Washington State Clean School Bus Program:

Report to 2005 Legislature
Final Draft

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WA Clean School Bus Program
Report to Legislature

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Executive Summary

School buses are the safest way to transport children to and from school. Each school day, nearly 475,000 children in Washington ride over 9000 school buses on over 20,000 routes, totaling more than 90,000,000 miles annually. The Washington State Clean School Bus Program guarantees real and immediate health benefits, insuring both a safe and healthy mode of transportation for nearly half a million children.

In 2003, the state legislature passed Engrossed Substitute Senate Bill (ESSB) 6072. The legislation established the "Washington State Clean School Bus Program," and launched a collaborative effort to reduce children's exposure to diesel exhaust and the amount of air pollution created by diesel school buses. Cleaner emissions can be achieved by retrofitting bus engines with pollution control devices, or by substituting diesel fuel with cleaner burning fuels such as biodiesel or ultra-low sulfur diesel. The program supports these actions by providing school districts with the necessary funds and technical help to make these changes to their bus fleet.

The program is voluntary, administered by the Department of Ecology, the state's seven local air quality agencies, and the State Office of the Superintendent of Public Instruction (OSPI). Program funding is derived from vehicle transfer fees, as provided under RCW 46.12.080, 46.12.170 and 46.12.181. These fees are estimated to generate revenue of $5 million per year, or approximately $25 million over the five-year life of the account, which ends on July 1, 2008.

The legislature acted because of growing concerns over the health risks posed by diesel emissions, especially on school children. Diesel particles can make asthma worse and can trigger bronchitic symptoms in children. The landmark California Children's Health Study recently found that children exposed to diesel exhaust had significantly decreased lung growth and development, potentially leading to permanent lung damage as adults. The study also showed that reducing exposure to diesel particles results in healthier lungs and improved lung capacity, and may reduce other associated health problems.

The first year of the five-year Clean School Bus program is now complete. Early months of the program focused on project design, with the last six months dedicated to school bus retrofits. At the outset, Ecology, local air quality agencies, and OSPI formed a workgroup to evaluate technical issues, support school districts and local air agencies, and develop program design and implementation strategies. During this period, the workgroup completed a number of essential program tasks including:

- Surveying interested school districts and assessing bus fleet characteristics;
- Identifying, verifying and selecting emission control equipment;
- Establishing a centralized state contract for hardware purchase, installation and maintenance; and,
- Establishing information collection, tracking and financial management systems.

Once these elements were in place, the retrofitting of buses began. Because retrofitting older pre-1994 buses provide nearly ten times greater emission benefits these buses are targeted first for retrofits, while newer buses will be retrofitted later. The general program strategy is proceeding as follows:

- Retrofit model year 1982-2000 school buses with diesel oxidation catalysts and crankcase ventilation filters.
- Retrofit model year 2001 and newer school buses with diesel particle filters and crankcase ventilation filters.

- The school bus retrofit effort has already proved successful in just its first year of operation and is nationally recognized as a model program. As of September 30, 2004, the program retrofitted 1221 school buses at 212 school districts in 38 counties. During the writing of this report, air quality agencies retrofitted another 530 buses and received bulk orders for an additional 900 retrofit kits. More importantly, the first round of retrofits is already providing significant emission reductions. These 1221retofitted buses are reducing annual carbon monoxide emissions by 28.3 tons, hydrocarbon emissions by 8.5 tons, and particulate emissions by 4.8 tons.

The 1221 retrofits completed over this period exceed the first year objectives by more than 400 buses. In addition to these results, the Northwest, Puget Sound, and Spokane Clean Air Agencies retrofitted an additional 400 school buses using a combination of federal and local funds that were obtained prior to ESSB 6072. These early, local air agency efforts provided the ground work for successfully coordinating a statewide program. As a result, the program is well ahead of its retrofit target and is in good shape to meet the second year's retrofit schedule.

The program also completed one clean fuel infrastructure project over this period, funding a biodiesel pilot project (20% biodiesel blend, B20) at the Central Valley School District in Spokane. In addition, the Puget Sound Clean Air Agency has provided funding commitments to help offset the of using ultra-low sulfur diesel (ULSD) fuel at Bainbridge Island and South Kitsap school districts. The Olympic Region Clean Air Agency has also funded the purchase of B20 for the Jefferson Transit Administration. Even without retrofit technology, use of either biodiesel or ULSD can provide a 5-10% reduction in fine particle emissions.

As of September 30, 2004, the program spent $1,616,885 on retrofits, $100,163 on cleaner fuel and related projects, and $128,595 on administrative costs, for a total expenditure of $1,845,644. First year administrative costs were 2.1% of the total revenue. Second year administrative costs should increase slightly, while second year expenditures should more than double. Future administrative costs are expected to hold constant at less than 3%. As of September 30, 2004, program retrofits and special projects also provided $1,616,885 to the private sector economy, of which $366,000 directly funded in-state labor to install retrofit technology. Both of these amounts should more than double during the second year of the program.

Going into the second year, the program will have carry-forward funds of $4,295,492 available to spend. These funds are important, as retrofit expenses will continue to ramp up, overwhelming annual program revenues over the remaining project period. To counter increasing expenses, the

program successfully negotiated bulk equipment orders that saved 25% per retrofit kit ($425/kit), for a total savings to date of $518, 925. In addition, the Northwest, Olympic Region, Puget Sound, and Southwest Clean Air Agencies used state program funding to leverage $366,000 in federal funds from EPA's Clean School Bus USA Program. These funds were used to retrofit school buses in rural districts and to offset the cost of ultra-low sulfur diesel fuel. EPA's Clean School Bus USA has recognized the Washington program as a model program for other states.

The original legislative budget request for $25 million (five years at $5 million per year) anticipated retrofitting 5000 school buses. Savings from the state contract and the decision to retrofit more of the fleet with diesel oxidation catalysts will enable the program to retrofit more school buses then originally estimated. Current long-term budget planning estimates that $25 million will retrofit approximately 7500 school buses, depending on the selected technologies, and the price of these technologies. Since 15% of the $25 million allocation may be used for other projects that reduce diesel emissions, each local air agency will need to make critical decisions regarding how best to spend this portion of the funding. Approximately 8000 public school buses and 1000 privately owned school buses may be eligible for retrofits, not including the purchase of an additional 800 to 850 model year 2005 and 2006 school buses.

During a period of economic slowdown and record budget deficits, the Washington State Legislature demonstrated great leadership by funding a program that guarantees real and immediate benefits that improve children's health. Because of the Washington State Clean School Bus Program, Washington's school bus fleet will rank among the cleanest in the nation, and nearly 500,000 children will breathe cleaner air.

Introduction

The 58th Washington State Legislature passed Engrossed Substitute Senate Bill (ESSB) 6072, effective July 27, 2003. The passage of this bill enabled the establishment of the "Washington State Clean School Bus Program," a collaborative effort designed to reduce children's exposure to diesel exhaust and reduce the amount of air pollution created by diesel school buses. The program provides technical and funding support to school districts to reduce emissions through engine retrofits, cleaner fuels, and clean fuels infrastructure.

