kasprak of the Big Dig Project on June 18, 2004.

[169] Information based on Donaldson letter to Environmental Defense dated March 25, 2004.

[170] Information based on e-mail correspondence with Fred Schmidt of Donaldson Company, Inc. on November 1, 2004.

[171] EPA, "Verified Products." August 11, 2004. Online resource, available at: http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm Last accessed 03/03/05.

[172] Information provided by Donaldson Brochure for Spiracle Filtration Systems.

[173] Information based on e-mail correspondence with Fred Schmidt, of Donaldson Company, Inc. on October 26, 2004.

[174] California Air Resources Board. "The Carl Moyer Memorial Air Quality Standards Attainment Program Guidelines: Approved Revision 2003." September 30, 2003. Page 6. Online resource, available at: http://www.arb.ca.gov/msprog/moyer/2003moyerguide.pdf Last accessed 03/03/05.

[175] Texas State House of Representatives. "House Bill 1365." §8(a) Effective 06/22/03. Online resource, available at: http://www.capitol.state.tx.us/cgi-bin/tlo/textframe.cmd?LEG=78&SESS=R&CHAMBER=H&BILLTYPE=B&BILLSUFFIX=01365&VERSION=5&TYPE=B Last accessed 03/03/05.

[176] Except for Extengine's ADEC system (see 3.1), no mobile SCR system has been EPA or CARB verified as of February 11, 2005.

[177] A reductant is a substance that is oxidized in the course of reduction. It is a reducing agent that chemically reduces other substances. Here, the reducing agent is urea or ammonia, which chemically reduces NO_x into N_2.

[178] Emissions reduction with use of 30ppm low sulfur fuel. Khair, Magdi. "Integration of EGR, SCR, DPF, and fuel-borne catalyst for NO_x/PM reduction," Oct. 1999. According to Argillon LLC, their SCR reduces 60% of soluble organic fraction of PM and up to 90% NO_x depending on the application (average between 60-80% NO_x reduction).

[179] Block, Michael. *Retrofit Prime—Emission Reduction Technologies and Strategies.* NESCAUM, October 2003. Page 13. Online resource, available at: http://bronze.nescaum.org/retrofitworkshop/folder/Primer.pdf Last accessed 03/03/05.

[180] For example, the Argillon mobile SCR is equipped with such a remote data-recording device.

[181] Information based on phone conversation with T.J. Tarabulski of Combustion Components Associates Inc. on February 11, 2005. Reference is also made to: http://www.extengine.com/index.html Last accessed 03/03/05.

[182] *Retrofit Emission Control Technologies for Diesel Engine,* Joe Kubsh, MECA, November 4, 2003. Joe Kubsch. *Retrofit Emission Control Technologies for Diesel Engine,* MECA, November 4, 2003. Online resource, available at: http://www.4cleanair.org/JoeKubsh.pdf Last accessed 03/03/05.

[183] Combustion Component Association Inc. has installed mobile SCR units in seven big earth moving construction vehicles (four scrapers, one rubber-tire dozer, one motor grader, one waterpull and one watertruck) in Palm Desert, CA). Information provided by Combustion Components Associates Inc.

[184] Based on a phone conversation with T.J. Tarabulski of Combustion Components Associates Inc. on February 11, 2005.

[185] DieselNet, "EMA Releases Urea-SCR Infrastructure Study." Oneline resource, available at: http://www.dieselnet.com/news/0308ema.html Last accessed August 3, 2005.

[186] Combustion Components Associates, Inc, "ELIM-NOx: A Mobile Diesel NO_x Emissions Reduction System." Online resource, available at: http://www.combustioncomponents.com/images/mobilescr/mobilescr.pdf Last accessed 03/03/05.

[187] Based on a phone conversation with T.J. Tarabulski of Combustion Components Associates Inc. on February 11, 2005.

[188] These numbers do not include installation and tax. Installation costs run usually between 20–30% of unit price. NO_x reduction level: 60-90% depending on catalyst volume, baseline NO_x levels and exhaust temperatures. Information provided by Clean Diesel Technologies, Inc. and Argillon LLC.

[189] Information provided by Argillon LLC.

[190] Lexico Publishing, LLC "Dictionary: Adsorb." Online resource, available at: http://dictionary.reference.com/search?q=adsorb. Last accessed 04/05/05.

[191] CARB, "Appendix B: Diesel Engine Emission Control Technologies." Online resource, available at: http://www.arb.ca.gov/regact/dieselrv/appb.doc. Last accessed 04/05/05.

[192] Jim Parks et al., "DeSulfation of NO_x Adsorbers: Studies with the SpaciMS

Technique." 7th Diesel Engine Emissions Reduction Workship. Portsmouth, Virginia. August 5–9, 2001. Online resource, available at: http://www.osti.gov/fcvt/deer2001/parks.pdf Last accessed 03/03/05.

[193] Manufacturers of Emission Controls Association, "Catalyst-Based Diesel Particulate Filters and NO_x Adsorbers: A Summary of the Technologies and the Effects of Fuel Sulfur." August 14, 2000. Online resource, available at: http://www.cleanairnet.org/infopool/1411/articles-35627_catalystbased_diesel.pdf Last accessed 03/03/05.

[194] Bruce Bertelsen, "Reducing Emissions from Existing Diesel Engines: The Critical Role of Diesel Retrofit Technologies: Background Document." Environmental & Energy Technology and Policy Institute. January 15–16, 2004. Online resource, available at: http://embarq.wri.org/documents/hittingtheroad/bertelsen.pdf Last accessed 03/03/05.

[195] Manufacturers of Emission Controls Association, "Catalyst-Based Diesel Particulate Filters and NO_x Adsorbers: A Summary of the Technologies and the Effects of Fuel Sulfur." August 14, 2000. Page 17. Online resource, available at: http://www.cleanairnet.org/infopool/1411/articles-35627_catalystbased_diesel.pdf Last accessed 03/03/05.

[196] Catalytica Energy Systems, "Diesel NO_x Reduction." Online resource, available at: http://www.catalyticaenergy.com/new_technologies/diesel.htm#Retrofit Last accessed 03/03/05.Catalytica is also working to develop NO_x adsorber technology for stationary diesel engines that will produce a 90% reduction in NO_x emissions in both new and retrofitted engines.

[197] Manufacturers of Emission Controls Association, "Catalyst-Based Diesel Particulate Filters and NO_x Adsorbers: A Summary of the Technologies and the Effects of Fuel Sulfur." August 14, 2000. Page 17. Online resource, available at: http://www.cleanairnet.org/infopool/1411/articles-35627_catalystbased_diesel.pdf Last accessed 03/03/05.

[198] "Verified" means that either the EPA or the California ARB have verified this type of technology. However, please refer to http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm and http://www.arb.ca.gov/diesel/verdev/verdev.htm for detailed information regarding the different types of verified emission control technologies and the different manufacturers whose technologies have been verified.

[199] Bruce Bertelsen, "Reducing Emissions from Existing Diesel Engines: The Critical Role of Diesel Retrofit Technologies: Background Document." Environmental & Energy Technology and Policy Institute. January 15–16, 2004. Online resource, available at: http://embarq.wri.org/documents/hittingtheroad/bertelsen.pdf Last accessed 03/03/05.

[200] Paul W. Park, "Correlation Between Catalyst Surface Structure and Catalyst Behavior: Selective Catalytic Reduction with Hydrocarbon." May 21, 2002. EMSL 2002. Richland, Washington. Online resource, available at: http://www.emsl.pnl.gov/new/emsl2002/abstracts/park.doc Last accessed 03/03/05.

[201] Diesel Technology Forum, "Engineering Clean Air: The Continuous Improvement of Diesel Engine Emission Peformance." March, 2001. Page 13. Online resource, available at: http://www.dieselforum.org/whitepaper/downloads/DTF-ContinuousImprovement03-01.pdf Last accessed 03/03/05.

[202] Carrie Boyer et al., "Lean NO_x Catalysis: Research and Development." Caterpillar, Inc. Online resource, available at: http://www.orau.gov/deer/DEER2003/presentations/session11/3.%20Endicott%20-%20DEER_2003_Final_Lean-NOx.pdf Last accessed 03/03/05.

[203] EPA, "Technical Summary." Online Resource, available at: http://www.epa.gov/otaq/retrofit/retropotentialtech.htm Last accessed 03/03/05.

[204] *Ibid.*

[205] Cleaire's "Longview" filter reduces 25% NO_x and 85% PM. The Longview filter has been CARB verified for onroad. Cleaire Inc, "Products." Online resource, available at http://www.cleaire.com/site/products/# Last accessed 03/03/05. Extengine's ADEC system reduces PM, HC, CO and NO_x by approx. 75%. CARB nonroad verification is pending (as per August 2004). Extengine, "ADEC Advanced Diesel Emission Control system." Online resource, available at: http://www.extengine.com/adec.html Last accessed 03/03/05.

[206] As of February 11, 2005, only the ADEC system has been verified, Johnson Matthey's SCRT is still in development and undergoing field testing.

[207] Extengine, "ARB Verifies Retrofit System to Reduce Diesel Exhaust on Older Off-Road Equipment." Online resource, available at: http://www.extengine.com/index.html Last accessed 03/03/05.

[208] California Air Resources Board, "Diesel Emission Control Strategies Verification: Level 1 Verified Technologies." 01.27.2005. Online resource, last accessed 02.04.2005. URL: http://www.arb.ca.gov/diesel/verdev/level1.htm

[209] Letter from Steve B. Dornak (Mayor's Office of the City of Houston) to Annette Herbert of CARB, dated July 15, 2004 stating, in part, the following: "Field tests of the Extengine ADEC system were the most impressive. Testing of the ADEC I and II systems produced CO reductions of 76 to 84%, while NO_x reduction of 78 to 82% were observed."

[210] Based on e-mail correspondence with Phillip Roberts, of Extengine, on 01.23.2005.

[211] A Slip Catalyst converts excessive ammonia into nitrogen and water to avoid ammonia being emitted through the exhaust gas. Information based on phone conversation with T.J. Tarabulski of Combustion Components Associates Inc. on February 11, 2005.

[212] *Ibid.*

[213] Johnson Matthey, "Johnson Matthey Introduces the SCRT System." Online resource, available at: http://www.jmcsd.com/scrttm_system.html Last accessed 03/03/05.

[214] Marty Lassen, "EPA Clean Diesel Engine Implementation Workshop." Johnson Matthey, August 6-7, 2003. Online resource, available at: http://www.epa.gov/otaq/regs/hd2007/wrkshop2/lassen.pdf, please see slide 5. Last accessed 03/03/05.

[215] "Verified" means that either the EPA or the California ARB have verified this type of technology. However, please refer to http://www.epa.gov/otaq/retrofit/retroverifiedlist.htm and http://www.arb.ca.gov/diesel/verdev/verdev.htm for detailed information regarding the different types of verified emission control technologies and the different manufacturers whose technologies have been verified.

[216] EPA and CARB have signed a Memorandum of Agreement for the Coordination and Reciprocity in Diesel Retrofit Device Verification.

[217] CARB, "Diesel Emissions Control Strategies Verification: Level 3 Verified Technologies." Online resource, available at: http://www.arb.ca.gov/diesel/verdev/level3.htm Last accessed 03/03/05.

[218] Cleaire Inc, "Products." Online resource, available at http://www.cleaire.com/site/products/# Last accessed 03/03/05.

[219] Longview filters have been installed on motor graders, wheel loaders, backhoe loaders and backup generators.

[220] Only once in a very unusual application could the exhaust gas temperature not be achieved. Information based on phone conversation with Tim Taylor of Cleaire on August 3, 2004.

[221] Pricing can vary depending on the distributor.

[222] These numbers include installation and tax. Numbers provided by Cleaire, Inc.

[223] Information based on e-mail correspondence with Tim Taylor, of Cleaire Advanced Emission Controls, LLC on February 18, 2005.

[224] *Ibid.*

[225] Cleaire Inc, "Products." Online resource, available at http://www.cleaire.com/site/products/# Last accessed 03/03/05.

[226] Information based on e-mail correspondence with Tim Taylor, of Cleaire Advanced Emission Controls, LLC on February 18, 2005.

[227] Numbers include installation and tax. Numbers provided by Cleaire, Inc. However, pricing can vary depending on the distributor.

[228] This section is from Retrofitting Emission Controls On Diesel-Powered Vehicles. MECA, March 2002. Online resource, available at http://www.meca.org/jahia/Jahia/engineName/filemanager/pid/229/dieselretrofitwp.pdf?actionreq=actionFileDownload&fileItem=220 Last accessed 03/03/05.

[229] MECA Diesel Retrofit. Frequently Asked Questions About The Installation Of Emission Controls On Existing Diesel Engines, page 3. Online resource, available at: http://www.meca.org/jahia/Jahia/engineName/filemanager/pid/224/retrofitFAQ%20(revised).pdf?actionreq=actionFileDownload&fileItem=712 Last accessed 03/03/05.

[230] Based on a telephone conversation with Alex Gorrel of SST Emtec on October 5, 2004.

[231] Based on a telephone conversation with Alex Gorrel of SST Emtec on October 5, 2004.

[232] CARB, "Carl Moyer Third Year Status Report." March 26, 2002. Online resource, available at: http://www.arb.ca.gov/msprog/moyer/2002report.pdf Last accessed 03/01/05.

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ENVIRONMENTAL DEFENSE

finding the ways that work

National headquarters
257 Park Avenue South
New York, NY 10010
212-505-2100

1875 Connecticut Avenue, NW
Washington, DC 20009
202-387-3500

5655 College Avenue
Oakland, CA 94618
510-658-8008

2334 North Broadway
Boulder, CO 80304
303-440-4901

2500 Blue Ridge Road
Raleigh, NC 27607
919-881-2601

44 East Avenue
Austin, TX 78701
512-478-5161

18 Tremont Street
Boston, MA 02108
617-723-5111

Project Office
3250 Wilshire Boulevard
Los Angeles, CA 90010
213-386-5501

Overview: Diesel Exhaust & Health

CATEGORIES

Topics Health, Air Pollution, Transportation Electrification, Construction & Earthmoving Equipment, Environmental Justice, Oceangoing Vessels & Harbor Craft, Freight & Goods Movement, Trains & Railyards, Transit, VW Diesel Vehicles

Programs Exposure, Community Air Protection Program , Community Health, Zero-Emission Powertrain Certification, Alternative Diesel Fuels, In-Use Off-Road Diesel-Fueled Fleets Regulation, Study of Neighborhood Air near Petroleum Sources, School Buses

Type Information

CONTACT

Research Division

Email research@arb.ca.gov

Phone (916) 445-0753

Background

Diesel engines emit a complex mixture of air pollutants, including both gaseous and solid

material.The solid material in diesel exhaust is known as diesel particulate matter (DPM). More than 90% of DPM is less than 1 µm in diameter (about 1/70th the diameter of a human hair), and thus is a subset of particulate matter less than 2.5 microns in diameter (PM2.5). Most PM2.5 derives from combustion, such as use of gasoline and diesel fuels by motor vehicles, burning of natural gas to generate electricity, and wood burning. PM2.5 is the size of ambient particulate matter air pollution most associated with adverse health effects of the air pollutants that have ambient air quality standards. These health effects include cardiovascular and respiratory hospitalizations, and premature death. As a California statewide average, DPM comprises about 8% of PM2.5 in outdoor air, although DPM levels vary regionally due to the non-uniform distribution of sources throughout the state.

DPM is typically composed of carbon particles (“soot”, also called black carbon, or BC) and numerous organic compounds, including over 40 known cancer-causing organic substances. Examples of these chemicals include polycyclic aromatic hydrocarbons, benzene, formaldehyde, acetaldehyde, acrolein, and 1,3-butadiene. Diesel exhaust also contains gaseous pollutants, including volatile organic compounds and oxides of nitrogen (NO_X). NO_X emissions from diesel engines are important because they can undergo chemical reactions in the atmosphere leading to formation of PM2.5 and ozone.

Most major sources of diesel emissions, such as ships, trains, and trucks operate in and around ports, rail yards, and heavily traveled roadways. These areas are often located near highly populated areas. Because of this, elevated DPM levels are mainly an urban problem, with large numbers of people exposed to higher DPM concentrations, resulting in greater health consequences compared to rural areas. A large fraction of personal exposure to DPM occurs during travel on roadways. Although Californians spend a relatively small proportion of their time in enclosed vehicles (about 7% for adults and teenagers, and 4% for children under 12), 30 to 55% of total daily DPM exposure typically occurs during the time people spend in motor vehicles.

Diesel Particulate Matter and Health

The majority of DPM is small enough to be inhaled into the lungs. Most inhaled particles are subsequently exhaled, but some deposit on the lung surface. Although particles the size of DPM can deposit throughout the lung, the largest fraction deposits in the deepest regions of the lungs where the lung is most susceptible to injury.

In 1998, CARB identified DPM as a toxic air contaminant based on published evidence of a relationship between diesel exhaust exposure and lung cancer and other adverse health effects. In 2012, additional studies on the cancer-causing potential of diesel exhaust published since CARB's determination led the International Agency for Research on Cancer (IARC, a division of the World Health Organization) to list diesel engine exhaust as "carcinogenic to humans". This determination is based primarily on evidence from occupational studies that show a link between exposure to DPM and lung cancer induction, as well as death from lung cancer. Download the IARC report (external site).

