Middle Harbor Terminal Zero Emission Conversion Project

Prepared for U.S. Department of Transportation
Office of the Secretary
Port Infrastructure Development Program
(PIDP) 2022

Submitted By
Port of Long Beach
415 W. Ocean Blvd., Long Beach, CA 90802 | 562-283-7100

May 16, 2022

Port of
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Long Beach
Container
Terminal

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May 16, 2022

The Honorable Pete Buttigieg
Secretary of Transportation
U.S. Department of Transportation
1200 New Jersey Ave, SE
Washington, DC 20590

Dear Secretary Buttigieg,

The Port of Long Beach (Port) is pleased to submit for your consideration the enclosed application for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project (Project), seeking grant funding in the 2022 Port Infrastructure Development (PIDP) program. This Project will deploy the largest fleet of manually operated, zero-emission cargo handling equipment (CHE) nationwide in order to improve the safety, efficiency, and reliability of goods movement at the country's second busiest seaport. The enclosed application requests $30.1 million in federal funding for the project design and management, equipment, and supporting infrastructure and installation.

The San Pedro Bay Port Complex, which includes the Port of Long Beach, is a leading gateway for international trade and moves about 25 percent of the nation's exports and 40 percent of containerized import traffic. The Port of Long Beach supports over 2.6 million jobs nationally, generates $46 billion a year in federal, state and local tax revenues, and contributes millions of dollars annually ($19 million in FY21) to City of Long Beach marina, beach and waterfront projects. The Port of Long Beach is also one of 17 ports in the United States that form the National Port Readiness Network to support nine federal agencies involved in military force deployments, contingency operations, and other defense emergencies.

The Port of Long Beach is also a leader amongst seaports in the development and execution of innovative clean air strategies, providing substantial, and much needed air quality and public health benefits to our surrounding communities. Since 2005, the Port of Long Beach and its partners have reduced diesel particulate matter by 90%, smog forming nitrogen oxides by 62%, sulfur oxides by 97%, and greenhouse gases by 10%, while cargo throughput increased 21%. In 2017, the Port of Long Beach and the Port of Los Angeles (Ports) jointly adopted an update to our Clean Air Action Plan (CAAP). The CAAP is the most comprehensive, far-reaching strategy for reducing port-related air pollution and health risks, while allowing port development, job creation and economic activity associated with that development to continue. The 2017 CAAP update adopted ambitious zero-emission goals, including zero-emission cargo handling equipment by 2030, and zero-emission drayage trucks entering and exiting the Ports by 2035.

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The MHT Zero Emission Conversion Project is a critical next step to achieving our zero-emission goals, and will support good-paying jobs, workforce development, incorporate equity-focused policies, and reduce climate and air-quality impacts on nearby historically disadvantaged, environmental-justice communities.

The Project will take place at Long Beach Container Terminal (LBCT) and will include the following elements:

- Acquisition of 60 battery-electric, manually operated, American-made yard tractors to reduce emissions and increase terminal and regional rail efficiency by improving equipment productivity on a per-hour basis;
- Construction of permanent equipment-charging infrastructure integrated with energy load management software to enhance energy efficiency;
- Power committed to and provided by the Port's electrical utility, Southern California Edison (SCE), of which 60% is anticipated to be generated from renewable sources by 2030 under State requirements;
- Training for yard tractor operators and maintenance personnel to prepare today's workers for the next generation of advanced clean technologies, thus equitably distributing the benefits of zero emissions and avoiding displacement of current workers;
- Installation of software equipment and implementation of training designed to be compatible with the Terminal Operating System to streamline cargo-handling capabilities, to maximize efficiency, and to minimize supply chain bottlenecks; and
- Construction on recently improved land with no anticipated environmental impacts subject to NEPA mitigation.

It is critical to the health of our residents and environment that this investment be made now to further eliminate Port-related air pollution, while ensuring our operations can continue to grow and support the national economy. LBCT, a long-time partner on clean air projects, has already demonstrated incredible leadership in this space and I feel confident in their ability to execute this transformational project. On behalf of the Port of Long Beach, I appreciate your consideration and thank you for supporting the MHT Zero Emission Conversion Project.

Should you have any questions regarding this Project, please reach out to Morgan Caswell, Manager of Air Quality Practices, at Morgan.Caswell@polb.com.

Sincerely,

Mario Cordero
Executive Director
Port of Long Beach

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APPENDICES

SUPPORTING DOCUMENTATION/ATTACHMENTS

The following supporting documentation for this application has been submitted on www.grants.gov as attachments, separately from this narrative and include the following:

1. Benefit-Cost Analysis (BCA) Narrative
2. BCA Excel model
3. Emissions Analysis
4. Memorandum of Understanding (MOU)
5. SF424
6. SF424c

INTRODUCTORY INFORMATION

Name of applicant	Port of Long Beach in partnership with Long Beach Container Terminal (LBCT)
Is the applicant applying as a lead applicant with any private entity partners or joint applicants?	Lead Applicant: Port of Long Beach Private Entity/Project Funding: Long Beach Container Terminal (LBCT)
What is the project name?	Middle Harbor Terminal (MHT) Zero Emissions Cargo-Handling Equipment (CHE) Conversion Project
Project Description	The Port of Long Beach (POLB), in partnership with LBCT, is requesting $30.1 million in 2022 Port Infrastructure and Development Program (PIDP) grant funding to transition 60 pieces of fossil-fueled (CHE) to zero-emission and construction of associated charging station infrastructure (the Project). The Project is the next step in the LBCT MHT Zero Emissions Conversion Project that will modernize CHE at the second busiest seaport in the U.S., support federal and State emissions goals, and reduce emissions within a CA State SB 535 Disadvantaged Community Zone. The Project site falls within a California Air Resources Board (CARB) "California Climate Investments Priority Populations" Census Tract.
Is this a planning project?	No
Is this a project at a coastal, Great Lakes, or inland river port?	Coastal
Is this application for a small project at a small port?	No
Is this project located in a noncontiguous State or U.S. territory?	No
GIS Coordinates (in Latitude and Longitude format)	Longitude -118.2111, Latitude 33.7515
Is this project in an urban or rural area?	Urban
Project Zip Code	90802

Is the project located in a Historically Disadvantaged Community or a Community Development Zone? (A CDZ is a Choice Neighborhood, Empowerment Zone, Opportunity Zone, or Promise Zone.)	Yes, the Project site is within a Historically Disadvantaged Community, Census Tract 9800.33 (Transportation Disadvantaged Census Tracts, Department of Transportation)
Has the same project been previously submitted for PIDP funding?	No
Is the applicant applying for other discretionary grant programs in 2022 for the same work or related scopes of work?	The applicant is not applying for other discretionary grant funds in 2022 for the Project specific components. The applicant is considering regional and State funding programs to replace the diesel yard tractors with electric yard tractors.
Has the applicant previously received TIGER, BUILD, RAISE, FASTLANE, INFRA or PIDP funding?	Yes: - FY21 PIDP - America's Green Gateway Phase 1: Pier B Early Rail Enhancements Project - $52.3 million award - FY19 PIDP - Alameda Corridor South Access: Terminal Island Rail Junction Project - $14.5 million award - FY11 TIGER – Green Port Gateway: Track Realignment at Ocean Boulevard and Pier F Support Yard - $17 million award
PIDP Grant Amount Requested	$30,141,080
Total Future Eligible Project costs	$37,676,350
Total Project Cost	$37,676,350
Total Federal Funding	$30,141,080
Total Non-Federal Funding	$7,535,270
Will RRIF or TIFIA funds be used as part of the project financing?	N/A

SECTION I – PROJECT DESCRIPTION

A. PROJECT SUMMARY

The Port of Long Beach (Port) in partnership with Long Beach Container Terminal (LBCT) proposes to deploy the largest fleet of manually operated, zero-emission cargo handling equipment (CHE) nationwide in order to improve the safety, efficiency, and reliability of goods movement at the country's second busiest seaport; to promote economic vitality; and to leverage federal funding with private funding. The Middle Harbor Terminal Zero Emissions Conversion Project (the Project) will support good-paying jobs and workforce development, incorporate equity-focused policies, and reduce climate and air-quality impacts on nearby historically disadvantaged, environmental-justice communities, eliminating 0.12 tons of diesel particulate matter, 3.2 tons of nitrogen oxides, 0.11 tons of sulfur oxides, and 8,339 metric tons of CO_2e annually, as described in Section IV.

The Project, which will take place at LBCT, serving the intermodal rail operation shown in Figure 1, includes

- Acquisition of 60 battery-electric, manually operated, American-made yard tractors to reduce emissions and increase terminal and regional rail efficiency by improving equipment productivity on a per-hour basis;
- Construction of permanent equipment-charging infrastructure integrated with energy load management software to enhance energy efficiency;
- Power committed to and provided by the Port's electrical utility, Southern California Edison (SCE), of which 60% is anticipated to be generated from renewable sources by 2030 under State requirements;
- Training for yard tractor operators and maintenance personnel to prepare today's workers for the next generation of advanced clean technologies, thus equitably distributing the benefits of zero emissions and avoiding displacement of current workers;
- Installation of software equipment and implementation of training designed to be compatible with the Terminal Operating System to streamline cargo-handling capabilities, to maximize efficiency, and to minimize supply chain bottlenecks; and
- Construction on recently improved land with no anticipated environmental impacts subject to NEPA mitigation.

Figure 1: Long Beach Container Terminal and the Middle Harbor Terminal

Once completed, this Project will help achieve LBCT's aggressive goal to become the first Net Zero Marine Terminal in the country and will support the Port's goal of zero-emission terminal operations by 2030 as set forth in the 2017 San Pedro Bay Ports Clean Air Action Plan (CAAP).[1] LBCT will become the nation's most productive large container terminal with the fewest climate and community impacts and will represent the future of efficient, resilient, and sustainable goods movement incorporating strong workforce protections and equity for all, as demonstrated by the following metrics:

- Lowest truck turn times on the west coast, averaging less than one hour
- Highest vessel productivity in North America – no ships forced to anchor during 2021-2022 congestion
- Largest, fastest and most reliable on-dock rail in North America
- Lowest-emissions container terminal in the world with nearly all cargo-handling equipment already electrified, resulting in 90% NO_x emission reductions since 2015, full shore power for ships at berth, and onsite renewable solar energy production

[1] www.cleanairactionplan.org

- Continuously increasing capacity – 700 TEU in 2015 to 3.3M TEU in 2022
- Sophisticated and superior supply chain terminal and on-line tools
- Proactive and positive relationships with workforce, agencies, and community

This Project, which will replace all of LBCT's remaining fossil-fueled yard tractors with electric zero-emission yard tractors, will reduce LBCT's current cargo-handling equipment CO2e emissions by 90% and particulate matter (PM) emissions by 82%. This Project supports the PIDP program goals of improving the safety, efficiency, and reliability of the movement of goods into, out of and around the San Pedro Port Complex by increasing equipment productivity, decreasing down time, and reducing dependence on scarce and price-volatile fossil fuels while at the same time improving community air quality and reducing climate change impacts. By shifting almost all of LBCT's fleet to one reliable and increasingly renewable energy source – electricity – this Project helps guard against long-term fossil-fuel shortages and price shocks and allows LBCT to provide a high level of service to its customers, the community, and the region.

This Middle Harbor Terminal (MHT) Zero Emissions Conversion Project is the next pivotal step in the journey for the Port and LBCT to modernize the remaining fossil-fueled CHE, meet federal, State, and regional emissions reductions and climate goals, and improve the air quality within a Historically Disadvantaged Community (USDOT designation). This Project site also falls within the California Air Resources Board (CARB) "California Climate Investments Priority Populations" Census Tract, and it has strong support from the environmental justice community, as demonstrated by the support letters (Appendix F).

The Project cost is estimated to be $37.7 million dollars. The Port and LBCT are submitting this application for $30.1 million, which represents 80% of the total project costs. LBCT is committed to provide the additional $7.5 million in matching funds, highly leveraging the federal contribution. The Project will be completed well within the grant program's period of performance.

B. Project Background

Diesel engines in trucks, locomotives, ships, harbor craft, and cargo handling equipment are major contributors to the air pollution challenges and account for most of the State of California's particulate matter emissions.[2] Near-source exposure to emissions of this particulate matter is associated with health risks, especially near distribution centers, railyards, and seaports, many of which impact disadvantaged communities. Emissions from freight transport also account for over one-third of the statewide nitrogen oxides (NOx) that form fine particles.

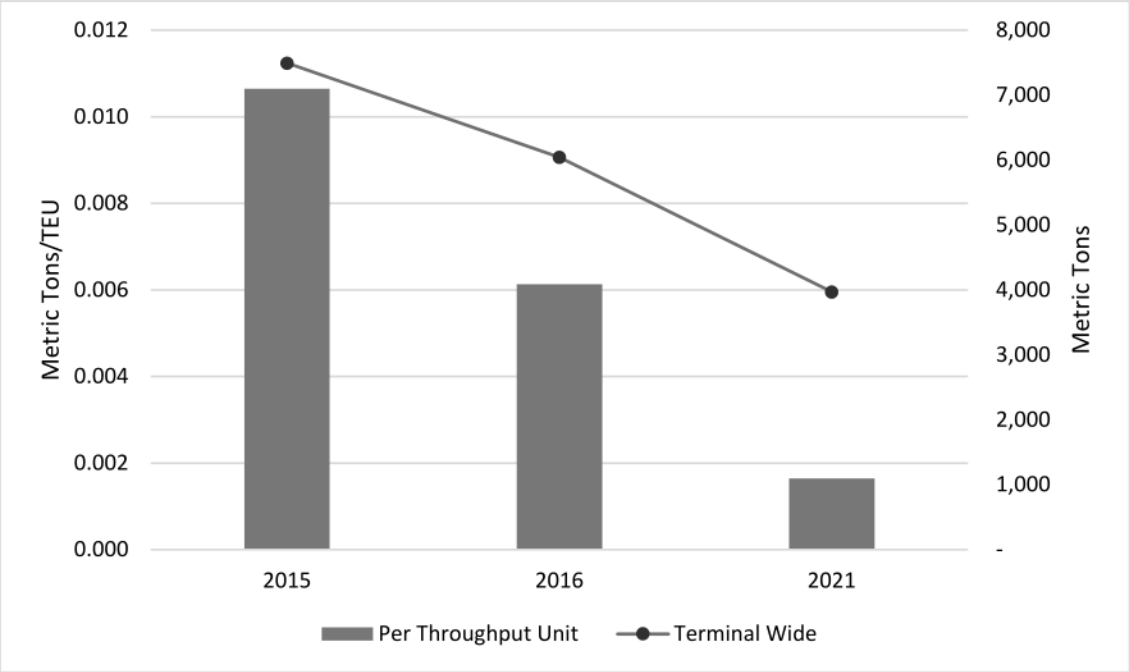
LBCT has already transformed its operations to put sustainability and zero emission operations at the forefront of its operations. The predominant mode for horizontal transport of containers includes the use of zero-emission, battery-powered CHE that move cargo between storage and vessels. Other CHE includes electric, grid-tied ship-to-shore (STS) cranes working at the berth,

[2] California Air Resources Board, 2020, Mobile Source Strategy, draft discussion document.

electric stacking cranes working in the container yard, and electric rail-mounted gantry cranes working in the intermodal yard.

As a consequence of early reductions in fossil-fuel equipment activities, LBCT has significantly reduced emissions over the years. Figure 2 below shows the CO2e emissions reductions from replacing fossil-fueled equipment, both terminal-wide and as a per-container (twenty-foot equivalent units, or TEU) metric.

Figure 2: Fossil Fuel Equipment CO2e Emissions Reduction



However, there remains 60 diesel-fueled yard tractors that transfer cargo between storage and rail. The Project would replace these 60 remaining fossil-fueled units with zero-emission, battery powered, manually operated yard tractors and install 60 UL-listed, minimum 100-kW charging units to support them.

Table 1 presents the estimated CO_2, NO_x, and $PM_{2.5}$ emission reductions resulting from this Project. The emissions analysis used 2021 emissions for LBCT equipment and yard tractors estimated by the Port's consultant as part of the annual emissions inventory project, which will be published later this year. Those emissions estimates were developed using a methodology that is reviewed by a technical working group including U.S. EPA Region 9, California Air Resources Board, and South Coast Air Quality Management District. The Project-related emissions reduction estimate takes into account a forecasted increase in terminal throughput to 3.5 million TEUs/year by 2023 and attributes 30% volume share for the rail intermodal yard where the terminal tractors will work.

Table 1:Emissions Reductions from this Project

Pollutant (unit)	Per TEU (g/yr)	Annual Reduction Resulting from Project
CO_2 (metric tons)	2,383	8,339
NO_x (tons)	0.825	3.18
$PM_{2.5}$ (tons)	0.031	0.12
SOx (tons)	0.027	0.11

Project team resources have been used to estimate the zero emissions energy requirements at the seven proposed charging stations within the MHT. This information, shown in Table 2, has been provided to SCE to ensure adequate power to the MHT site for the zero-emission equipment and infrastructure needs related to this Project.

Table 2:Energy Requirements at Various Charging Stations

Location	Yard Tractor (YT) Quantity	Volts	Amps (Rated)	Amps (Usage)	Power Factor	Demand (kVA)	Total Demand (kVA)
Site 1 Generic YT	1	480	200	80%	0.9	119.71584	119.71584
Site 2 Intermodal Yard	40	480	200	80%	0.9	119.71584	4788.6336
Site 3 Inspection Facility	4	480	200	80%	0.9	119.71584	478.86336
Site 4 Technology Facility	4	480	200	80%	0.9	119.71584	478.86336
Site 5 Crane Maintenance Facility	4	480	200	80%	0.9	119.71584	478.86336
Site 6 North Road	2	480	200	80%	0.9	119.71584	239.43168
Site 7 Operations Building	6	480	200	80%	0.9	119.71584	718.29504

C. INTENTION OF PROJECT

The Project is part of the Port and LBCT's ongoing commitment to achieve zero emission terminal operations by the year 2030 in order to reduce climate change and to minimize negative health and air-quality impacts on the workforce and nearby environmental-justice communities. Additionally, this Project incorporates equity-based policies by providing workforce training in advanced equipment technologies and by supporting good-paying union jobs throughout

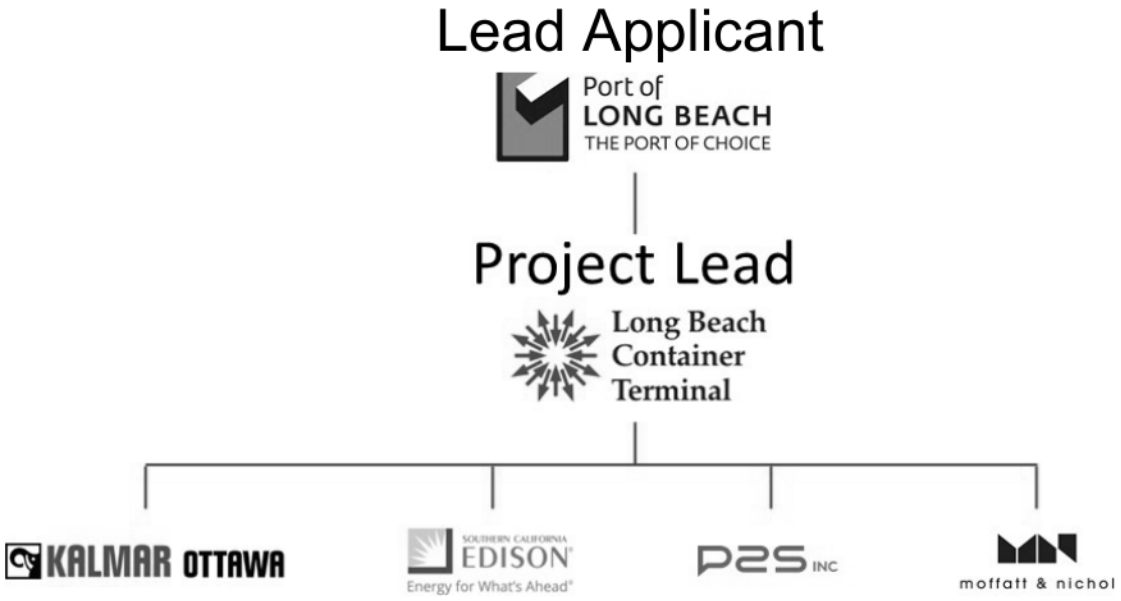
construction, installation, and deployment. This Project implements the federal government's vision of a more climate-friendly and efficient supply chain while supporting the zero-emissions goals of the State of California and the Port.

Project Team

The POLB will serve as the lead applicant and recipient of the grant funding should the Project be awarded. LBCT will lead implementation of the project, including design, bid, and build of the Project. LBCT will also be responsible for a multitude of PIDP-specific terms and conditions as the Project Lead, including meeting Buy American requirements. For a detailed description of roles and responsibilities between POLB and LBCT, please see Appendix A for a Memorandum of Understanding between the Port and LBCT.

This Project is supported by Southern California Edison (SCE) as they provide design for getting power to the Project site, Buy American compliant CHE manufacturers such as Kalmar Ottawa, P2S, Inc. who has provided preliminary design, and Moffat & Nichol (M&N) who are providing grant application support. The Project Application Team is shown graphically in Figure 3.

Figure 3: Project Application Team



The Project entails the construction of utility distribution infrastructure from SCE, the acquisition of 60 electrical-powered CHE yard tractors from a Buy American compliant CHE manufacturer, and 60 electric-charging units designed and permitted by qualified engineering firm(s) selected under federal contracting regulations. The Project will be constructed on previously disturbed soil, thus minimizing the risk of unforeseen construction conditions that could impact timeline and budget. The selected CHE manufacturer (at this time, presumed to be Kalmar Ottawa based on the availability of this emerging technology) will provide training for

the CHE yard tractor operators and maintenance personnel to ensure that today's dockworkers are prepared for the next generation of advanced, sustainable goods-movement technologies, thus equitably distributing the benefits of the zero-emissions transition to current workers rather than displacing them.

SECTION II – PROJECT LOCATION

A. PROJECT/PERFORMANCE SITE LOCATION

The Project is located within the POLB at 1171 Pier F, Long Beach, California 90802 (Longitude -118.2111, Latitude 33.7515), as shown in Figure 4. The Project is within the San Pedro Bay Coastal Seaport area.