Program funding is derived from fees collected from the transfer of motor vehicle ownership, as provided under RCW 46.12.080, 46.12.170 and 46.12.181. These fees are estimated to generate revenue of $5 million per year, or approximately $25 million over the life of the account, which ends July 1, 2008.

The program is voluntary, administered by the Department of Ecology, the state's seven local air quality agencies, and the State Office of the Superintendent of Public Instruction (OSPI).

The participating local air quality agencies include:

- Benton County Clean Air Agency (Benton County)
- Northwest Air Pollution Authority (Island, Skagit, and Whatcom Counties)
- Olympic Region Clean Air Agency (Clallam, Gray's Harbor, Jefferson, Mason, Pacific, and Thurston Counties)
- Puget Sound Clean Air Agency (King, Kitsap, Pierce, and Snohomish Counties)
- Southwest Clean Air Agencies (Clark, Cowlitz, Lewis, Skamania, and Wahkiakum Counties)
- Spokane Clean Air Authority (Spokane County)
- Yakima Regional Clean Air Authority (Yakima County)

The participating agencies formed a joint steering committee to design the program and successfully implement a statewide effort to reduce school bus diesel emissions.
The goals of the program include:

- Significantly reduce air pollution and public health risk from school bus emissions;
- Maximize cost-effectiveness and efficiency in use of appropriated dollars;
- Sustain or increase private sector employment;
- Fully track use and effects of dollars spent; and,
- Ensure geographic distribution of program benefits.

The program has a five year operational life, ending in June, 2008. Early months of the program focused on program design, with the last six months dedicated to school bus retrofits. Appendix A contains the timeline for the program development. During the first six month period, the workgroup completed a number of essential program tasks including:

- surveying interested school districts and assessing bus fleet characteristics;
- identifying, verifying and selecting emission control equipment;
- establishing a centralized state contract for hardware purchase, installation and maintenance;
- establishing information collection, tracking and financial management systems;
- establishing implementation schedules for bus retrofit activities.

The final four years of the program are focused on implementation activities. Early goal setting targeted a total of 5,000 school buses to be retrofitted with emission control devices over the five year program. Due to savings provided by a state retrofit contract that takes advantage of bulk orders, the program now anticipates retrofitting at least 7500 school buses with the $5,000,000. In addition, a minimum of 10 clean fuel infrastructure projects should be completed within this timeframe. These goals are continually being updated as program implementation efforts move forward.

Local air quality agencies have also used local and federal funds to retrofit school buses. Prior to ESSB 6072, and development of the Washington State Clean School Bus Program, the Northwest Air Pollution Authority, the Puget Sound Clean Air Agency, and the Spokane County Air Pollution Control Authority retrofitted approximately 400 school buses using local funds. In order to extend the benefits provided by ESSB 6072 funds, the Northwest Air Pollution Authority, the Olympic Region Clean Air Agency, the Puget Sound Clean Air Agency, and the Southwest Clean Air Agency jointly partnered to use $122,000 of ESSB 6072 funding to leverage $366,000 of federal funds from EPA's Clean School Bus USA Program to retrofit school buses and offset the cost differential for providing ultra-low sulfur diesel to school districts.

The program has now passed its first year milestone. This report provides an overview of where the program is currently, how it got to this point, and whether the program is on target to reach its objectives. Washington State school districts operate more than 9000 school buses statewide, which serve 296 school districts and over 475,000 students. The safe transportation of these students is of primary concern. The successful completion of this program is helping the state meet this goal by reducing school children’s exposure to diesel emissions.

Health Impacts

Diesel engines emit a complex mixture of gaseous pollutants and fine particles that include over forty cancer causing substances. Diesel exhaust accounts for greater than 80% of the associated cancer risk from air toxics in Washington. Appendix B-1 contains data on the statewide ranking of cancer risks due to hazardous air pollutants, and Appendix B-2 contains data on the county-level excess cancer risks due to hazardous air pollutants. Breathing diesel exhaust is responsible for increased cases of asthma, emergency room visits, and increased cancer risk over a lifetime. Children are more sensitive to pollutants in diesel exhaust than adults because children breathe more air relative to their body weight and because their lungs are not fully developed. Appendix B-3 contains data on county-level, asthma hospitalization rates in Washington, and Appendix B-4 contains asthma statistics for Washington.

Diesel emissions impact the health of children in a number of negative ways. Because diesel particles are allergens and also act in concert with other allergens, they are a potent trigger for worsening of asthma. Recently published data collected by the state of California, found that organic carbon from fine particles and nitrogen oxides (including that formed in diesel exhaust) is associated with bronchitic symptoms in children. The California Children's Health Study collected ten years of data for more than 55,000 children at 52 schools in twelve southern California communities to track how outdoor pollution affected children's health. Air pollution, including diesel particles and the building blocks that form ozone, not only worsen asthma, but cause new asthma in children that have not previously had it. Exposure to acidity and fine particles caused decreased lung function in children, and this damage could increase the possibility of chronic respiratory disease as children grow to adulthood. Children exposed to air ozone have significant increases in school absences, due to upper and lower respiratory illness.

The good news from this study is that children continued to be studied as they moved from one community to another. Children who moved to cleaner communities with lower particle levels showed improvements in their lung function growth rates. This means that the decrease in lung function and lung growth that happens to children exposed to air pollution can get better, if particle levels are reduced.

This also means that other ways of reducing children's exposure to diesel particles, such as the school bus retrofit program, will result in better lung function and lung growth in children. It will also reduce asthma triggers, and is likely to reduce the number of new asthma cases in children no longer exposed to high levels of diesel exhaust.

Summary of Engrossed Substitute Senate Bill 6072

The 58th Washington State Legislature passed Engrossed Substitute Senate Bill (ESSB) 6072, effective July 27, 2003. Appendix C-1 contains a copy of ESSB 6072. Among its other provisions, ESSB 6072 created a separate sub-account within the air pollution control account. Funds from this account are to be used to retrofit school buses with emission control technology, or to fund refueling infrastructure necessary for school bus fleets to use cleaner, alternative fuels.

The account is funded from fees collected from the transfer of an owner's interest in a motor vehicle, as provided under RCW 46.12.080, 46.12.170 and 46.12.181. These fees are estimated to generate revenue of $5 million per year, or approximately $25 million over the life of the account, with a currently scheduled sunset date of July 1, 2008.

The Department of Ecology (Ecology) retains 15% of these funds and distributes the remaining 85% to the local air agencies in direct proportion to the amount of fees collected from counties within each agency's jurisdiction. For counties where there is no local air agency, Ecology retains their portion of funds and spends them within the county in accordance with the purposes of ESSB 6072.

The purpose of ESSB 6072 is to reduce school children's exposure to airborne particulates generated by diesel school buses. Therefore, 85% of the funds received by both Ecology and local air agencies must be used to retrofit school buses with emission control equipment, or provide funding for school bus refueling infrastructure necessary to use alternative, cleaner fuels. The remaining 15% of these funds may be used as above, or to reduce motor vehicle emissions, clean up air pollution, or monitor and reduce toxic air contaminants.