Because it is part of PM2.5, DPM also contributes to the same non-cancer health effects as PM2.5 exposure. These effects include premature death, hospitalizations and emergency department visits for exacerbated chronic heart and lung disease, including asthma, increased respiratory symptoms, and decreased lung function in children. Several studies suggest that exposure to DPM may also facilitate development of new allergies. Those most vulnerable to non-cancer health effects are children whose lungs are still developing and the elderly who often have chronic health problems.

Estimated Health Effects of DPM in California

DPM has a significant impact on California's population. It is estimated that about 70% of total known cancer risk related to air toxics in California is attributable to DPM. Based on 2012 estimates of statewide exposure, DPM is estimated to increase statewide cancer risk by 520 cancers per million residents exposed over a lifetime. Non-cancer health effects associated with exposure to DPM (based on 2014 - 2016 air quality data) are shown in the table below.

Health Effect	**Estimated Annual Number of Cases***
Cardiopulmonary Death	730 (570 – 890)
Hospitalizations (Cardiovascular and Respiratory)	160 (20 – 290)
Emergency Room Visits for Asthma	370 (240 – 510)

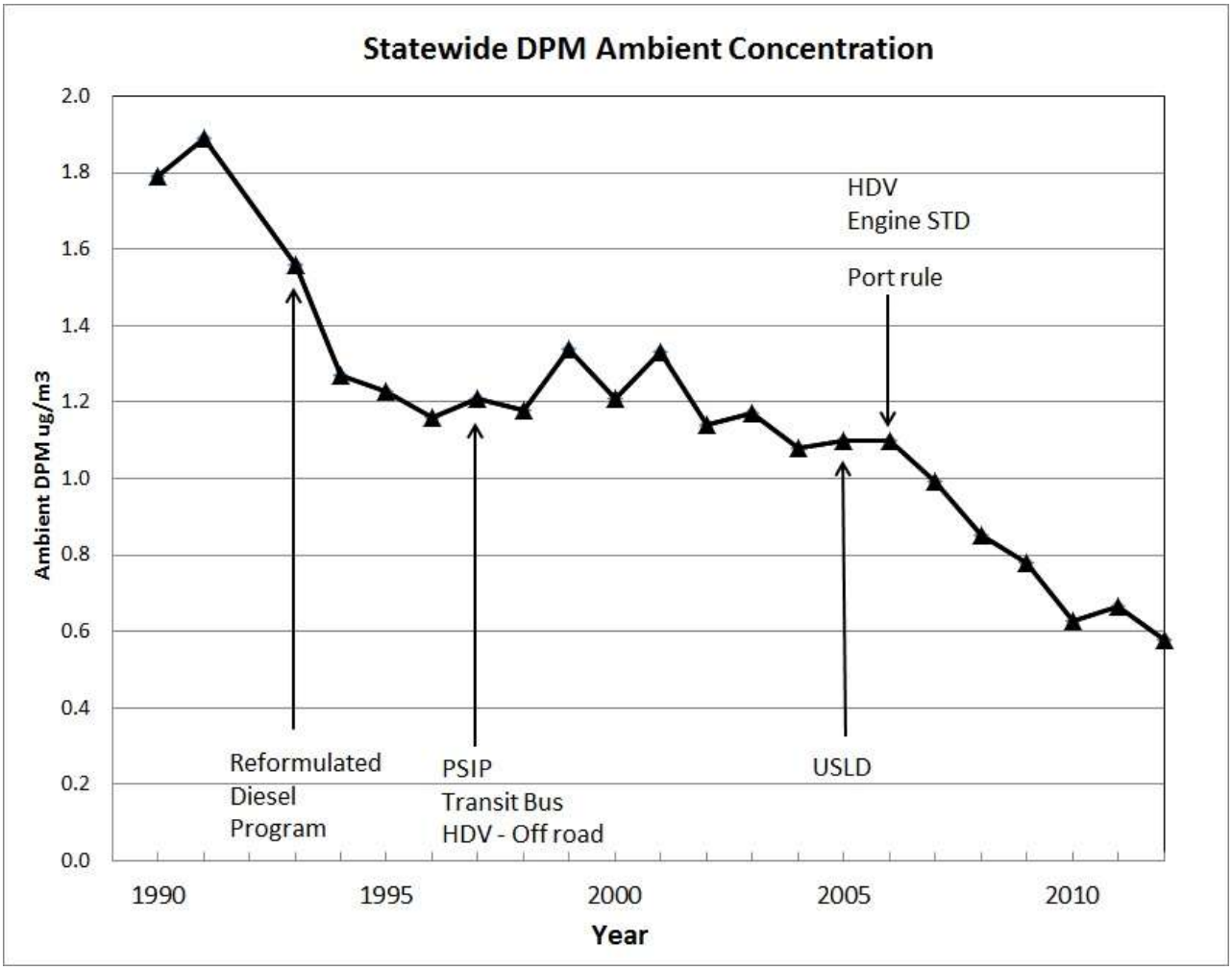
*Values in parenthesis indicate 95% confidence interval.

More Information

Trends in Outdoor Levels of DPM

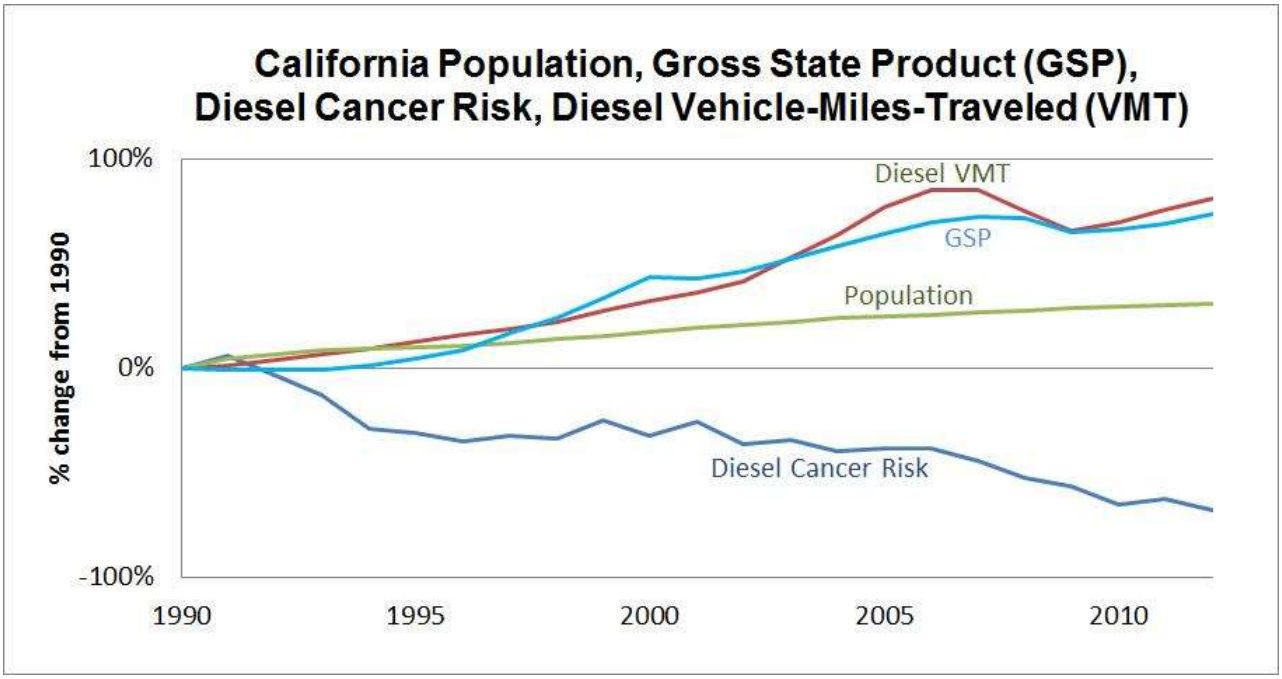
The figure below shows the trend in ambient DPM. CARB regulations** of diesel engines and fuels have had a dramatic effect on DPM concentrations. Since 1990, DPM levels have decreased by 68%. The figure also shows which regulations have had the greatest impact on DPM.

DPM levels are expected to continue declining as additional controls are adopted, and the number of new technology diesel vehicles increases.



**Abbreviations of CARB regulations used in table: HDV Engine STD = Heavy-duty diesel truck engine standard; HDV - Off road = Heavy-duty off-road diesel engines; Port rule = Port (drayage) trucks; PSIP = Periodic self-inspection program; Transit bus = Urban transit buses; ULSD = Clean diesel fuel

The figure below shows that despite the increased number of vehicle miles traveled by diesel vehicles (VMT, red line), and despite increases in statewide population (green line) and gross state product (GSP, a measure of growth in the state's economy, light blue line), CARB's regulatory programs still led to a decline in statewide cancer risk (dark blue line).



Additional Information

- CARB's diesel programs
- CARB's diesel mobile vehicles and equipment activities
- CARB's freight transport, ports and rail programs
- California's diesel fuel program
- Other diesel-related programs
- Selected references on diesel-related health effects

Environmental Effects of Diesel Exhaust

In addition to its health effects, diesel exhaust significantly contributes to haze that reduces visibility by obscuring outdoor views and decreasing the distance over which one can distinguish features across the landscape. Researchers have reported that in the San

Joaquin Valley and in southern California, diesel engines contribute to a reduction in visibility. This decrease in visibility is caused by scattering and absorption of sunlight by particles and gases present in diesel emissions.

DPM also plays an important role in climate change. A large proportion of DPM is composed of BC. Recent studies cited in the Intergovernmental Panel on Climate Change report estimate that emissions of BC are the second largest contributor to global warming, after carbon dioxide emissions. Warming occurs when BC particles absorb sunlight, convert it into infrared (heat) radiation, and emit that radiation to the surrounding air. A recent California-specific study showed that the darkening of snow and ice by BC deposition is a major factor in the rapid disappearance of the Sierra Nevada snow packs. Melting of the snow pack of the Sierra Nevada earlier in the spring is one of the contributing factors to the serious decline in California's water supply. As additional DPM controls are adopted, and the number of new technology diesel vehicles increases, BC emissions will continue to decline.

Conclusions

Although progress has been made over the past decade in reducing exposure to diesel exhaust, diesel exhaust still poses substantial risks to public health and the environment. Efforts to reduce DPM exposure through use of cleaner-burning diesel fuel, retrofitting engines with particle-trapping filters, introduction of new, advanced technologies that reduce particle emissions, and use of alternative fuels are approaches that are being explored and implemented. CARB anticipates that newly adopted diesel exhaust control measures will reduce population exposure even further, and that as the sustainable freight program expands, population exposure to diesel exhaust pollution will decrease even further. It is estimated that emissions of DPM in 2035 will be less than half those in 2010, further reducing statewide cancer risk and non-cancer health effects.

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Emission Impact: Additional Generator Usage Associated with Power Outage

January 30, 2020

This report has been reviewed by the staff of the California Air Resources Board. The contents do not necessarily reflect the views and policies of the California Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

Summary

For public safety, it may be necessary for utilities to turn off electricity when gusty winds and dry conditions, combined with a heightened fire risk, are forecasted. This is called a "Public Safety Power Shutoff" or "PSPS". According to CPUC de-energization report[1], in October 2019, there have been almost 806 PSPS events that have impacted almost 973,000 customers (~7.5% of households in California) of which ~854,000 of them were residential customers, and the rest were commercial/industrial/medical baseline/other customers. Data also indicates that on average each of these customers had about 43 hours of power outage in October 2019.

Following the PSPS events, many households and businesses in California started operating their back-up generators to provide power for their day-to-day operations. Generators used during power outage will increase emissions as compared to an average day. Staff assessment indicated that with 973,000 customers impacted by PSPS events in October 2019, approximately 125,000 back-up generators were used by customers to provide electricity during power outage. Assuming 50 hours of operation per generator during month of October 2019, staff estimated excess emissions from the use of generators which are summarized in Table 1.

Table 1: Population and excess emissions from the use of electricity power generators during October 2019 PSPS events.

Generator Type		NOx (tons)	PM (tons)	Diesel PM (tons)	Additional Generators Running in PSPS
Portable	Gasoline Less than 25 hp	24.3	10.6		122,000
	Diesel above 25 hp *Non-Rental Generator*	7.3	0.30	0.30	381
	Diesel above 25 hp *Rental Generator*	9.1	0.30	0.30	582
Permitted Stationary Back-Up Generators (Assuming 30% Load Factor)		125.7	8.3	8.3	1,810
Non-permitted generators[2]		N/A	N/A	N/A	N/A
Total		***166.4***	***19.4***	***8.9***	***124,774***

[1] https://www.cpuc.ca.gov/deenergization/

[2] This analysis does not include emissions estimates from non-permitted generators such as the residential standby natural gas powered generators with power rating of less than 50 hp (e.g, a 22 kW Guardian Series home standby generator by Generac). At this point there is no information available on their population and sales. According to discussion with industry, it is assumed that most of these generator are powered by natural gas.

To put these numbers into context, 9 tons of diesel PM is equivalent to emissions from almost 29,000 heavy duty diesel trucks (above 14,000 lbs.) driving on California roadways for the period of one month (on average each truck drives around 3,000 miles per month).

The calculations described in the rest of the document outlines the assumptions used to estimate potential emissions impact from the use of gasoline and diesel generators during PSPS events.

Small Gasoline Powered Generators (less than 25 hp)

Population

Based on 2018 California State University Fullerton (CSUF) Survey[3] for small off-road (SORE) equipment, about one out of 8 households own a generator in California. For a population of 973,000 households, about 122,000 generators will likely to be used to provide additional power during the power shut-off period.

Emission Factors

According to data provided by manufacturers as part of the SORE Evaporative Reporting Requirement[4], generators have an average horsepower of 3.5 hp of which when combined with a load factor of 0.68, derived from OFFROAD2007[5], results in an effective power of 2.4 hp. To determine emission factors, we used emissions data from SORE exhaust certification database. Table 2 shows the derived emission factors along with weighted average emission factors across all horsepower bins.

Table 2: Exhaust emission factors (g/bhp-hr) for gasoline powered generator less than 25 hp

Equipment	Tech Type	Horsepower	Percent Population	HC (g/bhp-hr)	NOX (g/bhp-hr)	PM (g/bhp-hr)
Generator Sets	G2-CARB	0 – 2	5%	27.860	0.900	0.600
	G4-CARB	2 – 5	82%	5.634	1.484	0.740
		5 – 15	9%	2.885	1.975	0.140
		15 – 25	3%	3.390	1.422	0.140
	G4-FI	15 – 25	1%	1.074	2.125	0.140
	Population Weighted Average			**6.296**	**1.505**	**0.655**

Using the effective power and emission factors described earlier, staff estimated excess emissions as well emissions during 50 hours of generators operation (5 days with 10 hours a day operation). For example, with 122,000 generators operating for 50 hours during power shutoff, staff estimated excess emissions of 24.3 tons of NOx, 101.5 tons of THC, and 10.6 tons of PM. The calculation below outlines the assumptions used for this emissions impact assessment. Obviously, a more refined estimate can be made with additional information.

[3] Survey of Small Off-Road Engines (SORE) Operating within California: Results from Surveys with Four Statewide Populations, Submitted May 15, 2019, Prepared by the Social Science Research Center (SSRC) at CSU, Fullerton.
[4] https://ww3.arb.ca.gov/msprog/mailouts/ecars1805/ecars1805.pdf?_ga=2.15158582.1846785299.1570743950-1632999103.1458687259
[5] https://ww2.arb.ca.gov/our-work/programs/mobile-source-emissions-inventory/msei-road-archives

Portable Diesel Generators (above 25 hp)

Portable diesel generators are generally much larger and supply more power than gasoline generators, and could be used during PSPS events to supply power to larger facilities (such as schools, industrial facilities, or buildings). Table 3 provides CARB's latest population, activity, and emissions associated diesel portable generators registered under CARB's PERP program[6].

Table 3: Emissions and Population of Diesel portable generators registered under CARB's PERP program

	Population (statewide)	Annual Activity (hours)	NOx (tons/yr)	PM (tons/yr)	PM25 (tons/yr)
Portable Equipment - Non-Rental Generator	5,081	1,299	2,537	99	91
Portable Equipment - Rental Generator	7,764	1,392	3,363	123	113

For assessing the emissions impact associated with this event, this analysis will assume that the percent of businesses that use generators and backup generators that are impacted by the PSPS is roughly proportional to the percent of households impacted (about 973,000 households out of 13,000,000 in California, or about 7.5 percent of the population of generators in the state). Table 4 shows the excess emissions from the use of portable diesel power generators during PSPS events assuming 50 hours of operations.

Table 4: Population and excess emissions from the use of portable diesel powered generators during October 2019 PSPS events

	Additional Generators Running in PSPS	NOx (tons)	PM (tons)	PM2.5 (tons)
Portable Equipment - Non-Rental Generator	381	7.3	0.30	0.30
Portable Equipment - Rental Generator	582	9.1	0.30	0.30
Total	**964**	**16.45**	**0.61**	**0.61**

Permitted Stationary Back-Up Generators (BUG)

Population

Data on permitted stationary back-up generators were provided to CARB by several air districts. Staff used the facility ID from the districts permit data to find the address of the facility that the stationary BUGs are operating and determined whether those BUGs were impacted by the PSPS events or not. Using this process, staff determined that almost 1,810 stationary BUGs across California were impacted by the October 2019 PSPS events.