Figure 4: Project Location

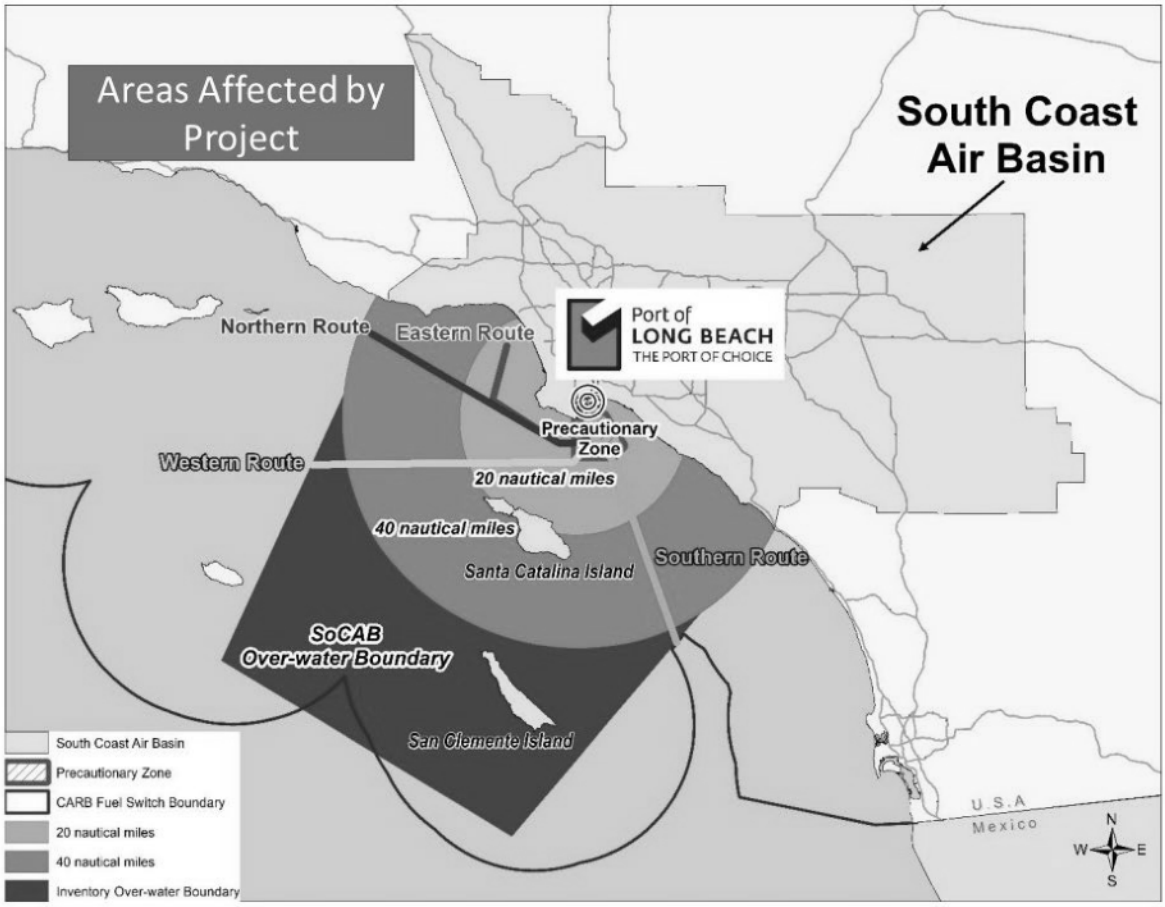
The following Figure 5 illustrates the project site specific locations for charging stations and quantity of charging stations required.

Figure 5: Location & Quantity of Charging Stations

B. Areas Affected by Project

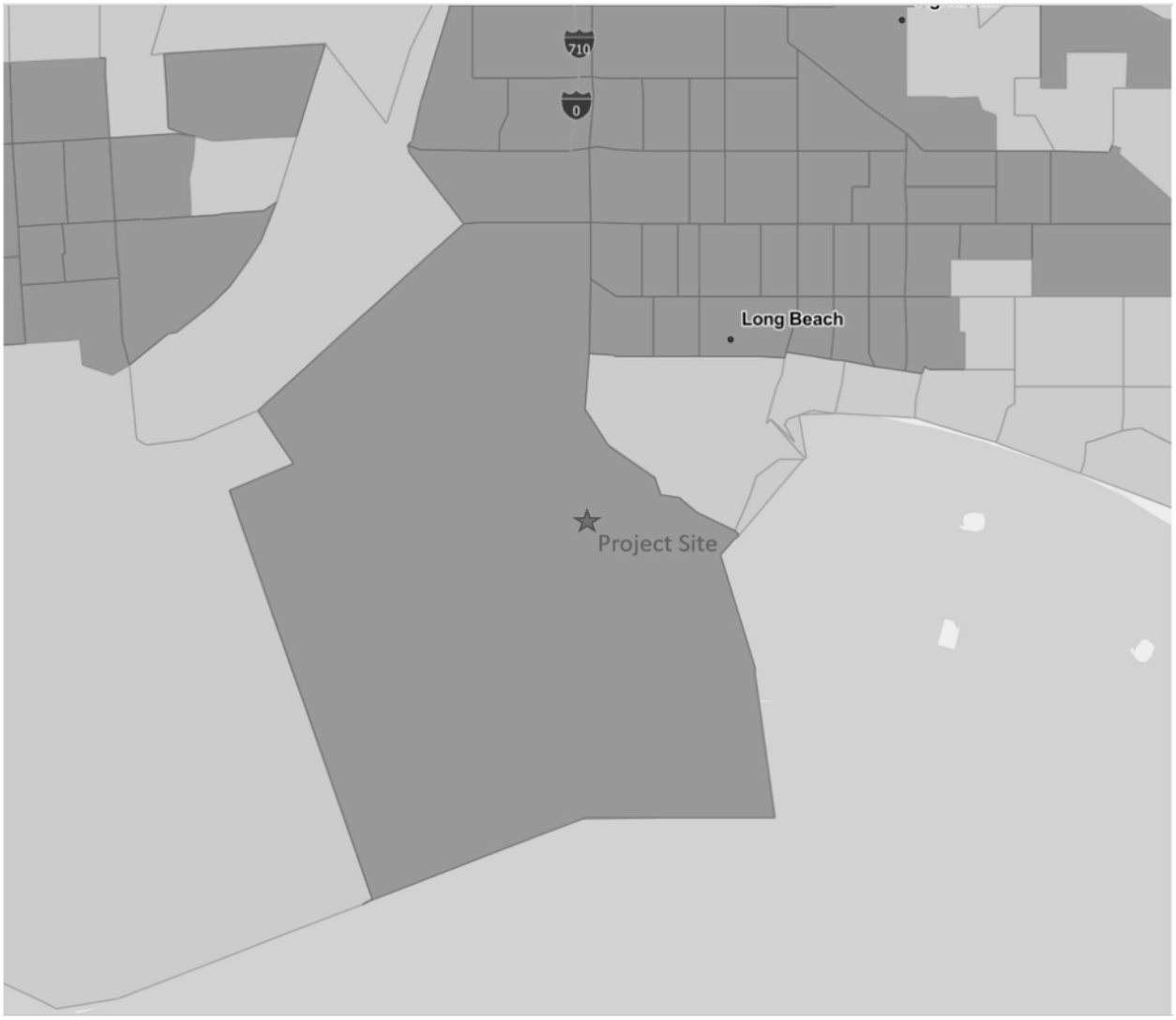
The Port of Long Beach 2020 Air Emissions Inventory indicates the emissions inventory domain as illustrated in Figure 6. The geographical domain lies within the harbor and up to the South Coast Air Basin overwater boundary, comprised of an overwater area bounded in the north by the southern Ventura County line at the coast and in the south with the southern Orange County line at the coast.

Figure 6: Affected Areas by Project



The Project also is located within a Historically Disadvantaged Community, Census Tract 9800.33 (Transportation Disadvantaged Census Tracts, Department of Transportation), and the benefits will accrue to the numerous Historically Disadvantaged Communities surrounding the Project site, as shown in Figure 7.

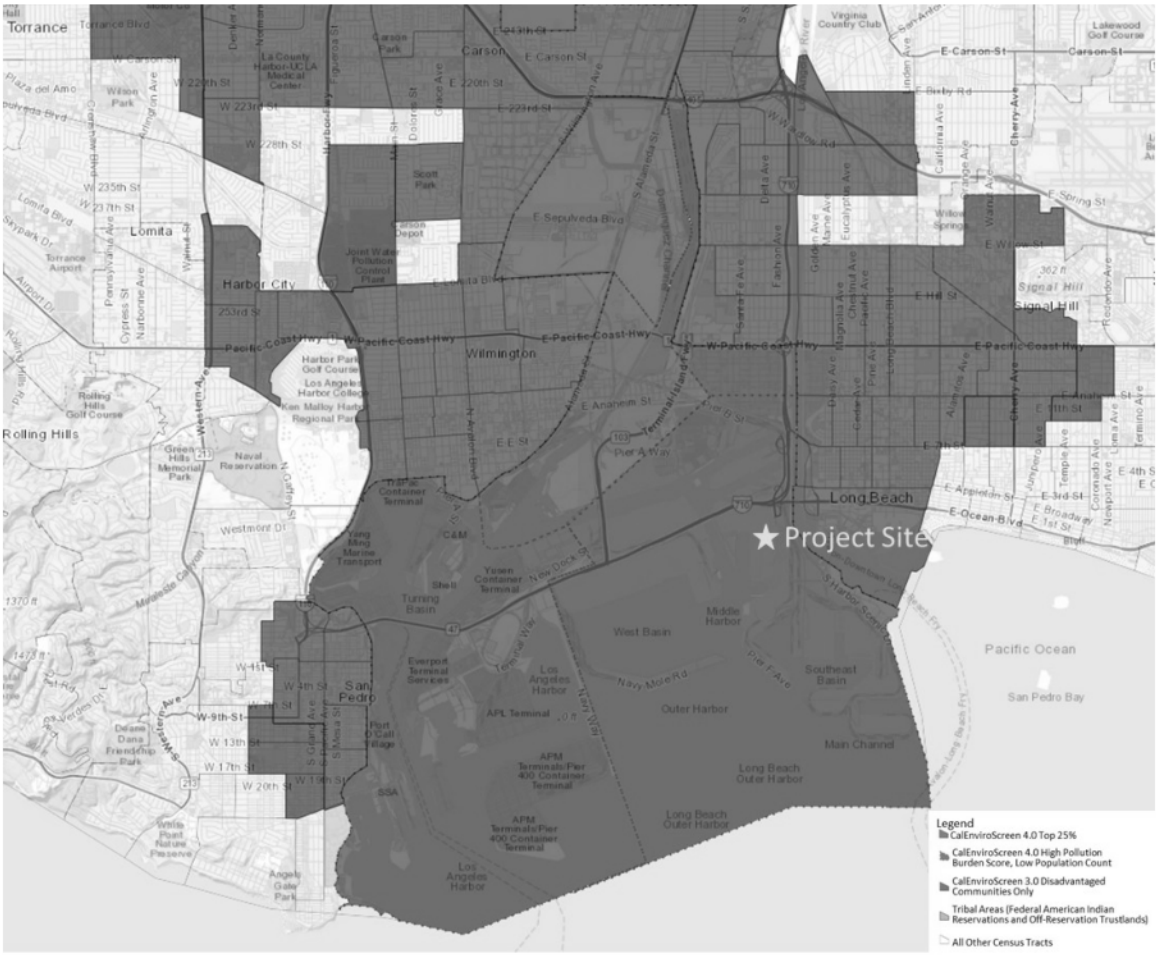
Figure 7: Historically Disadvantaged Community (US Department of Transportation)



Source: Transportation Disadvantaged Census Tracts (Historically Disadvantaged Communities)

The Project site also is within CA State SB 535 Disadvantaged Community Zone, Census Tract 6037980033, as shown in Figure 8. These areas represent the 25% highest scoring census tracts in the State for high amounts of pollution and low socioeconomic indicators. The Project site is in a location with a Pollution Burden Percentile of 98.4.

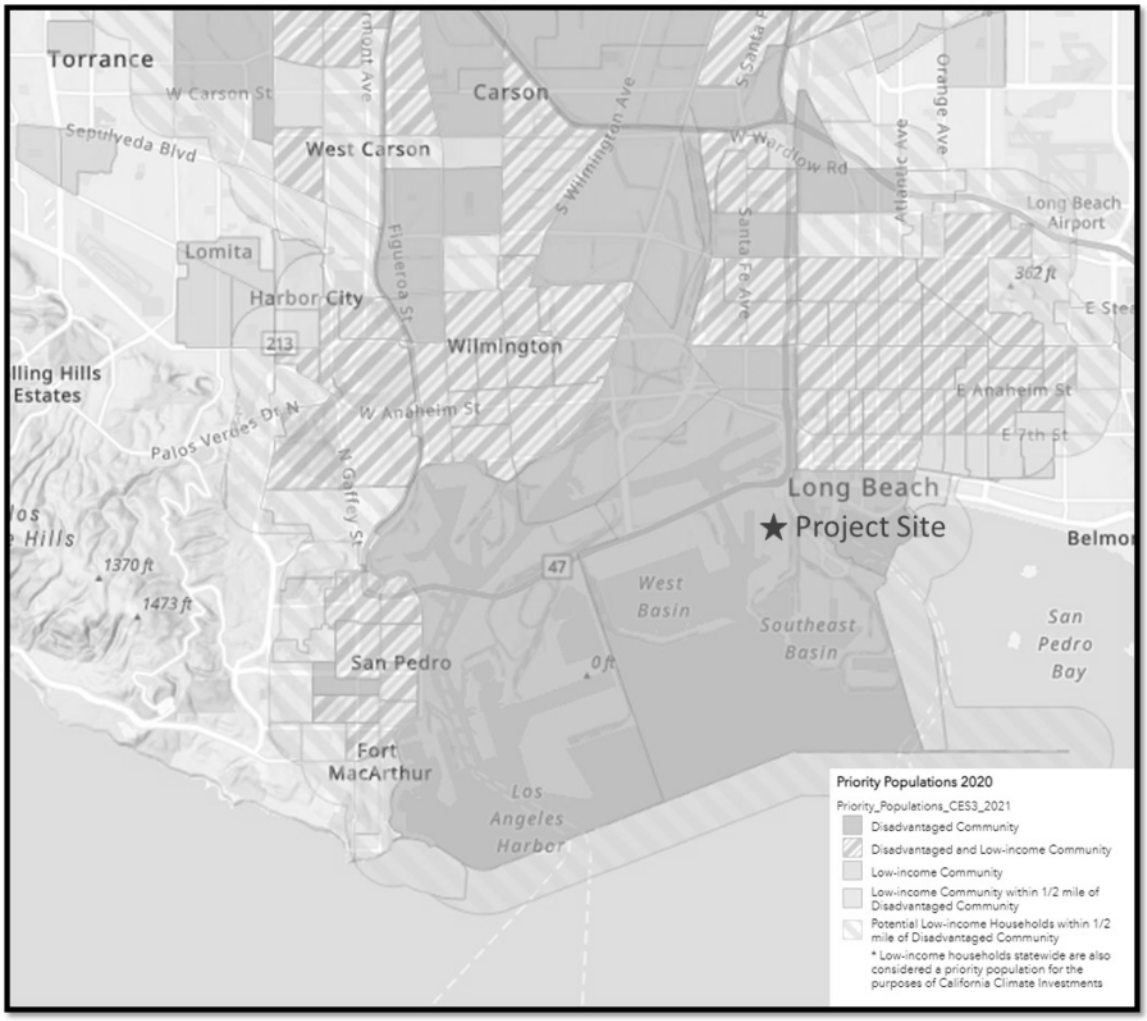
Figure 8: Disadvantaged Communities Designed by CalEPA



Source: CalEPA

Additionally, the Project site falls within a California Air Resources Board **"**California Climate Investments Priority Populations" Census Tract, as shown in Figure 9. These areas are given priority for projects that reduce the impacts of climate change, including elimination of fossil fuels, which is a major goal of this Project.

Figure 9: California Climate Investments Priority Population Tract by CARB



Source: California Air Resources Board

SECTION III– GRANT FUNDS, SOURCES, AND USES OF PROJECT FUNDS

A. PIDP FUNDING REQUEST

The total cost estimate for the Project is $37,676,350 in 2022 dollars. Equipment prices may come down over the next few years with manufacturing process improvements, and the relatively quick implementation timeline guards against significant cost escalations. The requested PIDP funds of $30,141,080 for the Project represents 80% of the estimated total Project cost and will be supported by $7,535,270 in cost share funds from LBCT. Notably, LBCT anticipates an additional contribution from SCE (see SCE support letter); however, the Port is not counting these funds as private match due to the uncertainty of the actual contribution.

B. PROJECT COSTS AND FUNDING SOURCES

LBCT has developed a comprehensive funding program for the Project, with the requested PIDP grant funding an essential element of LBCT's goal of meeting the needs of the freight and logistics industry, region, and state. Table 3 summarizes the infrastructure and equipment costs by funding source.

Table 3:Project Costs & Funding Sources

Project Component		Total Project Cost	Funding Allocation	
			PIDP	LBCT
1	MHT Site Infrastructure (Equipment & Installation)	$8,835,450	$7,068,360	$1,767,090
	1.1 Low Power Conversion Transformer *1.2 Trenching, Conduit, and Conductors* *1.3 Electrical Equipment Foundation* *1.4 Charging Station Units* *1.5 Charging Safety System* *1.6 Electrical Equipment Protection* *1.7 Vehicle Alignment* *1.8 Vehicle Concrete Pad*			
2	Equipment (60 CHE)	$25,533,900	$20,427,120	$5,106,780
	2.1 Yard Tractors *2.2 Operator & Maintenance Training* *2.3 TOS Connectivity (NOW System)* *2.4 TOS Connectivity (On-Board System)* *2.5 TOS Connectivity (ICTF Yard Eye)*			
3	Design & Management	$3,307,000	$2,645,600	$661,400
	4.1 Site Design *4.2 Construction Supervision* *4.3 Permitting* *4.4 Project & Grant Management*			

Project Component	Total Project Cost	Funding Allocation	
		PIDP	LBCT
TOTAL	**$37,676,350**	**$30,141,080**	**$7,535,270**

Costs for the yard tractors are based on a price quotation from Kalmar Ottawa dated February 28, 2022 and included in Appendix B. Costs for the charging infrastructure are based on a preliminary feasibility study conducted by P2S and include standard engineering estimates for conduit, cabling, concrete pads, charging units, and design and engineering.

The costs are considered to be order of magnitude and budgetary appropriate for the grant program application and are based on preliminary engineering. The request for PIDP funding does not include project expenses between the time of grant award announcement and obligation. Appendix B includes more details and supporting documentation.

No other Federal funding is anticipated. LBCT may seek funds from State incentive programs; however, there is no single program that can provide the volume of equipment and scope of infrastructure installation required by this Project on such an aggressive timeline, thus necessitating this Federal funding request.

C. Documentation of Funding Commitment

LBCT certifies that it is committed to funding the MHT Zero Emission Conversion Project (Project). LBCT is seeking $30,141,080 in grant funding from the FY 2022 PIDP to help fund the $37,676,350 MHT Zero Emission Conversion Project. LBCT has sufficient funds available to contribute the shared costs for the Project. Federal government support of early adopters of zero-emission technologies at the nation's second busiest seaport is critical.

Non-federal funds will be provided by LBCT, primarily from revenues collected from marine operations associated with being part of the national gateway and one of the world's busiest seaports. Please refer to the Finance Letter provided in Appendix C.

SECTION IV – MERIT CRITERIA

A. Achieving Safety, Efficiency, or Reliability Improvements

The Project aims to enhance the safety, efficiency and reliability of the Port by replacing diesel yard tractors with electric yard tractors and by installing permanent charging infrastructure in order to improve loading and unloading of goods at a Port; movement of goods in, around or within the Port; operations, including port resilience; and environmental mitigation, as described in more detail below. At the completion of this Project, LBCT is expected to realize measurable gains in equipment productivity, terminal efficiency, and long-term resiliency while significantly reducing its environmental impacts.

Loading and Unloading of Goods at a Port

The electric yard tractors will facilitate safer, more efficient, and more reliable movement of cargo around the MHT. Electric yard tractors require less maintenance than diesel yard tractors, which reduces equipment down time and per-hour operating costs. The switch to electric yard tractors will enable LBCT to handle more cargo per yard tractor than it can currently handle, vastly improving terminal efficiency as measured by overall capacity. Further, electric yard tractors eliminate the risk of fuel spills, which reduces down time associated with emergency clean-up response. Additionally, each yard tractor will be outfitted with a mechanized trailer coupling system to enable fast connection to the cargo containers, reducing wait times relative to manual coupling and improving worker safety. Each yard tractor also will feature advanced vehicle stability control to reduce accidents and worker injuries, all of which increases terminal productivity.

The charging infrastructure will be designed to accommodate future charging technologies as they become feasible. The charging infrastructure will include comprehensive load-management algorithms to curtail unnecessary energy usage, enabling operators to disconnect the equipment when it is ready for use rather than waiting for a predetermined time period, further enhancing equipment productivity.

These efficiency improvements are expected to increase terminal cargo-handling capacity and improve equipment productivity as measured by costs-per-operating-hour.

Movement of Goods Into, Out of, Around, or Within a Port

Handling one-third of the cargo at the nation's second busiest seaport, LBCT is a vital node in the regional and national supply chain. The electric equipment deployed under this Project serves the on-dock rail yard, and the projected efficiency gains (described in the previous section) are expected to benefit the regional rail network and hasten the movement of goods in and out of the Port by rail.

Additionally, as part of this Project, each electric yard tractor will be outfitted with software that enables on-board computer-generated data that provides the yard tractor operator with operational assignments and routing. The data provided to the operator will be connected to the terminal's comprehensive cargo-movement system. This on-board system will provide the yard tractor operator with real-time, up-to-the-minute container location data and origin-destination

information to streamline goods movement at MHT, and by extension, throughout the region. Such efficiency gains are expected to result in safer routing for the yard tractor operator and faster cargo-handling speeds relative to other terminals, translating into quicker gate turnaround times and shorter truck waits compared to the regional goods movement network.

Operational Improvements, Including Port Resilience

This Project significantly bolsters LBCT's ability to withstand and to recover from natural or human-made disruptions by decreasing dependence on increasingly volatile fossil fuels and by building new electrical charging capabilities on one of the nation's most robust, climate-resilient marine terminals with advanced cybersecurity safeguards.

The transition to electric equipment nearly eliminates LBCT's dependence on fossil fuels. Electricity is fast becoming a more reliable and resilient fuel source compared to fossil fuels as it is largely insulated from supply shortages (man-made or natural) and price shocks, particularly in California, where the utilities themselves are transitioning away from fossil fuels, and renewable energy sources will comprise 60% of grid power by 2030.

The charging infrastructure will be constructed on terminal land that has been redeveloped within the last 10 years to meet the nation's most rigorous engineering standards. All of LBCT's upstream electrical infrastructure has been upgraded, elevated, and encased in concrete to withstand sea-level rise and other man-made or natural threats, which provides robust long-term protection for the charging units funded through this Project. Additionally, LBCT will deploy the same state-of-the-art cybersecurity protections used in its current electric equipment to prevent attacks on the new charging units, which will depend heavily on software and wireless communications.

Environmental or Emissions Mitigation Measures

The Project will replace diesel-powered tractors with battery-powered tractors, primarily used for drayage between container yard and on-terminal rail yard, leading to significant emission reductions from diesel tractors annually, as shown in Table 4.

Table 4: Annual Emission Reductions from Project

Pollutant (unit)	Annual Reductions Resulting from Project
CO_2 (metric tons)	8,339
NO_x (tons)	3.18
$PM_{2.5}$ (tons)	0.12
SOx (tons)	0.11

The emission reduction analysis applies the emission estimation methodology recommended by California Air Resources Board (CARB) and referenced data used by the Port emission inventory reports. More details about the methodology can be found in the Benefit-Cost-Analysis (BCA) described in the next section.

In addition to emission reductions from the equipment, LBCT has solar panels on three of its buildings. This renewable energy production helps to offset electricity consumption, further reducing climate impacts.

B. Supporting Economic Vitality at the Regional or National Level

The benefits of replacing 60 diesel yard tractors with 60 electric yard tractors, including the associated charging equipment, outweigh the costs by a ratio of 1.04, as determined by the BCA.

To replace the current diesel-powered yard tractors with electric yard tractors there is an initial investment required to replace the equipment and to build out the charging infrastructure. These costs, however, are surpassed by the benefits of improved economic competitiveness, safety, reduced emissions, and reduced operating and maintenance costs at a ratio of 1.04 assuming a 7% discount rate (a discount rate of 3% was used for CO_2 emission benefits as recommended by USDOT in its 2021 BCA Guidance).

The benefits stem from the reduction of diesel-powered miles and the associated transportation costs and emissions. Damage cost values associated with the pollutants for all analysis years are also included. These were multiplied by estimated reductions in pollutant emissions in metric tons for CO_2, $PM_{2.5}$, NO_x and SO_2 to estimate the undiscounted values of the corresponding benefits (Note: elsewhere in this document, $PM_{2.5}$, NO_x and SO_2 reductions are presented in tons, which accounts for the differences in values). The emission reductions used in the BCA are shown in Table 5.