Retrofit Strategies

Program Development

Manufacturers of emission control equipment continually develop and market new and improved retrofit technologies that reduce harmful toxic emissions and fine particles from existing diesel engines. As with all developing technologies, the cost and features vary considerably, depending upon the desired performance of the technology. New retrofit technology may provide greater emissions reduction, but often costs more and is not time-tested in the field. The performance of older, field-tested technologies is better understood, yet often provides lesser emissions reductions. Deciding whether to use currently available technology, or wait for more advanced technology, is one of the primary challenges that users of retrofit technology must address.

The "Washington State Clean School Bus Program" technical workgroup provides a combined experience that exceeds forty years for solving air quality problems caused by diesel powered vehicles. In order to make the best decisions possible for selecting the appropriate retrofit technology, the technical workgroup regularly consults with industry retrofit experts and end users. To insure that the retrofit emissions control equipment used by this program meets the manufacturer's claims and specifications, the Washington Clean School Bus Program uses only EPA verified technology.

Competitive prices and quality services are guaranteed by a state contract managed by the State's Office of Financial Management. Through a competitive bid, the State awarded a one year contract to Cummins Northwest to install diesel oxidation catalysts manufactured by Fleetguard Emissions Solutions, a Cummins' subsidiary. Local air quality agencies have also awarded additional installation contracts for individual school districts to other local contractors.

For diesel powered school buses, after combustion control equipment must be appropriately matched to the type, size, age, and use of the diesel engine. No single technology can be universally applied to all school buses. Some technologies require use of cleaner fuels, such as ultra-low sulfur diesel. Failure to apply the appropriate technology, or use the appropriate fuel, can result in reduced performance or even failure of the retrofit equipment, or power loss and decreased fuel efficiency of the engine.

Criteria for Selecting Emissions Control Technology

The appropriate technology should:

- be field tested, time proven, and provide verifiable emissions benefits;
- target reducing toxic pollutants and fine particulates;
- not inhibit engine performance;
- require reasonable, or no maintenance;
- not create unreasonable burdens upon fleet managers during installation;
- provide cost-effective emissions benefits;
- when possible, provide emissions benefits equivalent or nearly equivalent to meeting EPA's emissions standards for model year 2007 heavy-duty diesel vehicles.

School Bus Emissions Standards

The appropriate selection of retrofit emissions control equipment is highly dependent upon the useful life of the diesel engine, which may be some combination of model years for the chassis, engine, and body. Retrofit technology is primarily matched to engine design and the associated engine technology. Unlike urban transit buses, EPA does not set independent emissions standards for school buses. School bus emission standards are included in the emissions standards for heavy-duty diesel vehicles, with older model years having less stringent emissions standards. Diesel powered buses manufactured prior to 1988 emit more than ten times the amount of fine particles than a model year 1994 and newer bus, and more than 100 times the 2007 model year standards. EPA's 2007 standards for heavy-duty diesel vehicles are considered the gold standard for limiting toxic emissions and fine particles.

Model Year Breakdown for EPA Emissions Standards (g/bhp-hr*):
Heavy-Duty Highway Compression Engines (1985-2007+)

Model Year	Carbon Monoxide	Hydrocarbons	Nitrogen Oxides	Particulate Matter
1985-1987	15.5	1.3	6.0	1.0
1988-1990	15.5	1.3	6.0	0.6
1991-1993	15.5	1.3	5.0	0.25
1994-1997	15.5	1.3	5.0	0.1
1998-2003	15.5	1.3	4.0	0.1
2004-2006	15.5	0.5	2.0	0.1
2007+	15.5	0.15	0.2	0.01

*g/bhp-hr = grams per brake-horsepower hour

Retrofit Technologies and Cleaner Fuels

Based upon the criteria for appropriate technology, three types of emissions control equipment have been selected for the Washington school bus fleet: diesel oxidation catalysts (DOCs), crankcase ventilation filters (open crankcase ventilation - OCV, or closed crankcase ventilation - CCV), and diesel particle filters (DPFs). Crankcase ventilation filters will be installed in combination with either a DOC or DPF. DOC and DPF photographs can be found in Appendix D 1-3.

The following table presents selected retrofit technologies by model years. In general, this breakout holds true for the majority of retrofits, although some technology overlap may occur between selected model year bins. For example, some model year 2000 buses have been retrofitted with DPF technology, while other model year 2001 buses have required a DOC rather than a DPF.

Selected Retrofit Technologies by Model Years

			DOC		

Model Years	Number of Buses	DOC (ceramic substrate)	(wire mesh substrate)	OCV/CCV Filter	DPF
1981-	522	No	No	No	No
1982-1987	957	Yes			
1988-1994	2708	Yes		Yes	
1995-2000	2332		Yes	Yes	
2001-2005	1671			Yes	Yes

Diesel Oxidation Catalysts

Since model year 1994 and older school buses emit ten times more harmful pollutants than model year 1995 and newer buses, the first year of the Washington program focused on retrofitting these older, more polluting buses with diesel oxidation catalysts or DOCs. A DOC consists of an off-the-shelf, ceramic substrate that is custom fitted in an installation kit designed for a specific school bus chassis and engine configuration. According to the manufacturer's specifications, the Fleetguard Emissions Solutions DOC provided under the state contract reduces 25% or more of the fine particulates, 70% or more of the hydrocarbons, and 70% or more of the carbon monoxide from the tailpipe emissions. Total toxic emissions are reduced by approximately 50%. DOCs are maintenance free and the average cost under the state contract is $920 for the retrofit kit, and $300 for installation. The average DOC cost for the second year of the contract is slightly less than the first year, $1182 for parts and installation for the Fleetguard product.

Diesel Oxidation Catalysts/Crankcase Ventilation Filter Packages

Crankcase ventilation filters eliminate crankcase emissions that include unburned fuel, blow-by gases, toxic hydrocarbon gases, and engine oil contaminants. Crankcase ventilation filters (CCVs) can reduce fine particulate emissions by an additional 10-12%. The filters also reduce engine oil consumption, and underhood odors and fumes that may be transmitted into the cab by way of the heater ventilation system. Crankcase ventilation filters may be installed on model year 1988 and newer school buses.

The Puget Sound Clean Air Agency and the Spokane Clean Air Authority awarded individual contracts to pilot closed crankcase ventilation filters combined with DOCs at the Lake Washington and Mead school districts, respectively. At the time of the award, only the Donaldson Corporation provided EPA verified CCV filters. The cost for parts and installation of the Donaldson DOC/CCV package is approximately $2100 per bus. The Donaldson CCV filters must be changed on a regular maintenance schedule, normally coinciding with oil and oil filter servicing.

Fleetguard Emissions Solutions (FES) is currently pursuing EPA verification for both an open crankcase and a closed crankcase ventilation filter. The OCV filter is designed to be installed on model year 1988-1998 school buses, and the CCV filter is to be installed on model year 1999 and newer buses. Beginning in approximately 1999, manufactures began using anti-corrosive materials in the intake manifold design. The Fleetguard OCV filter is specifically designed to be

installed on those engines that do not have intake manifolds manufactured from anti-corrosive materials. The Fleetguard OCV filter costs $512 ($257 parts and $255 labor), and the CCV filter costs $537 ($267 parts and $270) labor. Fleetguard's OCV and CCV filters provide an added benefit, in that neither type requires maintenance. The average cost for the Fleetguard DOC/CCV package is $1719 per school bus.

