

## Case Study: Clean Diesel Retrofits on the East County Courthouse

*An innovative partnership between the County, City of Portland, and private contractors provided funds to retrofit construction equipment with clean diesel technology. Using these machines to build the East County Courthouse resulted in cost savings and benefits to public health and health equity.*

Diesel engines are efficient, powerful, and durable. They are at the heart of the U.S. economy, moving approximately 94% of all freight in the U.S.<sup>1</sup> For all of their advantages, however, diesel engines also have disadvantages, such as negative impacts on human health and other aspects of the ecosystem.<sup>2</sup> New federal standards will significantly reduce the toxic emissions released by diesel engines manufactured in the future, but equipment operating today may be used for decades to come. Smart public policy and investments can make existing equipment less harmful with clean diesel retrofit technologies and other strategies, improving community health and health equity. One effort to address these challenges was a project piloting clean diesel contracting policies during the construction of Multnomah County's East County Courthouse, in the Rockwood community.

This case study describes: 1) the retrofitting project; 2) methods used to conduct the case study; 3) the project's costs and benefits; 4) the project's impacts on health and social equity; and 5) lessons learned from the project that may be applied to future efforts. As the community faces the ongoing challenges and opportunities posed by diesel engines, this case study can serve as a resource for decision-makers and other people who live, work, and play in Multnomah County.



*The completed Courthouse.*

### Retrofitting project overview

Retrofitting equipment used to build the East County Courthouse was one part of the larger Portland/Multnomah Clean Diesel Partnership, which was formed to help make clean diesel a reality in our community. In 2009, the Partnership—a collaboration between Multnomah County and the City of Portland—secured approximately \$2 million dollars in grant funding from the U.S. Environmental Protection Agency (EPA) and the Oregon Department of Environmental Quality (DEQ) to support this work. The Courthouse project was part of an effort to test clean diesel contracting rules for publicly financed projects. The pilot policy required that equipment used on these projects attain minimum emissions control standards. As a result, eight pieces of privately owned heavy construction equipment used to build the Courthouse were retrofitted. (The Partnership also retrofitted 193 other pieces of equipment owned by public agencies but not used on the Courthouse.) The Partnership used three types of clean diesel technology: diesel particulate filters, diesel oxidation catalysts, and fuel-operated heaters. The Courthouse project aimed to retrofit as much equipment used on the site as possible, meaning that the majority of construction work was completed with clean diesel equipment. The installations were made possible by the thoughtful collaboration of the contractors: Howard S. Wright, Parrish Excavation, and Hansen Drilling.



## Case study methods

This case study draws on three types of information: the Environmental Protection Agency’s (EPA) Diesel Emissions Quantifier,<sup>3</sup> statistics from the 2010 Census, and the experiences of people who participated in the Portland/Multnomah Clean Diesel Partnership.

The *Diesel Emissions Quantifier* (“the Quantifier”) was used to estimate how much emissions will be reduced when retrofitting technologies are employed for a given fleet of equipment. The Quantifier is an equation that takes into account factors such as the type and cost of the clean diesel device being used and characteristics of the equipment being retrofitted, such as its age and how many hours per year its engine runs. The Quantifier’s estimate is not place-specific, meaning that it does not consider where the equipment is being used. An additional Health Benefits module<sup>4</sup> (“the Health Module”) of the Quantifier estimates the averted health costs likely to result from the emissions reductions. The Health Module takes into account the differing levels of baseline or “background” pollution in different counties, meaning that it produces different estimates for the same fleet operating in different locations.

*Census data* were used to assess the very local impacts of the project by estimating the characteristics of the population living near the Courthouse site. This estimation was made by looking at six census tracts surrounding the Courthouse, as illustrated in the map on the next page. Census tracts are small geographic units used by the government to organize census data. About 32,000 people—or one in every 23 County residents—live within about a mile of the Courthouse.

*Experiences of participants* in the Courthouse project, such as City and County staffers, were the basis for the key opportunities and challenges described in this document.



*Diesel-powered equipment*

## Costs and benefits

The Health Module estimates that every dollar spent on the East County Courthouse retrofits will result in ten dollars’ worth of community benefits. The project will reduce diesel emissions for the remaining life of the retrofitted machines, 14 years on average. These emissions reductions will benefit the natural environment, save money, prevent health problems, and likely improve health equity—or, equal opportunities for good health.

### Costs

Purchasing and installing the clean diesel devices cost \$115,000, which was paid with grant funding. The costs ranged from \$2-40,000 per piece of equipment. Costs not reflected in the Quantifier include the value of the time spent by contractor and agency staff working on the project.

Emissions prevented by Courthouse retrofits		
	<i>Emissions prevented (lbs.)</i>	<i>Proportion of emissions</i>
Fine particulate matter	2,506	80%
Hydrocarbon	2,785	80%
Carbon monoxide	16,681	81%

### Benefits

The Quantifier estimates that the Courthouse project will prevent almost 22,000 pounds of pollution from being released (see table above right for detail). This includes the majority of the fine particulate matter (PM<sub>2.5</sub>), hydrocarbons, and carbon monoxide that would be released had the equipment not been retrofitted. Much of the estimated reduction is due to one particular piece of equipment that is expected to have a very long lifespan remaining.