Table 5: Emission Reductions Assumed for BCA

	PM2.5	NOx	SO2	CO2
Emission (MT/yr)	0.11	2.89	0.12	8,339

The BCA reflects USDOT's standard guidance regarding forecast periods and discount rates. As such, all estimates were calculated over a 12-year period. This 12-year forecast period is chosen because 12 years is considered to be the expected useful life of an electric yard tractor. The Benefit-Cost Analysis in Appendix D provides a more detailed description of how this ratio was calculated. Table 6 summarizes the BCA.

Table 6: Benefit-Cost Analysis Summary

Present Value (2020 US$)	Component
Economic Competitiveness	$10.83
Safety	$0.00
Environmental Sustainability	$5.56
Operating & Maintenance Costs	$3.99
Residual Value	$0.00
TOTAL BENEFITS	**$20.37**
Project Costs	$19.68
Net Present Value	$0.69
BENEFIT TO COST RATIO	**1.04**

Additionally, the deployment of manually operated zero-emission equipment supports good-paying union dockworker jobs and does not result in worker displacement. Equipment operators and maintenance personnel will receive training in how to operate and service advanced technology equipment, burnishing their workforce skills for a zero-emission future.

C. Addressing Climate Change and Environmental Justice Impacts

Climate change and environmental justice is at the forefront of this Project. The Port has long been a global leader in reducing its negative environmental impacts, and in 2017, it adopted the CAAP, which calls for a complete transition away from fossil fuels. The CAAP was developed with meaningful engagement from the local community and environmental-justice groups, who have long pushed for zero-emission port operations, and aligns with State plans, including the California Sustainable Freight Action Plan. LBCT, which already moves most of its cargo with electric equipment, is the Port's flagship example of this zero-emission future: by eliminating even more diesel-fueled equipment and by deploying electric manually operated equipment on a scale never seen before, this Project brings zero-emission goods movement closer than ever to becoming reality. Environmental justice groups and representatives from nearby disadvantaged communities strongly support the Project.

At the completion of this Project, LBCT will be a model for marine terminals across the nation – a large container terminal operated nearly entirely by zero-emission equipment with onsite renewable power generation and industry-leading efficiency strategies, handling more cargo with the fewest emissions and community impacts of any comparable conventional terminal in the country. In order to stimulate this Project's benefits across the national supply chain, the Port and LBCT will work closely with environmental-justice groups and industry partners to share progress at neighborhood events and at State and national conferences, workshops, and meetings. The Port also will report actual emission benefits each year in a publicly available and widely disseminated emissions inventory that is transparent and accessible to the community.

D. Advancing Equity and Opportunity For All

This Project thoughtfully incorporates strategies to promote equity in procurement and project delivery, provides for ongoing engagement with underserved communities, strengthens the

existing workforce through advanced-technology training, and supports good-paying union jobs with no worker displacement, as described below.

Equity

This Project helps to achieve the zero-emission vision of the Port's CAAP, an equity-driven plan to reduce disproportionate negative environmental impacts on nearby underserved communities. Throughout this Project's implementation, the Port and LBCT will incorporate equity-focused policies into design, procurement, and ongoing outreach to disadvantaged communities, specifically:

- Preference will be given to disadvantaged-business enterprises (DBE), including small businesses, minority- and women-owned businesses, and those in labor surplus areas, in compliance with 2 C.F.R. 200.321. LBCT will leverage the Port's longstanding and robust Small Business Enterprise/Very Small Business Enterprise program to identify, solicit, and hire DBEs, understanding that options may be constrained due to the specialized nature of this equipment and limited scope of construction. All Project partners are committed to directing Federal funds to DBEs as feasible and will document their good-faith efforts to do so.
- The Port will host a monthly meeting with environmental justice and community groups to provide updates on the Project. Groups invited to participate in the monthly meetings include the Natural Resources Defense Council, Coalition for Clean Air, East Yard Communities for Environmental Justice, Long Beach Alliance for Children with Asthma, Los Angeles Alliance for a New Economy, West Long Beach Project Area Committee, and West Long Beach Neighborhood Association.
- Project updates will be provided at quarterly CAAP Stakeholder meetings, which include representatives from disadvantaged communities.
- LBCT will partner with the Port's Academy of Global Logistics at Cabrillo High School, which serves roughly 500 students, primarily from underserved neighborhoods, and the Long Beach Unified School District, Long Beach City College, California State University Long Beach, and local vocational schools to provide opportunities for these students to rise out of poverty. This is a four-year program designed to equip students with a foundational knowledge of international trade, environmental sciences, global logistics, and supply chain management through their core academic, honors and Advanced Placement classes, career technical education courses, and hands-on experiences through work-based learning activities.
- The Port will provide waterside tours of the Project Area so the public can see the zero-emission equipment in operation and can promote the benefits of zero-emission goods movement to the broader community.

Workforce Opportunities

This Project protects good-paying jobs by deploying one-for-one equipment replacements, resulting in no worker displacement and demonstrating the viability of a zero-emission

conversion that continues to rely on manual labor. All on-dock labor at the MHT is unionized, and the equipment will be operated and maintained by union labor.

Additionally, this Project includes new training initiatives for equipment operators and maintenance personnel in partnership with the International Longshore and Warehouse Union (ILWU Local 13) to bolster skills in advanced-technology operations and service. Equipment operators will learn how to use the electric yard tractors efficiently and safely with a goal to maximize productivity and will learn the basics of electric charging. Maintenance technicians will learn how to service the new equipment and how to train new workers in the skills needed to support electric equipment going forward.

In selecting vendors that meet the project requirements, LBCT will give preference to companies with strong labor standards, practices, and policies and/or labor unions/apprenticeships, particularly those that benefit workers that are currently underrepresented in relevant jobs, including women, people of color, people with disabilities, people with criminal records, and other groups that face systemic barriers to employment.

This Project is expected to generate broad socioeconomic benefits, demonstrating that zero-emission goods movement can coexist with strong labor protections and support for underserved communities.

E. Leveraging Federal Funding to Attract Non-Federal Sources of Investment

This Project leverages federal dollars with more than $7 million in non-federal funding sources, with federal funds representing 80% of the project dollars, as show in Table 7. Importantly, the Port has not quantified SCE's project contribution related to the installation of utility distribution infrastructure that will provide electrical capacity to the MHT charging station sites. This contribution could be substantial, raising the share of non-federal funding sources.

Table 7: Federal and Non-Federal Funding Project Contributions

	Federal Funding	Non-Federal Sources
Project Costs	$30,141,080	$7,535,270
Share	80%	20%

The Port and LBCT will continue to pursue State grants to leverage the federal government's investment; however, as stated previously, no other grant program at this time can fund the volume of equipment purchases at the scope needed for success.

SECTION V – PROJECT READINESS

A. Technical Capacity

The Port and LBCT have the personnel, knowledge, skills, and expertise necessary to implement the Project on schedule and within budget to ensure its benefits are rapidly realized. The Port and LBCT have:

- The requisite experience and understanding of federal requirements, from contracting to construction, to ensure the Project can be delivered on time and within budget;
- Experience working together over the past 10 years to deliver successfully one of the nation's largest terminal redevelopment projects at MHT, a $1.5 billion construction project, including a major investment in emerging, zero-emission container-handling equipment;
- Project personnel are experienced in environmental reviews and have construction related experience to address any unforeseen circumstances, although none are anticipated for this Project given the high familiarity with the Project site; and,
- Extensive experience procuring services and goods in compliance with the Federal Acquisition Regulation and is committed to maintaining an open, competitive bidding and procurement process for all components proposed within this application. The Port and LBCT are familiar with FAR-compliant bidding packages to enable the Project to begin moving forward rapidly after entering into agreement with MARAD (if awarded PIDP grant funding).

Experience with Federal Agencies and Federal Grants

The Port and LBCT were part of the original MHT Redevelopment Project and worked with the Environmental Protection Agency (EPA) and Army Corps of Engineers on project compliance. The Port and LBCT have also delivered projects in compliance with federal permitting and grant requirements. The Port has received and managed several large federal grants for complex infrastructure and equipment projects, including PIDP (FY21), PIDP (FY19), and TIGER (FY11). Notable federally funded projects include the Ocean Boulevard/Terminal Island Interchange, the Gerald Desmond Bridge Replacement Project, the Green Port Gateway Project and the MHT 50-acre Landfill Project.

The Port and LBCT have also been successful in receiving numerous grants through the Department of Homeland Security and EPA over the last 10 years, including grants for zero-emission cargo-handling equipment. These examples demonstrate the POLB and LBCT ability to meet the requirements of federal grant funding in partnership with the USDOT and other federal agencies.

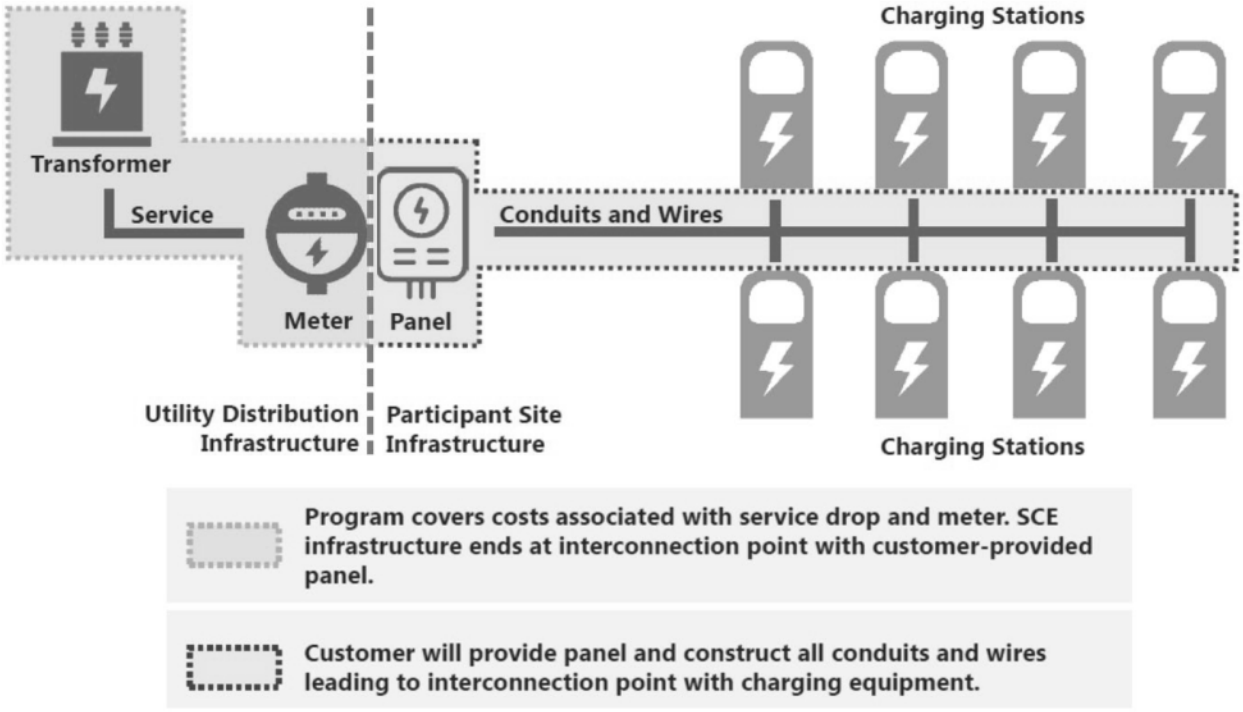
Technical Experience and Resources

Southern California Edison Coordination

LBCT is coordinating with SCE's Government & Institutions Business Customer Division and anticipates participating in SCE's Charge Ready Transport program, which provides installation

of the infrastructure required to support a fleet of electrically charged vehicles, as depicted in Figure 10.

Figure 10: Make-Ready Infrastructure (Customer-Built)



LBCT has provided SCE with the energy requirements needed for the Utility Distribution Infrastructure portion of the Project. SCE is committed to work in parallel to ensure that grid capacity is available for all terminal needs.

P2S Engineering

P2S, Inc. has provided preliminary design, cost estimating, power consumption needs and scheduling assistance and will continue to support the project moving forward as needed.

Kalmar Ottawa

Kalmar Ottawa is a leader in the development of electrified yard tractors. The Kalmar Ottawa yard tractors have completed through research and development that included testing at the MHT facility. Kalmar Ottawa yard tractors have been successfully deployed at various locations.

Feasibility / Constructability

The Project is both feasible and constructable based on:

- The Port and LBCT are both experienced with the process of port-related development and for decades have completed similar types of projects.

- LBCT has fully tested prototype versions of the electrified yard tractors over the past five years at the MHT, identifying issues and developing solutions to ensure seamless transition to the production models. Additionally, LBCT partnered with Kalmar Ottawa under a California Air Resources Board grant to deploy the first manually operated, battery electric yard tractor at LBCT.
- The charging equipment will be commercially available, UL-listed and certified, and the Port and LBCT have experience constructing high-power charging stations to support electric cargo-handling equipment.
- Engineering feasibility for the infrastructure has been evaluated by P2S (application partner).

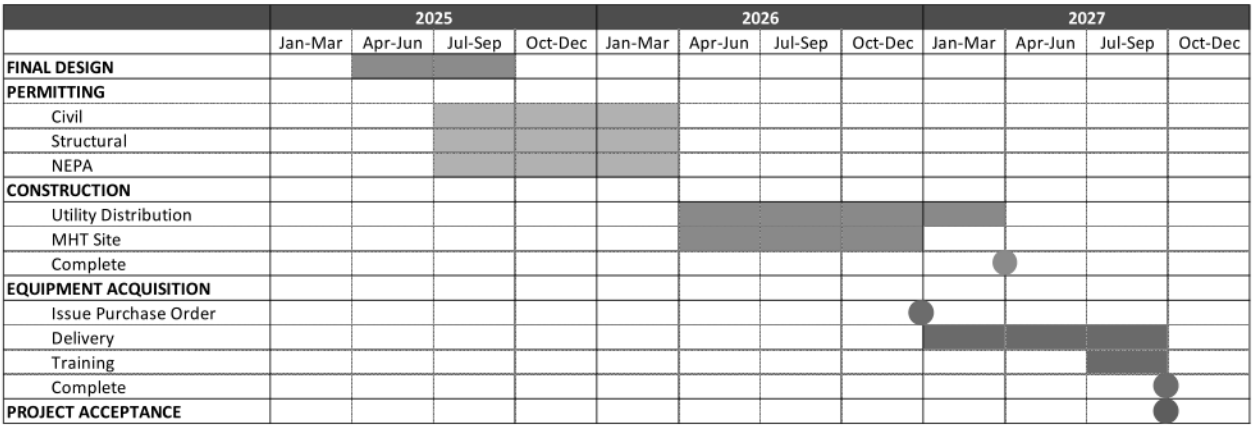
Project Schedule

The Project schedule includes input from LBCT, SCE, Kalmar Ottawa, P2S, and M&N as discussed below. The Project schedule shown in Figure 8 is based on design team and equipment suppliers' schedule determinations as well as the design team's experience with construction and permitting durations.

The Project does not include ground disturbance expected to result in significant environmental impacts nor does it include any improvements adjacent to coastal waters. The project site is within the existing MHT and located on previously disturbed soil. Site conditions are well known. All other Project requirements such as permitting, approvals, and construction will be completed once the contract has been executed.

As shown in Figure 11, the Project schedule duration falls well within the grant program period of performance. Assuming contract execution in 2025, LBCT anticipates completion in 2027. LBCT will be ready to start the project as soon as the funding contract is executed and can start earlier than the 2025 date provided in the schedule.

Figure 11: Project Schedule



B. Environmental Risk

The Project team has taken into account potential environmental risks and viable mitigation strategies, but given the nature of the Project – equipment replacement and charging infrastructure installation – there are no anticipated significant environmental risks, as described in more detail below.

National Environmental Policy Act (NEPA)

The Project is within the boundaries of the MHT fully developed site. The POLB and LBCT are familiar with the environmental review National Environmental Policy Act (NEPA) and federal, state, and local permitting processes. Project information will be submitted for NEPA review as part of USDOT and MARAD MAO600-001-0 process.

The MHT terminal is a fully developed and functioning container handling terminal, and this application is to replace diesel powered yard tractors with electrified yard tractors. There are proposed charging stations, all within the developed terminal boundary. A small amount of on-site trenching will be required to get from electrical substation to charging station.

It is anticipated that the NEPA process will include review under Sections 7 and 106. It is anticipated that the project will be eligible for a MARAD Categorical Exclusion. The requisite NEPA documentation process is included in the Project schedule.

Environmental Permits and Reviews

The Project is to be located on previously disturbed soil with minimal ground level intrusion for installation of battery charging stations. The original Middle Harbor Redevelopment Project successfully completed a Final Environmental Impact Statement (FEIS) review by the U.S. Environmental Protection Agency (USEPA) in 2009. This process included assistance and cooperation with the U.S. Army Corps of Engineers (Corps). The FEIS went through a rigorous public-engagement process proactively inclusive of Historically Disadvantaged Communities, and in response to public comments, led to the creation of a community grants program that mitigates port-related environmental impacts primarily in underserved communities.

State and Local Approvals

The Project will require a Harbor Development Permit from the Port and various permits from the City of Long Beach but is not expected to require substantial, non-routine State or local approvals. There is broad public support for the transition to manually operated zero-emission cargo-handling equipment.

Risk Mitigation

Although the Project is relatively simple and straightforward, with known construction and electrical infrastructure conditions, the Project team has assessed potential risks and developed mitigation strategies to ensure on-time successful completion.

- Equipment procurement delays: Delivery could be delayed if vehicle-component shortages persist and if overall demand for electric cargo-handling equipment increases as expected over the next few years. The Project schedule assumes long lead times and

has been developed to give LBCT ample time to place the order in advance of the projected spike in demand from other marine terminals.

- Charging infrastructure delays: There could be delays in procuring the charging units due to component shortages or overall demand increases; however, the Project schedule assumes long lead times and is presumed to give LBCT ample time to place orders. Utility work and other electrical improvements can proceed during the wait for delivery.
- Unforeseen construction or utility issues: The likelihood of significant delays or unanticipated construction issues is very low owing to the team's high familiarity with the Project site and the recent terminal modernization. To mitigate the risk even further, the team has reviewed detailed as-built and electrical design drawings and begun coordination with SCE well in advance of the Project start date.

SECTION VI– DOMESTIC PREFERENCE

A. BUY AMERICAN

LBCT commits unreservedly that 100% of materials to be used in the Project will be produced, manufactured, or assembled domestically in alignment with current guidance on complying with the Buy American Act (41 U.S.C. 8301-8305). LBCT will apply, comply with, and implement all provisions of the Buy American Act in the implementation of Project components funded by the PIDP. The Project components for which LBCT is requesting funding under the PIDP have been selected to avoid any undue delays or risks associated with the process of requesting a waiver to the Buy American Act. LBCT is receiving quotes from only those manufacturers that comply with Buy American. For example, Kalmar Ottawa has provided a quote for the CHE equipment of this Project, and they are located in Ottawa, Kansas and all their yard tractors are built by them in the United States.

SECTION VII – DETERMINATIONS

Project Determination	Guidance
1. The project improves the safety, efficiency, or reliability of the movement of goods through a port or intermodal connection to the port.	The Project improves safety, efficiency and reliability by increasing equipment productivity through on-board computer-generated operational assignment and routing, reducing equipment down time by moving away from diesel, enhancing safety through advanced vehicle stability control and reducing emissions.
2. The project is cost effective.	The Project has been determined to have a Benefit-Cost Ratio (BCR) of 1.04. A discount rate for CO2 emission benefits was used as recommended by USDOT in its 2021 BCA Guidance. The benefits quantified stem from the reduction of diesel-powered miles and the associated transportation costs and emissions. The BCA reflects USDOT's standard guidance regarding forecast periods and discount rates. As such, all estimates were calculated over a 12-year period. This 12-year forecast period is chosen because 12 years is considered to be the expected useful life of an electric UTR.
3. The eligible applicant has the authority to carry out the project.	Per PIDP NOFO the Port qualifies as a grant recipient and sponsor of LBCT. Port and LBCT are partnering in the implementation of the MHT Zero Emission Conversion Project. The two entities have participated in all phases of the state-of-the-art MHT development. MHT is also an integral part of the Port and State of California zero emissions goals. In conjunction with agreed MOU (see Attachment A: MOU), Port will submit and administer the grant and LBCT will be responsible for Project implmentation.
4. The eligible applicant has sufficient funding available to meet the matching	For the PIDP 2022 application, LBCT has provided a letter of financial commitment (see Attachment C: Financial Commitment Letter)

Project Determination	Guidance
requirements.	and notes that LBCT has sufficient funds available to contribute the shared costs for the Project. LBCT's MHT is an integral part of the POLB and POLA terminals handling ot 40% of the nation's goods.
5. The project will be completed without unreasonable delay.	The Project schedule indicates that the Project will meet PIDP required obligation date. Sufficient engineering and manufacturer coordination has taken place to determine that related issues will not impact schedule. The Project is to be conducted on a fully developed terminal and therefor no unforseen and or environmental issues are anticipated.
6. The project cannot be easily and efficiently completed without Federal funding or financial assistance available to the project sponsor.	There is no single program that can provide the volume of equipment and scope of infrastructure installation required by this Project on such an aggressive timeline, thus necessitating this Federal funding request. Without PIDP grant funding the Project: • would be delayed by approximately five (5) years. • would have the budget and scope reduced such that anticipated technology could not be deployed. As a result, the nearby Historically Disadvantaged environmental justice communities would continue to experience the negative impacts of climate change and air pollution for at least five more years.

Appendix A: MOU

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING (MOU) is dated for reference purposes as of May 13, 2022 between the City of Long Beach, California, a municipal corporation, acting by and through its Board of Harbor Commissioners (POLB), and LBCT, LLC (LBCT), a Delaware limited liability company. The aforementioned parties to this MOU shall be referred to individually herein as a "Party" and collectively herein as "Parties."

I. RECITALS

This MOU is made with reference to the following recitals:

A. The Port Infrastructure Development Program (PIDP) is a discretionary grant program administered by the U.S. Maritime Administration (MARAD). Funds for the PIDP are awarded on a competitive basis to projects that improve the safety, efficiency, or reliability of the movement of goods into, out of, around, or within a port.

B. POLB is applying to the PIDP for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project that includes the acquisition of 60 manually operated, electrified (battery-powered) yard tractors and the supporting battery charging equipment/infrastructure for a fully functional horizontal cargo transport system at Long Beach Container Terminal (the Project). The Project is designed to help Long Beach Container Terminal become the cleanest terminal in the world by meeting the aggressive goal of becoming the first Net Zero Marine Terminal and more directly supporting the San Pedro Bay Ports' Clean Air Action Plan goal of zero emissions terminal operations by 2030.

C. POLB and LBCT are partnering in the implementation of the Project. The two entities have participated in all phases of the state-of-the-art MHT development. MHT is also an integral part of the POLB and State of California zero emissions goals. Together, they provide a measure of cleaner air within the communities of the San Pedro Bay region.

D. By converting to zero emissions Cargo Handling Equipment (CHE), the Port of Long Beach and LBCT are helping to accomplish the PIDP program goals of improving the safety, efficiency, and reliability of the movement of goods into, out of and around the San Pedro Port Complex, and improving the air quality for the region. Acquisition of zero emissions CHE and construction of the fleet charging station infrastructure are projected to improve LBCT's ability to provide a high level of service to its customers and the region at large while reducing emissions for the community.

E. The Project seeks to support zero-emission goals established by LBCT, POLB, and the State of California. Specifically:

1. POLB's goal of zero emission cargo handling equipment by 2030 in the Clean Air Action Plan Update adopted in 2017;

2. LBCT's goal of net-zero operations by 2030; and

3. The State of California's goal, established through Executive Order N-79-20, of 100 percent zero-emission off-road vehicles and equipment operations in the State of California by 2035.