High-Performance Diesel Oxidation Catalysts

Year two of the state contract will provide an option to install a diesel oxidation catalyst with a wire mesh substrate that reduces greater than 50% of the tailpipe fine particle; these devices are referred to as "high-performance DOCs." In order to qualify for a high-performance DOC, the school bus temperature exhaust must reach 300 degrees Celsius for 10% of the duty cycle. Most buses belonging to model years 1995 to 2000 should qualify for the high-performance DOC. The cost of the high performance DOC is $3620: $3170 for parts and $450 for labor. The high-performance DOC can reduce twice the amount of particulates as the standard DOC. The cost of the high-performance DOC is three times greater than the standard DOC, so the installation of high-performance DOC will be targeted for buses that are likely to be retained for ten to twenty more years.

Cummins Northwest has installed data logging equipment to monitor the exhaust temperatures on a variety of school bus types and model years. This data will be used to develop exhaust temperature profiles for these buses and determine which types of buses qualify for the high-performance DOC. This evaluation is scheduled to be completed by mid-December, so that the first orders for high-performance DOC might be placed early in 2006.

Diesel Particle Filters (DPF)

Individual school bus qualifications for a DPF include technical specs, such as electronic fuel injectors and adequate exhaust temperature profiles, plus a dedicated supply of ultra-low sulfur diesel fuel. In order for a vehicle to qualify to be retrofitted with a particle filter, a temperature profile for the vehicle exhaust must be data logged to insure that the exhaust temperatures meet the minimum specifications for a particle filter. Most particle filters also require the use of ultra-low sulfur diesel fuel. Failure to meet the above criteria will cause the particle filter to clog. Particle filters also require routine maintenance in which the filters must be periodically cleaned.

King County Metro has successfully retrofitted their transit fleet with particle filters. However, a previous school bus retrofit effort, prior to development of the Washington State School Bus Program, resulted in clogged filters on a group of model year 1990-1993 buses serving the Everett School District. For this reason, the Program has elected to pilot particle filter retrofit projects at selected school districts. The Puget Sound Clean Air Agency is currently piloting installation of particle filters on selected model year 2000 and newer school buses that will be closely monitored to insure that the filters perform as designed.

Once the technical workgroup is confident that contractors can successfully retrofit school bus engines with particle filters, the Program will pursue developing a state contract to retrofit model years 2001 and newer buses with particle filters. Most likely, model years 2000 and older will

not have the appropriate engine technology to be suitable candidates for particle filters. Particle filters can reduce fine particles by up to 90% so that emissions might be reduced sufficiently to meet EPA's 2007 emissions standards. The cost of particle filters ranges widely between $6000 and $17000.

Particle filters need to be periodically cleaned, with the period varying from once per year to possibly several times a year. Particle filter maintenance depends on the vehicle and filter type, and the vehicle operation. At a minimum, most filters require an annual flushing in which a filter cleaning station forces compressed air through the filter to remove trapped particles. The cost for this forced air cleaning is about $100 per flushing. Most likely, particle filters will need a regenerative cleaning every one to two years. The regenerative cleaning combines heat with forced air to bake and flush particles from the filter, restoring the filter to a like new state. This regenerative process costs about $500 per cleaning. While the cost of filter cleaning may range from $100 to $700 per year, filter maintenance should average about $600 every two years. Long-term filter maintenance cost could be significantly reduced by purchasing filter cleaning stations at a cost of about $17,000 per station. The Program will explore establishing cooperative sites in which several school districts might share a single filter cleaning station.

Ultra-low Sulfur Diesel (ULSD)

EPA's current on-road diesel fuel requirements limit the maximum sulfur content to 500 parts per million (ppm). Beginning July 15, 2006, refiners must limit the maximum sulfur content to 15-ppm. For reducing diesel emissions, ultra-low sulfur diesel or ULSD, provides dual benefits. Substituting ULSD for standard on-road diesel reduces fine particle emissions by 5% to 9%, depending on the sulfur content of the available on-road diesel fuel. Advanced retrofit technologies such as particle filters require the use of ULSD, since sulfur in the fuel contributes to early clogging of the filters. At a cost differential of about five cents per gallon more than conventional on-road diesel, ULSD is available to school districts in the Central Puget Sound area.

Biodiesel and Clean Fuels

Biodiesel is a fuel that is produced from either vegetable oils or animal fats and meets the standard specification for use as a blend stock for distillate fuel oil. Ecology elected to use funding provided by ESSB 6072 to fund HB1243. This bill required a pilot program to use a 20% biodiesel blend (B20) at the Central Valley School District in Spokane WA for the 2003-2004 school year, and the North Shore School District for the 2004-2005 school year. Ecology also elected to continue funding the cost differential of B20 at the Central Valley School District for the 2004-2005 school year. B20 costs approximately twenty cents per gallon more than standard on-road diesel, but reduces fine particle emissions by 10% or more. Recently passed federal legislation could reduce the price of B20 to a cost that is competitive to ULSD, which would make a ULSD/B20 mix the gold standard for school buses.

ESSB 6072 also recognized the emission benefits that other clean fuels, such as compressed natural gas (CNG), may provide. Although no projects were funded in the first year of Program

operations, some school districts may consider alternate clean fuel programs in the ensuing years.

Retrofit Strategy

Based upon appropriately matching retrofit technology, the general strategy is described below. In general, this breakout holds true for the majority of retrofits, although some technology overlap may occur between selected model year bins. For example, some model year 2000 buses have been retrofitted with DPF technology, while other model year 2001 buses have required a DOC rather than a DPF.

- Model year 1981 and older buses are too old to qualify for retrofit technology (unless they've had their engines replaced).
- Retrofit model years 1982-1987 with diesel oxidation catalysts (ceramic substrates), provided they will be on the road for at least three years;
- Retrofit model years 1988-1994 with diesel oxidation catalysts (ceramic substrates) and crankcase ventilation filters resulting in a 40% reduction in fine particles, provided they will be on the road for at least three years;
- Retrofit model years 1995-2000 with high-performance diesel oxidation catalysts (wire mesh substrates) and crankcase ventilation filters resulting in a 60% reduction in fine particles (Some school districts began retrofitting model year 1995-2000 with DOC with ceramic substrates prior to the availability of wire mesh substrates.);
- Retrofit model year 2001 and newer school buses with diesel particle filters and crankcase ventilation filters resulting in a 90% reduction in fine particles (Some school districts may elect to retrofit school buses with DOC rather than a DPF.);

Once ultra-low sulfur diesel become readily available, those buses retrofitted with standard and high-performance diesel oxidation catalysts and crankcase ventilation filters will respectively achieve a 50% and 70% reduction in fine particles. Adding a 20% blend of biodiesel would provide additional fine particle reductions.