Emission Factors

Additionally, using actual emission factors for each diesel BUG engines provided in the districts' stationary BUGs database (i.e., stationary BUGs permit database), staff assumed a work based emission factors of 0.44 g/bhp-hr for PM and 6.7 g/bhp-hr for NOx, based on averaging of a

[6] https://ww2.arb.ca.gov/our-work/programs/portable-equipment-registration-program-perp

sample of permitted diesel powered backup generators in the state. The analysis also indicated that an average permitted back-up generator has a power rating of ~ 627 hp and they can go up as high as 4,400 hp which when combined with a load factor assumption of 30% resulted in an effective power of 188 hp. Table 5 provides a summary of excess emissions associated with the stationary BUGs impacted by the PSPS events.

Table 5: Population and excess emissions from the use of diesel powered stationary back-up generators (BUG) during October 2019 PSPS events

	Additional Generators Running in PSPS	NOx (tons)	PM (tons)	Diesel PM (tons)
Permitted Stationary Back-Up Generators	1,810	126	8.3	8.3

GUIDELINES

FOR

COMMUNITY NOISE

Edited by

Birgitta Berglund
Thomas Lindvall
Dietrich H Schwela

This WHO document on the *Guidelines for Community Noise* is the outcome of the WHO- expert task force meeting held in London, United Kingdom, in April 1999. It bases on the document entitled "Community Noise" that was prepared for the World Health Organization and published in 1995 by the Stockholm University and Karolinska Institute.

World Health Organization, Geneva
Cluster of Sustainable Development and Healthy Environment (SDE)
Department of the Protection of the Human Environment (PHE)
Occupational and Environmental Health (OEH)

TABLE OF CONTENTS

Foreword

Noise has always been an important environmental problem for man. In ancient Rome, rules existed as to the noise emitted from the ironed wheels of wagons which battered the stones on the pavement, causing disruption of sleep and annoyance to the Romans. In Medieval Europe, horse carriages and horse back riding were not allowed during night time in certain cities to ensure a peaceful sleep for the inhabitants. However, the noise problems of the past are incomparable with those of modern society. An immense number of cars regularly cross our cities and the countryside. There are heavily laden lorries with diesel engines, badly silenced both for engine and exhaust noise, in cities and on highways day and night. Aircraft and trains add to the environmental noise scenario. In industry, machinery emits high noise levels and amusement centres and pleasure vehicles distract leisure time relaxation.

In comparison to other pollutants, the control of environmental noise has been hampered by insufficient knowledge of its effects on humans and of dose-response relationships as well as a lack of defined criteria. While it has been suggested that noise pollution is primarily a "luxury" problem for developed countries, one cannot ignore that the exposure is often higher in developing countries, due to bad planning and poor construction of buildings. The effects of the noise are just as widespread and the long term consequences for health are the same. In this perspective, practical action to limit and control the exposure to environmental noise are essential. Such action must be based upon proper scientific evaluation of available data on effects, and particularly dose-response relationships. The basis for this is the
process of risk assessment and risk management.

The extent of the noise problem is large. In the European Union countries about 40 % of the population are exposed to road traffic noise with an equivalent sound pressure level exceeding 55 dB(A) daytime and 20 % are exposed to levels exceeding 65 dB(A). Taking all exposure to transportation noise together about half of the European Union citizens are estimated to live in zones which do not ensure acoustical comfort to residents. More than 30 % are exposed at night to equivalent sound pressure levels exceeding 55 dB(A) which are disturbing to sleep. The noise pollution problem is also severe in cities of developing countries and caused mainly by traffic. Data collected alongside densely travelled roads were found to have equivalent sound pressure levels for 24 hours of 75 to 80 dB(A).

The scope of WHO's effort to derive guidelines for community noise is to consolidate actual scientific knowledge on the health impacts of community noise and to provide guidance to environmental health authorities and professional trying to protect people from the harmful effects of noise in non-industrial environments. Guidance on the health effects of noise exposure of the population has already been given in an early publication of the series of Environmental Health Criteria. The health risk to humans from exposure to environmental noise was evaluated and guidelines values derived. The issue of noise control and health protection was briefly addressed.
At a WHO/EURO Task Force Meeting in Düsseldorf, Germany, in 1992, the health criteria and guideline values were revised and it was agreed upon updated guidelines in consensus. The essentials of the deliberations of the Task Force were published by Stockholm University and Karolinska Institute in 1995. In a recent Expert Task Force Meeting convened in April 1999 in London, United Kingdom, the Guidelines for Community Noise were extended to provide global coverage and applicability, and the issues of noise assessment and control were addressed in more detail. This document is the outcome of the consensus deliberations of the WHO Expert Task Force.

Dr Richard Helmer
Director, Department of Protection of the Human Environment
Cluster Sustainable Development and Healthy Environments

Preface

Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from all sources except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic, industries, construction and public work, and the neighbourhood. The main indoor sources of noise are ventilation systems, office machines, home appliances and neighbours. Typical neighbourhood noise comes from premises and installations related to the catering trade (restaurant, cafeterias, discotheques, etc.); from live or recorded music; sport events including motor sports; playgrounds; car parks; and domestic animals such as barking dogs. Many countries have regulated community noise from road and rail traffic, construction machines and industrial plants by applying emission standards, and by regulating the acoustical properties of buildings. In contrast, few countries have regulations on community noise from the neighbourhood, probably due to the lack of methods to define and measure it, and to the difficulty of controlling it. In large cities throughout the world, the general population is increasingly exposed to community due to the sources mentioned above and the health effects of these exposures are considered to be a more and more important public health problem. Specific effects to be considered when setting community noise guidelines include: interference with communication; noise-induced hearing loss; sleep disturbance effects; cardiovascular and psycho-physiological effects; performance reduction effects; annoyance responses; and effects on social behaviour.

Since 1980, the World Health Organization (WHO) has addressed the problem of community noise. Health-based guidelines on community noise can serve as the basis for deriving noise standards within a framework of noise management. Key issues of noise management include abatement options; models for forecasting and for assessing source control action; setting noise emission standards for existing and planned sources; noise exposure assessment; and testing the compliance of noise exposure with noise immission standards. In 1992, the WHO Regional Office for Europe convened a task force meeting which set up guidelines for community noise. A preliminary publication of the Karolinska Institute, Stockholm, on behalf of WHO, appeared in 1995. This publication served as the basis for the globally applicable *Guidelines for Community Noise* presented in this document. An expert task force meeting was convened by WHO in March 1999 in London, United Kingdom, to finalize the guidelines.

The *Guidelines for Community Noise* have been prepared as a practical response to the need for action on community noise at the local level, as well as the need for improved legislation, management and guidance at the national and regional levels. WHO will be pleased to see that these guidelines are used widely. Continuing efforts will be made to improve its content and structure. It would be appreciated if the users of the *Guidelines* provide feedback from its use and their own experiences. Please send your comments and suggestions on the WHO *Guidelines for Community Noise – Guideline document* to the Department of the Protection of the Human Environment, Occupational and Environmental Health, World Health Organization, Geneva, Switzerland (Fax: +41 22-791 4123, e-mail: schwelad@who.int).

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Dr Sudhakar B. Ogale, Medical College and KEM Hospital, Parel, Mumbai, India;
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Executive Summary

1. Introduction

Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from all sources except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic; industries; construction and public work; and the neighbourhood. The main indoor noise sources are ventilation systems, office machines, home appliances and neighbours.

In the European Union about 40% of the population is exposed to road traffic noise with an equivalent sound pressure level exceeding 55 dB(A) daytime, and 20% are exposed to levels exceeding 65 dB(A). When all transportation noise is considered, more than half of all European Union citizens is estimated to live in zones that do not ensure acoustical comfort to residents. At night, more than 30% are exposed to equivalent sound pressure levels exceeding 55 dB(A), which are disturbing to sleep. Noise pollution is also severe in cities of developing countries. It is caused mainly by traffic and alongside densely-travelled roads equivalent sound pressure levels for 24 hours can reach 75–80 dB(A).

In contrast to many other environmental problems, noise pollution continues to grow and it is accompanied by an increasing number of complaints from people exposed to the noise. The growth in noise pollution is unsustainable because it involves direct, as well as cumulative, adverse health effects. It also adversely affects future generations, and has socio-cultural, esthetic and economic effects.

2. Noise sources and measurement

Physically, there is no distinction between sound and noise. Sound is a sensory perception and the complex pattern of sound waves is labeled noise, music, speech etc. Noise is thus defined as unwanted sound.

Most environmental noises can be approximately described by several simple measures. All measures consider the frequency content of the sounds, the overall sound pressure levels and the variation of these levels with time. Sound pressure is a basic measure of the vibrations of air that make up sound. Because the range of sound pressures that human listeners can detect is very wide, these levels are measured on a logarithmic scale with units of decibels. Consequently, sound pressure levels cannot be added or averaged arithmetically. Also, the sound levels of most noises vary with time, and when sound pressure levels are calculated, the instantaneous pressure fluctuations must be integrated over some time interval.

Most environmental sounds are made up of a complex mix of many different frequencies. Frequency refers to the number of vibrations per second of the air in which the sound is propagating and it is measured in Hertz (Hz). The audible frequency range is normally considered to be 20–20 000 Hz for younger listeners with unimpaired hearing. However, our hearing systems are not equally sensitive to all sound frequencies, and to compensate for this various types of filters or frequency weighting have been used to determine the relative strengths of frequency components making up a particular environmental noise. The A-weighting is most commonly used and weights lower frequencies as less important than mid- and higher-frequencies. It is intended to approximate the frequency response of our hearing system.

The effect of a combination of noise events is related to the combined sound energy of those events (the equal energy principle). The sum of the total energy over some time period gives a level equivalent to the average sound energy over that period. Thus, LAeq,T is the energy average equivalent level of the A-weighted sound over a period T. LAeq,T should be used to measure continuing sounds, such as road traffic noise or types of more-or-less continuous industrial noises. However, when there are distinct events to the noise, as with aircraft or railway noise, measures of individual events such as the maximum

noise level (LAmax), or the weighted sound exposure level (SEL), should also be obtained in addition to LAeq,T. Time-varying environmental sound levels have also been described in terms of percentile levels.

Currently, the recommended practice is to assume that the equal energy principle is approximately valid for most types of noise and that a simple LAeq,T measure will indicate the expected effects of the noise reasonably well. When the noise consists of a small number of discrete events, the A-weighted maximum level (LAmax) is a better indicator of the disturbance to sleep and other activities. In most cases, however, the A-weighted sound exposure level (SEL) provides a more consistent measure of single-noise events because it is based on integration over the complete noise event. In combining day and night LAeq,T values, night-time weightings are often added. Night-time weightings are intended to reflect the expected increased sensitivity to annoyance at night, but they do not protect people from sleep disturbance.

Where there are no clear reasons for using other measures, it is recommended that LAeq,T be used to evaluate more-or-less continuous environmental noises. Where the noise is principally composed of a small number of discrete events, the additional use of LAmax or SEL is recommended. There are definite limitations to these simple measures, but there are also many practical advantages, including economy and the benefits of a standardized approach.

3. Adverse health effects of noise

The health significance of noise pollution is given in chapter 3 of the *Guidelines* under separate headings according to the specific effects: noise-induced hearing impairment; interference with speech communication; disturbance of rest and sleep; psychophysiological, mental-health and performance effects; effects on residential behaviour and annoyance; and interference with intended activities. This chapter also considers vulnerable groups and the combined effects of mixed noise sources.

Hearing impairment is typically defined as an increase in the threshold of hearing. Hearing deficits may be accompanied by tinnitus (ringing in the ears). Noise-induced hearing impairment occurs predominantly in the higher frequency range of 3 000–6 000 Hz, with the largest effect at 4 000 Hz. But with increasing LAeq,8h and increasing exposure time, noise-induced hearing impairment occurs even at frequencies as low as 2 000 Hz. However, hearing impairment is not expected to occur at LAeq,8h levels of 75 dB(A) or below, even for prolonged occupational noise exposure.

Worldwide, noise-induced hearing impairment is the most prevalent irreversible occupational hazard and it is estimated that 120 million people worldwide have disabling hearing difficulties. In developing countries, not only occupational noise but also environmental noise is an increasing risk factor for hearing impairment. Hearing damage can also be caused by certain diseases, some industrial chemicals, ototoxic drugs, blows to the head, accidents and hereditary origins. Hearing deterioration is also associated with the ageing process itself (presbyacusis).

The extent of hearing impairment in populations exposed to occupational noise depends on the value of LAeq,8h, the number of noise-exposed years, and on individual susceptibility. Men and women are equally at risk for noise-induced hearing impairment. It is expected that environmental and leisure-time noise with a LAeq,24h of 70 dB(A) or below will not cause hearing impairment in the large majority of people, even after a lifetime exposure. For adults exposed to impulse noise at the workplace, the noise limit is set at peak sound pressure levels of 140 dB, and the same limit is assumed to be appropriate for environmental and leisure-time noise. In the case of children, however, taking into account their habits while playing with noisy toys, the peak sound pressure should never exceed 120 dB. For shooting noise with LAeq,24h levels greater than 80 dB(A), there may be an increased risk for noise-induced hearing impairment.

The main social consequence of hearing impairment is the inability to understand speech in daily living conditions, and this is considered to be a severe social handicap. Even small values of hearing impairment (10 dB averaged over 2 000 and 4 000 Hz and over both ears) may adversely affect speech comprehension.

Speech intelligibility is adversely affected by noise. Most of the acoustical energy of speech is in the frequency range of 100–6 000 Hz, with the most important cue-bearing energy being between 300–3 000 Hz. Speech interference is basically a masking process, in which simultaneous interfering noise renders speech incapable of being understood. Environmental noise may also mask other acoustical signals that are important for daily life, such as door bells, telephone signals, alarm clocks, fire alarms and other warning signals, and music.

Speech intelligibility in everyday living conditions is influenced by speech level; speech pronunciation; talker-to-listener distance; sound level and other characteristics of the interfering noise; hearing acuity; and by the level of attention. Indoors, speech communication is also affected by the reverberation characteristics of the room. Reverberation times over 1 s produce loss in speech discrimination and make speech perception more difficult and straining. For full sentence intelligibility in listeners with normal hearing, the signal-to-noise ratio (i.e. the difference between the speech level and the sound level of the interfering noise) should be at least 15 dB(A). Since the sound pressure level of normal speech is about 50 dB(A), noise with sound levels of 35 dB(A) or more interferes with the intelligibility of speech in smaller rooms. For vulnerable groups even lower background levels are needed, and a reverberation time below 0.6 s is desirable for adequate speech intelligibility, even in a quiet environment.

The inability to understand speech results in a large number of personal handicaps and behavioural changes. Particularly vulnerable are the hearing impaired, the elderly, children in the process of language and reading acquisition, and individuals who are not familiar with the spoken language.

Sleep disturbance is a major effect of environmental noise. It may cause primary effects during sleep, and secondary effects that can be assessed the day after night-time noise exposure. Uninterrupted sleep is a prerequisite for good physiological and mental functioning, and the primary effects of sleep disturbance are: difficulty in falling asleep; awakenings and alterations of sleep stages or depth; increased blood pressure, heart rate and finger pulse amplitude; vasoconstriction; changes in respiration; cardiac arrhythmia; and increased body movements. The difference between the sound levels of a noise event and background sound levels, rather than the absolute noise level, may determine the reaction probability. The probability of being awakened increases with the number of noise events per night. The secondary, or after-effects, the following morning or day(s) are: reduced perceived sleep quality; increased fatigue; depressed mood or well-being; and decreased performance.

For a good night's sleep, the equivalent sound level should not exceed 30 dB(A) for continuous background noise, and individual noise events exceeding 45 dB(A) should be avoided. In setting limits for single night-time noise exposures, the intermittent character of the noise has to be taken into account. This can be achieved, for example, by measuring the number of noise events, as well as the difference between the maximum sound level and the background sound level. Special attention should also be given to: noise sources in an environment with low background sound levels; combinations of noise and vibrations; and to noise sources with low-frequency components.

Physiological Functions. In workers exposed to noise, and in people living near airports, industries and noisy streets, noise exposure may have a large temporary, as well as permanent, impact on physiological functions. After prolonged exposure, susceptible individuals in the general population may develop permanent effects, such as hypertension and ischaemic heart disease associated with exposure to high sound levels. The magnitude and duration of the effects are determined in part by individual characteristics, lifestyle behaviours and environmental conditions. Sounds also evoke reflex responses, particularly when they are unfamiliar and have a sudden onset.

Workers exposed to high levels of industrial noise for 5–30 years may show increased blood pressure and an increased risk for hypertension. Cardiovascular effects have also been demonstrated after long-term exposure to air- and road-traffic with LAeq,24h values of 65–70 dB(A). Although the associations are weak, the effect is somewhat stronger for ischaemic heart disease than for hypertension. Still, these small risk increments are important because a large number of people are exposed.

Mental Illness. Environmental noise is not believed to cause mental illness directly, but it is assumed that it can accelerate and intensify the development of latent mental disorders. Exposure to high levels of occupational noise has been associated with development of neurosis, but the findings on environmental noise and mental-health effects are inconclusive. Nevertheless, studies on the use of drugs such as tranquillizers and sleeping pills, on psychiatric symptoms and on mental hospital admission rates, suggest that community noise may have adverse effects on mental health.