F. The Parties are hereby entering into this MOU in order to satisfy the requirement of MARAD and PIDP that partnership entities applying for and participating in PIDP-funded projects shall execute an MOU setting forth their roles and responsibilities.

II. NOW, THEREFORE, in consideration of the foregoing, and the mutual undertakings contained herein, the Parties hereby agree as follows:

A. POLB's Roles and Responsibilities: POLB shall be responsible for:

1. Being the lead applicant and being the primary point of contact for the award;

2. Financial administration of the Project;

3. Submission of the PIDP 2022 application;

4. Upon receipt of award, enter into a grant agreement with MARAD and a subgrant agreement with LBCT;

5. Submission of required PIDP reports, including, but not limited to:

   i. Progress Reports

   ii. Outcome Performance Reports

   iii. Port Performance Reports

6. Submission of PIDP reimbursement requests;

7. Review, consideration, and approval of Harbor Development Permit (HDP) pursuant to the California Environmental Quality Act and Certified Port Master Plan; and

8. Submitting changes to the scope of work or schedule to MARAD for its approval in accordance with the terms and conditions of the MARAD grant agreement.

B. LBCT, LLC's Roles and Responsibilities: LBCT, LLC shall be responsible for:

1. Being the primary recipient of the award;

2. Preparing the PIDP 2022 application package, including successful addressal of all of the PIDP 2022 eligibility requirements and evaluation criteria;

3. Provision of any supporting documentation required for contract execution between the Port and MARAD, or POLB and LBCT;

4. Execution of a subgrant agreement with POLB should POLB receive a PIDP grant award;

5. Collection of performance measurement data that is outlined in the Port contract with MARAD; Development and submission to the Port of any PIDP performance or progress reports, and Port Performance Reports as required by the terms and conditions of the Port contract with MARAD, and all required supporting documentation;

6. Development of timely PIDP reimbursement requests and supporting documentation to be submitted to POLB;

7. Non-federal cost share requirements of the PIDP award, including project cost overruns;

8. Ensuring the activities and contracts performed to execute this project comply with the contract between the Port and MARAD, and that funds provided under this MOU are not expended on costs that are not allowable under PIDP or not allocable to this funding.

9. Keep all project accounts and records that fully disclose the amount and disposition by LBCT LLC, the total cost of the project, and the amount or nature of that portion of the cost of the Project supplied by other sources, and any other financial records related to the project.

10. Keep accounts and records as required by the Port contract with MARAD to facilitate an effective and successful audit. Include in all contracts in excess of $2,000 for work on the Project that involves labor, provisions establishing minimum rates of wages, to be predetermined by the United States Secretary of Labor, in accordance with the Davis-Bacon Act, 40 U.S.C. 3141 to 3148, or 23 U.S.C. 113, as applicable, that contractors shall pay to skilled and unskilled labor, and such minimum rates shall be stated in the

invitation for bids and shall be included in proposals or bids for the work.

11. Project implementation, including design, bid, and build of the project;

12. Coordination with project partners including POLB, Southern California Edison, original equipment manufacturers, technology developers, and contractors;

13. Developing a schedule and implementing the Project in accordance with that schedule;

14. Meeting the obligations of the grant prior to the grant liquidation deadline, as defined by the master contract between POLB and MARAD;

15. Compliance with all applicable local, State, or Federal permitting requirements;

16. Payment for required permits;

17. Ensuring that all Electric Vehicle Supply Equipment deployed are UL certified or certified by an OSHA Nationally Recognized Training Laboratory;

18. Submission of an HDP application to POLB;

19. Applying for infrastructure dollars under the SCE Charge Ready Program; and

20. Overseeing and paying for any required data collection.

21. Notifying the Port within 15 calendar days of any change in key personnel identified in the grant application.

22. Compliance with the Buy American requirements outlined in the contract between the Port and MARAD.

23. Changes to the scope of the project or project schedule must be submitted to the Port and ultimately approved by MARAD.

24. Compliance with the Small and Disadvantaged Business Requirements outlined in the contract between the Port and MARAD.

25. Compliance with the Engineering and Design Services requirements outlined in the contract between the Port and MARAD.

26. Compliance with the Foreign Market Restrictions outlined in the contract between the Port and MARAD.

27. Compliance with the Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment outlined in the contract between the Port and MARAD.

28. Compliance with the Timing of Project Costs outlined in the contract between the Port and MARAD.

29. Request reimbursement only after the Port has entered into an obligation with MARAD.

C. Term: This MOU shall be in full force and effect when signed by all Parties and shall remain in effect for the full term of the grant.

D. Modification in Writing: The Parties anticipate amending this MOU upon award of a grant to POLB to ensure that the terms and conditions of the master contract between the Port and MARAD are included in the roles and responsibilities set forth in this MOU. This MOU may be modified, amended or terminated only by a written agreement signed by all the Parties.

E. Notice: All notices to be given under this MOU shall be in writing and either sent by a nationally recognized overnight courier service, in which case notice shall be deemed delivered as of the date shown on the courier's delivery receipt; or sent by telecopy during business hours of the recipient, with a copy of the notice also deposited in the United States mail (postage prepaid) the same business day, in which case notice shall be deemed delivered on transmittal by telecopier provided that a transmission report is generated reflecting the accurate transmission of the notices, or sent by United States mail, postage prepaid, in which case notice shall be deemed delivered as of two business days after deposit in the mail, addressed as follows:

The Port of Long Beach
415 W. Ocean Boulevard
Long Beach, CA 90802
Attention: Morgan Caswell

With a copy to:

Long Beach City Attorney
City of Long Beach, 9th Floor
411 W. Ocean Blvd.
Long Beach, CA 90802
Attn: Harbor Department

LBCT, LLC
1171 Pier F Avenue
Long Beach, California 90802

These addresses may be changed by written notice to the other party provided that no notice of a change of address shall be effective until actual receipt of the notice. Copies of notices are for informational purposes only, and a failure to give or receive copies of any notice shall not be deemed a failure to give notice.

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This MOU has been entered into and executed by:

LBCT, LLC

May 5, 2022

By: _____
Name: Anthony Otto
Title: CEO

CITY OF LONG BEACH, California, acting by and through its Board of Harbor Commissioners

By: _____
Name: Mario Cordero
Title: Executive Director

The foregoing document is hereby approved as to form.

CHARLES PARKIN, City Attorney

May 13, 2022

Sudhir N. Lay

Sudhir N. Lay, Deputy

Appendix B: Detailed Costs and Documentation

PROJECT COST ESTIMATE				
Project Cost Items		**Quantity**	**Unit Cost**	**Totals**
1	**Utility Distribution Infrastructure (SCE)***			
2	**MHT Site Infrastructure (Equipment & Installation)**			**$ 8,835,450**
	2.1 Low Power Conversion Transformer	6	$ 40,500	$ 243,000
	2.2 Trenching, Conduit, & Conductors	6	$ 200,000	$ 1,200,000
	2.3 Electrical Equipment Foundation	60	$ 5,000	$ 300,000
	2.4 Charging Station Units (Power, User, & Connection)	60	$ 85,000	$ 5,100,000
	2.5 Electrical Equipment Protection (guard posts)	60	$ 5,000	$ 300,000
	2.6 Vehicle Alignment (Vehicle Stall Paint, Signage, & Wheel Stops)	60	$ 3,000	$ 180,000
	2.7 Vehicle Concrete Pad	60	$ 6,000	$ 360,000
	2.8 Contingency (15%)		15%	$ 1,152,450
3	**Equipment**			**$ 25,533,900**
	3.1 Yard Tractors	60	$ 350,000	$ 21,000,000
	3.2 Operator & Maintenance Training	60	$ 5,000	$ 300,000
	3.3 Terminal Operating System Network Connectivity (NOW System)	60	$ 38,000	$ 2,280,000
	3.4 Terminal Operating System Network Connectivity (On-Board Computer)	60	$ 5,400	$ 324,000
	3.5 Terminal Operating System Network Connectivity (ICTF YardEye)	60	$ 6,900	$ 414,000
	3.6 Contingency		5%	$ 1,215,900
4	**Design & Management**			**$ 3,307,000**
	4.1 Site Design (7% of Construction)		7%	$ 619,000
	4.2 Construction Supervision (10% of Construction)		10%	$ 884,000
	4.3 Permitting (5% of Construction)		5%	$ 442,000
	4.4 Project & Grant Management (5% of Award)		5%	$ 1,362,000
	Total Project Cost			**$ 37,676,350**

Note: Percentages for contingencies, design, construction supervision, permitting and management are based on industry standards.

PROJECT FUNDING ALLOCATION				
Project Component		**Cost**	**Funding Allocation**	
			PIDP	**LBCT**
			80.00%	20.00%
1	MHT Site Infrastructure	$ 8,835,450	$ 7,068,360	$ 1,767,090
2	Equipment	$25,533,900	$ 20,427,120	$ 5,106,780
3	Design & Management	$ 3,307,000	$ 2,645,600	$ 661,400
	Total	**$37,676,350**	**$ 30,141,080**	**$ 7,535,270**

KALMAR

Quotation Number Q-56335-1

T2E+

Picture might show non quoted options.

KALMAR

Quotation for OT2E_CT150-60

To	Long Beach Container Terminal 201 S Pico Ave Long Beach, CA. 90802	From	Cal Lift Inc. 13027 Crossroads Pkwy South City Of Industry, CA. 91746
Contact	Mr. Jeff Podgorski	Contact	Rick Zaklan
Tel	562-951-6142	Tel	562-480-3964
Email	Jeff.podgorski@lbct.com	Email	rzaklan@cal-lift.com

Quotation Number Q-56335-1

With reference to your inquiry, we are pleased to offer you the following equipment according to your specifications.

Kalmar, model T2E+ Electric Terminal Tractor
Built in accordance with ANSI 56.1 according to technical description above.

Price per piece	**USD**	**$ 407,261.00 plus tax**

Terms

Payment terms	Net Due Upon Delivery
Valid until	May 31st , 2022
Availability	Depending on our current backlog, normal delivery time is 360 days after receipt of order.
Delivery terms	FOB: Long Beach, CA.
Warranty	Maximum period of 24 months or 6,000 hours whichever occurs first. All non-battery components - three years or 6,500 hours, whichever occurs first. Battery and BMS coverage 5 years / 15000 H
Delivery Service	Included

We trust you will find the quotation of interest and look forward to hearing from you. For further information, do not hesitate to contact us.

Kind Regards

Rick Zaklan
Cal Lift Inc.
562-480-3964
ww.cal-lift.com

KALMAR

Technical Description

Basic machine

Selected options

- **Kalmar Ottawa T2E+ CT150-60**
  150,000 lbs GCW and 60,000 lbs lifting capacity
  Features may change depending on the options selected

  Chassis
  Modular frame design
  14"x4.25"x3.5" steel, 50,000 PSI ?" formed c-channel with "L" reinforcer
  Reinforced removable bumper with 55 degree taper curbside
  Integral front and rear tow points
  126" Wheel Base

  Powertrain
  Cummins traction motor with 348Hp cont/496 Hp peak, 1328 lb*ft cont/2508 lb*ft peak
  regenerative braking
  182kWh ESS
  Power battery 618V nominal
  Battery thermal management system to allow optimal operation in temperatures -22°F to +122°F
  660VDC-14VDC, 270A converter
  High voltage distribution system

  Axles
  Front Meritor MFS20, 20,000 lb rated with automatic slack adjusters
  Rear Meritor MOR32, 70,000 lb rated @12.5 MPH with automatic slack adjusters

  Wheels (Tyres & Rims)
  280/75R22.5, 8.25x22.5 - 335mm BC
  Hub Piloted

  Suspension
  Front: Parabolic 3-leaf, lube free, shackle free
  Rear: Solid mount

  Cabin
  Cab with Roll-Over protection structure (ROPS), aluminum sliding rear door and interior LED dome lights
  Three point cab mounting with air suspension
  Electric cab tilt system: 40 degrees with 90 degrees tilt capability
  Integral heating/ventilation system with three vents for driver, 4 front and 2 side defrost vents
  Air Conditioning system
  Tinted glass all windows. (Laminated solar grey in rear only)
  Air ride seat with isolator and 2 point retractable seat belt
  Digital display with touch screen: Front and rear air pressure, Battery State of Charge (SoC), hour meter, odometer, speedometer and critical situations indicators
  Mounting plate integrated into dash for yard management system
  Electric pantograph windshield wiper
  West coast 16" x 7" mirrors

- Lifting Boom
  Holland FW-35TT fifth wheel with 80,000lb plate rating
  Double acting cylinders with upper and lower spherical bearings
  Heavy duty lift boom with 5" Lift Cylinders and 17" lift height

  Electric System and Lights
  12 Volt electrical system
  LED Headlights, front park/turning, LED rear park/stop/reverse lights
  One rear facing LED floodlight on the upper right hand side of the cab
  Two 12 Volt low maintenance batteries
  7 wire receptacle at rear of cab
  Electric back-up alarm

  Pneumatic System
  Two color coded and coiled air lines with glad hand couplers
  18 CFM compressor with 5,431 cu.in. reservoir capacity
  Color coded air lines and split air brake system

  Hydraulic System
  Power assisted Integral gear type steering with mechanical back-up, with 1.3 gal. steering reservoir
  10.5 gallon hydraulic tank with sight glass and 10 micron internal return filter

  Paint
  Cab: Metal structures - Full immersion, multi-stage "E" coat with white powder coat
  Composite components - Color impregnated. Rubberized undercoating under cab
  Chassis: Black
  Wheels: White
  Grab handles, steps and platforms: Yellow

  Equipped with hardware for Kalmar Insight

Power train

Selected options

- **Maximum Road Speed (Not to Exceed 33mph; specify in parameter sheet)**

Load carrying devices

Includes Magnum AUCOS Coupling System

Cab

Selected options

- **Miles per hour speedometer (standard).**
- **Seat - National 2000 mid back, Mordura fabric**
- **Three point retractable orange seat belt**
  -Incorporates both shoulder and lap belts.

- **Two 8' (203mm) convex mirrors**
  Installed underneath the standard view mirrors, one on each side of the truck
  - Substantially expanding / widening the operator's field of vision
  - Gives the operator a wider perspective of what is beside and behind the trailer or container chassis
- **See-through visor**
  Filters bright light without obscuring the operator's frontal view.
  - Sun visor installed on the inside top of the windshield
  - Made of smoked plastic material
  - Size: 711 mm width X 203 mm height (28 " x 8")

  - Visor is adjustable
- **(1) Cab fan**
- **Drivers Side Door**
- **Rear window behind the drivers seat**
- **Electric windshield washer**
- **Vent Wing Window - Right Hand Side**
- **Polyurethane cab pivot bushings**
- **5lbs ABC Fire Extinguisher**
  Installed behind the driver's seat.
  Extinguisher type: dry chemical, suitable for fire types A, B and C.
  Rechargeable unit.
  The valve body is made of nylon material
  Non-magnetic structure
  Charge weight: 2.3 kg (5 lbs.)
  Unit weight: 3.6 kg (8 lbs)

Chassis

Selected options

- **Cab container guard**
  - Strong steel structure installed on the chassis behind the cabin
  - Fitted to the main frame rails with heavy-duty brackets
  - Has built-in trailer guards at the bottom rear section of the structure
  - Prevents cabin damage if a container or trailer accidentally hit on the cabin. (not FOPS/ROPS certified)
- **Bumper extended 6" from cab**
- **Beaver Tail Chassis**

Hydraulics and Pneumatics

Selected options

- **Two 15ft (4.5m) long straight rubber hoses with gladhand connectors.**
- **Glad hands both ends trailer air lines.**
- **Glad hand receptacle bucket (one 6" dia)**
- **Air Horn**
  Air horn with dual trumpets. Double-note horn

Electric system

Selected options

- **12 volt electrical system - negative ground.**
- **Floodlight - (1) LED mounted high left side of the cab - wired thru reversing light**
- **Strobe light - Amber LED**
  Installed to the bracket on the top, rear, curb side corner of the cabin roof ECCO (SAE class 2) - Wired through ignition switch
- **Five LED amber lights on top of the cab**
- **Exterior seat belt indicator light - 360 degrees visible (green color mid-high strobe type light constant on with top covered)**
- **Accessory power point**
- **Smart backup alarm**

Miscellaneous

Selected options

- **Decal - Reflective Tape Kit with container guard**

Color

Standard

- **Megaseal anti-skid paint on top of frame rails from back of cab to fifth wheel.**

Appendix C: Financial Commitment Letter

Long Beach Container Terminal

1171 Pier F Avenue
Tel: (562) 951-6000

Long Beach, California 90802-6252
Fax: (562) 951-6235

May 16, 2022

The Honorable Pete Buttigieg
Secretary of the United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Re: FY 2022 Port Infrastructure Development Program (PIDP) Grant Application – Middle Harbor Terminal (MHT) Zero Emission Conversion Project Financial Commitment

Dear Secretary Buttigieg:

On behalf of LBCT LLC, I hereby certify that LBCT LLC is committed to funding the MHT Zero Emission Conversion Project (Project). LBCT LLC is seeking $30,141,080 in grant funding from the FY 2022 PIDP to help fund the $37,676,350 MHT Zero Emission Conversion Project. LBCT LLC has sufficient funds available to contribute the shared costs of $7,535,270 for the Project. Federal government support of this Project is critical as there is no single funding program that can provide the volume of zero-emission equipment and scope of infrastructure installation required by this Project on such an aggressive timeline.

This Project will replace 60 fossil-fueled yard tractors with manually operated zero-emissions yard tractors, significantly reducing emissions and climate impacts and supporting good-paying union jobs. The Project is part of LBCT's ongoing commitment to meet zero emissions for the MHT by year 2030. At the completion of this Project, LBCT will be a model for marine terminals across the nation – a large container terminal operated nearly entirely by zero-emission equipment with onsite renewable power generation and industry-leading efficiency strategies, handling more cargo with the fewest emissions and community impacts of any comparable conventional terminal in the country. The Project takes place within a Historically Disadvantaged Community census tract and the benefits will accrue to the many Historically Disadvantaged and environmental justice community census tracts surrounding the Port.

The Port of Long Beach combined with the Port of Los Angeles handle nearly 40% of the nation's goods. The first quarter of 2022 marks the busiest quarter on record for the Port of Long Beach, dockworkers and terminal operators. The MHT is the premier container handling terminal and has increased capacity from 700,000 TEU in 2015 to 3.3 million TEU in 2021. Together, POLB and MHT are a leading gateway for the U.S. international trade and one of the world's busiest seaports.

Should you or your staff have any questions regarding LBCT LLC financial commitment to the Project, please contact me at anthony.otto@lbct.com or 562-951-6000.

Sincerely,

Anthony Otto
Chief Executive Officer

Appendix D: Benefit-Cost Analysis

(see BCA Spreadsheet for more details)

Benefit-Cost Analysis

Model Period Ending
Pre-forecast vs Forecast
Financial Year Ending
Model Column counter

	Constant	Unit	Total
PROJECT BENEFITS			
Reduction in energy consumption costs with yard tractor electrification - Build - PV	-	US$	10,829,854
[Stretch row]			
Economic competitiveness benefits - Build - PV		US$	10,829,854
[Stretch row]			
Safety outcome benefits - Build - PV		US$	-
Environmental benefits - Electrified yard tractor - Build - PV	-	US$	5,555,693
[Stretch row]			
Environmental sustainability benefits - Build - PV		US$	5,555,693
Economic competitiveness benefits - Build - PV	-	US$	10,829,854
Safety outcome benefits - Build - PV	-	US$	-
Environmental sustainability benefits - Build - PV	-	US$	5,555,693
Maintenance cost savings - Build - PV	-	US$	3,987,102
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-
Total project benefits - No-build - PV		US$	20,372,648
BENEFIT-COST RATIO			
Economic competitiveness benefits - Build - PV	-	US$	10,829,854
Safety outcome benefits - Build - PV	-	US$	-
Environmental sustainability benefits - Build - PV	-	US$	5,555,693
Maintenance cost savings - Build - PV	-	US$	3,987,102
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-
Total benefits		US$	20,372,648
Electric vs diesel yard tractor costs - 60 units - CPV	-	US$	19,682,942
Net present value		US$	689,707
Benefit-cost ratio			1.04

Project Costs

Model Period Ending
Pre-forecast vs Forecast
Financial Year Ending
Model Column counter

	Constant	Unit	Total
PROJECT COSTS			
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	24,112,450
Discount rate multiplier - 7 percent	-	factor	-
Electric vs diesel yard tractor costs - 60 units - CPV		US$	19,682,942
MAINTENANCE & OPERATING COSTS			
Conventional yard tractor maintenance cost per hour	9.00	US$ / hour	
Electrical yard tractor maintenance cost per hour	6.30	US$ / hour	
Maintenance cost savings per hour	2.70	US$ / hour	
Maintenance cost savings per hour	2.70	US$ / hour	
IY tractor working hours	-	hours	2,733,120
Operating period flag	-	flag	12
Maintenance cost savings - Build		US$	7,379,424
Maintenance cost savings - Build	-	US$	7,379,424
Maintenance cost savings - Build - Annual average	614,952	US$	
Maintenance cost savings - Build	-	US$	7,379,424
Discount rate multiplier - 7 percent	-	factor	-
Maintenance cost savings - Build - PV		US$	3,987,102
RESIDUAL VALUE			
O&M			
Maintenance cost savings - Build - Annual average	614,952	US$	
Post analysis period remaining service life flag	-	flag	-
Post analysis period maintenance and operating costs - Sustainability elements		US$	-
Post analysis period maintenance and operating costs - Sustainability elements	-	US$	-
Discount rate multiplier - 7 percent	-	factor	-
Post analysis period maintenance and operating costs - Sustainability elements - PV		US$	-
Residual Value			
Length of BCA period (operating)	12	years	
Project design life	12	years	
Remaining service life at end of analysis period - Sustainability elements	-	years	
Remaining service life at end of analysis period - Sustainability elements	-	years	
Project design life	12	years	
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	24,112,450
Post analysis period remaining service life flag	-	flag	-
Residual value - Sustainability elements		US$	-
Residual value - Sustainability elements	-	US$	-
Discount rate multiplier - 7 percent	-	factor	-
Residual value - Sustainability elements - PV		US$	-
Residual value - Sustainability elements - PV	-	US$	-
Post analysis period maintenance and operating costs - Sustainability elements - PV	-	US$	-
Residual value including future maintenance & operating costs - Sustainability elements - PV		US$	-

Sustainability Elements

Model Period Ending
Pre-forecast vs Forecast
Financial Year Ending
Model Column counter