Retrofit Schedule:

Year One:

- As of September 30, 2004, the program physically retrofitted more than 1221 school buses. During the writing of this report, air quality agencies retrofitted another 530 buses and received bulk orders for an additional 900 retrofit kits.
- As of May 1, 2004, the program implemented two pilot projects to test more advanced technologies and two projects to test alternative fuels.
- As of June 1, 2004, the program developed and implemented a state-wide, school bus emission maintenance program.

Year Two:

- Pilot additional retrofit projects with more advanced technologies.
- Complete retrofits on model years 2000 and older.

Year Three:

- Transition to most advanced technology for model year 2001 and newer buses.

Year Four:

- Retrofit all remaining school buses to achieve 90% penetration.

Year Five:

- Retrofit all remaining school buses, subject to available funds.

First Year Results

As of September 30, 2004, the program:

- retrofitted 1221 school buses at 212 out of 296 school districts in 38 out of 39 counties, exceeding the first-year retrofit goal by more than 400 school buses. During the writing of this report, air quality agencies retrofitted another 530 buses and received bulk orders for an additional 900 retrofit kits;
- spent $ $1,845,614 of the $6,141,136 available revenue, leaving a balance of$4,295,492. (During the writing of this report, an additional $650,000 worth of work was completed.)

The amount of variance is due to several factors:

- the first two years of the program focus on retrofitting older, more polluting buses with diesel oxidation catalysts, which cost significantly less than retrofitting newer buses with diesel particle filters,
- the market price of diesel oxidation catalysts has significantly decreased in 2003,
- the state contract takes advantage of bulk orders that result in a savings of 25% per retrofit kit, and,
- the required startup time to develop a statewide retrofit program meant that no money was spent on retrofit installations for the first seven months of the program.

The General Administration's Office of State Procurement, the Department of Ecology, and the state's local air agencies all designated development of a state contract for this program as a high priority. This collaborative effort resulted in a state contract that was awarded by a competitive process in exactly four months. The contractor immediately began the first fleet school bus surveys, and the first buses were retrofitted during the spring break period of 2004. The state contractor completed the majority of year one retrofits during the summer vacation period. In addition, while the state contract was being developed, the Puget Sound Clean Air Agency implemented separate retrofit contracts. Under those independent retrofit contracts, diesel oxidation catalysts were installed on 218 buses at seven school districts in three counties. On those buses that were retrofitted, bus drivers and mechanics reported noticing a significant difference in the reduction in the smell of diesel exhaust.

Summaries for year-one goals, objectives/tasks/targets, and performance measures are provided in this section. Appendix E-1, Year One Results by School District, contains detailed information for measuring the program performance.

Year-One Goals:

- **Significantly Reduce Air Pollution and Public Health Risk from School Bus Emissions**

As of September 30, 2004, the program retrofitted 1221 school buses, resulting in an estimated annual reduction of 8 tons of HC emissions, 28 tons of CO emissions and 5 tons of diesel particles. During the writing of this report, air quality agencies retrofitted another 530 buses. Emissions benefits for these additional buses will be included with the retrofit benefits in the second year report.

The California Children's Health Study has documented that reducing air pollution improves children's health. However, scientists have not quantified the improvements in children's health resulting from retrofitting school buses. The Department of Ecology has provided EPA grant funds to the University of Washington to assist in the development of a comprehensive study designed to provide information on the expected health outcomes of asthmatic children's exposure to diesel emissions. Retrofitting school buses with emissions control technology does decrease children's exposure to diesel emissions.

- **Maximize Cost Effectiveness and Efficiency in the Use of Appropriated Dollars**

The state contract takes advantage of bulk orders that result in a savings of 25% per retrofit kit ($425/kit) when compared to previous retrofit projects for individual Washington school districts or current retrofit projects in other areas of the U.S. To date, the total program savings resulting from lower kit prices amount to $518,925 for 1221 retrofits.

As of September 30, 2004, program revenue and expenditures are as follows:

Revenue	Retrofits Expenditures	Administrative Expenditures	Other Expenditures*	Total Expenditures	Balance
$6,141,136	$1,616,885	$128,595	$100,163	$1,845,644	$4,295,492

*Other expenses include cleaner fuel infrastructure projects and some education outreach efforts that promote the retrofit program.

Administrative costs were eight percent of the total expenditure. Year-two administrative costs should remain relatively fixed, while year-two expenditures should more than double, so that future administrative costs should hold constant at approximately three percent of total expenditures.

The original legislative budget request for $25,000,000 (five years at $5,000,000 per year) anticipated retrofitting 5000 school buses. More recent budget planning estimates that $25,000,000 will retrofit at least 7500 school buses, depending on the selected technologies, and the price of these technologies. Approximately 8000 public school buses and 1000 privately owned school buses may be eligible for retrofits, not including the purchase of an additional 800 to 850 model year 2005 and 2006 school buses.

In order to extend the benefits provided by ESSB 6072 funds, the Northwest Air Pollution Authority, the Olympic Region Clean Air Agency, the Puget Sound Clean Air Agency, and the Southwest Clean Air Agency jointly partnered to use $122,000 of ESSB 6072 funding to leverage $366,000 of federal funds from EPA's Clean School Bus USA Program to retrofit school buses and offset the cost differential for providing ultra-low sulfur diesel to school districts.

- **Sustain or Increase Private Sector Employmen**t

As of September 30, 2004, program retrofits and special projects directly provided $1,616,885 to the private sector economy, of which $366,000 directly funded in-state labor to install retrofit technology. Both of these figures should more than double during the second year of the program.

- **Fully Track Use and Effects of Dollars Spent**

Local air authorities provide local management to the retrofit program. Each local air authority, in coordination with the school districts in their jurisdiction, insures that the contractor has retrofitted any invoiced school bus retrofits, and that all invoice charges are in agreement with the state contract. Local air authorities report their quarterly expenditures to the Department of Ecology. Ecology compiles and summarizes these quarterly reports, and reports annually to the legislature.

- **Ensure Statewide Geographic Equity**

The state contract is written to insure statewide geographic equity, with local air authorities providing local management for their individual jurisdictions. To insure that rural school districts are not disadvantaged, the state contract allows a surcharge for travel to remote installation sites. During year one, the program retrofitted school buses at 212 out of 296 Washington school districts, in 38 out of 39 Washington counties.

- **Achieve 100% Customer Satisfaction**

The program's customers are the school districts. The installation of emissions control technology must not hinder the performance of any individual bus, or inconvenience the fleet management for scheduling operations. The state contractor is highly experienced with both servicing engines and with retrofitting vehicles. The program has received zero complaints from school districts, and many superintendents, principals, fleet managers, and mechanics have praised the performance of the program.

No program of this magnitude operates without ever making mistakes; however, the program is dedicated to quickly identifying and correcting problems, so as to prevent the repetition of errors. During year-one, the program identified one occurrence for an installation error, two occurrences regarding retrofits on buses which were not included in an invoice, and one occurrence in which retrofits kits were delivered and installed in a region other than which they were intended. In each of these occurrences, the contractor either quickly corrected the problem, or corrected the process to prevent any future problems. None of these occurrences created any type of inconvenience for the school districts involved. Appendix B details these occurrences.