The Health Module suggests that the reduction in emissions of fine particulate matter alone is worth \$1.25 million over the course of the retrofitted equipment’s lifespan. This is the value of costs saved by preventing: heart attacks; premature deaths; emergency room visits and hospital stays; respiratory problems, including asthma and bronchitis; and days that people limit their activities or miss work due to poor health. The actual savings are likely much higher. This is because the model does not take into account health

problems caused by other substances in diesel exhaust and because the value is calculated based on prices from 2006 that have not been adjusted for inflation.

### Health and social equity implications

While everyone in the region may benefit from air quality improvements, people who work with diesel equipment and live near construction sites may experience the most benefit from retrofitting projects because their direct exposure to air pollution is reduced. The characteristics of the people who live in Rockwood near the Courthouse, presented in the table and discussed below, suggest that the project is also a step toward narrowing the gaps among racial and age groups in terms of exposure to air pollution.

Young people, older adults, and people with existing health conditions are physiologically vulnerable to the effects of air pollution. Recent national studies have found that African American/Black and Hispanic people are exposed to more air pollution than White/Caucasian and Asian people.<sup>5,6</sup> This same research also suggests that young people and people living in poverty may be exposed to higher levels of air pollution than adults and people with higher incomes, respectively. Locally, the Oregon Department of Environmental Quality (DEQ) reports high levels of diesel particulate throughout Multnomah County, with elevated levels in areas with higher proportions of residents who are people of color and/or low-income.<sup>7</sup> Most of these groups that are especially vulnerable to air pollution problems (highlighted in the table below) are present in higher proportions in the area near the Courthouse than in the county overall.

*Race and Hispanic origin:* A quarter of people living near the Courthouse are Hispanic, compared to just over 10% countywide. The area near the Courthouse also has a slightly higher proportion of residents who are African American/Black. Compared to the County overall, residents of the area near the Courthouse are also more likely to be American Indian/Alaska native, Hawaiian/Pacific Islander, or members of some other

#### Area surrounding the East County Courthouse



#### Population characteristics

	<i>Courthouse area</i>	<i>County overall</i>
Young people (under 18)	<b>27.8%</b>	10.5%
Older adults (65+)	9.2%	<b>10.5%</b>
People living in poverty	<b>27.6%</b>	16.5%
Young people in poverty	<b>39.6%</b>	22.4%
<i>Racial groups (Hispanic &amp; non-Hispanic people)</i>		
White/Caucasian	61.2%	<b>78.4%</b>
African American/Black	<b>6.8%</b>	5.7%
American Indian/Alaska native	<b>4.7%</b>	1.2%
Asian	4.9%	<b>6.6%</b>
Hawaiian/Pacific Isl.	<b>1.2%</b>	0.6%
Other race	<b>10.1%</b>	3.5%
Multiracial	3.2%	<b>4.0%</b>
Hispanic of any race	<b>25.9%</b>	10.7%

*Sources:* American Community Survey estimates for 2007-2011, tables B01001, B02001, B03003, S1701

race not listed by the Census Bureau.

**Income:** Poverty is much more common near the Courthouse than it is countywide, with more than a quarter of adults and almost two in five young people living below the federal poverty line.

**Age:** Twenty-eight percent of the people living near the Courthouse are under age 18, in contrast to just over 10% countywide. There are also several schools in the vicinity of Courthouse, meaning that many young people spend their days in the area.

## Lessons Learned

This case study of the East County Courthouse demonstrates the potential of retrofitting projects as a part of a comprehensive strategy for reducing air pollution and addressing the health harms associated with diesel exhaust. In addition, the project suggests that retrofitting could be a useful tool to protect populations who are more vulnerable to health problems related to air pollution. One of the key lessons to apply in assessing the feasibility of future work in this area is that the success of the Courthouse project resulted from a unique combination of financial resources and opportunities—namely grant funding, a larger construction project than is usually done by the County, and contracting firms that were able to be unusually flexible. These conditions enabled Multnomah County and its contracted partners to address several implementation challenges. Challenges that would need to be considered for future efforts include:

**Installation**, while cost-effective in the long run, requires substantial expenditures. Equipment owners generally bear the cost of installation, which can be especially challenging for small businesses.

**Selecting the appropriate technology** for a retrofit is a complex decision based on the type, age, and use of the equipment, and cost-effectiveness of the installation.

**Typical construction timelines** makes it difficult to include retrofitting without disrupting the project pacing, except on the largest projects.

An additional lesson learned is that, given limited resources to invest in such technology, it is important that strategic, intentional decisions are made about when, where, and how to invest in clean diesel technologies. These decisions can have a significant impact on health equity, from exacerbating existing gaps in exposure to pollution among neighborhoods and populations in Multnomah County to reducing some of the avoidable, unnecessary, and unjust differences in the health of our communities.

The East County Courthouse Project suggests several actions that could be considered to support future investments in diesel retrofitting, including:

**Educating** contractors, elected officials and government employees, and the public about the economic, health, and health equity benefits of investing in clean diesel.

**Developing public-private partnerships** to implement pilot projects that help identify the specific types of technology to target for cost effective retrofitting investments

**Identifying policies** that could encourage use of clean diesel technology and assure that it is within reach for disadvantaged, minority- and woman-owned, and emerging small businesses (DMWESB).

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