	Constant	Unit	Total
RUNNING HOURS			
IY working hours per day	16	hours	
Number of days per year	365	days / year	
IY tractor utilization	65.00%	percent	3,796
Number of IY tractors	60	units	
Operating period flag	-	flag	12
IY tractor working hours		hours	2,733,120
ECONOMIC COMPETITIVENESS BENEFITS - ELECTRIFIED YARD TRACTORS			
Energy Costs			
Diesel Consumption			
Diesel unit cost	1.4200	US$ / liter	
Conventional yard tractor fuel consumption per hour	9	liter / hour	
Hourly fuel costs per diesel yard tractor	12	US$ / hour	
Electricity Consumptio			
Electrical yard tractor energy consumption per hour	34.0	kWh	
Electricity unit cost	0.1393	US$ / kWh	
Hourly electricity costs per electric yard tractor	5	US$ / hour	
Savings			
Hourly fuel costs per diesel yard tractor	12	US$ / hour	
Hourly electricity costs per electric yard tractor	5	US$ / hour	
Hourly energy savings per yard tractor due to electrification	7.33	US$ / hour	
Hourly energy savings per yard tractor due to electrification	7	US$ / hour	
IY tractor working hours	-	hours	2,733,120
Operating period flag	-	flag	12
Energy savings per yard tractor due to electrification - Build		US$	20,044,155
Energy savings per yard tractor due to electrification - Build	-	US$	20,044,155
Discount rate multiplier - 7 percent	-	factor	-
Operating period flag	-	flag	12
Reduction in energy consumption costs with yard tractor electrification - Build - PV		US$	10,829,854
ENVIRONMENTAL BENEFITS - ELECTRIFIED YARD TRACTORS			
CO2 Emissions			
Annual CO2 emission reduction per unit - Yard tractors - Build	8,339	metric tons	
Operating period flag	-	flag	12
Reduction in carbon dioxide emissions - Electrified yard tractor - Build		metric tons	100,065
Reduction in carbon dioxide emissions - Electrified yard tractor - Build	-	metric tons	100,065
Damage costs for emissions - CO2 - 2020 US$	-	US$ / metric ton	Benefit Cost Ana
Operating period flag	-	flag	12
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build		US$	6,120,662
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build	-	US$	6,120,662
Discount rate multiplier - 3 percent	-	factor	-
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV		US$	4,616,512
NOx Emissions			
Annual NOx emission reduction per unit - Yard tractors - Build	3	metric tons	
Operating period flag	-	flag	12
Reduction in NOx emissions - Electrified yard tractor - Build		metric tons	35
Reduction in NOx emissions - Electrified yard tractor - Build	-	metric tons	35
Damage costs for emissions - NOx - 2020 US$	-	US$ / metric ton	Benefit Cost Ana
Reduction in NOx emission costs - Electrified yard tractor - Build		US$	607,478
Reduction in NOx emission costs - Electrified yard tractor - Build	-	US$	607,478
Discount rate multiplier - 7 percent	-	factor	-
Reduction in NOx emission costs - Electrified yard tractor - Build - PV		US$	325,401
PM2.5 Emissions			
Annual PM2.5 emission reduction per unit - Yard tractors - Build	0.1076	metric tons	
Operating period flag	-	flag	12
Reduction in PM2.5 emissions - Electrified yard tractor - Build		metric tons	1.2906
Reduction in PM2.5 emissions - Electrified yard tractor - Build	-	metric tons	1
Damage costs for emissions - PM2.5 - 2020 US$	-	US$ / metric ton	Benefit Cost Ana
Reduction in PM2.5 emission costs - Electrified yard tractor - Build		US$	1,089,689
Reduction in PM2.5 emission costs - Electrified yard tractor - Build	-	US$	1,089,689
Discount rate multiplier - 7 percent	-	factor	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV		US$	584,429
SOx Emissions			
Annual SO2 emission reduction per unit - Yard tractors - Build	0.0959	metric tons	
Operating period flag	-	flag	12
Reduction in SOx emissions - Electrified yard tractor - Build		metric tons	1.1509
Reduction in SOx emissions - Electrified yard tractor - Build	-	metric tons	1
Damage costs for emissions - SOx - 2020 US$	-	US$ / metric ton	Benefit Cost Ana
Reduction in SOx emission costs - Electrified yard tractor - Build		US$	54,784
Reduction in SOx emission costs - Electrified yard tractor - Build	-	US$	54,784
Discount rate multiplier - 7 percent	-	factor	-
Reduction in SOx emission costs - Electrified yard tractor - Build - PV		US$	29,352
Total			
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV	-	US$	4,616,512
Reduction in NOx emission costs - Electrified yard tractor - Build - PV	-	US$	325,401
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV	-	US$	584,429
Reduction in SOx emission costs - Electrified yard tractor - Build - PV	-	US$	29,352
Environmental benefits - Electrified yard tractor - Build - PV		US$	5,555,693

Appendix E: Emissions Analysis

Emissions Analysis

Please see Appendix D: Benefit Cost Analysis spreadsheet for the emission reduction analysis. The information below provides supporting documentation for the underlying assumptions.

The following Excerpt is from "San Pedro Bay Ports Emissions Inventory Methodology"
Version 2 dated 2021
Full report found at: https://polb.com/environment/air#emissions-inventory

Cargo Handling Equipment (CHE) Emissions Estimation Methodology
The emissions calculation methodology used to estimate CHE emissions is consistent with CARB's latest methodology for estimating emissions from CHE[1]. The basic equation used to estimate CHE emissions is as follows.

Equation 1

$$\boldsymbol{E = Power \times Activity \times LF \times EF \times FCF \times CF}$$

Where:

E = emissions, grams/year
Power = maximum rated power of the engine, hp or kW
Activity = equipment's engine activity, hr/year
LF = load factor (ratio of average load used during normal operations as compared to full load at maximum rated horsepower), dimensionless
EF = emission factor, grams of pollutant per unit of work, g/hp-hr or g/kW-hr
FCF = fuel correction factors are used to adjust EF associated with a base fuel to the fuel being used to reflect changes in fuel properties that have occurred over time, dimensionless
CF = control factor to reflect changes in emissions due to installation of emission reduction technologies not originally reflected in the emission factors, dimensionless

The emission factor is a function of the zero-hour emission rate by fuel type (diesel, propane or liquefied natural gas), by CHE engine type (off-road or on-road), for the CHE engine model year (in the absence of any malfunction or tampering of engine components that can change emissions), deterioration rate, and cumulative hours. The deterioration rate reflects the fact that the engine's zero-hour emission rates change as the equipment is used, due to wear of various engine parts or reduced efficiency of emission control devices. The cumulative hours reflect the CHE engine's total operating hours. The emission factor is calculated as:

Equation 2

$$\boldsymbol{EF = ZH + (DR \times Cumulative\ Hours)}$$

Where:

EF = emission factor, g/hp-hr or g/kW-hr
ZH = zero-hour emission rate by fuel type by CHE engine type for a given horsepower category and model year, g/hp-hr or g/kW-hr
DR = deterioration rate (rate of change of emissions as a function of CHE engine age), g/hp-hr^2 or g/kW-hr^2

[1] CARB, Appendix B: *Emission Estimation Methodology for Cargo Handling Equipment Operating at Ports and Intermodal Rail Yards in California.*

Cumulative hours = number of hours the CHE engine has been in use and calculated as annual operating hours times age of the CHE engine, hours

Emissions used for PIDP Application

The following draft 2021 emission for LBCT equipment and yard tractors were estimated by the Port of Long Beach's consultant as part of the annual emissions inventory project. The 2021 Port of Long Beach Emissions Inventory report will be published later in the year (Q3 2022), but 2021 draft emissions are used for the PIDP as they are using methodology that is reviewed by a technical working group that included U.S. EPA Region 9, California Air Resources Board, and South Coast Air Quality Management District.

Table 1: 2021 LBCT Annual CHE Emissions by Equipment Type, tons and MT

Equipment Type	PM_{10} tons	$PM_{2.5}$ tons	NO_x tons	SO_x tons	CO_2e MT	Energy kW-hr
Yard tractor	0.09	0.08	2.20	0.07	5,771	7,541,186
Cone Vehicle	0.01	0.01	1.09	0.00	166	214,892
Top handler	0.00	0.00	0.41	0.00	147	191,182
Forklift	0.01	0.01	0.20	0.00	102	120,654
Man Lift	0.00	0.00	0.05	0.00	8	9,772
Sweeper	0.00	0.00	0.01	0.00	14	16,483
Total	**0.11**	**0.10**	**3.97**	**0.08**	**6,207**	**8,094,168**

The existing diesel yard tractors account for 93% of the energy in kW-hr for the cargo handling equipment at LBCT in 2021. The characteristics of the yard tractors are included below. They are all 2014 model year with 250 horsepower engines and the average hours of use in 2021 was 1,733 hours per year.

Table 2: 2021 LBCT Existing Yard Tractor Characteristics

Port Equip Type	Count	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Engine Year	HP	Avg Annual Hours
Yard tractor	60	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	1,733

The 2021 emissions for the diesel yard tractors used as the basis for the emission reductions are summarized below.

Table 3: 2021 LBCT Yard Tractor Annual Emissions, tons and MT

Equipment Type	$PM_{2.5}$ tons	NOx tons	SOx tons	CO_2e MT
Yard tractor	0.08	2.20	0.07	5,771

The 2021 throughput for LBCT is expected to continue increasing. Therefore, the future emissions were estimated using the TEU forecast for the timeframe when they will be replaced.

Table 4: Throughput Forecast

Throughput base year	2021	2,422,422	TEU/yr
Throughput during Project	2023+	3,500,000	TEU/yr

The resulting emission reductions used for BCA are summarized below.

Table 5: Emissions in Metric Tons per Year (MT/yr) for BCA

Emission	per TEU (g/yr)	Annual Reduction (MT/yr)
CO2e	2,383	8,339
NOx	0.825	2.89
PM2.5	0.031	0.11
SOx	0.0274	0.10

Port Equip Type	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Category
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3306	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3302	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3290	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3265	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3149	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3147	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3115	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3102	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3071	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3064	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3054	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	3025	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2994	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2976	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2934	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2917	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2859	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2839	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2838	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2831	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2827	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2769	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2708	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2685	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2666	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2658	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2604	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2531	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2501	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2492	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2461	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2458	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	2089	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	1874	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	1380	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	1077	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	853	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	741	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	609	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	523	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	340	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	331	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	313	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	277	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	206	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	183	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	178	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	172	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	145	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	116	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	57	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	28	CHE On Road Diesel

Port Equip Type	Equip Make	Equip Model	Engine Type	Engine Make	Engine Model	Engine Year	HP	Annual Hours	Category
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	17	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	11	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250	1	CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250		CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250		CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250		CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250		CHE On Road Diesel
Yard tractor	Ottawa	YT-50	Diesel	Cummins	ISB6-720	2014	250		CHE On Road Diesel

Appendix F: Letters of Support

May 6, 2022

The Honorable Pete Buttigieg
Secretary of the United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg:

The undersigned organizations support the Port of Long Beach application to the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP) competitive grant program for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project in partnership with Long Beach Container Terminal (LBCT).

This project will transition 60 fossil-fueled yard tractors to battery-electric – representing the largest zero-emission replacement project for manually operated diesel-fueled equipment at the Port of Long Beach to date. Additionally, this project in partnership with Southern California Edison, the Port's electrical utility provider, will construct the requisite make ready infrastructure to support vehicle fueling, and will improve LBCT's ability to more efficiently accommodate our growing on dock rail operations while reducing emissions. Training will be provided to LBCT's yard tractor operators and maintenance personnel, expanding workforce development opportunities for longshore workers and other applicable trades, and ensuring a smooth and just transition to cleaner terminal operations. The MHT Zero Emissions Conversation Project will modernize CHE, meet state emissions goals, reduce national dependance on fossil fuels and reduce emissions within a CA State SB 535 Disadvantaged Community Zone.

It is more critical than ever that the federal government support early adopters of zero-emission technologies at the nation's second busiest seaport. The first quarter of 2022 marks the busiest quarter on record for the Port of Long Beach. Dockworkers and terminal operators moved 863,156 twenty-foot equivalent units of container cargo in March of 2022 - a 2.7% increase from the previous record set in March of 2021. Although this increase in cargo throughput may arguably have economic benefits, it comes at a cost to the health of our local communities, which are historically disadvantaged. The MHT Zero Emissions Project is expected to reduce emissions from cargo handling equipment at the terminal by up to 90% - thereby mitigating impacts on our local community while furthering LBCT's reputation as having one of the cleanest terminals in the world.

There is an urgent need to invest in American ports to strengthen our supply chains, improve resilience,

effectively support the U.S. economy, and help ensure environmental justice, job creation and transition goals as well as community vitality. Our organizations strongly support the MHT Zero Emissions Project for its quantifiable greenhouse gas and criteria pollution benefits that will help to move the needle on State air quality goals, large-scale deployment of zero-emission infrastructure for vehicles that service a port, and the progress that it will make towards addressing environmental justice concerns, particularly for communities that disproportionally experience climate change-related consequences.

Our organizations appreciate USDOT's consideration of the MHT Zero Emissions Project.

Sincerely,

Adrian Martinez
Earthjustice

Faraz Rivzi
Center for Community Action & Environmental Justice

John Kaltenstein
Friends of the Earth

Heather Kryczka
Natural Resources Defense Council

Peter Warren
San Pedro & Peninsula Homeowners Coalition

Yassi Kavezade
Sierra Club

COALITION FOR CLEAN AIR

May 3, 2022

The Honorable Pete Buttigieg
Secretary of the United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg:

The Coalition for Clean Air supports the Port of Long Beach application to the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP) competitive grant program for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project in partnership with Long Beach Container Terminal (LBCT).

This project will transition 60 fossil-fueled yard tractors to battery-electric – representing the largest zero emission replacement project for manually operated diesel-fueled equipment at the Port of Long Beach to date. In addition, this project in partnership with Southern California Edison, the Port's electrical utility provider, will construct the requisite make ready infrastructure to support vehicle charging, and will improve LBCT's ability to more efficiently accommodate their growing on dock rail operations while reducing emissions. Training will be provided to LBCT's yard tractor operators and maintenance personnel, expanding workforce development opportunities for longshore workers and other applicable trades, and ensuring a smooth and just transition to cleaner terminal operations. The MHT Zero Emissions Conversation Project will modernize terminal yard equipment, surpass state regulatory requirements, reduce national dependance on fossil fuels, and reduce diesel exhaust exposure in a heavily impacted low-income community of color.

Federal government support of early adopters of zero emission technologies at the nation's second busiest seaport is critical. The Port of Long Beach combined with the Port of Los Angeles handle nearly 40% of the nation's imports. The first quarter of 2022 marks the busiest quarter on record for the Port of Long Beach. Dockworkers and terminal operators moved 863,156 twenty-foot equivalent units of container cargo in March of 2022 - a 2.7% increase from the previous record set in March of 2021. This zero emissions project will help this critical international trade gateway that is an important stimulus for our local, regional, and national economies grow green, while continuing the Port of Long Beach's success in reducing emissions and the negative health impacts within our local communities. The MHT Zero Emissions

Conversion Project is expected to reduce emissions from cargo handling equipment at the terminal by up to 90% - thereby mitigating impacts on our local community while further boosting LBCT's reputation as one of the least polluting marine terminals in the world.

There is an urgent need to invest in American ports to strengthen our supply chains, improve resilience, effectively support the U.S. economy, and help achieve environmental justice, job creation, and transition goals as well as community vitality. The Coalition for Clean Air strongly supports the MHT Zero Emissions Conversion Project for its quantifiable greenhouse gas, toxic air contaminant, and criteria air pollution benefits.

Thank you for your consideration of the MHT Zero Emissions Conversion Project.

Sincerely,

Joseph K. Lyou, Ph.D.
President & CEO
Coalition for Clean Air

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

4/28/22

Bonnie Nixon
Director of Sustainability
Long Beach Container Terminal
1171 Pier F Avenue Long Beach, CA 90802

SUBJECT: Letter of Intended Support for the Long Beach Container Terminal Middle Harbor Terminal Zero Emission Conversion Project

Southern California Edison ("SCE") is pleased to offer this letter of intended support for the proposal entitled Middle Harbor Terminal (MHT) Zero Emission Conversion Project submitted by Long Beach Container Terminal (LBCT) in response to Port Infrastructure Development Program (PIDP) MA-PID-22-001.

SCE, a subsidiary of Edison International ("EIX"), is an investor-owned electric utility operating in the State of California, covering over 50,000 square miles and serving 15 million people. SCE has a strong interest in successfully enabling promising technologies and supporting the long-term success of the cities and customers within the SCE service area. As such, SCE agrees with the Project's overall goals to transition and/or replace all of MHT's remaining fossil-fueled yard tractors, with a goal of achieving significant reductions of ~90% diesel emissions at the Terminal.

SCE's potential participation in this project is expected to serve as support in site planning and construction of Charge Ready Transport infrastructure, with the scope of the activities to be mutually acceptable to SCE and LBCT. Because this is an unfunded collaboration and SCE will not be seeking reimbursement from LBCT, SCE expects to be able to provide this type of support without being subject to the terms and conditions that may apply to a sub-recipient or vendor for the project.

Any potential participation or support provided by SCE is conditioned upon the successful negotiation of mutually acceptable contractual arrangements. For the avoidance of doubt, this letter may not be construed by LBCT or any third party as creating any legally binding obligation by SCE.

We support the advancement of this project and wish for a successful outcome from the proposal selection process.

P. O. Box 800
2244 Walnut Grove Avenue
Rosemead, CA 91770
626-302-1212

SOUTHERN CALIFORNIA EDISON®
An EDISON INTERNATIONAL® Company

Sincerely,

DocuSigned by:
Brian Stonerock
78636BDC5CE7432...

Brian Stonerock
Principal Manager
Transportation Electrification / eMobility Operations
Southern California Edison

P. O. Box 800
2244 Walnut Grove Avenue
Rosemead, CA 91770
626-302-1212

BOARD OF SUPERVISORS
COUNTY OF LOS ANGELES

822 KENNETH HAHN HALL OF ADMINISTRATION/ LOS ANGELES, CALIFORNIA 90012
Telephone (213) 974-4444 / FAX (213) 229-3676

JANICE HAHN
Supervisor, Fourth District

April 26, 2022

The Honorable Pete Buttigieg
Secretary of the United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg:

On behalf of Los Angeles County's 4th District, I am writing in support of the Port of Long Beach application to the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP) competitive grant program for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project in partnership with Long Beach Container Terminal (LBCT).

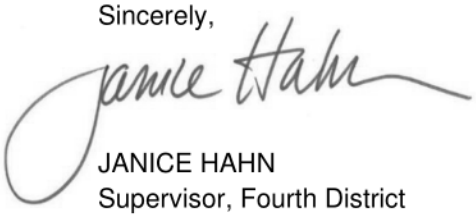
This project will transition 60 fossil-fueled yard tractors to battery-electric – representing the largest zero-emission replacement project for manually operated diesel-fueled equipment at the Port of Long Beach to date. Additionally, this project, in partnership with Southern California Edison, the Port's electrical utility provider, will construct the requisite make ready infrastructure to support vehicle fueling and will improve LBCT's ability to more efficiently accommodate the Port's growing on dock rail operations while reducing emissions. Training will be provided to LBCT's yard tractor operators and maintenance personnel, expanding workforce development opportunities for longshore workers and other applicable trades, and ensuring a smooth and just transition to cleaner terminal operations. The MHT Zero Emissions Conversation Project will modernize CHE, meet state emissions goals, reduce national dependance on fossil fuels and reduce emissions within a CA State SB 535 Disadvantaged Community Zone.

Federal government support of early adopters of zero-emission technologies at the nation's second busiest seaport is critical. The Port of Long Beach combined with the Port of Los Angeles handle nearly 40% of the nation's goods. The first quarter of 2022 marks the busiest quarter on record for the Port of Long Beach. Dockworkers and terminal operators moved 863,156 twenty-foot equivalent units of container cargo in March of 2022 - a 2.7% increase from the previous record set in March of 2021. This zero emissions project will help this critical international trade gateway that is an important stimulus for our local, regional, and national economies grow green, while continuing the Port of Long Beach's success in reducing emissions and the negative health impacts within our local communities, which are historically disadvantaged. Emissions from the Port of Long Beach have plummeted as a result of the Port's groundbreaking air quality programs, but more work needs to be done. The MHT Zero Emissions Conversion Project is expected to reduce emissions from cargo handling equipment at the terminal by up to 90% - thereby mitigating impacts on our local community while furthering LBCT's reputation as having one of the cleanest terminals in the world.

There is an urgent need to invest in American ports to strengthen our supply chains, improve resilience, effectively support the U.S. economy, and help ensure environmental justice, job creation and transition goals as well as community vitality. That is why I strongly support the MHT Zero Emissions Conversion Project for its quantifiable greenhouse gas and criteria pollution benefits that will help to move the needle on State air quality goals, large-scale deployment of zero-emission infrastructure for vehicles that service a port, and the progress that it will make towards addressing environmental justice concerns, particularly for communities that disproportionally experience climate change-related consequences.

Thank you for your consideration of the MHT Zero Emissions Conversion Project.

Sincerely,



JANICE HAHN
Supervisor, Fourth District
County of Los Angeles

California Department of Transportation

OFFICE OF THE DIRECTOR
P.O. BOX 942873, MS–49 | SACRAMENTO, CA 94273–0001
(916) 654-6130 | FAX (916) 653-5776 TTY 711
www.dot.ca.gov

May 16, 2022

The Honorable Pete Buttigieg
Secretary of the United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg:

The California Department of Transportation (Caltrans) supports the application of the Port of Long Beach to the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP) competitive grant program for the Middle Harbor Terminal Zero Emission Conversion Project (Project).

The total project cost is estimated to be approximately $39M. The Port of Long Beach is requesting approximately $31M in federal funds while the balance of approximately $8M will be private matching funds. The Project will support the PIDP program's goals of improving the safety, efficiency, and reliability of the movement of goods into, out of, around, and within the port. Acquisition of 60, manually operated, zero-emissions Container Handling Equipment (CHE) vehicles and construction of the CHE fleet charging station infrastructure will improve the MHT operations and serve to improve the accommodation of container vessels efficiently while significantly reducing emissions. The Project will modernize CHE, meet state emissions goals, and reduce emissions within a CA State SB 535 Disadvantaged Community Zone. The Project site falls within a California Air Resources Board "California Climate Investments Priority Populations" census tract.

There is an urgent need to invest in American ports to strengthen our supply chains, improve resilience, effectively support the U.S. economy, and help ensure environmental justice and community vitality. Caltrans supports this Project for its quantifiable greenhouse gas and criteria pollutant reductions that will help move the needle on State air quality goals, large-scale deployment of zero-emission infrastructure for vehicles that service a port, and the progress it will make towards addressing environmental justice concerns, particularly for communities that disproportionally experience climate change-related consequences.

Caltrans would like to thank USDOT for its consideration of this Project.

Sincerely,

STEVEN KECK
Acting Director

MAYOR ROBERT GARCIA
CITY OF LONG BEACH

April 26, 2022

The Honorable Pete Buttigieg
Secretary, United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg,

On behalf of the City of Long Beach, I write to support the Port of Long Beach's Middle Harbor Terminal (MHT) Zero Emission Conversion Project, in partnership with Long Beach Container Terminal (LBCT), for consideration of funding through the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP).

This project will transition 60 fossil-fueled yard tractors to battery-electric, representing the largest zero-emission replacement project for manually operated diesel-fueled equipment at the Port to date. Additionally, this project will construct infrastructure to support vehicle fueling and will improve LBCT's ability to more efficiently accommodate our growing on-dock rail operations while reducing emissions. Training will be provided to LBCT's yard tractor operators and maintenance personnel, expanding workforce development opportunities for longshore workers and other trades, and ensuring a smooth and just transition to cleaner terminal operations. The MHT Zero Emissions Conversation Project will modernize cargo-handling equipment, meet State emissions goals, reduce national dependence on fossil fuels, and reduce emissions in disadvantaged communities.

Federal support of zero-emission technologies at the nation's second busiest seaport is critical. The Ports of Long Beach and Los Angeles handle nearly 40% of the nation's goods. The first quarter of 2022 marks the busiest quarter on record for the Port of Long Beach. Dockworkers and terminal operators moved 863,156 twenty-foot equivalent units of container cargo in March 2022—a 2.7% increase from the previous record set in March 2021. This zero-emissions project will advance the Port's efforts to reduce emissions from cargo-handling equipment at the terminal by up to 90%.

There is an urgent need to invest in American ports to strengthen our supply chains, improve resilience, effectively support job creation, and help ensure environmental justice. The City strongly supports the MHT Zero Emissions Conversion Project for its greenhouse gas and criteria pollution benefits that will advance State air quality goals, large-scale deployment of zero-emission infrastructure, and environmental justice.

Thank you for your consideration of the MHT Zero Emissions Conversion Project.