<u>Year-One Objectives/Tasks/Targets</u>:

- **By September 30, 2004, Retrofit at Least 800 School Buses**

Program funding is based upon the fiscal year, which runs from July 1 through June 31. The Program's state contract runs from November 1 through October 31. In order to minimize any

inconvenience that might be imposed upon school bus fleet manager, most retrofits must occur in the school system's summer vacation period. As of June 31, 2004, the end of first fiscal year for the program, the state had completed 650-700 retrofits. As of September 30, 2004, near the end of first year's state contract, the program had completed approximately 1221 retrofits.

- **Prepare 1st Report to Legislature: Costs, Benefits, Problems, Successes and Future Needs and Recommendations**

This report to the legislature is intended to fully assess costs, benefits, problems, and future needs. The report covers the period July 1 2003 through September 30, 2004.

- **Survey Remaining Public School District Fleets for Appropriate Retrofit Technology**

During year one, the program retrofitted school buses in 212 out of 296 Washington school districts. Local air authorities and Educational Service Districts are directly contacting all remaining school districts that have not yet volunteered to participate in the program.

- **Complete at Least One Cleaner Fuel Infrastructure Project**

Ecology provided funding for ESHB 1243 to offset the increased cost of a 20% biodiesel blended, B-20, with regular on-highway diesel at the Central Valley School District, Spokane, for the 2003-2004 school year. Ecology will similarly provide funding to offset the cost of B20, and the Puget Sound Clean Air Agency will provide funding to offset the cost of ultra-low sulfur diesel, at the North Shore School District for the 2004-2005 school year. Additional information on this project is provided in the Special Projects section of this report.

- **Ensure Future, New School Bus Purchases Have Best Available Emission Control Technology**

Ecology and local air authorities have attempted to implement a program to insure that future bus purchases have the best available factory installed emission control technology. Installation of factory-installed emission control technology is an option under the state contract for purchasing new school buses; however, the award of a competitive bid for the purchase of school buses is not evaluated on these types of options. Under the state purchasing contract for school buses, a factory-installed diesel oxidation catalyst costs more than twice the amount for a retrofitted diesel oxidation catalyst. Similarly, a factory-installed particle filter costs several thousand dollars more than any previous award for particle filter retrofits. Therefore the state has determined that ensuring that new bus purchases have the best available emission control technology is not a cost-effective option at this time.

- **Prepare Legislative Fix for ESSB 6072**

After completion of the 2003 Legislative session, it was discovered that SB6072 did not transfer funds to the appropriate accounts, thus not funding the intended services. House Bill 2483, passed during the 2004 Legislative session, corrected the disposition of title fee revenue to meet the intentions of SB 6072.

Year One Performance Measures (See Appendices D and E and Section 8):

- Number of retrofitted school buses, by type of technology and location
- Emissions reduced
- Dollars spent by location and activity (hardware, installation, admin costs etc)
- Cost effectiveness ($/ton per year for air emissions and particles)

Five-year Budget Assessment

The five-year budget assessment can best be understood by analyzing the state's school bus fleet by grouped model years and the appropriate type of retrofit technology.

Retrofits by Bus Classification:

School buses are classified by Type-A, -B, -C, and -D. Type-A buses are constructed on a van-type or cutaway front-section vehicle, with a gross vehicle weight generally less than 10,000 pounds. Type-A buses have an expected school bus service life of 10 years or 150,000 miles. Many model year 1998 and newer Type-A buses have factory-installed diesel oxidation catalysts. Since the expected service-life of model year 1997 and older Type-A buses is three years or less, the program does not anticipate the retrofit of Type-A school buses. The program will retrofit all model year 1982 and newer Type-B, -C, and -D school buses that do not already have emissions control technology. Appendix E contains the number of Washington State school buses by model year.

The following discussion presents selected retrofit technologies by model years. In general, this breakout holds true for the majority of retrofits, although some technology overlap may occur between selected model year bins. For example, some model year 2000 buses have been retrofitted with DPF technology, while other model year 2001 buses have required a DOC rather than a DPF.

Model year 1982-2000 school buses: diesel oxidation catalysts and crankcase ventilation filters

The cost to retrofit model years 1982-2000 school buses can be reasonably assessed, since the state contract contains specific prices for retrofit technologies to be applied to these model years. Approximately 5500 to 6000, model years 1982-2000, public school buses qualify for retrofit technology. The cost to retrofit 5500 to 6000 model years 1982-2000 school buses with some type of diesel oxidation catalysts (either ceramic or wire mesh substrate), and crankcase ventilation filters is estimated to range from $13,831,000 to $16,859,000. The actual cost will depend on the total number of buses that are retrofitted and the type of diesel oxidation catalysts. (This range does not reflect the reduction in DOC costs for the second year of the state contract.) It is anticipated that some buses may be ineligible for retrofit because of maintenance reasons. Other buses may be scheduled for early retirement or out-of-state sale, or may be equipped with factory-installed diesel oxidation catalysts. No additional maintenance costs are required for the retrofit technologies chosen for these model year buses.

Model year 2001-2006 school buses: high-performance diesel oxidation catalysts and crankcase ventilation filters, or diesel particle filters and crankcase ventilation filters

The program does not currently have a state contract for diesel particle filters, so prices for filters must be estimated based upon other state or local agency contracts. The current retrofit price for particle filters ranges from $7000 to $17,000 per vehicle, with an associated annual maintenance

cost expected to average about $300 per bus. The use of filters on school buses is still relatively new so that precise on-going maintenance costs remain unknown. The state currently owns about 1670 model year 2001-2005 buses. Assuming that the state will purchase an additional 800-850 new buses during the next two years, then approximately 2500 school buses will be eligible for retrofit with particle filters.

Retrofitting 2500 model years 2001-2006 school buses with crankcase ventilation filters and with the least expensive particle filters is estimated to cost $$18,958,000. Annual maintenance cost for these 2500 school buses retrofitted with particle filters is expected to average $750,000. Model year 2007 buses will not require retrofits since these school buses will meet EPA's new emissions standards, but any factory-installed particle filter will most likely have some associated maintenance costs.

Some school bus fleet managers have expressed concerns regarding the operational characteristics and maintenance costs associated with diesel particle filters. For this reason, the program should assume that some model year 2001-2006 buses may be retrofitted with high-performance diesel oxidation catalysts in lieu of diesel particle filters. An optional scenario assumes retrofitting model year 2000-2006 school buses with 50% high-performance diesel oxidation catalysts and 50% diesel particle filters. All of these buses would also be retrofitted with closed crankcase ventilation filters. The cost to retrofit this optional scenario would be $15,116,000. Under this scenario annual maintenance cost for 1250 school buses retrofitted with particle filters is expected to average $375,000.

Total Retrofit Costs: model year 1982 and newer

The cost to retrofit model years 1982-2000 school buses is anticipated to range from $28,947,000 to $35,817,000. This amount does not include administrative or cleaner fuel expenses. These retrofit costs also do not take into account maintenance costs for particle filters, or the cost to retrofit private, or contracted, pupil transportation services that own and operate approximately 1000 school buses in the Seattle and Spokane areas. The following table, Scenario 1, summarizes these total costs by grouped model years, based upon the appropriate type of retrofit technology. An alternative retrofit strategy, Scenario 2, is also presented below.