Performance. It has been shown, mainly in workers and children, that noise can adversely affect performance of cognitive tasks. Although noise-induced arousal may produce better performance in simple tasks in the short term, cognitive performance substantially deteriorates for more complex tasks. Reading, attention, problem solving and memorization are among the cognitive effects most strongly affected by noise. Noise can also act as a distracting stimulus and impulsive noise events may produce disruptive effects as a result of startle responses.

Noise exposure may also produce after-effects that negatively affect performance. In schools around airports, children chronically exposed to aircraft noise under-perform in proof reading, in persistence on challenging puzzles, in tests of reading acquisition and in motivational capabilities. It is crucial to recognize that some of the adaptation strategies to aircraft noise, and the effort necessary to maintain task performance, come at a price. Children from noisier areas have heightened sympathetic arousal, as indicated by increased stress hormone levels, and elevated resting blood pressure. Noise may also produce impairments and increase in errors at work, and some accidents may be an indicator of performance deficits.

Social and Behavioural Effects of Noise; Annoyance. Noise can produce a number of social and behavioural effects as well as annoyance. These effects are often complex, subtle and indirect and many effects are assumed to result from the interaction of a number of non-auditory variables. The effect of community noise on annoyance can be evaluated by questionnaires or by assessing the disturbance of specific activities. However, it should be recognized that equal levels of different traffic and industrial noises cause different magnitudes of annoyance. This is because annoyance in populations varies not only with the characteristics of the noise, including the noise source, but also depends to a large degree on many non-acoustical factors of a social, psychological, or economic nature. The correlation between noise exposure and general annoyance is much higher at group level than at individual level. Noise above 80 dB(A) may also reduce helping behaviour and increase aggressive behaviour. There is particular concern that high-level continuous noise exposures may increase the susceptibility of schoolchildren to feelings of helplessness.

Stronger reactions have been observed when noise is accompanied by vibrations and contains low-frequency components, or when the noise contains impulses, such as with shooting noise. Temporary, stronger reactions occur when the noise exposure increases over time, compared to a constant noise exposure. In most cases, LAeq,24h and L_{dn} are acceptable approximations of noise exposure related to annoyance. However, there is growing concern that all the component parameters should be individually assessed in noise exposure investigations, at least in the complex cases. There is no consensus on a model for total annoyance due to a combination of environmental noise sources.

Combined Effects on Health of Noise from Mixed Sources. Many acoustical environments consist of sounds from more than one source, i.e. there are mixed sources, and some combinations of effects are common. For example, noise may interfere with speech in the day and create sleep disturbance at night.

These conditions certainly apply to residential areas heavily polluted with noise. Therefore, it is important that the total adverse health load of noise be considered over 24 hours, and that the precautionary principle for sustainable development be applied.

Vulnerable Subgroups. Vulnerable subgroups of the general population should be considered when recommending noise protection or noise regulations. The types of noise effects, specific environments and specific lifestyles are all factors that should be addressed for these subgroups. Examples of vulnerable subgroups are: people with particular diseases or medical problems (e.g. high blood pressure); people in hospitals or rehabilitating at home; people dealing with complex cognitive tasks; the blind; people with hearing impairment; fetuses, babies and young children; and the elderly in general. People with impaired hearing are the most adversely affected with respect to speech intelligibility. Even slight hearing impairments in the high-frequency sound range may cause problems with speech perception in a noisy environment. A majority of the population belongs to the subgroup that is vulnerable to speech interference.

4. Guideline values

In chapter 4, guideline values are given for specific health effects of noise and for specific environments.

Specific health effects.

Interference with Speech Perception. A majority of the population is susceptible to speech interference by noise and belongs to a vulnerable subgroup. Most sensitive are the elderly and persons with impaired hearing. Even slight hearing impairments in the high-frequency range may cause problems with speech perception in a noisy environment. From about 40 years of age, the ability of people to interpret difficult, spoken messages with low linguistic redundancy is impaired compared to people 20–30 years old. It has also been shown that high noise levels and long reverberation times have more adverse effects in children, who have not completed language acquisition, than in young adults.

When listening to complicated messages (at school, foreign languages, telephone conversation) the signal-to-noise ratio should be at least 15 dB with a voice level of 50 dB(A). This sound level corresponds on average to a casual voice level in both women and men at 1 m distance. Consequently, for clear speech perception the background noise level should not exceed 35 dB(A). In classrooms or conference rooms, where speech perception is of paramount importance, or for sensitive groups, background noise levels should be as low as possible. Reverberation times below 1 s are also necessary for good speech intelligibility in smaller rooms. For sensitive groups, such as the elderly, a reverberation time below 0.6 s is desirable for adequate speech intelligibility even in a quiet environment.

Hearing Impairment. Noise that gives rise to hearing impairment is by no means restricted to occupational situations. High noise levels can also occur in open air concerts, discotheques, motor sports, shooting ranges, in dwellings from loudspeakers, or from leisure activities. Other important sources of loud noise are headphones, as well as toys and fireworks which can emit impulse noise. The ISO standard 1999 gives a method for estimating noise-induced hearing impairment in populations exposed to all types of noise (continuous, intermittent, impulse) during working hours. However, the evidence strongly suggests that this method should also be used to calculate hearing impairment due to noise exposure from environmental and leisure time activities. The ISO standard 1999 implies that long-term exposure to LAeq,24h noise levels of up to 70 dB(A) will not result in hearing impairment. To avoid hearing loss from impulse noise exposure, peak sound pressures should never exceed 140 dB for adults, and 120 dB for children.

Sleep Disturbance. Measurable effects of noise on sleep begin at LAeq levels of about 30 dB. However, the more intense the background noise, the more disturbing is its effect on sleep. Sensitive groups mainly include the elderly, shift workers, people with physical or mental disorders and other individuals who have difficulty sleeping.

Sleep disturbance from intermittent noise events increases with the maximum noise level. Even if the total equivalent noise level is fairly low, a small number of noise events with a high maximum sound pressure level will affect sleep. Therefore, to avoid sleep disturbance, guidelines for community noise should be expressed in terms of the equivalent sound level of the noise, as well as in terms of maximum noise levels and the number of noise events. It should be noted that low-frequency noise, for example, from ventilation systems, can disturb rest and sleep even at low sound pressure levels.

When noise is continuous, the equivalent sound pressure level should not exceed 30 dB(A) indoors, if negative effects on sleep are to be avoided. For noise with a large proportion of low-frequency sound a still lower guideline value is recommended. When the background noise is low, noise exceeding 45 dB LAmax should be limited, if possible, and for sensitive persons an even lower limit is preferred. Noise mitigation targeted to the first part of the night is believed to be an effective means for helping people fall asleep. It should be noted that the adverse effect of noise partly depends on the nature of the source. A special situation is for newborns in incubators, for which the noise can cause sleep disturbance and other health effects.

Reading Acquisition. Chronic exposure to noise during early childhood appears to impair reading acquisition and reduces motivational capabilities. Evidence indicates that the longer the exposure, the greater the damage. Of recent concern are the concomitant psychophysiological changes (blood pressure and stress hormone levels). There is insufficient information on these effects to set specific guideline values. It is clear, however, that daycare centres and schools should not be located near major noise sources, such as highways, airports, and industrial sites.

Annoyance. The capacity of a noise to induce annoyance depends upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time. During daytime, few people are highly annoyed at LAeq levels below 55 dB(A), and few are moderately annoyed at LAeq levels below 50 dB(A). Sound levels during the evening and night should be 5–10 dB lower than during the day. Noise with low-frequency components require lower guideline values. For intermittent noise, it is emphasized that it is necessary to take into account both the maximum sound pressure level and the number of noise events. Guidelines or noise abatement measures should also take into account residential outdoor activities.

Social Behaviour. The effects of environmental noise may be evaluated by assessing its interference with social behavior and other activities. For many community noises, interference with rest/recreation/watching television seem to be the most important effects. There is fairly consistent evidence that noise above 80 dB(A) causes reduced helping behavior, and that loud noise also increases aggressive behavior in individuals predisposed to aggressiveness. In schoolchildren, there is also concern that high levels of chronic noise contribute to feelings of helplessness. Guidelines on this issue, together with cardiovascular and mental effects, must await further research.

Specific environments.

A noise measure based only on energy summation and expressed as the conventional equivalent measure, LAeq, is not enough to characterize most noise environments. It is equally important to measure the maximum values of noise fluctuations, preferably combined with a measure of the number of noise events. If the noise includes a large proportion of low-frequency components, still lower values than the guideline values below will be needed. When prominent low-frequency components are present, noise

measures based on A-weighting are inappropriate. The difference between dB(C) and dB(A) will give crude information about the presence of low-frequency components in noise, but if the difference is more than 10 dB, it is recommended that a frequency analysis of the noise be performed. It should be noted that a large proportion of low-frequency components in noise may increase considerably the adverse effects on health.

In Dwellings. The effects of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 dB LAeq for continuous noise and 45 dB LAmax for single sound events. Lower noise levels may be disturbing depending on the nature of the noise source. At night-time, outside sound levels about 1 metre from facades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedroom windows open. This value was obtained by assuming that the noise reduction from outside to inside with the window open is 15 dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB LAeq. The maximum sound pressure level should be measured with the sound pressure meter set at "Fast".

To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB LAeq on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB LAeq. Where it is practical and feasible, the lower outdoor sound level should be considered the maximum desirable sound level for new development.

In Schools and Preschools. For schools, the critical effects of noise are speech interference, disturbance of information extraction (e.g. comprehension and reading acquisition), message communication and annoyance. To be able to hear and understand spoken messages in class rooms, the background sound level should not exceed 35 dB LAeq during teaching sessions. For hearing impaired children, a still lower sound level may be needed. The reverberation time in the classroom should be about 0.6 s, and preferably lower for hearing impaired children. For assembly halls and cafeterias in school buildings, the reverberation time should be less than 1 s. For outdoor playgrounds the sound level of the noise from external sources should not exceed 55 dB LAeq, the same value given for outdoor residential areas in daytime.

For preschools, the same critical effects and guideline values apply as for schools. In bedrooms in preschools during sleeping hours, the guideline values for bedrooms in dwellings should be used.

In Hospitals. For most spaces in hospitals, the critical effects are sleep disturbance, annoyance, and communication interference, including warning signals. The LAmax of sound events during the night should not exceed 40 dB(A) indoors. For ward rooms in hospitals, the guideline values indoors are 30dB LAeq, together with 40 dB LAmax during night. During the day and evening the guideline value indoors is 30 dB LAeq. The maximum level should be measured with the sound pressure instrument set at "Fast".

Since patients have less ability to cope with stress, the LAeq level should not exceed 35 dB in most rooms in which patients are being treated or observed. Attention should be given to the sound levels in intensive care units and operating theaters. Sound inside incubators may result in health problems for neonates, including sleep disturbance, and may also lead to hearing impairment. Guideline values for sound levels in incubators must await future research.

Ceremonies, Festivals and Entertainment Events. In many countries, there are regular ceremonies, festivals and entertainment events to celebrate life periods. Such events typically produce loud sounds, including music and impulsive sounds. There is widespread concern about the effect of loud music and impulsive sounds on young people who frequently attend concerts, discotheques, video arcades, cinemas, amusement parks and spectator events. At these events, the sound level typically exceeds 100 dB LAeq. Such noise exposure could lead to significant hearing impairment after frequent attendances.

Noise exposure for employees of these venues should be controlled by established occupational standards; and at the very least, the same standards should apply to the patrons of these premises. Patrons should not be exposed to sound levels greater than 100 dB LAeq during a four-hour period more than four times per year. To avoid acute hearing impairment the LAmax should always be below 110 dB.

Headphones. To avoid hearing impairment from music played back in headphones, in both adults and children, the equivalent sound level over 24 hours should not exceed 70 dB(A). This implies that for a daily one hour exposure the LAeq level should not exceed 85 dB(A). To avoid acute hearing impairment LAmax should always be below 110 dB(A). The exposures are expressed in free-field equivalent sound level.

Toys, Fireworks and Firearms. To avoid acute mechanical damage to the inner ear from impulsive sounds from toys, fireworks and firearms, adults should never be exposed to more than 140 dB(lin) peak sound pressure level. To account for the vulnerability in children when playing, the peak sound pressure produced by toys should not exceed 120 dB(lin), measured close to the ears (100 mm). To avoid acute hearing impairment LAmax should always be below 110 dB(A).

Parkland and Conservation Areas. Existing large quiet outdoor areas should be preserved and the signal-to-noise ratio kept low.

Table 1 presents the WHO guideline values arranged according to specific environments and critical health effects. The guideline values consider all identified adverse health effects for the specific environment. An adverse effect of noise refers to any temporary or long-term impairment of physical, psychological or social functioning that is associated with noise exposure. Specific noise limits have been set for each health effect, using the lowest noise level that produces an adverse health effect (i.e. the critical health effect). Although the guideline values refer to sound levels impacting the most exposed receiver at the listed environments, they are applicable to the general population. The time base for LAeq for “daytime” and “night-time” is 12–16 hours and 8 hours, respectively. No time base is given for evenings, but typically the guideline value should be 5–10 dB lower than in the daytime. Other time bases are recommended for schools, preschools and playgrounds, depending on activity.

It is not enough to characterize the noise environment in terms of noise measures or indices based only on energy summation (e.g., LAeq), because different critical health effects require different descriptions. It is equally important to display the maximum values of the noise fluctuations, preferably combined with a measure of the number of noise events. A separate characterization of night-time noise exposures is also necessary. For indoor environments, reverberation time is also an important factor for things such as speech intelligibility. If the noise includes a large proportion of low-frequency components, still lower guideline values should be applied. Supplementary to the guideline values given in Table 1, precautions should be taken for vulnerable groups and for noise of certain character (e.g. low-frequency components, low background noise).

Table 1: Guideline values for community noise in specific environments.

Specific environment	Critical health effect(s)	L_{Aeq} [dB(A)]	Time base [hours]	L_{Amax} fast [dB]
Outdoor living area	Serious annoyance, daytime and evening Moderate annoyance, daytime and evening	55 50	16 16	- -
Dwelling, indoors Inside bedrooms	Speech intelligibility & moderate annoyance, daytime & evening Sleep disturbance, night-time	35 30	16 8	 45
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60
School class rooms & pre-schools, indoors	Speech intelligibility, disturbance of information extraction, message communication	35	during class	-
Pre-school bedrooms, indoor	Sleep disturbance	30	sleeping-time	45
School, playground outdoor	Annoyance (external source)	55	during play	-
Hospital, ward rooms, indoors	Sleep disturbance, night-time Sleep disturbance, daytime and evenings	30 30	8 16	40 -
Hospitals, treatment rooms, indoors	Interference with rest and recovery	#1		
Industrial, commercial shopping and traffic areas, indoors and outdoors	Hearing impairment	70	24	110
Ceremonies, festivals and entertainment events	Hearing impairment (patrons:<5 times/year)	100	4	110
Public addresses, indoors and outdoors	Hearing impairment	85	1	110
Music and other sounds through headphones/ earphones	Hearing impairment (free-field value)	85 #4	1	110
Impulse sounds from toys, fireworks and firearms	Hearing impairment (adults) Hearing impairment (children)	- -	- -	140 #2 120 #2
Outdoors in parkland and conservations areas	Disruption of tranquillity	#3		

#1: As low as possible.

#2: Peak sound pressure (not LAF, max) measured 100 mm from the ear.
#3: Existing quiet outdoor areas should be preserved and the ratio of intruding noise to natural background sound should be kept low.
#4: Under headphones, adapted to free-field values.

5. Noise Management

Chapter 5 is devoted to noise management with discussions on: strategies and priorities in managing indoor noise levels; noise policies and legislation; the impact of environmental noise; and on the enforcement of regulatory standards.

The fundamental goals of noise management are to develop criteria for deriving safe noise exposure levels and to promote noise assessment and control as part of environmental health programmes. These basic goals should guide both international and national policies for noise management. The United Nation's Agenda 21 supports a number of environmental management principles on which government policies, including noise management policies, can be based: the principle of precaution; the "polluter pays" principle; and noise prevention. In all cases, noise should be reduced to the lowest level achievable in the particular situation. When there is a reasonable possibility that the public health will be endangered, even though scientific proof may be lacking, action should be taken to protect the public health, without awaiting the full scientific proof. The full costs associated with noise pollution (including monitoring, management, lowering levels and supervision) should be met by those responsible for the source of noise. Action should be taken where possible to reduce noise at the source.

A legal framework is needed to provide a context for noise management. National noise standards can usually be based on a consideration of international guidelines, such as these *Guidelines for Community Noise*, as well as national criteria documents, which consider dose-response relationships for the effects of noise on human health. National standards take into account the technological, social, economic and political factors within the country. A staged program of noise abatement should also be implemented to achieve the optimum health protection levels over the long term.

Other components of a noise management plan include: noise level monitoring; noise exposure mapping; exposure modeling; noise control approaches (such as mitigation and precautionary measures); and evaluation of control options. Many of the problems associated with high noise levels can be prevented at low cost, if governments develop and implement an integrated strategy for the indoor environment, in concert with all social and economic partners. Governments should establish a "National Plan for a Sustainable Noise Indoor Environment" that applies both to new construction as well as to existing buildings.

The actual priorities in rational noise management will differ for each country. Priority setting in noise management refers to prioritizing the health risks to be avoided and concentrating on the most important sources of noise. Different countries have adopted a range of approaches to noise control, using different policies and regulations. A number of these are outlined in chapter 5 and Appendix 2, as examples. It is evident that noise emission standards have proven insufficient and that the trends in noise pollution are unsustainable.