Sincerely,

Mayor Robert Garcia
City of Long Beach

562.570.6801 | mayor@longbeach.gov | @LongBeachMayor
411 West Ocean Blvd, Long Beach, California 90802

STATE CAPITOL
P.O. BOX 942849
SACRAMENTO, CA 94249-0070
(916) 319-2070
(916) 319-2170 FAX

Assembly
California Legislature

PATRICK O'DONNELL
ASSEMBLYMEMBER, SEVENTIETH DISTRICT

DISTRICT OFFICE
5000 East Spring Street, Suite 550
LONG BEACH, CA 90815
(562) 429-0470
(562) 429-7871 FAX

May 5, 2022

The Honorable Pete Buttigieg
Secretary of the United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg:

I am pleased to support the Port of Long Beach (POLB) application to the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP) competitive grant program for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project in partnership with Long Beach Container Terminal (LBCT).

This project will transition 60 fossil-fueled yard tractors to battery-electric – representing the largest zero-emission replacement project for manually operated diesel-fueled equipment at the POLB to date. Additionally, this project in partnership with Southern California Edison, the Port's electrical utility provider, will construct infrastructure to support vehicle fueling, and will improve LBCT's ability to more efficiently accommodate our growing on dock rail operations while reducing emissions. Training will be provided to LBCT's yard tractor operators and maintenance personnel, expanding workforce development opportunities for longshore workers and other applicable trades, and ensuring a smooth and just transition to cleaner terminal operations.

As the Assemblymember representing both the Port of Long Beach and Port of Los Angeles, I understand the importance of having federal government support of early adopters of zero-emission technologies at the nation's second busiest seaport is critical. The Port of Long Beach combined with the Port of Los Angeles handle nearly 40% of the nation's goods. This zero emissions project will help this critical international trade gateway that is an important stimulus for our local, regional, and national economies grow green, while continuing the Port of Long Beach's success in reducing emissions and the negative health impacts within our local communities, which are historically disadvantaged. The MHT Zero Emissions Conversion Project is expected to reduce emissions from cargo handling equipment at the terminal by up to 90% - thereby mitigating impacts on our local community.

Thank you for your consideration of MHT Zero Emissions Conversion Project. Please contact my office at 562-429-0470 if my office may be of further assistance.

Sincerely,

Patrick O'Donnell,
Assemblymember, 70th District

ALAN LOWENTHAL
47TH DISTRICT, CALIFORNIA

COMMITTEE ON NATURAL RESOURCES
CHAIR, SUBCOMMITTEE ON ENERGY & MINERAL RESOURCES
SUBCOMMITTEE ON NATIONAL PARKS, FORESTS, & PUBLIC LANDS
SUBCOMMITTEE ON WATER, OCEANS, & WILDLIFE

COMMITTEE ON TRANSPORTATION & INFRASTRUCTURE
SUBCOMMITTEE ON HIGHWAYS & TRANSIT
SUBCOMMITTEE ON WATER & ENVIRONMENT
SUBCOMMITTEE ON COAST GUARD & MARITIME
SUBCOMMITTEE ON RAILROADS, PIPELINES & HAZARDOUS MATERIALS

Congress of the United States
House of Representatives
Washington, DC 20515

108 CANNON HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
PHONE (202) 225-7924
FAX (202) 225-7926

275 MAGNOLIA AVENUE
SUITE 1955
LONG BEACH, CA 90802
PHONE (562) 436-3828
FAX (562) 437-6434

12865 MAIN STREET
SUITE 200
GARDEN GROVE, CA 92840
PHONE (714) 243-4088
FAX (562) 437-6434

www.lowenthal.house.gov
facebook.com/RepLowenthal
twitter.com/RepLowenthal

May 12, 2022

The Honorable Pete Buttigieg
Secretary
U.S. Department of Transportation
1200 New Jersey Avenue, S.E.
Washington, D.C. 20590

Dear Secretary Buttigieg:

I support the Port of Long Beach application to the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP) competitive grant program for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project in partnership with Long Beach Container Terminal (LBCT).

This project will transition 60 fossil-fueled yard tractors to battery-electric – representing the largest zero-emission replacement project for manually operated diesel-fueled equipment at the Port of Long Beach to date. Additionally, this project in partnership with Southern California Edison, the Port's electrical utility provider, will construct the requisite make ready infrastructure to support vehicle fueling, and will improve LBCT's ability to more efficiently accommodate our growing on dock rail operations while reducing emissions. Training will be provided to LBCT's yard tractor operators and maintenance personnel, expanding workforce development opportunities for longshore workers and other applicable trades, and ensuring a smooth and just transition to cleaner terminal operations. The MHT Zero Emissions Conversation Project will modernize CHE, meet state emissions goals, reduce national dependance on fossil fuels and reduce emissions within a CA State SB 535 Disadvantaged Community Zone.

Federal government support of early adopters of zero-emission technologies at the nation's second busiest seaport is critical. The Port of Long Beach combined with the Port of Los Angeles handle nearly 40% of the nation's goods. The first quarter of 2022 marks the busiest quarter on record for the Port of Long Beach. Dockworkers and terminal operators moved 863,156 twenty-foot equivalent units of container cargo in March of 2022 - a 2.7% increase from the previous record set in March of 2021. These zero emissions projects will help this critical international trade gateway that is an important stimulus for our local, regional, and national economies grow green, while continuing the Port of Long Beach's success in reducing emissions and the negative health impacts within our local communities, which are historically disadvantaged. Emissions from the Port of Long Beach have plummeted as a result of the Port's groundbreaking air quality programs, but more work needs to be done. The MHT Zero Emissions Conversion Project is expected to reduce emissions from cargo handling equipment at the terminal by up to 90% - thereby mitigating impacts on our local community while furthering LBCT's reputation as having one of the cleanest terminals in the world.

There is an urgent need to invest in American ports to strengthen our supply chains, improve resilience, effectively support the U.S. economy, and help ensure environmental justice, job creation and transition goals as well as community vitality. [Organization] strongly supports the MHT Zero Emissions Conversion Project for its quantifiable greenhouse gas and criteria pollution benefits that will help to move the needle on State air quality goals, large-scale deployment of zero-emission infrastructure for vehicles that service a port, and the progress that it will make towards addressing environmental justice concerns, particularly for communities that disproportionally experience climate change-related consequences.

I appreciate USDOT's consideration of the MHT Zero Emissions Conversion Project.

Sincerely,

Alan Lowenthal
Member of Congress

PMSA
PACIFIC MERCHANT SHIPPING ASSOCIATION

April 27, 2022

The Honorable Pete Buttigieg
Secretary of the United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg:

The Pacific Merchant Shipping Association (PMSA) supports the Port of Long Beach application to the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP) competitive grant program for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project in partnership with Long Beach Container Terminal (LBCT). PMSA is a regional maritime trade association representing ocean carriers and marine terminal operators on a variety of local, state, and federal issues. PMSA members are working to reach the goal of zero emissions for cargo handling equipment using the latest and cleanest available technology.

This project will transition 60 fossil-fueled yard tractors to battery-electric – representing the largest zero-emission replacement project for manually operated diesel-fueled equipment at the Port of Long Beach to date. Additionally, this project in partnership with Southern California Edison, the Port's electrical utility provider, will construct the requisite make-ready infrastructure to support vehicle fueling, and will improve LBCT's ability to more efficiently accommodate growing on dock rail operations while reducing emissions. Training will be provided to LBCT's yard tractor operators and maintenance personnel, expanding workforce development opportunities for longshore workers and other applicable trades, and ensuring a smooth and just transition to cleaner terminal operations. The MHT Zero Emissions Conversation Project will modernize CHE, meet state emissions goals, reduce national dependance on fossil fuels and reduce emissions within a CA State SB 535 Disadvantaged Community Zone.

Federal government support of early adopters of zero-emission technologies at the nation's second busiest seaport is critical. The Port of Long Beach combined with the Port of Los Angeles handle nearly 40% of the nation's goods. The first quarter of 2022 marks the busiest quarter on record for the Port of Long Beach. Dockworkers and terminal operators moved 863,156 twenty-foot equivalent units of container cargo in March of 2022 - a 2.7% increase from the previous record set in March of 2021. This zero-emissions project will help this critical international trade gateway that is an important stimulus for our local, regional, and national economies grow green, while continuing the Port of Long Beach's success in reducing emissions and the negative health impacts within our local communities, which are historically disadvantaged. Emissions from the Port of Long Beach have plummeted as a result of the Port's groundbreaking air quality programs, but more work needs to be done. The MHT Zero Emissions Conversion Project is expected to reduce emissions from cargo handling equipment at the terminal by up to 90% - thereby mitigating impacts on our local community while furthering LBCT's reputation as having one of the cleanest terminals in the world.

There is an urgent need to invest in American ports to strengthen our supply chains, improve resilience,

effectively support the U.S. economy, and help ensure environmental justice, job creation and transition goals as well as community vitality. PMSA strongly supports the MHT Zero Emissions Conversion Project for its quantifiable greenhouse gas and criteria pollution benefits that will help to move the needle on State air quality goals, large-scale deployment of zero-emission infrastructure for vehicles that service a port, and the progress that it will make towards addressing environmental justice concerns, particularly for communities that disproportionally experience climate change-related consequences.

PMSA appreciates USDOT's consideration of the MHT Zero Emissions Conversion Project.

Sincerely,

Thomas Jelenić
Vice President

California State Senate

STANDING COMMITTEES
ENERGY, UTILITIES AND COMMUNICATIONS
ENVIRONMENTAL QUALITY
HEALTH
JUDICIARY

SELECT COMMITTEE
CHAIR, PORTS AND GOODS MOVEMENT

SPECIAL COMMITTEE
PANDEMIC EMERGENCY RESPONSE

SENATOR LENA A. GONZALEZ
THIRTY-THIRD SENATE DISTRICT
SENATE MAJORITY WHIP
CHAIR, SENATE COMMITTEE ON TRANSPORTATION

May 4th, 2022

The Honorable Pete Buttigieg
Secretary of the United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Dear Secretary Buttigieg:

I am writing to urge your support for the Port of Long Beach's application to the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP) competitive grant program for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project in partnership with Long Beach Container Terminal (LBCT).

This project will transition 60 fossil-fueled yard tractors to battery-electric – representing the largest zero-emission replacement project for manually operated diesel-fueled equipment at the Port of Long Beach to date. Additionally, this project in partnership with Southern California Edison, the Port's electrical utility provider, will construct the requisite make ready infrastructure to support vehicle fueling, and will improve LBCT's ability to more efficiently accommodate our growing on dock rail operations while reducing emissions.

As the representative for California Senate District-33, which includes the Port of Long Beach, I am committed to supporting the Port of Long Beach in leading the transition to zero-emission heavy-duty equipment. Currently, many communities in my district suffers from elevated levels of air pollution that have real and harmful health impacts. The MHT Zero Emissions Conversion Project is expected to reduce emissions from cargo handling equipment at the terminal by up to 90% - thereby mitigating impacts on our local community while furthering LBCT's reputation as having one of the cleanest terminals in the world.

There is an urgent need to invest in American ports to strengthen our supply chains, improve resilience, effectively support the U.S. economy, and help ensure environmental justice, job creation and transition goals as well as community vitality. I strongly supports the MHT Zero Emissions Conversion Project for its quantifiable greenhouse gas and criteria pollution benefits that will help to move the needle on State air quality goals, large-scale deployment of zero-emission infrastructure for vehicles that service a port, and the progress that it will make towards addressing environmental justice concerns, particularly for communities that disproportionally experience climate change-related consequences.

Sincerely,

Senator Lena Gonzalez

Calfiornia Senate District 33

South Coast
Air Quality Management District
South Coast AQMD 21865 Copley Drive, Diamond Bar, CA 91765-4178
(909) 396-2000 • www.aqmd.gov

Aaron Katzenstein, Ph.D.
Technology Advancement Office
☎ 909.396.2219 *akatzenstein@aqmd.gov*

May 11, 2022

The Honorable Pete Buttigieg
Secretary of the United States Department of Transportation
1200 New Jersey Avenue, SE
Washington, DC 20590

Subject: Letter of Support for the Port Infrastructure Development Program Application

Dear Secretary Buttigieg:

South Coast Air Quality Management District (South Coast AQMD) staff is pleased to provide this letter of support for the Port of Long Beach's (POLB) application to the United States Department of Transportation's (USDOT) Port Infrastructure Development Program (PIDP) competitive grant program for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project in partnership with Long Beach Container Terminal (LBCT).

South Coast AQMD is the regulatory agency responsible for improving air quality for large areas of Los Angeles, Orange County, Riverside and San Bernardino counties. The region is home to more than 17 million people- about half the population of the entire state of California. The South Coast Air Basin is classified as an "extreme" nonattainment area for ozone under the federal Clean Air Act (CAA). The MHT project will reduce air pollution which will help the region meet CAA standards and protect public health, especially in nearby frontline communities directly impacted by goods movement.

This project will transition 60 diesel powered yard tractors to battery-electric – representing the largest zero-emission replacement project for manually operated diesel equipment at the Long Beach Container Terminal (LBCT). Additionally, this project in partnership with Southern California Edison, the Port's electrical utility provider, will construct the requisite make ready infrastructure to support vehicle charging, and will improve LBCT's ability to more efficiently accommodate our growing on dock rail operations while reducing emissions. The MHT Zero Emissions Conversation Project will modernize Cargo Handling Equipment (CHE), meet state emissions goals, reduce national dependence on fossil fuels and reduce emissions within a CA State SB 535 Disadvantaged Community Zone.

The South Coast AQMD supports POLB's proposal and strongly believes that POLB and its project partners are highly qualified to successfully implement this project. If the proposal is awarded, staff will work with POLB to identify the best role for South Coast AQMD to play in supporting this program within our jurisdiction. If you have any questions about our support, please do not hesitate to contact me at akatzenstein@aqmd.gov or (909) 396-2219.

Sincerely,

Aaron Katzenstein

Aaron Katzenstein, Ph.D.
Deputy Executive Officer

moffatt & nichol

Version 1.0
Forecast Model

Present Value (2020 US$)	Component 3
Economic Competitveness	$10,829,854
Safety	$0
Environmental Sustainability	$5,555,693
Operating & Maintenance Costs	$3,987,102
Residual Value	$0
Total Benefits	**$20,372,648**
Project Costs	$19,682,942
Net Present Value	$689,707
Benefit to Cost Ratio	**1.04**

Present Value (2020 US$)	Component 3
Economic Competitveness	$10.83
Safety	$0.00
Environmental Sustainability	$5.56
Operating & Maintenance Costs	$3.99
Residual Value	$0.00
Total Benefits	**$20.37**
Project Costs	$19.68
Net Present Value	$0.69
Benefit to Cost Ratio	**1.04**

Inputs - Constants

	Constant	Unit	Notes
TIMING ASSUMPTIONS			
1st model column start date	01 Jan 15	date	
Forecast start date	2023	year	
Length of BCA period (operating)	12	years	
Months per model period	12	months	
Financial year end month number	12	month #	
Project operation start year	2024	year	
Base year	2020	year	
Discount rate (excluding CO2 emissions)	7.00%	percent	
Discount rate (for CO2 emissions)	3.00%	percent	
PROJECT ASSUMUPTIONS			
Project design life	12	years	
Volumes			
Terminal annual throughput	########	TEU	
TEU per box	1.9000	TEU / box	
IY volume as share of total	30.00%	percent	
IY Tractors			
Number of IY tractors	60	units	
IY tractor utilization	65.00%	percent	
IY working hours per day	16	hours	
ENERGY COSTS			
Conventional yard tractor fuel consumption per hour	9	liter / hour	
Electrical yard tractor energy consumption per hour	34	kWh	
Diesel unit cost	1.4200	US$ / liter	
Electricity unit cost	0.1393	US$ / kWh	https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a
MAINTENANCE COSTS			
Conventional yard tractor maintenance cost per hour	9.00	US$ / hour	
Electrical yard tractor maintenance cost per hour	6.30	US$ / hour	
ENVIRONMENTAL SUSTAINABILITY			
CO2 emissions per gallon of diesel	10,180	gram / gal	https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references
Annual CO2 emission reduction per unit - Yard tractors - Build	8,339	metric tons	
Annual NOx emission reduction per unit - Yard tractors - Build	2.89	metric tons	
Annual PM2.5 emission reduction per unit - Yard tractors - Build	0.11	metric tons	
Annual SO2 emission reduction per unit - Yard tractors - Build	0.10	metric tons	
NON CHANGEABLE MODEL TECHNICAL INPUTS			
Grams per metric ton	########	gram / metric ton	
Units in thousand	1,000	units / 000s	
Weeks per year	52	weeks / year	
Hours per day	24	hours / day	
kWh per BTU	0.0003	kWh / BTU	
Number of days per year	365	days / year	

Input - Time Series

Model Period Ending					**31 Dec 15**	**31 Dec 16**	**31 Dec 17**	**31 Dec 18**	**31 Dec 19**	**31 Dec 20**	**31 Dec 21**	**31 Dec 22**	**31 Dec 23**	**31 Dec 24**	**31 Dec 25**	**31 Dec 26**	**31 Dec 27**	**31 Dec 28**
Pre-forecast vs Forecast					Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Financial Year Ending					2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Model Column counter	**Constant**	**Unit**		**Total**	1	2	3	4	5	6	7	8	9	10	11	12	13	14
PROJECT COSTS																		
Electric vs diesel yard tractor costs - 60 units - Constant dollars		US$		24,112,450	-	-	-	-	-	-	-	-	24,112,450	-	-	-	-	-
ENVIRONEMNTAL BENEFITS																		
Emissions																		
Costs																		
Damage costs for emissions - CO2 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		-	-	-	-	-	-	52	53	54	55	56	57	58	60
Damage costs for emissions - NOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		-	-	-	-	-	-	15,600	15,800	16,000	16,200	16,500	16,800	17,100	17,400
Damage costs for emissions - PM2.5 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		-	-	-	-	-	-	748,600	761,600	774,700	788,100	801,700	814,500	827,400	840,600
Damage costs for emissions - SOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		-	-	-	-	-	-	41,500	42,300	43,100	44,000	44,900	45,700	46,500	47,300

Input - Time Series

Model Period Ending				**31 Dec 29**	**31 Dec 30**	**31 Dec 31**	**31 Dec 32**	**31 Dec 33**	**31 Dec 34**	**31 Dec 35**	**31 Dec 36**	**31 Dec 37**	**31 Dec 38**	**31 Dec 39**	**31 Dec 40**	**31 Dec 41**	**31 Dec 42**
Pre-forecast vs Forecast				Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042
Model Column counter	**Constant**	**Unit**	**Total**	15	16	17	18	19	20	21	22	23	24	25	26	27	28
PROJECT COSTS																	
Electric vs diesel yard tractor costs - 60 units - Constant dollars		US$	24,112,450	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONEMNTAL BENEFITS																	
Emissions																	
Costs																	
Damage costs for emissions - CO2 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	61	62	63	64	65	66	67	68	69	70	71	72	73	75
Damage costs for emissions - NOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	17,700	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Damage costs for emissions - PM2.5 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	854,000	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Damage costs for emissions - SOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	48,200	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100

Input - Time Series

Model Period Ending					**31 Dec 43**	**31 Dec 44**	**31 Dec 45**	**31 Dec 46**	**31 Dec 47**	**31 Dec 48**	**31 Dec 49**	**31 Dec 50**	**31 Dec 51**	**31 Dec 52**	**31 Dec 53**	**31 Dec 54**	**31 Dec 55**	**31 Dec 56**
Pre-forecast vs Forecast					Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending					2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056
Model Column counter	**Constant**	**Unit**		**Total**	29	30	31	32	33	34	35	36	37	38	39	40	41	42
PROJECT COSTS																		
Electric vs diesel yard tractor costs - 60 units - Constant dollars		US$		24,112,450	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONEMNTAL BENEFITS																		
Emissions																		
Costs																		
Damage costs for emissions - CO2 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		77	78	79	80	81	82	83	85	85	85	85	85	85	85
Damage costs for emissions - NOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Damage costs for emissions - PM2.5 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Damage costs for emissions - SOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100

Input - Time Series

Model Period Ending					**31 Dec 57**	**31 Dec 58**	**31 Dec 59**	**31 Dec 60**	**31 Dec 61**	**31 Dec 62**	**31 Dec 63**	**31 Dec 64**	**31 Dec 65**	**31 Dec 66**	**31 Dec 67**	**31 Dec 68**	**31 Dec 69**	**31 Dec 70**
Pre-forecast vs Forecast					Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending					2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Model Column counter	**Constant**	**Unit**		**Total**	43	44	45	46	47	48	49	50	51	52	53	54	55	56
PROJECT COSTS																		
Electric vs diesel yard tractor costs - 60 units - Constant dollars		US$		24,112,450	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONEMNTAL BENEFITS																		
Emissions																		
Costs																		
Damage costs for emissions - CO2 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		85	85	85	85	85	85	85	85	85	85	85	85	85	85
Damage costs for emissions - NOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Damage costs for emissions - PM2.5 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Damage costs for emissions - SOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100

Input - Time Series

Model Period Ending					**31 Dec 71**	**31 Dec 72**	**31 Dec 73**	**31 Dec 74**	**31 Dec 75**	**31 Dec 76**	**31 Dec 77**	**31 Dec 78**	**31 Dec 79**	**31 Dec 80**	**31 Dec 81**	**31 Dec 82**	**31 Dec 83**	**31 Dec 84**
Pre-forecast vs Forecast					Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending					2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084
Model Column counter	**Constant**	**Unit**		**Total**	57	58	59	60	61	62	63	64	65	66	67	68	69	70
PROJECT COSTS																		
Electric vs diesel yard tractor costs - 60 units - Constant dollars		US$		24,112,450	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONEMNTAL BENEFITS																		
Emissions																		
Costs																		
Damage costs for emissions - CO2 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		85	85	85	85	85	85	85	85	85	85	85	85	85	85
Damage costs for emissions - NOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Damage costs for emissions - PM2.5 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Damage costs for emissions - SOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100

Input - Time Series

Model Period Ending					**31 Dec 85**	**31 Dec 86**	**31 Dec 87**	**31 Dec 88**	**31 Dec 89**	**31 Dec 90**	**31 Dec 91**	**31 Dec 92**	**31 Dec 93**	**31 Dec 94**	**31 Dec 95**	**31 Dec 96**	**31 Dec 97**	**31 Dec 98**
Pre-forecast vs Forecast					Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending					2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098
Model Column counter	**Constant**	**Unit**		**Total**	71	72	73	74	75	76	77	78	79	80	81	82	83	84
PROJECT COSTS																		
Electric vs diesel yard tractor costs - 60 units - Constant dollars		US$		24,112,450	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONEMNTAL BENEFITS																		
Emissions																		
Costs																		
Damage costs for emissions - CO2 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		85	85	85	85	85	85	85	85	85	85	85	85	85	85
Damage costs for emissions - NOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Damage costs for emissions - PM2.5 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Damage costs for emissions - SOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100

Input - Time Series

Model Period Ending					**31 Dec 99**	**31 Dec 00**	**31 Dec 01**	**31 Dec 02**	**31 Dec 03**	**31 Dec 04**	**31 Dec 05**	**31 Dec 06**	**31 Dec 07**	**31 Dec 08**	**31 Dec 09**	**31 Dec 10**	**31 Dec 11**	**31 Dec 12**
Pre-forecast vs Forecast					Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending					2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112
Model Column counter	**Constant**	**Unit**		**Total**	85	86	87	88	89	90	91	92	93	94	95	96	97	98
PROJECT COSTS																		
Electric vs diesel yard tractor costs - 60 units - Constant dollars		US$		24,112,450	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONEMNTAL BENEFITS																		
Emissions																		
Costs																		
Damage costs for emissions - CO2 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		85	85	85	85	85	85	85	85	85	85	85	85	85	85
Damage costs for emissions - NOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Damage costs for emissions - PM2.5 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Damage costs for emissions - SOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)		49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100