Cost to Retrofit the Washington State Public School Bus Fleet:
Contains Type B, C, and D Buses; Excludes Type A Vans

Scenario 1

Technology Type	Model Year Group	Number of Buses*	Total Costs**
None	1981-	552	$0
DOC	1982-1987	957	$1,273,000
DOC + OCV	1988-1994	2708	$5,107,000
HP-DOC + OCV/CCV	1995-2000	2332	$10,479,000
DPF + CCV	2001-2006	2500	$18,958,000
Total		*	$35,817,000

Scenario 2

Technology Type	Model Year Group	Number of Buses	Total Costs**
None	1981-	552	$0
DOC	1982-1987	957	$1,273,000
DOC + OCV	1988-1994	2708	$5,107,000
50% DOC + OCV/CCV 50% HP-DOC + OCV/CCV	1995-2000	2332	$7,451,000
50% HP-DOC + /CCV 50% DPF + CCV	2001-2006	2500	$15,116,000
Total		*	$28,947,000

DOC = Diesel Oxidation Catalysts
OCV = Open Crankcase Ventilation Filter
CCV = Closed Crankcase Ventilation Filter
HP-DOC = High Performance Diesel Oxidation Catalysts
OCV/CCV = OCV or CCV
DPF = Diesel Particle Filter
*Total number eligible for retrofit equals 8497 buses.
** Does not include any maintenance costs that may be associated with particle filters.

Private pupil transportation services:

Private, or contracted, pupil transportation services in the Seattle and Spokane areas own and operate approximately 1000 buses, mostly model years 2000 and newer, so that most of these buses will qualify for particle filters. In general, managers for these private fleets are comfortable with the state retrofitting their school buses with particle filters. Retrofitting these buses with particle filters and closed crankcase ventilation filters will most likely cost a minimum of $7,600,000, with an expected annual maintenance cost of $300,000.

Cleaner Fuel, Cleaner Fuel Infrastructure Projects, and Other Projects that Reduce Diesel Emissions:

The program has proposed to complete ten cleaner fuels or cleaner fuel infrastructure projects over five years. Funding for cleaner fuel and other projects that reduce diesel emissions must come out of the 15% flexible portion of the allocated funds. To date, these include funding the cost differential for ultra-low sulfur diesel (ULSD) or diesel blended with biodiesel, B20. The annual cost for these projects might be expected to range from a few thousand dollars per project, to a few tens of thousands of dollars per project. In 2006, federal law will require refiners to produce ULSD fuel, so that the funding of any cost differential will cease. In addition, the 2004 Congress passed a twenty cent per gallon tax credit for B20. As a result, the cost differential for B20 should be reduced to five to ten cents per gallon when compared to current on-road diesel fuel, and to only a few cents per gallon when compared to ULSD. The total costs for cleaner fuel or other projects that reduce diesel emissions cannot exceed $750,000 per year (15% of $5 million), or $3,750,000 over five years (15% of $25,000,000).

Administrative Costs:

Administrative costs for the five-quarter period July 1, 2003 through September 30, 2004 were $128,595. Annual administrative costs are expected to remain reasonably constant at an amount of $103,000, for a total of $515,000 over five years.

Total Costs:

Based upon the strategies identified in this report, the five-year cost to retrofit both the public and private school bus fleet is anticipated to cost between $40,812,000 and $47,682,000, exceeding the state's five year allotment of $25,000,000 by $15,812,000 to $22,682,000. An additional annual maintenance cost for school buses retrofitted with particle filters is expected to range from $675,000 to $1,050,000. These filter maintenance costs might be best managed by a one-time purchase of regional filter cleaning stations for school districts.

Estimated Costs to Retrofit All School Buses in Washington State:

Scenario 1

Retrofit Public Fleet	Retrofit Private Fleet	Clean Fuels/ Other Projects	Admin.	Total Cost	Revenue	Shortfall
$35,817,000	$7,600,000	$3,750,000	$515,000	$47,682,000	$25,000,000	$22,682,000

Scenario 2

Retrofit Public Fleet	Retrofit Private Fleet	Clean Fuels/ Other Projects	Admin.	Total Cost	Revenue	Shortfall
$28,947,000	$7,600,000	$3,750,000	$515,000	$40,812,000	$25,000,000	$15,812,000

Cost vs. Revenue Assessment:

The Department of Ecology and local air quality agencies, along with industry retrofit experts, have coordinated a state retrofit strategy to insure that retrofit technologies are appropriately applied to the state's school bus fleet. The following points are noteworthy:

- The age of school buses in the public fleet is not uniform across the state. Smaller rural school districts tend to have a greater quantity of older buses than larger urban school districts.
- Retrofitting older, late model school buses with diesel oxidation catalysts reduces three to five times more emissions per school bus, than retrofitting newer school buses with diesel particle filters.
- Diesel oxidation catalysts are maintenance free, while diesel particle filters have associated maintenance costs.
- Retrofitting a newer school bus with a diesel particle filter costs three to four times more than retrofitting an older school bus with a diesel oxidation catalyst, but a particle filter is three to four times more effective than an oxidation catalysts.

- For the selected technologies, newer school buses can be retrofitted with diesel oxidation catalysts, either ceramic or wire mesh substrates, or with diesel particle filters.

Since each local air quality agency is responsible for independently managing their jurisdictions budgets, two scenarios may evolve:

- A local air agency whose jurisdiction contains hundreds of newer school buses, and which elects to retrofit those school buses with diesel particle filters, will have a shortfall of state retrofit funds.
- A local air agency whose jurisdiction contains aging school bus fleets may have a surplus of funding.

Each air quality agency will need to decide how to manage potential budget shortfalls. The program will explore and assess the feasibility of the following options:

- Increase efforts to leverage federal grant funds with existing state funds.
- Apply less-expensive technology to model year 2001 and newer buses.
- Seek additional supplementary state funds or extend current funding beyond five years.

Fiscal Summary

ESSB 6072 requires that program revenue fund retrofits in the counties where the fees are collected. Revenue for the first year of the program was $5,000,000. As of September 30, 2004 the program spent $1,845,644 out of $6,141,136, leaving a balance of $4,295,492. Details regarding expenses are discussed in the "First Year Results" section of this report.

Fiscal Summary (7/01/03-9/30/04):

Quarter	Period	Carry Forward*	Quarterly Revenue	Total Expenses
1st QTR	7/01/03-9/30/03	0	1,250,000	66,640
2nd QTR	10/01/03-12/31/03	1,183,360	1,250,000	25,004
3rd QTR	1/01/04-3/31/04	2,408,356	1,250,000	193,237
4th QTR	4/01/04-6/30/04	3,465,119	1,250,000	621,794
5th QTR	7/01/04-9/30/04	4,093,325	1,141,136	938,968
Sum	7/01/03-9/30/04	$4,295,492	$6,141,136	$1,845,644

*Carry Forward = Revenue minus expenses; each quarter will be cumulative.