The concept of environmental an environmental noise impact analysis is central to the philosophy of managing environmental noise. Such an analysis should be required before implementing any project that would significantly increase the level of environmental noise in a community (typically, greater than a 5 dB increase). The analysis should include: a baseline description of the existing noise environment; the

expected level of noise from the new source; an assessment of the adverse health effects; an estimation of the population at risk; the calculation of exposure-response relationships; an assessment of risks and their acceptability; and a cost-benefit analysis.

Noise management should:

1. Start monitoring human exposures to noise.
2. Have health control require mitigation of noise immissions, and not just of noise source emissions. The following should be taken into consideration:
    - specific environments such as schools, playgrounds, homes, hospitals.
    - environments with multiple noise sources, or which may amplify the effects of noise.
    - sensitive time periods such as evenings, nights and holidays.
    - groups at high risk, such as children and the hearing impaired.
3. Consider the noise consequences when planning transport systems and land use.
4. Introduce surveillance systems for noise-related adverse health effects.
5. Assess the effectiveness of noise policies in reducing adverse health effects and exposure, and in improving supportive "soundscapes".
6. Adopt these *Guidelines for Community Noise* as intermediary targets for improving human health.
7. Adopt precautionary actions for a sustainable development of the acoustical environments.

Conclusions and recommendations

In chapter 6 are discussed: the implementation of the guidelines; further WHO work on noise; and research needs are recommended.

Implementation. For implementation of the guidelines it is recommended that:

- Governments should protection the population from community noise and consider it an integral part of their policy of environmental protection.
- Governments should consider implementing action plans with short-term, medium-term and long-term objectives for reducing noise levels.
- Governments should adopt the *Health Guidelines for Community Noise* values as targets to be achieved in the long-term.
- Governments should include noise as an important public health issue in environmental impact assessments.
- Legislation should be put in place to allow for the reduction of sound levels.
- Existing legislation should be enforced.
- Municipalities should develop low noise implementation plans.
- Cost-effectiveness and cost-benefit analyses should be considered potential instruments for meaningful management decisions.
- Governments should support more policy-relevant research.

Future Work. The Expert Task Force worked out several suggestions for future work for the WHO in the field of community noise. WHO should:

- Provide leadership and technical direction in defining future noise research priorities.
- Organize workshops on how to apply the guidelines.

- Provide leadership and coordinate international efforts to develop techniques for designing supportive sound environments (e.g. "soundscapes").
- Provide leadership for programs to assess the effectiveness of health-related noise policies and regulations.
- Provide leadership and technical direction for the development of sound methodologies for environmental and health impact plans.
- Encourage further investigation into using noise exposure as an indicator of environmental deterioration (e.g. black spots in cities).
- Provide leadership and technical support, and advise developing countries to facilitate development of noise policies and noise management.

Research and Development. A major step forward in raising the awareness of both the public and of decision makers is the recommendation to concentrate more research and development on variables which have monetary consequences. This means that research should consider not only dose-response relationships between sound levels, but also politically relevant variables, such as noise-induced social handicap; reduced productivity; decreased performance in learning; workplace and school absenteeism; increased drug use; and accidents.

In Appendices 1–6 are given: bibliographic references; examples of regional noise situations (African Region, American Region, Eastern Mediterranean Region, South East Asian Region, Western Pacific Region); a glossary; a list of acronyms; and a list of participants.

Introduction

Community noise (also called environmental noise, residential noise or domestic noise) is defined as noise emitted from all sources, except noise at the industrial workplace. Main sources of community noise include road, rail and air traffic, industries, construction and public work, and the neighbourhood. Typical neighbourhood noise comes from premises and installations related to the catering trade (restaurant, cafeterias, discotheques, etc.); from live or recorded music; from sporting events including motor sports; from playgrounds and car parks; and from domestic animals such as barking dogs. The main indoor sources are ventilation systems, office machines, home appliances and neighbours. Although many countries have regulations on community noise from road, rail and air traffic, and from construction and industrial plants, few have regulations on neighbourhood noise. This is probably due to the lack of methods to define and measure it, and to the difficulty of controlling it. In developed countries, too, monitoring of compliance with, and enforcement of, noise regulations are weak for lower levels of urban noise that correspond to occupationally controlled levels (>85 dB LAeq,8h; Frank 1998). Recommended guideline values based on the health effects of noise, other than occupationally-induced effects, are often not taken into account.

The extent of the community noise problem is large. In the European Union about 40% of the population is exposed to road traffic noise with an equivalent sound pressure level exceeding 55 dBA daytime; and 20% is exposed to levels exceeding 65 dBA (Lambert & Vallet 19 1994). When all transportation noise is considered, about half of all European Union citizens live in zones that do not ensure acoustical comfort to residents. At night, it is estimated that more than 30% is exposed to equivalent sound pressure levels exceeding 55 dBA, which are disturbing to sleep. The noise pollution problem is also severe in the cities of developing countries and is caused mainly by traffic. Data collected alongside densely traveled roads were found to have equivalent sound pressure levels for 24 hours of 75–80 dBA (e.g. National Environment Board Thailand 19 1990; Mage & Walsh 19 1998).

(a) In contrast to many other environmental problems, noise pollution continues to grow, accompanied by an increasing number of complaints from affected individuals. Most people are typically exposed to several noise sources, with road traffic noise being a dominant source (OECD-ECMT 19 1995). Population growth, urbanization and to a large extent technological development are the main driving forces, and future enlargements of highway systems, international airports and railway systems will only increase the noise problem. Viewed globally, the growth in urban environmental noise pollution is unsustainable, because it involves not simply the direct and cumulative adverse effects on health. It also adversely affects future generations by degrading residential, social and learning environments, with corresponding economical losses (Berglund 1998). Thus, noise is not simply a local problem, but a global issue that affects everyone (Lang 1999; Sandberg 1999) and calls for precautionary action in any environmental planning situation.

The objective of the World Health Organization (WHO) is the attainment by all peoples of the highest possible level of health. As the first principle of the WHO Constitution the definition of ‘health’ is given as: “A state of complete physical, mental and social well-

being and not merely the absence of disease or infirmity". This broad definition of health embraces the concept of well-being and, thereby, renders noise impacts such as population annoyance, interference with communication, and impaired task performance as 'health' issues. In 1992, a WHO Task Force also identified the following specific health effects for the general population that may result from community noise: interference with communication; annoyance responses; effects on sleep, and on the cardiovascular and psychophysiological systems; effects on performance, productivity, and social behavior; and noise-induced hearing impairment (WHO 1993; Berglund & Lindvall 1995; *cf*. WHO 1980). Hearing damage is expected to result from both occupational and environmental noise, especially in developing countries, where compliance with noise regulation is known to be weak (Smith 1998).

Noise is likely to continue as a major issue well into the next century, both in developed and in developing countries. Therefore, strategic action is urgently required, including continued noise control at the source and in local areas. Most importantly, joint efforts among countries are necessary at a system level, in regard to the access and use of land, airspace and seawaters, and in regard to the various modes of transportation. Certainly, mankind would benefit from societal reorganization towards healthy transport. To understand noise we must understand the different types of noise and how we measure it, where noise comes from and the effects of noise on human beings. Furthermore, noise mitigation, including noise management, has to be actively introduced and in each case the policy implications have to be evaluated for efficiency.

This document is organized as follows. In Chapter 2 noise sources and measurement are discussed, including the basic aspects of source characteristics, sound propagation and transmission. In Chapter 3 the adverse health effects of noise are characterized. These include noise-induced hearing impairment, interference with speech communication, sleep disturbance, cardiovascular and physiological effects, mental health effects, performance effects, and annoyance reactions. This chapter is rounded out by a consideration of combined noise sources and their effects, and a discussion of vulnerable groups. In Chapter 4 the Guideline values are presented. Chapter 5 is devoted to noise management. Included are discussions of: strategies and priorities in the management of indoor noise levels; noise policies and legislation; environmental noise impact; and enforcement of regulatory standards. In Chapter 6 implementation of the WHO Guidelines is discussed, as well as future WHO work on noise and its research needs. In Appendices 1–6 are given: bibliographic references; examples of regional noise situations (African Region, American Region, Eastern Mediterranean Region, South East Asian Region, Western Pacific Region); a glossary; a list of acronyms; and a list of participants.

Working Group Meeting #1

Proposed Amended Rule 1110.2 – Emissions from Gaseous- and Liquid-Fueled Engines

Proposed Amended Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines

Proposed Amended Rule 1472 – Requirements For Facilities With Multiple Stationary Emergency Standby Diesel-Fueled Internal Combustion Engines

December 10, 2020, 1:00 p.m.

Join Zoom Meeting

https://scaqmd.zoom.us/j/92386239548

Zoom Webinar ID: 923 8623 9548

Teleconference Dial-In: +1 (669) 900-6833

If the Zoom link does not work, please cut and paste it into your browser

Agenda

- Background
- Rule Development Process
- Current Requirements Emergency Standby Engines
- Public Safety Power Shutoff (PSPS)
- Rule Comparisons and State Airborne Toxic Control Measure (ATCM) Requirements
- Next Steps

Today’s Working Group Meeting

- First Working Group Meeting in a series of future meetings
- Objective is to provide background information about the rulemaking process and regulatory requirements
- Staff is not providing any recommendations today
- Encourage stakeholder comments

Background

- During the 2020 legislative session SB 1099 – Emergency backup generators: critical facilities: exemptions was introduced but was not passed
- Through the legislative process, staff worked with supporters to develop a possible regulatory pathway to address their concerns
- Concerns generally focused on the need for increased use of emergency standby engines at critical facilities due to wildfires and other natural disasters

Key Comments from Supporters of SB1099

- Comments were primarily from water districts and hospitals
- Two general comments:
  - Need for regulatory certainty and relief if an emergency standby engine exceeded allowable usage hours under certain circumstances
  - Need for additional testing and maintenance hours for older higher emitting emergency standby engines

Proposed Rulemaking

- The purpose of this rulemaking process is to work with stakeholders to identify regulatory pathways to address stakeholder comments identified through SB 1099
- Initial thoughts are that proposed rulemaking will focus on:
  - Use of emergency standby engines at essential public services and health facilities during certain events
  - Health facility as defined in Section 1250 of the California Health and Safety Code
- Through the rulemaking staff will discuss types of certain events, initial thoughts are Public Safety Power Shutoffs (PSPS) and possibly wildfires

Rule 1302 Essential Public Services Include:

- Sewage treatment facilities
- Prisons
- Police facilities
- Fire fighting facilities
- Schools
- Hospitals
- Construction and operation of landfill gas control or processing facility
- Water delivery operations
- Public transit

Rule Development Process

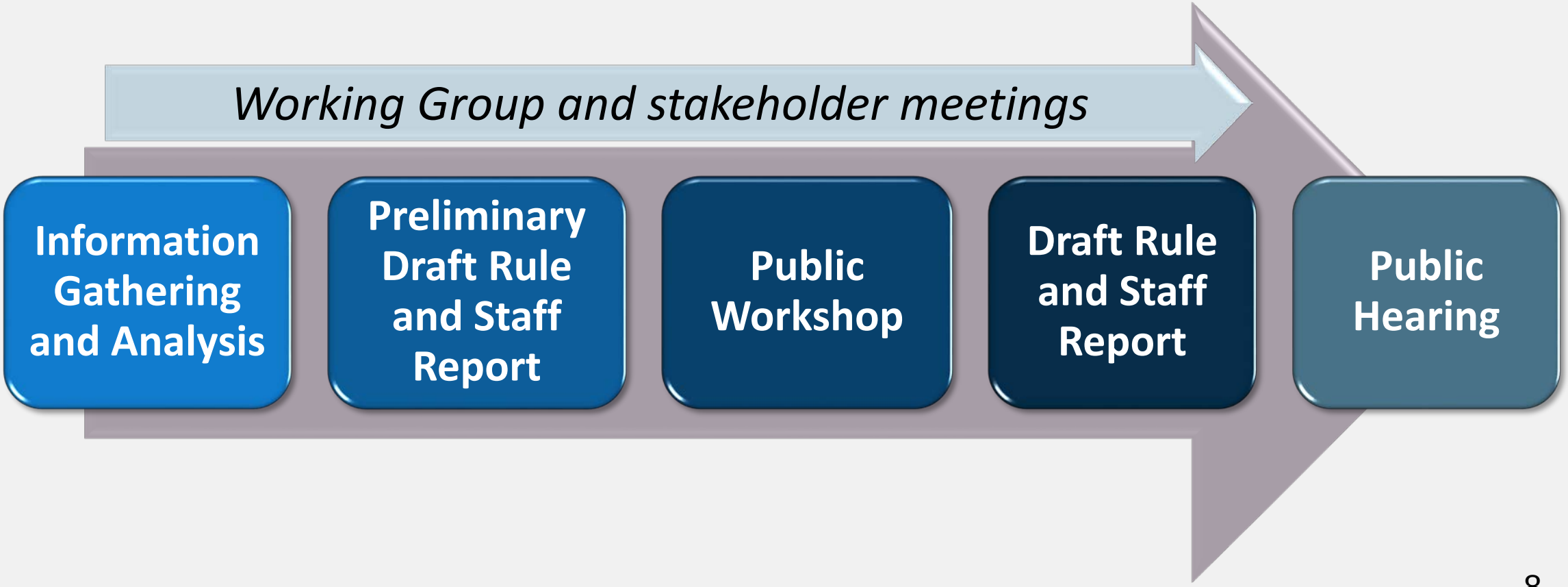
South Coast AQMD's rulemaking process is designed to be collaborative

Objective is to build consensus and to work through key issues

All stakeholders are encouraged to participate in the rulemaking process

Working Groups generally meet monthly

Overview of Rule Development Process



Key Milestone Dates in Rulemaking Process

Public Workshop May 2021	**Stationary Source Committee*** June 2021	**Set Hearing** June 2021	**Public Hearing** August 2021
Public comment and on Preliminary Draft Rule	Staff presents summary of Proposed Amended Rules to Committee	Sets the Public Hearing date	Public comments and Board action

- Preliminary schedule, subject to change
- California Environmental Quality Act (CEQA) compliance required
  - Significant environmental impacts require additional CEQA analysis which may extend rulemaking process
- Draft Rule and Draft Staff Report released 30 days before Public Hearing
  - Socioeconomic impact analysis
  - Substantial rule changes which impact emissions will require re-noticing of Public Hearing

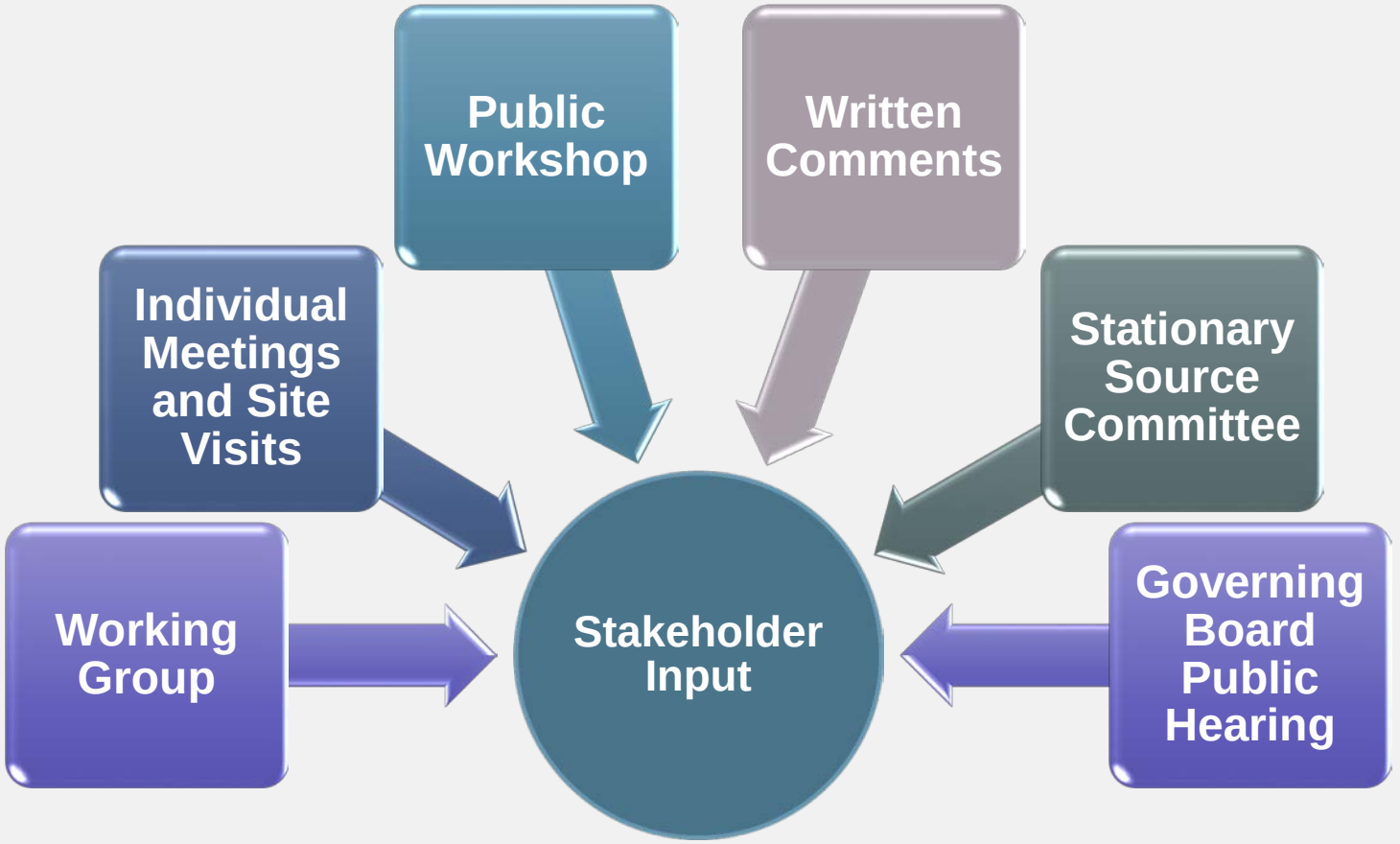
* Generally two months prior to the Public Hearing, staff will brief the Stationary Source Committee. Anticipated briefing