Input - Time Series

				31 Dec 13	31 Dec 14	31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20
Model Period Ending											
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2113	2114	2115	2116	2117	2118	2119	2120
Model Column counter	**Constant**	**Unit**	**Total**	99	100	101	102	103	104	105	106
PROJECT COSTS											
Electric vs diesel yard tractor costs - 60 units - Constant dollars		US$	24,112,450	-	-	-	-	-	-	-	-
ENVIRONEMNTAL BENEFITS											
Emissions											
Costs											
Damage costs for emissions - CO2 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	85	85	85	85	85	85	85	85
Damage costs for emissions - NOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Damage costs for emissions - PM2.5 - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Damage costs for emissions - SOx - 2020 US$		US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100

Time and Escalation

Model Period Ending				**31 Dec 15**	**31 Dec 16**	**31 Dec 17**	**31 Dec 18**	**31 Dec 19**	**31 Dec 20**	**31 Dec 21**	**31 Dec 22**	**31 Dec 23**	**31 Dec 24**	**31 Dec 25**	**31 Dec 26**	**31 Dec 27**	**31 Dec 28**	**31 Dec 29**	**31 Dec 30**	**31 Dec 31**	**31 Dec 32**	**31 Dec 33**
Pre-forecast vs Forecast				Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Financial Year Ending				2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Model Column counter	**Constant**	**Unit**	**Total**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
TIME RULER																						
Model column counter		counter		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
First model column flag		flag		1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1st model column start date	########	date																				
Months per model period	12	months																				
First model column flag	-	flag	- -	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Model period beginning		date		01 Jan 15	01 Jan 16	01 Jan 17	01 Jan 18	01 Jan 19	01 Jan 20	01 Jan 21	01 Jan 22	01 Jan 23	01 Jan 24	01 Jan 25	01 Jan 26	01 Jan 27	01 Jan 28	01 Jan 29	01 Jan 30	01 Jan 31	01 Jan 32	01 Jan 33
Months per model period	12	months																				
Model period beginning	-	date	- -	01 Jan 15	01 Jan 16	01 Jan 17	01 Jan 18	01 Jan 19	01 Jan 20	01 Jan 21	01 Jan 22	01 Jan 23	01 Jan 24	01 Jan 25	01 Jan 26	01 Jan 27	01 Jan 28	01 Jan 29	01 Jan 30	01 Jan 31	01 Jan 32	01 Jan 33
Model period ending		date		31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20	31 Dec 21	31 Dec 22	31 Dec 23	31 Dec 24	31 Dec 25	31 Dec 26	31 Dec 27	31 Dec 28	31 Dec 29	31 Dec 30	31 Dec 31	31 Dec 32	31 Dec 33
1st model column start date	########	date																				
First modeling column financial year	2015	year																				
First modeling column financial year	2015	year																				
Financial year end month number	12	month #																				
Model period ending	-	date	- -	31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20	31 Dec 21	31 Dec 22	31 Dec 23	31 Dec 24	31 Dec 25	31 Dec 26	31 Dec 27	31 Dec 28	31 Dec 29	31 Dec 30	31 Dec 31	31 Dec 32	31 Dec 33
First model column flag	-	flag	- -	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending		year		2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
FLAGS AND ESCALATIONS																						
Timing Flags																						
Forecast start date	2023	year																				
Project operation start year	2024	year																				
Length of BCA period (operating)	12	years																				
Length of forecast period	12	year #																				
Forecast start date	2023	year																				
Length of forecast period	12	year #																				
Last forecast date	2035	date																				
Forecast start date	2023	year																				
Financial year ending	-	year	- -	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Forecast period flag		flag	13	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1
Forecast start date	2023	year																				
Financial year ending	-	year	- -	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Pre-forecast flag		flag	8	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Forecast period flag	-	flag	13 -	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1
Pre-forecast flag	-	flag	8 -	1	1	1	1	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast vs forecast		timeline label		Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Forecast start date	2023	year																				
Financial year ending	-	year	- -	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
First forecast period flag		flag	1	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Last forecast date	2035	date																				
Financial year ending	-	year	- -	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Last forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year																				
Financial year ending	-	year	- -	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Forecast period flag	-	flag	13 -	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1	1
Operating period flag		flag	12	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Project operation start year	2024	year																				
Project design life	12	years																				
Operating period flag	-	flag	12 -	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Financial year ending	-	year	- -	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Post analysis period remaining service life flag		flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Escalations																						
Base year	2020	year																				
Discount rate (excluding CO2 emissions)	7.00%	percent																				
Financial year ending	-	year	- -	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Discount rate multiplier - 7 percent		factor		0.7130	0.7629	0.8163	0.8734	0.9346	1.0000	1.0700	1.1449	1.2250	1.3108	1.4026	1.5007	1.6058	1.7182	1.8385	1.9672	2.1049	2.2522	2.4098
Base year	2020	year																				
Discount rate (for CO2 emissions)	3.00%	percent																				
Financial year ending	-	year	- -	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Discount rate multiplier - 3 percent		factor		0.8626	0.8885	0.9151	0.9426	0.9709	1.0000	1.0300	1.0609	1.0927	1.1255	1.1593	1.1941	1.2299	1.2668	1.3048	1.3439	1.3842	1.4258	1.4685

Time and Escalation

Model Period Ending				**31 Dec 34**	**31 Dec 35**	**31 Dec 36**	**31 Dec 37**	**31 Dec 38**	**31 Dec 39**	**31 Dec 40**	**31 Dec 41**	**31 Dec 42**	**31 Dec 43**	**31 Dec 44**	**31 Dec 45**	**31 Dec 46**	**31 Dec 47**	**31 Dec 48**	**31 Dec 49**	**31 Dec 50**	**31 Dec 51**	**31 Dec 52**
Pre-forecast vs Forecast				Forecast	Forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Model Column counter	**Constant**	**Unit**	**Total**	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
TIME RULER																						
Model column counter		counter		20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
First model column flag		flag		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1st model column start date	########	date																				
Months per model period	12	months																				
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Model period beginning		date		01 Jan 34	01 Jan 35	01 Jan 36	01 Jan 37	01 Jan 38	01 Jan 39	01 Jan 40	01 Jan 41	01 Jan 42	01 Jan 43	01 Jan 44	01 Jan 45	01 Jan 46	01 Jan 47	01 Jan 48	01 Jan 49	01 Jan 50	01 Jan 51	01 Jan 52
Months per model period	12	months																				
Model period beginning	-	date	-	01 Jan 34	01 Jan 35	01 Jan 36	01 Jan 37	01 Jan 38	01 Jan 39	01 Jan 40	01 Jan 41	01 Jan 42	01 Jan 43	01 Jan 44	01 Jan 45	01 Jan 46	01 Jan 47	01 Jan 48	01 Jan 49	01 Jan 50	01 Jan 51	01 Jan 52
Model period ending		date		31 Dec 34	31 Dec 35	31 Dec 36	31 Dec 37	31 Dec 38	31 Dec 39	31 Dec 40	31 Dec 41	31 Dec 42	31 Dec 43	31 Dec 44	31 Dec 45	31 Dec 46	31 Dec 47	31 Dec 48	31 Dec 49	31 Dec 50	31 Dec 51	31 Dec 52
1st model column start date	########	date																				
First modeling column financial year	2015	year																				
First modeling column financial year	2015	year																				
Financial year end month number	12	month #																				
Model period ending	-	date	-	31 Dec 34	31 Dec 35	31 Dec 36	31 Dec 37	31 Dec 38	31 Dec 39	31 Dec 40	31 Dec 41	31 Dec 42	31 Dec 43	31 Dec 44	31 Dec 45	31 Dec 46	31 Dec 47	31 Dec 48	31 Dec 49	31 Dec 50	31 Dec 51	31 Dec 52
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending		year		2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
FLAGS AND ESCALATIONS																						
Timing Flags																						
Forecast start date	2023	year																				
Project operation start year	2024	year																				
Length of BCA period (operating)	12	years																				
Length of forecast period	12	year #																				
Forecast start date	2023	year																				
Length of forecast period	12	year #																				
Last forecast date	2035	date																				
Forecast start date	2023	year																				
Financial year ending	-	year	-	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Forecast period flag		flag	13	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Forecast start date	2023	year																				
Financial year ending	-	year	-	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Pre-forecast flag		flag	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Forecast period flag	-	flag	13	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast flag	-	flag	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast vs forecast		timeline label		Forecast	Forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Forecast start date	2023	year																				
Financial year ending	-	year	-	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
First forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Last forecast date	2035	date																				
Financial year ending	-	year	-	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Last forecast period flag		flag	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year																				
Financial year ending	-	year	-	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Forecast period flag	-	flag	13	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag		flag	12	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year																				
Project design life	12	years																				
Operating period flag	-	flag	12	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending	-	year	-	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Post analysis period remaining service life flag		flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Escalations																						
Base year	2020	year																				
Discount rate (excluding CO2 emissions)	7.00%	percent																				
Financial year ending	-	year	-	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Discount rate multiplier - 7 percent		factor		2.5785	2.7590	2.9522	3.1588	3.3799	3.6165	3.8697	4.1406	4.4304	4.7405	5.0724	5.4274	5.8074	6.2139	6.6488	7.1143	7.6123	8.1451	8.7153
Base year	2020	year																				
Discount rate (for CO2 emissions)	3.00%	percent																				
Financial year ending	-	year	-	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Discount rate multiplier - 3 percent		factor		1.5126	1.5580	1.6047	1.6528	1.7024	1.7535	1.8061	1.8603	1.9161	1.9736	2.0328	2.0938	2.1566	2.2213	2.2879	2.3566	2.4273	2.5001	2.5751

Time and Escalation

Model Period Ending				31 Dec 53	31 Dec 54	31 Dec 55	31 Dec 56	31 Dec 57	31 Dec 58	31 Dec 59	31 Dec 60	31 Dec 61	31 Dec 62	31 Dec 63	31 Dec 64	31 Dec 65	31 Dec 66	31 Dec 67	31 Dec 68	31 Dec 69	31 Dec 70	31 Dec 71
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
Model Column counter	**Constant**	**Unit**	**Total**	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
TIME RULER																						
Model column counter		counter		39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
First model column flag		flag		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1st model column start date	########	date																				
Months per model period	12	months																				
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Model period beginning		date		01 Jan 53	01 Jan 54	01 Jan 55	01 Jan 56	01 Jan 57	01 Jan 58	01 Jan 59	01 Jan 60	01 Jan 61	01 Jan 62	01 Jan 63	01 Jan 64	01 Jan 65	01 Jan 66	01 Jan 67	01 Jan 68	01 Jan 69	01 Jan 70	01 Jan 71
Months per model period	12	months																				
Model period beginning	-	date	-	01 Jan 53	01 Jan 54	01 Jan 55	01 Jan 56	01 Jan 57	01 Jan 58	01 Jan 59	01 Jan 60	01 Jan 61	01 Jan 62	01 Jan 63	01 Jan 64	01 Jan 65	01 Jan 66	01 Jan 67	01 Jan 68	01 Jan 69	01 Jan 70	01 Jan 71
Model period ending		date		31 Dec 53	31 Dec 54	31 Dec 55	31 Dec 56	31 Dec 57	31 Dec 58	31 Dec 59	31 Dec 60	31 Dec 61	31 Dec 62	31 Dec 63	31 Dec 64	31 Dec 65	31 Dec 66	31 Dec 67	31 Dec 68	31 Dec 69	31 Dec 70	31 Dec 71
1st model column start date	########	date																				
First modeling column financial year	2015	year																				
First modeling column financial year	2015	year																				
Financial year end month number	12	month #																				
Model period ending	-	date	-	31 Dec 53	31 Dec 54	31 Dec 55	31 Dec 56	31 Dec 57	31 Dec 58	31 Dec 59	31 Dec 60	31 Dec 61	31 Dec 62	31 Dec 63	31 Dec 64	31 Dec 65	31 Dec 66	31 Dec 67	31 Dec 68	31 Dec 69	31 Dec 70	31 Dec 71
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending		year		2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
FLAGS AND ESCALATIONS																						
Timing Flags																						
Forecast start date	2023	year																				
Project operation start year	2024	year																				
Length of BCA period (operating)	12	years																				
Length of forecast period	12	year #																				
Forecast start date	2023	year																				
Length of forecast period	12	year #																				
Last forecast date	2035	date																				
Forecast start date	2023	year																				
Financial year ending	-	year	-	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
Forecast period flag		flag	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Forecast start date	2023	year																				
Financial year ending	-	year	-	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
Pre-forecast flag		flag	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Forecast period flag	-	flag	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast flag	-	flag	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast vs forecast		timeline label		Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Forecast start date	2023	year																				
Financial year ending	-	year	-	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
First forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Last forecast date	2035	date																				
Financial year ending	-	year	-	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
Last forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year																				
Financial year ending	-	year	-	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
Forecast period flag	-	flag	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag		flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year																				
Project design life	12	years																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending	-	year	-	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
Post analysis period remaining service life flag		flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Escalations																						
Base year	2020	year																				
Discount rate (excluding CO2 emissions)	7.00%	percent																				
Financial year ending	-	year	-	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
Discount rate multiplier - 7 percent		factor		9.3253	9.9781	10.6766	11.4239	12.2236	13.0793	13.9948	14.9745	16.0227	17.1443	18.3444	19.6285	21.0025	22.4726	24.0457	25.7289	27.5299	29.4570	31.5190
Base year	2020	year																				
Discount rate (for CO2 emissions)	3.00%	percent																				
Financial year ending	-	year	-	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
Discount rate multiplier - 3 percent		factor		2.6523	2.7319	2.8139	2.8983	2.9852	3.0748	3.1670	3.2620	3.3599	3.4607	3.5645	3.6715	3.7816	3.8950	4.0119	4.1323	4.2562	4.3839	4.5154

Time and Escalation

Model Period Ending				**31 Dec 72**	**31 Dec 73**	**31 Dec 74**	**31 Dec 75**	**31 Dec 76**	**31 Dec 77**	**31 Dec 78**	**31 Dec 79**	**31 Dec 80**	**31 Dec 81**	**31 Dec 82**	**31 Dec 83**	**31 Dec 84**	**31 Dec 85**	**31 Dec 86**	**31 Dec 87**	**31 Dec 88**	**31 Dec 89**	**31 Dec 90**
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Model Column counter	**Constant**	**Unit**	**Total**	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
TIME RULER																						
Model column counter		counter		58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
First model column flag		flag		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1st model column start date	########	date																				
Months per model period	12	months																				
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Model period beginning		date		01 Jan 72	01 Jan 73	01 Jan 74	01 Jan 75	01 Jan 76	01 Jan 77	01 Jan 78	01 Jan 79	01 Jan 80	01 Jan 81	01 Jan 82	01 Jan 83	01 Jan 84	01 Jan 85	01 Jan 86	01 Jan 87	01 Jan 88	01 Jan 89	01 Jan 90
Months per model period	12	months																				
Model period beginning	-	date	-	01 Jan 72	01 Jan 73	01 Jan 74	01 Jan 75	01 Jan 76	01 Jan 77	01 Jan 78	01 Jan 79	01 Jan 80	01 Jan 81	01 Jan 82	01 Jan 83	01 Jan 84	01 Jan 85	01 Jan 86	01 Jan 87	01 Jan 88	01 Jan 89	01 Jan 90
Model period ending		date		31 Dec 72	31 Dec 73	31 Dec 74	31 Dec 75	31 Dec 76	31 Dec 77	31 Dec 78	31 Dec 79	31 Dec 80	31 Dec 81	31 Dec 82	31 Dec 83	31 Dec 84	31 Dec 85	31 Dec 86	31 Dec 87	31 Dec 88	31 Dec 89	31 Dec 90
1st model column start date	########	date																				
First modeling column financial year	2015	year																				
First modeling column financial year	2015	year																				
Financial year end month number	12	month #																				
Model period ending	-	date	-	31 Dec 72	31 Dec 73	31 Dec 74	31 Dec 75	31 Dec 76	31 Dec 77	31 Dec 78	31 Dec 79	31 Dec 80	31 Dec 81	31 Dec 82	31 Dec 83	31 Dec 84	31 Dec 85	31 Dec 86	31 Dec 87	31 Dec 88	31 Dec 89	31 Dec 90
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending		year		2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
FLAGS AND ESCALATIONS																						
Timing Flags																						
Forecast start date	2023	year																				
Project operation start year	2024	year																				
Length of BCA period (operating)	12	years																				
Length of forecast period	12	year #																				
Forecast start date	2023	year																				
Length of forecast period	12	year #																				
Last forecast date	2035	date																				
Forecast start date	2023	year																				
Financial year ending	-	year	-	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Forecast period flag		flag	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Forecast start date	2023	year																				
Financial year ending	-	year	-	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Pre-forecast flag		flag	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Forecast period flag	-	flag	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast flag	-	flag	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast vs forecast		timeline label		Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Forecast start date	2023	year																				
Financial year ending	-	year	-	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
First forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Last forecast date	2035	date																				
Financial year ending	-	year	-	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Last forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year																				
Financial year ending	-	year	-	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Forecast period flag	-	flag	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag		flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year																				
Project design life	12	years																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending	-	year	-	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Post analysis period remaining service life flag		flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Escalations																						
Base year	2020	year																				
Discount rate (excluding CO2 emissions)	7.00%	percent																				
Financial year ending	-	year	-	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Discount rate multiplier - 7 percent		factor		33.7253	36.0861	38.6122	41.3150	44.2071	47.3015	50.6127	54.1555	57.9464	62.0027	66.3429	70.9869	75.9559	81.2729	86.9620	93.0493	99.5627	106.5321	113.9894
Base year	2020	year																				
Discount rate (for CO2 emissions)	3.00%	percent																				
Financial year ending	-	year	-	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Discount rate multiplier - 3 percent		factor		4.6509	4.7904	4.9341	5.0821	5.2346	5.3917	5.5534	5.7200	5.8916	6.0684	6.2504	6.4379	6.6311	6.8300	7.0349	7.2459	7.4633	7.6872	7.9178

Time and Escalation

Model Period Ending				31 Dec 91	31 Dec 92	31 Dec 93	31 Dec 94	31 Dec 95	31 Dec 96	31 Dec 97	31 Dec 98	31 Dec 99	31 Dec 00	31 Dec 01	31 Dec 02	31 Dec 03	31 Dec 04	31 Dec 05	31 Dec 06	31 Dec 07	31 Dec 08	31 Dec 09
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
Model Column counter	**Constant**	**Unit**	**Total**	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
TIME RULER																						
Model column counter		counter		77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
First model column flag		flag		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1st model column start date	########	date																				
Months per model period	12	months																				
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Model period beginning		date		01 Jan 91	01 Jan 92	01 Jan 93	01 Jan 94	01 Jan 95	01 Jan 96	01 Jan 97	01 Jan 98	01 Jan 99	01 Jan 00	01 Jan 01	01 Jan 02	01 Jan 03	01 Jan 04	01 Jan 05	01 Jan 06	01 Jan 07	01 Jan 08	01 Jan 09
Months per model period	12	months																				
Model period beginning	-	date	-	01 Jan 91	01 Jan 92	01 Jan 93	01 Jan 94	01 Jan 95	01 Jan 96	01 Jan 97	01 Jan 98	01 Jan 99	01 Jan 00	01 Jan 01	01 Jan 02	01 Jan 03	01 Jan 04	01 Jan 05	01 Jan 06	01 Jan 07	01 Jan 08	01 Jan 09
Model period ending		date		31 Dec 91	31 Dec 92	31 Dec 93	31 Dec 94	31 Dec 95	31 Dec 96	31 Dec 97	31 Dec 98	31 Dec 99	31 Dec 00	31 Dec 01	31 Dec 02	31 Dec 03	31 Dec 04	31 Dec 05	31 Dec 06	31 Dec 07	31 Dec 08	31 Dec 09
1st model column start date	########	date																				
First modeling column financial year	2015	year																				
First modeling column financial year	2015	year																				
Financial year end month number	12	month #																				
Model period ending	-	date	-	31 Dec 91	31 Dec 92	31 Dec 93	31 Dec 94	31 Dec 95	31 Dec 96	31 Dec 97	31 Dec 98	31 Dec 99	31 Dec 00	31 Dec 01	31 Dec 02	31 Dec 03	31 Dec 04	31 Dec 05	31 Dec 06	31 Dec 07	31 Dec 08	31 Dec 09
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending		year		2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
FLAGS AND ESCALATIONS																						
Timing Flags																						
Forecast start date	2023	year																				
Project operation start year	2024	year																				
Length of BCA period (operating)	12	years																				
Length of forecast period	12	year #																				
Forecast start date	2023	year																				
Length of forecast period	12	year #																				
Last forecast date	2035	date																				
Forecast start date	2023	year																				
Financial year ending	-	year	-	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
Forecast period flag		flag	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Forecast start date	2023	year																				
Financial year ending	-	year	-	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
Pre-forecast flag		flag	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Forecast period flag	-	flag	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast flag	-	flag	8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast vs forecast		timeline label		Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Forecast start date	2023	year																				
Financial year ending	-	year	-	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
First forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Last forecast date	2035	date																				
Financial year ending	-	year	-	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
Last forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year																				
Financial year ending	-	year	-	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
Forecast period flag	-	flag	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag		flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year																				
Project design life	12	years																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending	-	year	-	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
Post analysis period remaining service life flag		flag		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Escalations																						
Base year	2020	year																				
Discount rate (excluding CO2 emissions)	7.00%	percent																				
Financial year ending	-	year	-	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
Discount rate multiplier - 7 percent		factor		121.9686	130.5065	139.6419	149.4168	159.8760	171.0673	183.0421	195.8550	209.5648	224.2344	239.9308	256.7260	274.6968	293.9255	314.5003	336.5154	360.0714	385.2764	412.2458
Base year	2020	year																				
Discount rate (for CO2 emissions)	3.00%	percent																				
Financial year ending	-	year	-	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
Discount rate multiplier - 3 percent		factor		8.1554	8.4000	8.6520	8.9116	9.1789	9.4543	9.7379	10.0301	10.3310	10.6409	10.9601	11.2889	11.6276	11.9764	12.3357	12.7058	13.0870	13.4796	13.8839