Balance as of 9/30/04: $4,295,492

Summary of Expenses:

The Department of Ecology's headquarters disperses the program revenue to local air quality agencies, tracks expenditures, manages the program's state contract, coordinates activities among local air quality agencies, and reports program results to the state legislature. The state's local air quality agencies independently provide local project management and service to their customer school districts. The Department of Ecology's headquarters administrative costs are 0.5% of the total revenue, and should remain constant over time.

Local air quality agencies solicit school districts participation, make final decisions on the appropriate technology for individual school buses, provide quality control and quality assurance, track local expenditures, and provide progress reports to the Department of Ecology. Total administrative expenses for local air quality agencies plus the Department of Ecology are 2.1% of the total revenue. As the number of retrofits increase in the second through fifth year of the program, overall administrative costs are expected to increase, but not exceed, 3% of total program revenues.

Summary of Program Expenses:

Quarter	Period	Retrofit Expenses	Administrative Expenses	Other Expenses	Total Expenses
1st QTR	7/01/03-9/30/03	53,480	13,160	0	66,640

2nd QTR	10/01/03-12/31/03	0	24,951	53	25,004
3rd QTR	1/01/04-3/31/04	150,049	28,645	14,542	193,237
4th QTR	4/01/04-6/30/04	522,554	30,195	69,045	621,794
5th QTR	7/01/04-9/30/04	890,802	31,643	16,523	938,968
Sum	7/01/03-9/30/04	$1,616,885	$128,595	$100,163	$1,845,644

Administrative Costs:

% of Total Revenue for All Air Quality Agencies	2.1%
% of Total Revenue for Ecology Headquarters	0.5%

Cleaner Fuels, Clean Fuels Infrastructure, and Other Projects that Reduce Diesel Emissions

The purpose of Engrossed Substitute Senate Bill (ESSB) 6072 is to reduce school children's exposure to airborne particulates generated by diesel school buses. Therefore, 85% of the funds received by both Ecology and local air agencies must be used to retrofit school buses with emission control equipment, or provide funding for school bus refueling infrastructure necessary to use alternative, cleaner fuels. The remaining 15% of these funds may be used as above, or to reduce motor vehicle emissions, clean up air pollution, or monitor and reduce toxic air contaminants.

Summary of Projects Funded through 15% Flexible Funding

Project	Lead Agency	Recipient	Funding
School Bus Check-up	Ecology	Statewide	$31,542
Bio-diesel (B-20)	Ecology	Central Valley School District - Spokane	$31,710
Bio-diesel (B-20)	ORCAA	Jefferson County Transit	$7500
Total			$70,752

The Washington State School Bus Check-Up Program:

SUMMARY: The Department of Ecology conducts an emissions test on school buses for school districts that are located in Ecology's five-county, vehicle inspection and maintenance (I/M) Program area. As an extension of the Washington State Patrol's (WSP) School Bus Safety Inspection Program and Ecology's I/M Program, I/M staff trained WSP bus inspection staff to emissions test school buses in those counties outside of the I/M area. Training included proper administration of paperwork and use and maintenance of opacity equipment. The Office of Superintendent for Public Instruction (SPI) and WSP compile data consisting of vehicle year, size, engine type and size, vehicle use, mileage and opacity readings. Ecology reviews this data and provides SPI with maintenance recommendations to help reduce emissions. The opacity readings from the emission testing will be used as tool to identify vehicles in need of advanced maintenance or repair. (Does this fit into the retrofit effort as per testing buses that have been retrofitted with control equipment?)

COST: Educational Service District 101 will purchase 9 Wager opacity meters (sensor head, software, and printer) at a cost of $2970 each, for a total equipment cost of $26,730. Additional costs will include sales tax ($2272), plus a 9.5% ($2540) ESD processing fee, bring the total costs to $31,542. No future costs are anticipated.

REPORTING: SPI will provide progress reports to Ecology leads, which will maintain records and report progress to the AQ Program's Steering Committee.

BENEFITS: This collaboratively (SPI/WSP/ECY) developed program reduces additional emissions beyond the retrofit program, improves fuel economy, and provides school districts a fleet education/maintenance program. Expanding this program statewide insures equity among school districts in both urban and rural areas.

Cleaner Fuels: B20 for Central Valley School District

SUMMARY: ESHB 1243 is an unfunded mandate requiring the Office of Superintendent of Public Instruction (OSPI) to conduct a pilot project on the use of biodiesel, ultra-low sulfur diesel (ULSD), and ULSD combined with bio-diesel on diesel school buses at two school districts during the 2003-2004 and 2004-2005 school years. Ecology is providing OSPI funding to offset the increased cost of a 20% biodiesel blended, B20, with regular on-highway diesel at the Central Valley School District in Spokane. Ecology will continue to fund the cost differential for B20 to Central Valley School District during the 2004-2005 school year. The Puget Sound Clean Air Agency and Ecology will fund the cost differential for ultra-low sulfur diesel and B20 at the School District during the 2004-2005 school year.

COSTS: $31,710 to offset the cost to provide a 20% biodiesel blend for 100% of the diesel fleet.

REPORTING: Ecology conducted baseline emission tests in 2002, prior to providing the 20% biodiesel blend. Ecology will conduct additional annual emissions testing, and provide this data to OSPI for a report to the legislature in 2005.

BENEFITS: Reduced fine particles from tailpipe emissions.

Cleaner Fuels: B20 for Jefferson County Transit

SUMMARY: The Olympic Region Clean Air Agency is providing funding to offset the increased cost of a 20% biodiesel blended, B20, with regular on-highway diesel for Jefferson County Transit. Jefferson County Transit transports children to and from school as part of their regularly scheduled routes.

COSTS: $7500 to offset the cost to provide a 20% biodiesel blend for a portion of the diesel fleet.

BENEFITS: Reduced fine particles from tailpipe emissions.

Next Steps and Future Recommendations

Several next steps have been identified for the second year of the program. These steps will insure that the program continues to make sound and cost effective decisions. Appendix H-1 identifies start-up problems and the corrective actions that were taken to address these problems.

During the next year, the program will address the following items:

1. Achieve 100% participation from school districts.

2. Implement an improved school bus maintenance program specifically designed to reduce school bus emissions, including development of an electronic data transfer system that tracks performance.

3. Complete an assessment of diesel particle filters to determine which types (passive regenerative, continuously regenerative, etc.) are technologically appropriate and most cost effective, including maintenance costs, for school bus retrofits.

4. Evaluate the cost effectiveness of retrofitting model year 2001 and newer school buses with diesel particle filters vs. diesel oxidation catalysts.

5. Based upon the results from (3) and (4), develop and implement a state contract to obtain a competitive price for particle filter installation.

6. Based upon the results from (3) and (4) and (5), develop a third through fifth year retrofit plan and schedule for particle filter installations, including an assessment of revenue vs. costs.

7. Increase efforts to leverage federal grant funds with existing state funds.

8. Evaluate the need to seek additional supplementary state funds or extend current funding beyond the current five-year period.