Working Group Meetings

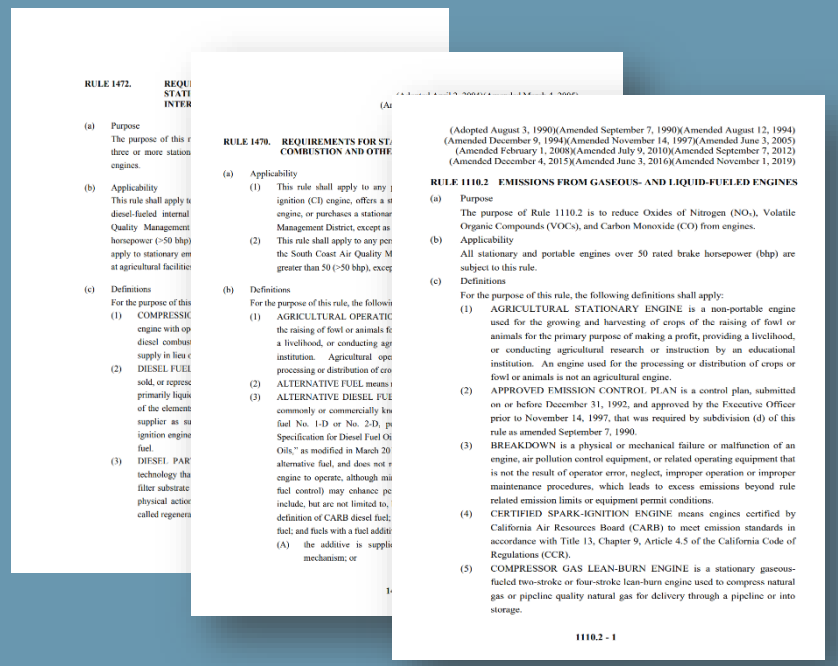
- Working Group Meetings are a key component of the rule development process
- Comprised of representatives from industry, equipment suppliers, community and environmental groups, other agencies, and other interested parties
- Working Group Meetings are generally held monthly and throughout the rule development process
- Objectives of Working Group Meetings:
  - Build consensus and work through issues
  - Exchange information and understanding of key issues
  - Collaboration and create a dialogue with stakeholders

Stakeholder Input

- Stakeholders can provide input throughout the rulemaking process
- Early input is strongly encouraged
  - Provides staff the opportunity to try to resolve issues
- Variety of ways for stakeholders to provide input



Current Requirements for Emergency Standby Engines



(Adopted August 3, 1990)(Amended September 7, 1990)(Amended August 12, 1994)
(Amended December 9, 1994)(Amended November 14, 1997)(Amended June 3, 2005)
(Amended February 1, 2008)(Amended July 9, 2010)(Amended September 7, 2012)
(Amended December 4, 2015)(Amended June 3, 2016)(Amended November 1, 2019)

RULE 1110.2 EMISSIONS FROM GASEOUS- AND LIQUID-FUELED ENGINES

(a) Purpose

The purpose of Rule 1110.2 is to reduce Oxides of Nitrogen (NO_x), Volatile Organic Compounds (VOCs), and Carbon Monoxide (CO) from engines.

(b) Applicability

All stationary and portable engines over 50 rated brake horsepower (bhp) are subject to this rule.

(c) Definitions

For the purpose of this rule, the following definitions shall apply:

(1) AGRICULTURAL STATIONARY ENGINE is a non-portable engine used for the growing and harvesting of crops of the raising of fowl or animals for the primary purpose of making a profit, providing a livelihood, or conducting agricultural research or instruction by an educational institution. An engine used for the processing or distribution of crops or fowl or animals is not an agricultural engine.

(2) APPROVED EMISSION CONTROL PLAN is a control plan, submitted on or before December 31, 1992, and approved by the Executive Officer prior to November 14, 1997, that was required by subdivision (d) of this rule as amended September 7, 1990.

(3) BREAKDOWN is a physical or mechanical failure or malfunction of an engine, air pollution control equipment, or related operating equipment that is not the result of operator error, neglect, improper operation or improper maintenance procedures, which leads to excess emissions beyond rule related emission limits or equipment permit conditions.

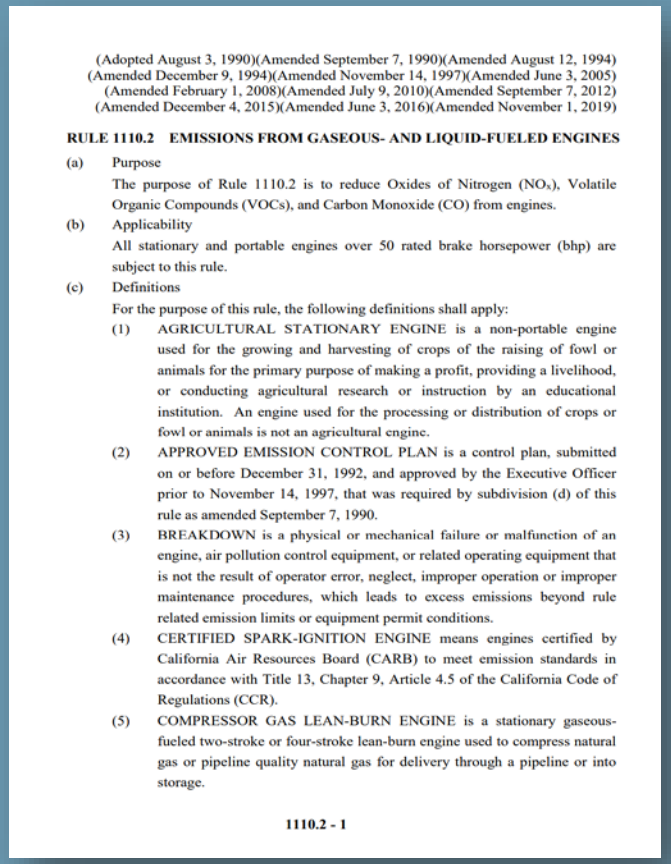
(4) CERTIFIED SPARK-IGNITION ENGINE means engines certified by California Air Resources Board (CARB) to meet emission standards in accordance with Title 13, Chapter 9, Article 4.5 of the California Code of Regulations (CCR).

(5) COMPRESSOR GAS LEAN-BURN ENGINE is a stationary gaseous-fueled two-stroke or four-stroke lean-burn engine used to compress natural gas or pipeline quality natural gas for delivery through a pipeline or into storage.

1110.2 - 1

- Three main rules that establish existing requirements for emergency standby engines:
  - Rule 1110.2 - Emissions from Gaseous- and Liquid-Fueled Engines
  - Rule 1470 – Requirements for Stationary Diesel-Fueled Internal Combustion and Other Compression Ignition Engines
  - Rule 1472 - Requirements For Facilities With Multiple Stationary Emergency Standby Diesel-fueled Internal Combustion Engines

Rule 1110.2 Requirements



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1110.2 - 1

- Establishes NOx, VOC, and CO emission limits for stationary and portable engines > 50 bhp
- Requires emissions testing, monitoring, reporting, and recordkeeping
- Includes specific exemptions for emergency standby engines

NOx	VOC	CO
11 ppmv*	30 ppmv*	250 ppmv*

* Parts per million by volume, corrected to 15% oxygen

Rule 1110.2 Requirements for Emergency Standby Engines

- Includes specific exemptions for emergency standby engines
- Defines emergency standby engine as an engine which operates as a temporary replacement for primary mechanical or electrical power during periods of fuel or energy shortage or while the primary power supply is under repair

Exemption for Emergency Standby Engines

- Currently exempts emergency standby engines, engines used for fire-fighting and flood control, and any other emergency engine approved by the Executive Officer from meeting NOx, VOC, and CO emission limits provided:
  - Engine has a permit condition that limits the operation to 200 hours or less per year as determined by an elapsed time meter
- Exempted emergency standby engines also exempted from monitoring, testing, recordkeeping, and reporting requirements
- Operating hours includes all operations:
  - Emergency use
  - Maintenance
  - Testing

Stakeholder Comments Related to Rule 1110.2

- Need for regulatory certainty and relief if an emergency standby engine exceeds 200 hours under certain circumstances
- Some stakeholders are concerned about increased usage of emergency standby engines due to PSPS events
- Under the current regulatory structure, if an operator exceeds the 200 hours they can petition the Hearing Board

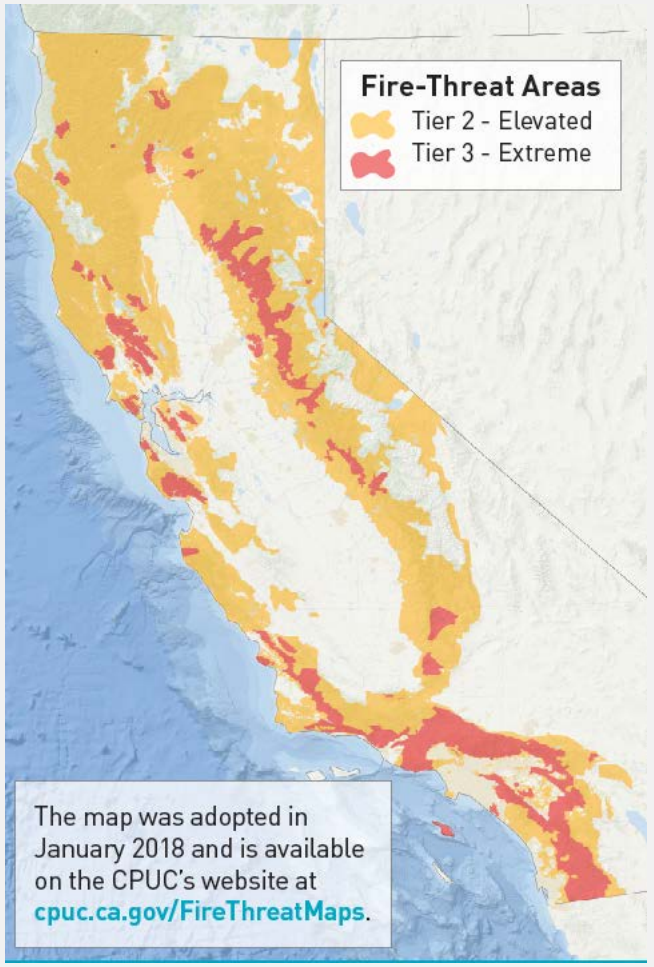
Public Safety Power Shutoff

A PSPS occurs in response to severe weather where power is turned off to help prevent a wildfire and keep communities safe

- Over the past decade, California has experienced increased wildfires
  - Roughly half of the most destructive fires in California history are attributed to power lines
- In 2012, California Public Utilities Code Sections 451 and 399.2(a) provides electric utilities the authority to shut off electric power in order to protect public safety

Public Safety Power Shutoff Program

- Electricity providers continually monitor for extreme weather threats and high fire danger
- PSPS events are considered after taking a combination of criteria into account including:
  - “Extreme” fire danger threat level
  - Red flag warning
  - Sustained winds
  - Low humidity levels
  - Site-specific conditions
  - Critically dry vegetation
  - Real-time observations



General Process for PSPS Event

Planning and Monitoring	**4-7 Days Ahead**	When extreme weather is forecasted, begin planning for potential PSPS
	3 Days Ahead	Send initial notifications about possible PSPS event to local governments, first responders, hospitals, and other critical infrastructure and service providers
	2 Days Ahead	Send initial notifications to customers and update notifications to local government and agencies
	1 Day Ahead	Send update notifications
Outage	**Day of Power Shutoff**	When extreme fire weather is present and dangerous conditions validated by field resources; notify local government, agencies, and customers of power shutoff
	Power Restoration	Inspections begin when extreme weather subsides to safe levels and conditions validated by field resource. When power is restored, agencies and customers notified of power restoration

Duration of PSPS Events

- From January 2019 to December 2019, Southern California Edison reported 158 of their circuits underwent a PSPS event
  - Sum of PSPS durations per circuit ranging from less than hour to 154 hours
- Table below depicts circuits with PSPS durations totaling over 120 hours
- PSPS hours vary for specific locations within the circuit

Circuit Name	Location	Number of PSPS Events	Average Duration (Hours)	Total Duration (Hours)
Acosta	San Bernardino County	3	45	135
Calstate	San Bernardino County	4	30	120
Club Oaks	San Bernardino County	3	45	136
Energy	Los Angeles County	4	35	141
Shovel	Los Angeles County	4	38	154

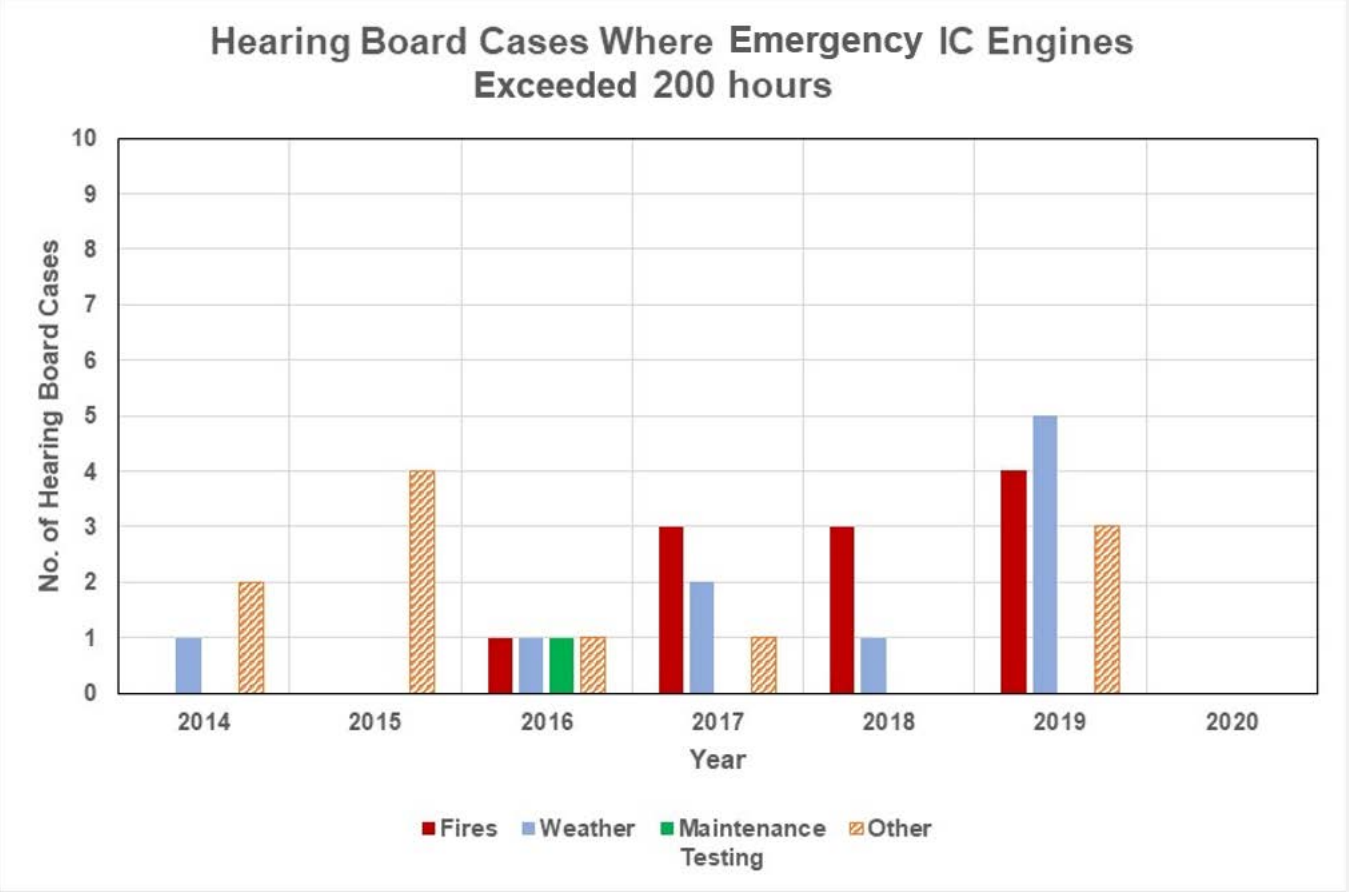
South Coast AQMD's Hearing Board

Quasi-judicial board authorized to provide relief from South Coast AQMD regulations under certain circumstances

- Authorized to hear:
  - Petitions for variances and Orders for Abatement
  - Appeals from granting of permits, permit conditions, permit denials and suspensions, denials of emission reduction credits and pollution control plans
  - Appeals by third parties
- Not authorized to:
  - Modify rules
  - Exempt businesses from compliance with a rule
  - Grant variances from violation of the public nuisance law
  - Review violation notices
- Listens to all sides of a case before weighing evidence to reach a decision

Hearing Board Activity

- Since January 2014, 33 cases for emergency standby engines were filed with the Hearing Board for exceeding 200 hours limit
  - 11 – fire related
  - 10 – weather related
  - 1 – maintenance/testing
  - 11 – other reasons
- Total emergency engine universe at ~13,700 permitted units



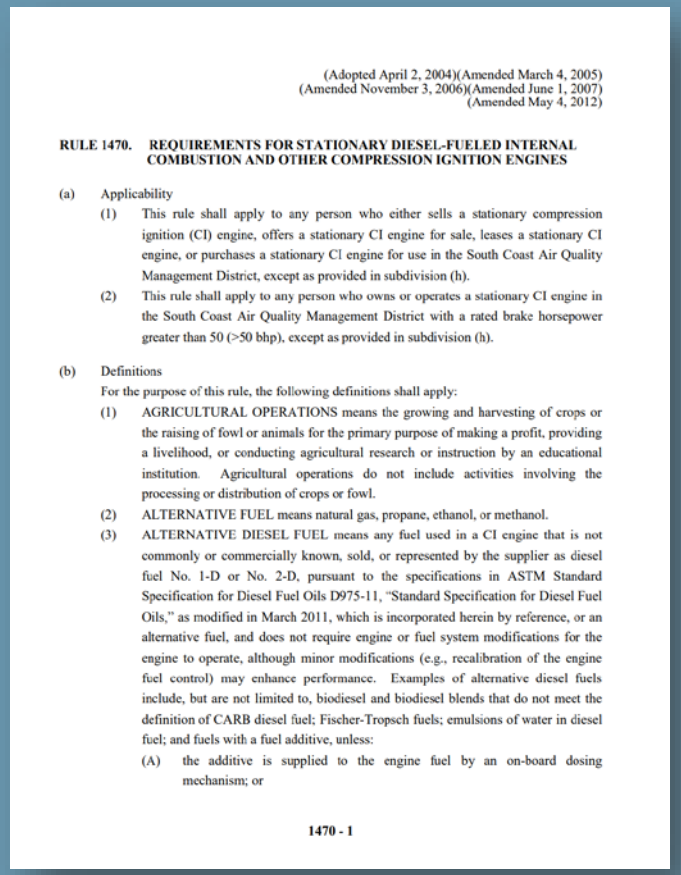
Rule 303 - Hearing Board Fees

- All applicants must pay a filing fee for each petition of $1,300 to $2,000, depending on type of variance
- When variance is granted, there is a minimum fee of $204.66 after excess fee is remitted
- Establishes method to calculate excess emission fees
- Table I - Schedule of Excess Emission Fees
  - $3,771.10 per ton oxides of nitrogen
  - $4,397.67 per ton of particulate matter

Background for Rule 1470 and 1472

- Diesel particulate matter (PM) from internal combustion engines was designated as a carcinogen by CARB in 1998
- Rules 1470 and 1472 are designed to reduce diesel particulate from engines
  - Both rules are designed to implement and supplement the State ATCM for diesel engines
  - Both rules have specific requirements for emergency standby engines
- Emergency standby engines are currently exempt from health risk requirements under Rule 1401 – Toxics New Source Review

Rule 1470 Requirements



(Adopted April 2, 2004)(Amended March 4, 2005)
(Amended November 3, 2006)(Amended June 1, 2007)
(Amended May 4, 2012)

RULE 1470. REQUIREMENTS FOR STATIONARY DIESEL-FUELED INTERNAL COMBUSTION AND OTHER COMPRESSION IGNITION ENGINES

(a) Applicability

(1) This rule shall apply to any person who either sells a stationary compression ignition (CI) engine, offers a stationary CI engine for sale, leases a stationary CI engine, or purchases a stationary CI engine for use in the South Coast Air Quality Management District, except as provided in subdivision (h).

(2) This rule shall apply to any person who owns or operates a stationary CI engine in the South Coast Air Quality Management District with a rated brake horsepower greater than 50 (>50 bhp), except as provided in subdivision (h).

(b) Definitions

For the purpose of this rule, the following definitions shall apply:

(1) AGRICULTURAL OPERATIONS means the growing and harvesting of crops or the raising of fowl or animals for the primary purpose of making a profit, providing a livelihood, or conducting agricultural research or instruction by an educational institution. Agricultural operations do not include activities involving the processing or distribution of crops or fowl.

(2) ALTERNATIVE FUEL means natural gas, propane, ethanol, or methanol.

(3) ALTERNATIVE DIESEL FUEL means any fuel used in a CI engine that is not commonly or commercially known, sold, or represented by the supplier as diesel fuel No. 1-D or No. 2-D, pursuant to the specifications in ASTM Standard Specification for Diesel Fuel Oils D975-11, "Standard Specification for Diesel Fuel Oils," as modified in March 2011, which is incorporated herein by reference, or an alternative fuel, and does not require engine or fuel system modifications for the engine to operate, although minor modifications (e.g., recalibration of the engine fuel control) may enhance performance. Examples of alternative diesel fuels include, but are not limited to, biodiesel and biodiesel blends that do not meet the definition of CARB diesel fuel; Fischer-Tropsch fuels; emulsions of water in diesel fuel; and fuels with a fuel additive, unless:

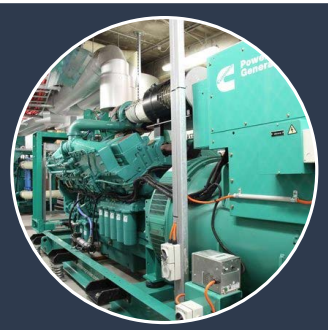
(A) the additive is supplied to the engine fuel by an on-board dosing mechanism; or

1470 - 1

- Purpose of Rule 1470 is to reduce diesel PM emissions from new and in-use engines $\geq$ 50 brake horsepower (bhp)
- Rule 1470 establishes requirements for prime and emergency standby engines

Requirements for Emergency Standby Engines

Fuel requirements



Emission Standards for New Engines

Operating Requirements and Emission Standards for In-Use Engines

Stakeholder comments were generally focused on in-use requirements

Rule 1470 Operating Requirements and Emission Standards for In-Use Engines

- Established limits for non-emergency operating requirements for in-use engines within 500 feet of a school including maintenance and testing
- Engines located at an essential public service or health facility may install an engine exhaust back pressure relief device under certain conditions
- Establishes limits on maintenance and testing hours which vary based on the PM emission rate of the engine

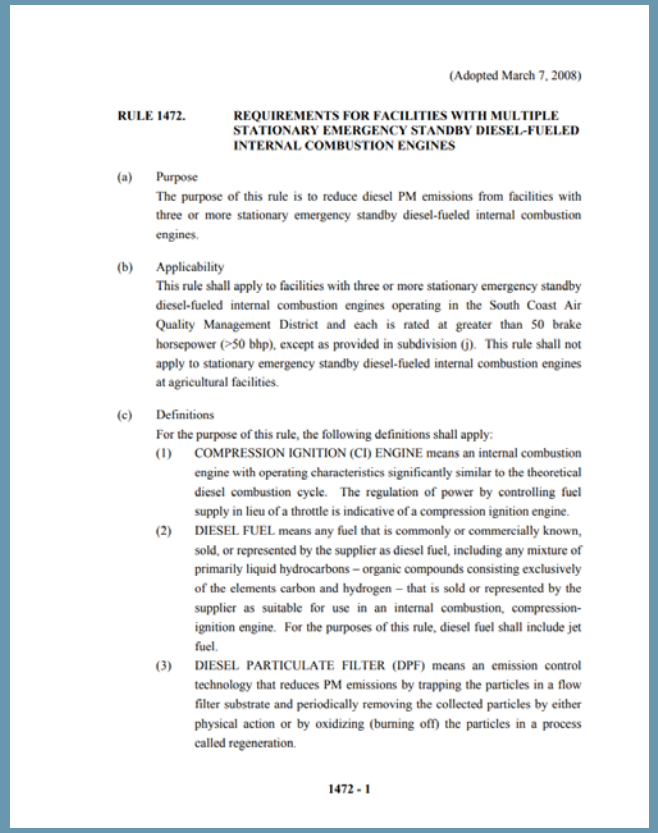
Rule 1470 Maintenance and Testing Hours

- Annual maintenance and testing of engines cannot exceed:

Engines	Hours	PM Emission Rate (g/bhp-hr)
In-use	20*	> 0.4 g
	30	>0.15 and ≤0.4
	50	>0.01 and ≤0.15
	100	≤0.01
New	50	≤0.15

*10 additional hours of operation allowed at health facilities (defined by CHSC, Section 1250)

Rule 1472 Requirements



(Adopted March 7, 2008)

RULE 1472. REQUIREMENTS FOR FACILITIES WITH MULTIPLE STATIONARY EMERGENCY STANDBY DIESEL-FUELED INTERNAL COMBUSTION ENGINES

(a) Purpose

The purpose of this rule is to reduce diesel PM emissions from facilities with three or more stationary emergency standby diesel-fueled internal combustion engines.

(b) Applicability

This rule shall apply to facilities with three or more stationary emergency standby diesel-fueled internal combustion engines operating in the South Coast Air Quality Management District and each is rated at greater than 50 brake horsepower (>50 bhp), except as provided in subdivision (j). This rule shall not apply to stationary emergency standby diesel-fueled internal combustion engines at agricultural facilities.

(c) Definitions

For the purpose of this rule, the following definitions shall apply:

(1) COMPRESSION IGNITION (CI) ENGINE means an internal combustion engine with operating characteristics significantly similar to the theoretical diesel combustion cycle. The regulation of power by controlling fuel supply in lieu of a throttle is indicative of a compression ignition engine.

(2) DIESEL FUEL means any fuel that is commonly or commercially known, sold, or represented by the supplier as diesel fuel, including any mixture of primarily liquid hydrocarbons – organic compounds consisting exclusively of the elements carbon and hydrogen – that is sold or represented by the supplier as suitable for use in an internal combustion, compression-ignition engine. For the purposes of this rule, diesel fuel shall include jet fuel.

(3) DIESEL PARTICULATE FILTER (DPF) means an emission control technology that reduces PM emissions by trapping the particles in a flow filter substrate and periodically removing the collected particles by either physical action or by oxidizing (burning off) the particles in a process called regeneration.

1472 - 1

- Reduce diesel PM emissions from facilities with three or more stationary emergency standby engines
- Supplements Rule 1470 by requiring facilities with three or more engines to meet a specific risk level (referenced as an “Engine Group Index”)
  - Facilities exceeding Engine Group Index required to reduce diesel PM emissions
- References the testing hours in Rule 1470

Stakeholder Comments Related to Rule 1470

- A water district has commented that up to 10 additional testing hours are needed for the most restrictive engine category (engines with a PM emission rate > 0.4 g/bhp-hour)
- Staff may have limitations on allowing additional testing hours

Implementation of the State ATCM

- Rule 1470 implements State Airborne Toxic Control Measure (ATCM) requirements for Stationary Compression Ignition Engines such as
  - Emission standards and operating requirements for In-Use Stationary Emergency Stand-By Engines
  - Limits on maintenance and testing hours [definition (b)(43)] of engines
- California Health and Safety Code Section 39666 requires local air districts to implement and enforce the ATCMs or adopt and enforce equally effective or more stringent ATCMs requirements than those adopted by the state board

Areas Where Rule 1470 and 1472 are More Stringent than the State ATCM

- Two general areas where Rule 1470 is more stringent than the State ATCM
  - Annual limits for maintenance and testing hours for health facilities
  - New engines less than 50 meters from a sensitive receptor*
- Rule 1472 goes beyond the State ATCM by establishing additional requirements for facilities with three or more engines

*Sensitive receptor means any residence including private homes, condominiums, apartments, and living quarters, schools as defined under paragraph (b)(57), preschools, daycare centers and health facilities such as hospitals or retirement and nursing homes. A sensitive receptor includes long term care hospitals, hospices, prisons, and dormitories or similar live-in housing.

Comparison Between Rule 1470 and the ATCM for Testing Hours at Health Facilities

- Rule 1470 allows fewer testing hours for engines with a PM emission rate > 0.15 g/bhp-hour at health facilities than the ATCM

Engine	Diesel PM Emission Rate (g/bhp-hr)	Rule 1470	State ATCM
In-use	> 0.4 g	30 hours	Up to 40 hours
In-use	>0.15 and ≤0.4 g	30 hours	Up to 40 hours for health facilities
In-use	>0.01 and ≤0.15	50 hours	50 hours
In-use	≤0.01	100 hours	100 hours
New	≤0.15	50 hours	50 hours
New	≤0.01	50 hours	Up to 100 hours

Comparison Between Rule 1470 and the ATCM for PM Emission Limits for New Engines

- Rule 1470 establishes lower PM limits for new engines less than 50 meters from a sensitive receptor than the ATCM

Engine Size	Rule 1470	State ATCM
50 < HP < 175	0.15 g/bhp-hr	0.15 g/bhp-hr
175 ≤ HP ≤ 750	0.01 g/bhp-hr	0.15 g/bhp-hr
> 750 HP	0.075 g/bhp-hr 0.02 g/bhp-hr	0.15 g/bhp-hr

Comparison Between Rule 1472 and the ATCM for In-Use Requirements for Multiple Engines at a Facility

- State ATCM does not establish in-use PM or health risk requirements for facilities with multiple engines
- Rule 1472 goes beyond the State ATCM by requiring facilities to meet an Engine Group Index, which is based on health risk
- Rule 1472 allows three compliance options:
  - Reduce Engine Group Index to less than or equal to 1.0
  - All engines meet a diesel PM emission rate less than or equal to 0.15 g/bhp-hr
  - Emit diesel PM at weighted average rate of less than or equal to 0.15 g/bhp-hr for all engines within engine group

Comparison of Rule 1110.2, Rule 1470, and Rule 1472

	Rule 1110.2	Rule 1470	Rule 1472
Applicability	All stationary and portable engines > 50 bhp	Stationary compression ignition engines > 50 bhp	Facilities with three or more stationary compression ignition engines > 50 bhp
Fuel Types	All fuel types	Diesel-fueled only	Diesel-fueled only
Pollutants Regulated	NOx, CO, and VOC	Diesel PM (toxic air contaminant)	Diesel PM (toxic air contaminant)
Emergency Engines	Exempt if operating < 200 hours/year	Establishes testing hours depending on how diesel PM emissions	Establishes compliance plan requirements and Engine Group Index calculations

Next Steps

- Staff will discuss possible rule concepts at next Working Group Meeting
- Next Working Group Meeting in early February

Rule Contacts

Proposed Amended Rules 1110.2, 1470, and 1472	
Tiffani To Assistant Air Quality Specialist 909-396-2738 tto@aqmd.gov	Michael Laybourn Program Supervisor (909) 396-3066 mlaybourn@aqmd.gov
Jillian Wong Planning and Rules Manager (909) 396-3176 jwong1@aqmd.gov	Susan Nakamura Assistant DEO (909) 396-3105 snakamura@aqmd.gov

Polonia Majas <polonia.majas@lacity.org>

Fwd: letter of support MFA 8th Grand and Hope

2 messages

William Lamborn <william.lamborn@lacity.org> Thu, Dec 16, 2021 at 10:08 AM
To: Polonia Majas <polonia.majas@lacity.org>, Alan Como <alan.como@lacity.org>

---------- Forwarded message ---------
From: **Cari Wolk** <cwolk@sbcglobal.net>
Date: Wed, Dec 15, 2021 at 8:20 PM
Subject: letter of support MFA 8th Grand and Hope
To: william.lamborn@lacity.org <william.lamborn@lacity.org>
Cc: Stuart Morkun <smorkun@mfamerica.com>

Mr Lamborn,

Please see attached letter voicing my support for the Mitsui Fudosan America residential project at 8thGrand&Hope

Please contact me with any questions on the attached letter

Thank you Stay safe

Cari Wolk
President
Athena Parking, Inc.
818 W. 7th St., Suite 860
Los Angeles, CA 90017
(213) 891-9565

--

William Lamborn
Pronouns: He, His, Him
City Planner
Los Angeles City Planning
221 N. Figueroa St., Room 1350
Los Angeles, CA 90012
T: (213) 847-3637| Planning4LA.org
E-NEWS

MFA letter.pdf
288K

Stuart Morkun <smorkun@mfamerica.com> Mon, Jan 10, 2022 at 1:28 PM
To: "Polonia Majas (polonia.majas@lacity.org)" <polonia.majas@lacity.org>
Cc: Vicki Piazza <vjp@carrierjohnson.com>, Ryan Metzler <rmetzler@mfamerica.com>

Polonia:

Happy New Year...Just forwarding this letter of support along as it may not have been coped to you.

Stuart Morkun

Vice President, Development

MITSUI FUDOSAN AMERICA

213.321.3493 C

smorkun@mfamerica.com

From: Cari Wolk <cwolk@sbcglobal.net>
Sent: Wednesday, December 15, 2021 8:21 PM
To: william.lamborn@lacity.org
Cc: Stuart Morkun <smorkun@mfamerica.com>
Subject: letter of support MFA 8th Grand and Hope

Mr Lamborn,

Please see attached letter voicing my support for the Mitsui Fudosan America residential project at 8thGrand&Hope

Please contact me with any questions on the attached letter

Thank you Stay safe

Cari Wolk
President
Athena Parking, Inc.
818 W. 7th St., Suite 860
Los Angeles, CA 90017
(213) 891-9565

Disclaimer

MFA letter.pdf
288K

ATHENA PARKING INC.

818 West Seventh Street, Suite 860
Los Angeles, California 90017
Tel: 213 891 9565
Fax: 213 891 9562

December 14, 2021

Mr. William Lamborn
City Planning Associate
City Planning Department
City of Los Angeles
Via Email: William.lamborn@lacity.org

Re: Expression of Support
8th Grand & Hope 580-unit Residential Development Project
ZA-2021-7053-ZAI
VTT-74876
ENV-2017-506-EIR

Dear Mr. Lamborn:

We recently had the pleasure of seeing the design mock-ups for the referenced Mitsui Fudosan America housing project. It is visually a beautifully designed building and will be a welcome addition to the Downtown Los Angeles skyline.

It is also an incredibly well thought out project that will serve the community in its continuing quest for live, work, play and much needed housing.

We wholeheartedly support the Mitsui Fudosan America project at 8th Grand & Hope.

Sincerely,

Cari Wolk
President

cc: Stuart Morkun

Los Angeles United Investment Co.
650 South Hill Street, Suite 1010, Los Angeles, CA. 90014
Phone 213.629.2124 Fax 213.629.3366
www.SVJC.com

VIA ELECTRONIC MAIL (William.lamborn@lacity.org)

December 9, 2021

Mr. Will Lamborn
City Planning Associate
City Planning Department
City of Los Angeles
200 N. Spring Street
Los Angeles, CA 90012

RE: Expression of Support
8th Grand & Hope 580-unit Residential Development Project
ZA-2021-7053-ZAI
VTT-74876
ENV-2017-506-EIR

To Whom It May Concern:

Recently I was briefed by Stuart Morkun of Mitsui Fudosan America on the above referenced project. As a Downtown Los Angeles stakeholder, I support the construction of more housing in order to help alleviate the city's housing crisis and make Downtown Los Angeles a thriving and more dynamic place to work, play, and live. I feel this is a very important step in helping with the lack of housing in DTLA.

Therefore, please accept this letter as my expression of support for the proposed project at 8th Grand & Hope.

Best regards,

Nejdeh Avedian
General Manager

cc: Stuart Morkun (smorkun@me.com)

St. Vincent Jewelry Center

Polonia Majas <polonia.majas@lacity.org>

Comment re: DEIR for the 8th, Grand and Hope Project (ENV-2017-506-EIR; SCH 2019050010)

1 message

Amalia Bowley Fuentes <amalia@lozeaudrury.com> Wed, Jan 5, 2022 at 9:34 AM
To: polonia.majas@lacity.org
Cc: Richard Drury <richard@lozeaudrury.com>, Stacey Oborne <stacey@lozeaudrury.com>, Molly Greene <molly@lozeaudrury.com>

Dear Ms. Majas,

On behalf of Supporters Alliance for Environmental Responsibility ("SAFER"), attached please find comments on the DEIR for the 8th, Grand and Hope Project (ENV-2017-506-EIR; SCH 2019050010).

Thank you for your assistance. If you could please confirm receipt of this e-mail and the attached comments it would be appreciated. Thank you for considering these comments.

Best,

Amalia Bowley Fuentes
Legal Fellow
Lozeau | Drury LLP
1939 Harrison Street, Suite 150
Oakland, CA 94612
amalia@lozeaudrury.com

2022.01.05 DEIR Comment for 8th Grand and Hope Project.pdf
171K

LOZEAU DRURY LLP
T 510.836.4200
F 510.836.4205
1939 Harrison Street, Ste. 150
Oakland, CA 94612
www.lozeaudrury.com
richard@lozeaudrury.com

Via Email

January 5, 2022

Polonia Majas, Planning Assistant
Department of City Planning
City of Los Angeles
221 North Figueroa Street, Suite 1350
Los Angeles, CA 90012
polonia.majas@lacity.org

Re: Comment on Draft Environmental Impact Report for 8th, Grand and Hope Project (ENV-2017-506-EIR; SCH 2019050010)

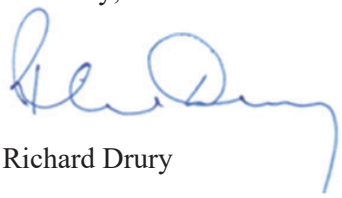
Dear Ms. Majas,

I am writing on behalf of Supporters Alliance For Environmental Responsibility ("SAFER"), regarding the Draft Environmental Impact Report ("DEIR") prepared for the 8th, Grand and Hope Project (ENV-2017-506-EIR; SCH 2019050010), including all actions related or referring to the development of a 50-story mixed-use building consisting of 580 residential units, up to 7,499 square feet of ground floor commercial/retail/restaurant space, and parking within 3 subterranean levels and 8 above-grade levels ("Project").

After reviewing the DEIR, we conclude that the DEIR fails as an informational document and fails to impose all feasible mitigation measures to reduce the Project's impacts. SAFER requests that the Planning and Development Services Department address these shortcomings in a revised draft environmental impact report ("RDEIR") and recirculate the RDEIR prior to considering approvals for the Project.

We reserve the right to supplement these comments during review of the Final EIR for the Project and at public hearings concerning the Project. Galante Vineyards v. Monterey Peninsula Water Management Dist., 60 Cal. App. 4th 1109, 1121 (1997).

Sincerely,



Richard Drury

Polonia Majas <polonia.majas@lacity.org>

Re: 8th, Grand and Hope project

1 message

Herb Goodman <herbgood15@icloud.com> Fri, Nov 19, 2021 at 5:54 PM
To: polonia.majas@lacity.org

Hi: We live directly across 8th in Sky Lofts from where the new building is going to be built. We understood that the portion being built on the Hope side is only around 17 stories and that the taller part would be on the Grand Ave side. Can you please let us know if that is the case.
Thk's,
Herb Goodman

Sent from my iPhone

Polonia Majas <polonia.majas@lacity.org>

Public Comment on ENV-2017-506-EIR

1 message

Diane Kravif <dkravif@gmail.com> Wed, Dec 22, 2021 at 1:47 PM
To: polonia.majas@lacity.org

Dear Ms. Majas:

I received a Notice of Completion and Availability dated 11/18/21 for the DEIR for the 8th, Grand and Hope project and have attached a 2-page PDF with my comments. Please let me know that you received it, since the PDF is almost 2 MB.

FYI, it wasn't an easy task to be able to review the document! In accordance with instructions in the letter, I tried to access it online at the City Planning website. I was able to get to the web page with links to download the various sections, but wasn't able to download even the Table of Contents and Executive Summary (which is pretty short) even though I tried three different browsers—Brave, Firefox, and Safari. Since I live downtown, I walked over to the Central Library and discovered that even though the 11/18 letter says they have a copy of the DEIR, they did not in fact have it. They directed me to the Little Tokyo Branch, where I was finally able to review it. Success! But perhaps you can alert your IT Department to my problem with the website, and also make sure the Central Library receives a(nother) copy.

Thanks very much,

Diane Kravif

DKravif_comments on ENV-2017-506-EIR.pdf
1860K

645 W 9th Street, Apt 311
Los Angeles, CA 90015-1643
December 22, 2021

Ms. Polonia Majas
City of Los Angeles, Department of City Planning
221 N. Figueroa Street, Suite 1350
Los Angeles, CA 90012

Subject: Comments on Draft Environment Impact Statement, 8th, Grand and Hope Project, ENV-2017-506-EIR

Dear Ms. Majas:

I live in the Market Lofts at 9th & Hope. Currently two major developments are under construction in the vicinity: one on the northeast corner of 8th & Figueroa, and the other on the north side of 8th between Figueroa and Francisco. Both projects include 24-hour, 7-day closures of the northernmost lane on 8th and often on adjacent lanes to the south; recently only one lane was available on 8th between Figueroa and Francisco. The northbound and southbound access ramps to the Harbor Freeway are located on 8th just west of Francisco.

The current construction-related lane closures cause traffic backups on 8th between the access ramps and Grand daily, both during evening rush hour and often during the day. Westbound vehicles enter the intersections of 8th & Hope, 8th & Flower, and 8th & Figueroa on a green light but become trapped in the intersection when the light changes. This in turn blocks north-south traffic on Hope, southbound traffic on Flower, and northbound traffic on Figueroa--also impeding emergency vehicle access. We poor pedestrians must thread our way between vehicles blocking the crosswalks on 8th, all the while hoping that the drivers see us.

I have reviewed the DEIR for the 8th, Grand and Hope project (referred to here as 8th G&H), ENV-2017-506-EIR. I am writing to express my concern that the DEIR does not address environmental impact on traffic, emergency access, nor pedestrian safety during construction. The two current development projects under construction on the north side of 8th provide a preview of the impact of 8th G&H project on traffic during construction. It is significant. According to the DEIR, 8th G&H project construction will start in 2022 and last 3 years. Even by itself, the project will have similarly significant impact on traffic during construction; its cumulative impact will be even greater if the other two projects are still ongoing.

Here are my specific comments:

1. Table I-2 Summary of Impacts Under the Project, Section G Transportation, identifies all impacts as "Less Than Significant" but apparently (since the separate subcategories of Construction and Operation are not identified under this heading) only addresses transportation impacts during operation,. Transportation impacts during construction will be as significant as those described above, and should be considered explicitly in the EIR. I recognize that the DEIR calls a number of times for an LADOT-approved Construction Traffic Management Plan

(CTMP) and Worksite Traffic Control Plan (WTCP), but I believe that it should also identify construction-related traffic impact mitigation measures that must be incorporated into the project specifications on which contractors will base their bids. I suggest one in the summary paragraph at the end of my comments.

2. Section IV-G of the DEIR analyzes traffic impact during construction, specifically on emergency access. It discusses the required CTMP and WTCP and says, among other things, "The plans would identify all traffic control measures, signs, delineators, and work instructions to be implemented by the construction contractor through the duration of demolition and construction activities. The Project would coordinate the plan details with emergency services and affected transit providers.... As such, *the plans would minimize the potential conflicts between construction activities, street traffic, bicyclists, and pedestrians*" (emphasis mine). It concludes that "Therefore, Project impacts to emergency access, including emergency routes, during construction would be less than significant." Under Section (2) Mitigation Measures, the DEIR states that "Project-level impacts with regard to emergency access would be less than significant. Therefore, no mitigation measures are required." All you have to do is stand at the intersection of 8th & Hope, 8th & Flower, or 8th & Figueroa today to see that this is untrue.

3. Section IV-G of the DEIR does not specifically analyze construction-related impact on traffic other than on emergency access. Construction-related traffic impact on vehicle hours of delay, vehicle safety, and pedestrian safety are not even mentioned. Again, observe above-mentioned 8th St intersections during evening rush hour and you will see that this omission is serious.

4. The Transportation Assessment by The Mobility Group, Section 3.4.5 Evaluation, Temporary Transportation Constraints, page 95 says, "Temporary closures of two right turn lanes (one on Grand Avenue and one on 8th Street) would occur for a period of 36 months.... 8th Street leads to the on-ramps to the SR-110 Freeway. *However, the streets are not congested (LOS B and LOS C at adjacent intersections)...*" (emphasis mine). I guarantee that 8th & Hope, 8th & Flower, and 8th & Figueroa are all currently at LOS F during the PM peak because of the impact of the current construction projects on traffic. Even if these projects are already complete when the 8th G&H project begins, the same will happen at least at 8th & Grand and perhaps at 8th & Olive.

In summary, I believe that the DEIR should be revised to analyze the significant individual and possibly cumulative impact of the 8th G&H project on traffic during construction--specifically, on emergency access, vehicle safety, and pedestrian safety. I also believe that an appropriate mitigation measure would be to require the contractor selected by the developer to fund City of LA traffic control officers at the affected intersections, at least during evening rush hours, to keep the intersections clear.

Sincerely yours,

Diane Kravif, P.E.
Registered Professional Civil Engineer, California License 34931

Polonia Majas <polonia.majas@lacity.org>

Case No. ENV-2017-506-EIR 8th, Grand & Hope high-rise building development

1 message

Dan Louis <louis4@gmail.com> Sun, Jan 2, 2022 at 10:41 AM
To: polonia.majas@lacity.org
Cc: Tricia Louis <tcl471@gmail.com>

Dear Polonia,

Please find our attached letter submitting comments following our DEIR review. A hard copy of the letter is also being mailed today.

Thank you.

Dan & Tricia Louis
801 S Grand Ave. #2005, Los Angeles, CA 90017

754 S Hope St Response Letter 01.02.22.pdf
1163K

January 2, 2022

Polonia Majas
Senior Contract Administrator
City of Los Angeles, Department of Planning
221 N. Figueroa Street, Room 1350
Los Angeles, CA 90012

Subject: **Case No. ENV-2017-506-EIR**
Project: 8th, Grand and Hope (MFA 8th Grand and Hope LLC)

Dear Polonia,

This letter is in response to the "Notice of Completion and Availability" dated November 18, 2021, that we received regarding the subject building development being proposed. We have been aware of this development and attended the Public Scoping Meeting on May 29, 2019. We are very concerned about this new development because we are owners of a 20/F condo directly south, opposite 8th Street. We have written previous letters on September 18, 2017 and May 19, 2019. Although the new arrangement of the development has evolved, many of our previous comments remain and are documented again in order of priority below.

Aesthetics / Visual Resources - Light, Glare and Shading: We live in the mixed-use building south of this development and our condominium will face directly at the new Amenity Deck levels being proposed. Although the residential tower is now further east, the light, glare and shading of this new high-rise building will still **create adverse environmental impacts to us** and other Sky residences. The new development will create impacts with regard to light, glare, and shading, including:

a) Light impacts from night-time light, both point sources and indirect sources. The residences in our building should be recognized as light-sensitive because we have an expectation for privacy during evening hours and will be subject to disturbance by bright light sources.
b) Glare will be experienced, primarily during daytime, caused by the reflection of sunlight or artificial light from the new building's highly-polished surfaces, window glass and/or reflective materials. Glare generation is expected to be significant.
c) Shading is expected to have an adverse impact to our residences because the shading will substantially interfere with the enjoyment of sun-related activities. The proposed **now 50-story tower** would be much taller than our existing 22-story building and the new shadows created by this development would be correspondingly longer at all times of the year. Sunlight is important to us for our physical comfort and well-being, and direct sunlight for the Sky residencies is an important environmental factor.

Aesthetics / Visual Quality / Views: Visual resources are an important component of the quality of life when living downtown. Significant adverse impacts on aesthetic/visual quality is expected, including:

a) Adverse effects on scenic LA vistas.
b) Degradation of the existing visual character and visual quality of our unit, and other Sky residences.

We only purchased this condo in Jan. 2017 and the 20/F City views of our unit were a key attraction for us. Further to above, the proposed development will directly impact our City views and will adversely impact our enjoyment of our residence (and associated amenities), as well as our property values.

Aesthetics / Visual Resource Impact Mitigation: We believe that mitigation of the above-referenced Aesthetics / Visual Quality / View impacts is incumbent on the new development (particularly for impacted DTLA privately-owned residences such as ours) and we believe that **compensation is warranted to offset the impacts from the new tower**. This compensation could be done in many different ways, including one-time monetary payment to the affected owners, or allow affected unit owners free access to the amenities deck of the new development.

Public Services – Sidewalks & Homeless Countermeasures: Based on the current plans, wide sidewalks are envisioned surrounding this development – this will be an important positive feature in enhancing DTLA living conditions. Similarly, good lighting and security provisions will be needed to ensure that homeless encampments are discouraged in this area. Although the homeless situation is far worse to the east of this area, greater attention is needed to solve the ongoing homeless issues, which present very real health and personal security hazards to DTLA residents.

Parking: We have noted that this DTLA area has an excess of available parking and future parking requirements will need to consider the ongoing and planned improvements to public transportation, the prevalence of ride-sharing services, and the likelihood of future autonomous vehicle developments – all of these will further reduce personal car ownership in DTLA and consequently reduce the need for residential parking. In addition, any new parking should include generous provisions for Electric Vehicle (EV) hookups, preferably with some public access, as the share of EVs will undoubtedly be increasing going forward.

Public Services – Charter School / Children's Play Areas: We support the provisions for a school within the development. We note that DTLA is evolving quickly and we anticipate that more families will be attracted to the new residential options that are becoming available. We think new developments such as this need to be forward-looking and make provisions for future family needs, such as children's play areas.

Public Services – Resident Pet Areas: We note that the development no longer includes a "Dog Park with Astroturf", which was shown in previous plans. We believe this should be reinstated as this amenity is critical to the planned development. The amount of pet ownership in DTLA is growing and there are currently not enough areas for dogs, which has led to frequent unsightly and unsanitary conditions on city sidewalks in this neighborhood. All such new developments need to show leadership in combating this adverse situation.

Please feel free to contact us at any time if there is a question regarding this letter.

Sincerely,

Dan Louis
801 S. Grand #2005
Los Angeles, CA 90017
Louis4@gmail.com
213.471.5655

Patricia Louis