Time and Escalation

Model Period Ending				**31 Dec 10**	**31 Dec 11**	**31 Dec 12**	**31 Dec 13**	**31 Dec 14**	**31 Dec 15**	**31 Dec 16**	**31 Dec 17**	**31 Dec 18**	**31 Dec 19**	**31 Dec 20**
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Model Column counter	**Constant**	**Unit**	**Total**	96	97	98	99	100	101	102	103	104	105	106
TIME RULER														
Model column counter		counter		96	97	98	99	100	101	102	103	104	105	106
First model column flag		flag		-	-	-	-	-	-	-	-	-	-	-
1st model column start date	########	date												
Months per model period	12	months												
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-
Model period beginning		date		01 Jan 10	01 Jan 11	01 Jan 12	01 Jan 13	01 Jan 14	01 Jan 15	01 Jan 16	01 Jan 17	01 Jan 18	01 Jan 19	01 Jan 20
Months per model period	12	months												
Model period beginning	-	date	-	01 Jan 10	01 Jan 11	01 Jan 12	01 Jan 13	01 Jan 14	01 Jan 15	01 Jan 16	01 Jan 17	01 Jan 18	01 Jan 19	01 Jan 20
Model period ending		date		31 Dec 10	31 Dec 11	31 Dec 12	31 Dec 13	31 Dec 14	31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20
1st model column start date	########	date												
First modeling column financial year	2015	year												
First modeling column financial year	2015	year												
Financial year end month number	12	month #												
Model period ending	-	date	-	31 Dec 10	31 Dec 11	31 Dec 12	31 Dec 13	31 Dec 14	31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20
First model column flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-
Financial year ending		year		2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
FLAGS AND ESCALATIONS														
Timing Flags														
Forecast start date	2023	year												
Project operation start year	2024	year												
Length of BCA period (operating)	12	years												
Length of forecast period	12	year #												
Forecast start date	2023	year												
Length of forecast period	12	year #												
Last forecast date	2035	date												
Forecast start date	2023	year												
Financial year ending	-	year	-	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Forecast period flag		flag	13	-	-	-	-	-	-	-	-	-	-	-
Forecast start date	2023	year												
Financial year ending	-	year	-	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Pre-forecast flag		flag	8	-	-	-	-	-	-	-	-	-	-	-
Forecast period flag	-	flag	13	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast flag	-	flag	8	-	-	-	-	-	-	-	-	-	-	-
Pre-forecast vs forecast		timeline label		Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Forecast start date	2023	year												
Financial year ending	-	year	-	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
First forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-
Last forecast date	2035	date												
Financial year ending	-	year	-	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Last forecast period flag		flag	1	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year												
Financial year ending	-	year	-	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Forecast period flag	-	flag	13	-	-	-	-	-	-	-	-	-	-	-
Operating period flag		flag	12	-	-	-	-	-	-	-	-	-	-	-
Project operation start year	2024	year												
Project design life	12	years												
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-
Financial year ending	-	year	-	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Post analysis period remaining service life flag		flag	-	-	-	-	-	-	-	-	-	-	-	-
Escalations														
Base year	2020	year												
Discount rate (excluding CO2 emissions)	7.00%	percent												
Financial year ending	-	year	-	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Discount rate multiplier - 7 percent		factor		441.1030	471.9802	505.0188	540.3701	578.1960	618.6697	661.9766	708.3150	757.8970	810.9498	867.7163
Base year	2020	year												
Discount rate (for CO2 emissions)	3.00%	percent												
Financial year ending	-	year	-	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Discount rate multiplier - 3 percent		factor		14.3005	14.7295	15.1714	15.6265	16.0953	16.5782	17.0755	17.5878	18.1154	18.6589	19.2186

Sustainability Elements

Model Period Ending				31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20	31 Dec 21	31 Dec 22	31 Dec 23	31 Dec 24	31 Dec 25	31 Dec 26	31 Dec 27	31 Dec 28	31 Dec 29	31 Dec 30	31 Dec 31	31 Dec 32	31 Dec 33
Pre-forecast vs Forecast				Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Financial Year Ending				2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Model Column counter	Constant	Unit	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
RUNNING HOURS																						
IY working hours per day	16	hours																				
Number of days per year	365	days / year																				
IY tractor utilization	65.00%	percent	3,796																			
Number of IY tractors	60	units																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
IY tractor working hours		hours	2,733,120	-	-	-	-	-	-	-	-	-	227,760	227,760	227,760	227,760	227,760	227,760	227,760	227,760	227,760	227,760
ECONOMIC COMPETITIVENESS BENEFITS - ELECTRIFIED YARD TRACTORS																						
Energy Costs																						
Diesel Consumption																						
Diesel unit cost	1.4200	US$ / liter																				
Conventional yard tractor fuel consumption per hour	9	liter / hour																				
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Electricity Consumptio																						
Electrical yard tractor energy consumption per hour	34.0	kWh																				
Electricity unit cost	0.1393	US$ / kWh																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Savings																						
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7.33	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7	US$ / hour																				
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	227,760	227,760	227,760	227,760	227,760	227,760	227,760	227,760	227,760	227,760
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Energy savings per yard tractor due to electrification - Build		US$	20,044,155		-	-	-	-	-	-	-	-	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346
Energy savings per yard tractor due to electrification - Build	-	US$	20,044,155	-	-	-	-	-	-	-	-	-	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346	1,670,346
Discount rate multiplier - 7 percent	-	factor	-	-	0.7130	0.7629	0.8163	0.8734	0.9346	1.0000	1.0700	1.1449	1.2250	1.3108	1.4026	1.5007	1.6058	1.7182	1.8385	1.9672	2.1049	2.2522	2.4098
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Reduction in energy consumption costs with yard tractor electrification - Build - PV		US$	10,829,854		-	-	-	-	-	-	-	-	-	1,274,299	1,190,934	1,113,022	1,040,208	972,157	908,558	849,119	793,569	741,654	693,134
ENVIRONMENTAL BENEFITS - ELECTRIFIED YARD TRACTORS																						
CO2 Emissions																						
Annual CO2 emission reduction per unit - Yard tractors - Build	8,339	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Reduction in carbon dioxide emissions - Electrified yard tractor - Build		metric tons	100,065		-	-	-	-	-	-	-	-	8,339	8,339	8,339	8,339	8,339	8,339	8,339	8,339	8,339	8,339
Reduction in carbon dioxide emissions - Electrified yard tractor - Build	-	metric tons	100,065	-	-	-	-	-	-	-	-	-	8,339	8,339	8,339	8,339	8,339	8,339	8,339	8,339	8,339	8,339
Damage costs for emissions - CO2 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	-	-	-	-	-	-	-	52	53	54	55	56	57	58	60	61	62	63	64	65
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build		US$	6,120,662		-	-	-	-	-	-	-	-	-	458,633	466,971	475,310	483,649	500,327	508,665	517,004	525,343	533,682	542,020
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build	-	US$	6,120,662	-	-	-	-	-	-	-	-	-	-	458,633	466,971	475,310	483,649	500,327	508,665	517,004	525,343	533,682	542,020
Discount rate multiplier - 3 percent	-	factor	-	-	0.8626	0.8885	0.9151	0.9426	0.9709	1.0000	1.0300	1.0609	1.0927	1.1255	1.1593	1.1941	1.2299	1.2668	1.3048	1.3439	1.3842	1.4258	1.4685
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV		US$	4,616,512		-	-	-	-	-	-	-	-	-	407,489	402,814	398,065	393,251	394,962	389,850	384,700	379,519	374,314	369,090
NOx Emissions																						
Annual NOx emission reduction per unit - Yard tractors - Build	3	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Reduction in NOx emissions - Electrified yard tractor - Build		metric tons	35		-	-	-	-	-	-	-	-	3	3	3	3	3	3	3	3	3	3
Reduction in NOx emissions - Electrified yard tractor - Build	-	metric tons	35	-	-	-	-	-	-	-	-	-	3	3	3	3	3	3	3	3	3	3
Damage costs for emissions - NOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	-	-	-	-	-	-	-	15,600	15,800	16,000	16,200	16,500	16,800	17,100	17,400	17,700	18,100	18,100	18,100	18,100
Reduction in NOx emission costs - Electrified yard tractor - Build		US$	607,478		-	-	-	-	-	-	-	-	-	46,796	47,662	48,529	49,396	50,262	51,129	52,284	52,284	52,284	52,284
Reduction in NOx emission costs - Electrified yard tractor - Build	-	US$	607,478	-	-	-	-	-	-	-	-	-	-	46,796	47,662	48,529	49,396	50,262	51,129	52,284	52,284	52,284	52,284
Discount rate multiplier - 7 percent	-	factor	-	-	0.7130	0.7629	0.8163	0.8734	0.9346	1.0000	1.0700	1.1449	1.2250	1.3108	1.4026	1.5007	1.6058	1.7182	1.8385	1.9672	2.1049	2.2522	2.4098
Reduction in NOx emission costs - Electrified yard tractor - Build - PV		US$	325,401		-	-	-	-	-	-	-	-	-	35,700	33,983	32,337	30,761	29,253	27,811	26,579	24,840	23,215	21,696
PM2.5 Emissions																						
Annual PM2.5 emission reduction per unit - Yard tractors - Build	0.1076	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Reduction in PM2.5 emissions - Electrified yard tractor - Build		metric tons	1.2906		-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Reduction in PM2.5 emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Damage costs for emissions - PM2.5 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	-	-	-	-	-	-	-	748,600	761,600	774,700	788,100	801,700	814,500	827,400	840,600	854,000	867,600	867,600	867,600	867,600
Reduction in PM2.5 emission costs - Electrified yard tractor - Build		US$	1,089,689		-	-	-	-	-	-	-	-	-	84,760	86,223	87,600	88,987	90,407	91,848	93,311	93,311	93,311	93,311
Reduction in PM2.5 emission costs - Electrified yard tractor - Build	-	US$	1,089,689	-	-	-	-	-	-	-	-	-	-	84,760	86,223	87,600	88,987	90,407	91,848	93,311	93,311	93,311	93,311
Discount rate multiplier - 7 percent	-	factor	-	-	0.7130	0.7629	0.8163	0.8734	0.9346	1.0000	1.0700	1.1449	1.2250	1.3108	1.4026	1.5007	1.6058	1.7182	1.8385	1.9672	2.1049	2.2522	2.4098
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV		US$	584,429		-	-	-	-	-	-	-	-	-	64,663	61,476	58,371	55,417	52,618	49,959	47,434	44,331	41,431	38,721
SOx Emissions																						
Annual SO2 emission reduction per unit - Yard tractors - Build	0.0959	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1	1
Reduction in SOx emissions - Electrified yard tractor - Build		metric tons	1.1509		-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Reduction in SOx emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Damage costs for emissions - SOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	-	-	-	-	-	-	-	41,500	42,300	43,100	44,000	44,900	45,700	46,500	47,300	48,200	49,100	49,100	49,100	49,100
Reduction in SOx emission costs - Electrified yard tractor - Build		US$	54,784		-	-	-	-	-	-	-	-	-	4,220	4,306	4,383	4,460	4,537	4,623	4,709	4,709	4,709	4,709
Reduction in SOx emission costs - Electrified yard tractor - Build	-	US$	54,784	-	-	-	-	-	-	-	-	-	-	4,220	4,306	4,383	4,460	4,537	4,623	4,709	4,709	4,709	4,709
Discount rate multiplier - 7 percent	-	factor	-	-	0.7130	0.7629	0.8163	0.8734	0.9346	1.0000	1.0700	1.1449	1.2250	1.3108	1.4026	1.5007	1.6058	1.7182	1.8385	1.9672	2.1049	2.2522	2.4098
Reduction in SOx emission costs - Electrified yard tractor - Build - PV		US$	29,352		-	-	-	-	-	-	-	-	-	3,219	3,070	2,921	2,777	2,640	2,515	2,394	2,237	2,091	1,954
Total																						
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV	-	US$	4,616,512	-	-	-	-	-	-	-	-	-	-	407,489	402,814	398,065	393,251	394,962	389,850	384,700	379,519	374,314	369,090
Reduction in NOx emission costs - Electrified yard tractor - Build - PV	-	US$	325,401	-	-	-	-	-	-	-	-	-	-	35,700	33,983	32,337	30,761	29,253	27,811	26,579	24,840	23,215	21,696
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV	-	US$	584,429	-	-	-	-	-	-	-	-	-	-	64,663	61,476	58,371	55,417	52,618	49,959	47,434	44,331	41,431	38,721
Reduction in SOx emission costs - Electrified yard tractor - Build - PV	-	US$	29,352	-	-	-	-	-	-	-	-	-	-	3,219	3,070	2,921	2,777	2,640	2,515	2,394	2,237	2,091	1,954
Environmental benefits - Electrified yard tractor - Build - PV		US$	5,555,693		-	-	-	-	-	-	-	-	-	511,072	501,343	491,694	482,206	479,473	470,134	461,107	450,927	441,050	431,460

Sustainability Elements

Model Period Ending				31 Dec 34	31 Dec 35	31 Dec 36	31 Dec 37	31 Dec 38	31 Dec 39	31 Dec 40	31 Dec 41	31 Dec 42	31 Dec 43	31 Dec 44	31 Dec 45	31 Dec 46	31 Dec 47	31 Dec 48	31 Dec 49	31 Dec 50	31 Dec 51	31 Dec 52
Pre-forecast vs Forecast				Forecast	Forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052
Model Column counter	Constant	Unit	Total	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
RUNNING HOURS																						
IY working hours per day	16	hours																				
Number of days per year	365	days / year																				
IY tractor utilization	65.00%	percent	3,796																			
Number of IY tractors	60	units																				
Operating period flag	-	flag	12	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IY tractor working hours		hours	2,733,120	227,760	227,760	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECONOMIC COMPETITIVENESS BENEFITS - ELECTRIFIED YARD TRACTORS																						
Energy Costs																						
Diesel Consumption																						
Diesel unit cost	1.4200	US$ / liter																				
Conventional yard tractor fuel consumption per hour	9	liter / hour																				
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Electricity Consumptio																						
Electrical yard tractor energy consumption per hour	34.0	kWh																				
Electricity unit cost	0.1393	US$ / kWh																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Savings																						
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7.33	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7	US$ / hour																				
IY tractor working hours	-	hours	2,733,120	227,760	227,760	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build		US$	20,044,155	1,670,346	1,670,346	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build	-	US$	20,044,155	1,670,346	1,670,346	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	2.5785	2.7590	2.9522	3.1588	3.3799	3.6165	3.8697	4.1406	4.4304	4.7405	5.0724	5.4274	5.8074	6.2139	6.6488	7.1143	7.6123	8.1451	8.7153
Operating period flag	-	flag	12	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in energy consumption costs with yard tractor electrification - Build - PV		US$	10,829,854	647,789	605,410	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONMENTAL BENEFITS - ELECTRIFIED YARD TRACTORS																						
CO2 Emissions																						
Annual CO2 emission reduction per unit - Yard tractors - Build	8,339	metric tons																				
Operating period flag	-	flag	12	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build		metric tons	100,065	8,339	8,339	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build	-	metric tons	100,065	8,339	8,339	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - CO2 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	66	67	68	69	70	71	72	73	75	77	78	79	80	81	82	83	85	85	85
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build	-	US$	6,120,662	550,359	558,698	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build	-	US$	6,120,662	550,359	558,698	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 3 percent	-	factor	-	1.5126	1.5580	1.6047	1.6528	1.7024	1.7535	1.8061	1.8603	1.9161	1.9736	2.0328	2.0938	2.1566	2.2213	2.2879	2.3566	2.4273	2.5001	2.5751
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV		US$	4,616,512	363,852	358,607	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOx Emissions																						
Annual NOx emission reduction per unit - Yard tractors - Build	3	metric tons																				
Operating period flag	-	flag	12	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build		metric tons	35	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build	-	metric tons	35	3	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - NOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Reduction in NOx emission costs - Electrified yard tractor - Build		US$	607,478	52,284	52,284	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build	-	US$	607,478	52,284	52,284	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	2.5785	2.7590	2.9522	3.1588	3.3799	3.6165	3.8697	4.1406	4.4304	4.7405	5.0724	5.4274	5.8074	6.2139	6.6488	7.1143	7.6123	8.1451	8.7153
Reduction in NOx emission costs - Electrified yard tractor - Build - PV		US$	325,401	20,277	18,950	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM2.5 Emissions																						
Annual PM2.5 emission reduction per unit - Yard tractors - Build	0.1076	metric tons																				
Operating period flag	-	flag	12	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build		metric tons	1.2906	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build	-	metric tons	1	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - PM2.5 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Reduction in PM2.5 emission costs - Electrified yard tractor - Build		US$	1,089,689	93,311	93,311	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build	-	US$	1,089,689	93,311	93,311	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	2.5785	2.7590	2.9522	3.1588	3.3799	3.6165	3.8697	4.1406	4.4304	4.7405	5.0724	5.4274	5.8074	6.2139	6.6488	7.1143	7.6123	8.1451	8.7153
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV		US$	584,429	36,187	33,820	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOx Emissions																						
Annual SO2 emission reduction per unit - Yard tractors - Build	0.0959	metric tons																				
Operating period flag	-	flag	12	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build		metric tons	1.1509	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build	-	metric tons	1	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - SOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100
Reduction in SOx emission costs - Electrified yard tractor - Build		US$	54,784	4,709	4,709	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build	-	US$	54,784	4,709	4,709	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	2.5785	2.7590	2.9522	3.1588	3.3799	3.6165	3.8697	4.1406	4.4304	4.7405	5.0724	5.4274	5.8074	6.2139	6.6488	7.1143	7.6123	8.1451	8.7153
Reduction in SOx emission costs - Electrified yard tractor - Build - PV		US$	29,352	1,826	1,707	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																						
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV	-	US$	4,616,512	363,852	358,607	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build - PV	-	US$	325,401	20,277	18,950	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV	-	US$	584,429	36,187	33,820	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build - PV	-	US$	29,352	1,826	1,707	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV		US$	5,555,693	422,143	413,084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sustainability Elements

Model Period Ending				31 Dec 53	31 Dec 54	31 Dec 55	31 Dec 56	31 Dec 57	31 Dec 58	31 Dec 59	31 Dec 60	31 Dec 61	31 Dec 62	31 Dec 63	31 Dec 64	31 Dec 65	31 Dec 66	31 Dec 67	31 Dec 68	31 Dec 69	31 Dec 70	31 Dec 71
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071
Model Column counter	**Constant**	**Unit**	**Total**	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57
RUNNING HOURS																						
IY working hours per day	16	hours																				
Number of days per year	365	days / year																				
IY tractor utilization	65.00%	percent	3,796																			
Number of IY tractors	60	units																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IY tractor working hours		hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECONOMIC COMPETITIVENESS BENEFITS - ELECTRIFIED YARD TRACTORS																						
Energy Costs																						
Diesel Consumption																						
Diesel unit cost	1.4200	US$ / liter																				
Conventional yard tractor fuel consumption per hour	9	liter / hour																				
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Electricity Consumptio																						
Electrical yard tractor energy consumption per hour	34.0	kWh																				
Electricity unit cost	0.1393	US$ / kWh																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Savings																						
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7.33	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7	US$ / hour																				
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build		US$	20,044,155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build	-	US$	20,044,155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	9.3253	9.9781	10.6766	11.4239	12.2236	13.0793	13.9948	14.9745	16.0227	17.1443	18.3444	19.6285	21.0025	22.4726	24.0457	25.7289	27.5299	29.4570	31.5190
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in energy consumption costs with yard tractor electrification - Build - PV		US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONMENTAL BENEFITS - ELECTRIFIED YARD TRACTORS																						
CO2 Emissions																						
Annual CO2 emission reduction per unit - Yard tractors - Build	8,339	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build		metric tons	100,065	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build	-	metric tons	100,065	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - CO2 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build		US$	6,120,662	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build	-	US$	6,120,662	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 3 percent	-	factor	-	2.6523	2.7319	2.8139	2.8983	2.9852	3.0748	3.1670	3.2620	3.3599	3.4607	3.5645	3.6715	3.7816	3.8950	4.0119	4.1323	4.2562	4.3839	4.5154
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV		US$	4,616,512	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOx Emissions																						
Annual NOx emission reduction per unit - Yard tractors - Build	3	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build		metric tons	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build	-	metric tons	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - NOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Reduction in NOx emission costs - Electrified yard tractor - Build		US$	607,478	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build	-	US$	607,478	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	9.3253	9.9781	10.6766	11.4239	12.2236	13.0793	13.9948	14.9745	16.0227	17.1443	18.3444	19.6285	21.0025	22.4726	24.0457	25.7289	27.5299	29.4570	31.5190
Reduction in NOx emission costs - Electrified yard tractor - Build - PV		US$	325,401	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM2.5 Emissions																						
Annual PM2.5 emission reduction per unit - Yard tractors - Build	0.1076	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build		metric tons	1.2906	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - PM2.5 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Reduction in PM2.5 emission costs - Electrified yard tractor - Build		US$	1,089,689	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build	-	US$	1,089,689	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	9.3253	9.9781	10.6766	11.4239	12.2236	13.0793	13.9948	14.9745	16.0227	17.1443	18.3444	19.6285	21.0025	22.4726	24.0457	25.7289	27.5299	29.4570	31.5190
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV		US$	584,429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOx Emissions																						
Annual SO2 emission reduction per unit - Yard tractors - Build	0.0959	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build		metric tons	1.1509	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - SOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100
Reduction in SOx emission costs - Electrified yard tractor - Build		US$	54,784	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build	-	US$	54,784	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	9.3253	9.9781	10.6766	11.4239	12.2236	13.0793	13.9948	14.9745	16.0227	17.1443	18.3444	19.6285	21.0025	22.4726	24.0457	25.7289	27.5299	29.4570	31.5190
Reduction in SOx emission costs - Electrified yard tractor - Build - PV		US$	29,352	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																						
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV	-	US$	4,616,512	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build - PV	-	US$	325,401	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV	-	US$	584,429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build - PV	-	US$	29,352	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV		US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sustainability Elements

Model Period Ending				31 Dec 72	31 Dec 73	31 Dec 74	31 Dec 75	31 Dec 76	31 Dec 77	31 Dec 78	31 Dec 79	31 Dec 80	31 Dec 81	31 Dec 82	31 Dec 83	31 Dec 84	31 Dec 85	31 Dec 86	31 Dec 87	31 Dec 88	31 Dec 89	31 Dec 90
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090
Model Column counter	**Constant**	**Unit**	**Total**	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76
RUNNING HOURS																						
IY working hours per day	16	hours																				
Number of days per year	365	days / year																				
IY tractor utilization	65.00%	percent	3,796																			
Number of IY tractors	60	units																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IY tractor working hours		hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECONOMIC COMPETITIVENESS BENEFITS - ELECTRIFIED YARD TRACTORS																						
Energy Costs																						
Diesel Consumption																						
Diesel unit cost	1.4200	US$ / liter																				
Conventional yard tractor fuel consumption per hour	9	liter / hour																				
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Electricity Consumptio																						
Electrical yard tractor energy consumption per hour	34.0	kWh																				
Electricity unit cost	0.1393	US$ / kWh																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Savings																						
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7.33	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7	US$ / hour																				
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build		US$	20,044,155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build	-	US$	20,044,155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	33.7253	36.0861	38.6122	41.3150	44.2071	47.3015	50.6127	54.1555	57.9464	62.0027	66.3429	70.9869	75.9559	81.2729	86.9620	93.0493	99.5627	106.5321	113.9894
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in energy consumption costs with yard tractor electrification - Build - PV		US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONMENTAL BENEFITS - ELECTRIFIED YARD TRACTORS																						
CO2 Emissions																						
Annual CO2 emission reduction per unit - Yard tractors - Build	8,339	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build		metric tons	100,065	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build	-	metric tons	100,065	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - CO2 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build		US$	6,120,662	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build	-	US$	6,120,662	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 3 percent	-	factor	-	4.6509	4.7904	4.9341	5.0821	5.2346	5.3917	5.5534	5.7200	5.8916	6.0684	6.2504	6.4379	6.6311	6.8300	7.0349	7.2459	7.4633	7.6872	7.9178
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV		US$	4,616,512	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOx Emissions																						
Annual NOx emission reduction per unit - Yard tractors - Build	3	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build		metric tons	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build	-	metric tons	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - NOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Reduction in NOx emission costs - Electrified yard tractor - Build		US$	607,478	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build	-	US$	607,478	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	33.7253	36.0861	38.6122	41.3150	44.2071	47.3015	50.6127	54.1555	57.9464	62.0027	66.3429	70.9869	75.9559	81.2729	86.9620	93.0493	99.5627	106.5321	113.9894
Reduction in NOx emission costs - Electrified yard tractor - Build - PV		US$	325,401	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM2.5 Emissions																						
Annual PM2.5 emission reduction per unit - Yard tractors - Build	0.1076	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build		metric tons	1.2906	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - PM2.5 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Reduction in PM2.5 emission costs - Electrified yard tractor - Build		US$	1,089,689	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build	-	US$	1,089,689	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	33.7253	36.0861	38.6122	41.3150	44.2071	47.3015	50.6127	54.1555	57.9464	62.0027	66.3429	70.9869	75.9559	81.2729	86.9620	93.0493	99.5627	106.5321	113.9894
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV		US$	584,429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOx Emissions																						
Annual SO2 emission reduction per unit - Yard tractors - Build	0.0959	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build		metric tons	1.1509	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - SOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100
Reduction in SOx emission costs - Electrified yard tractor - Build		US$	54,784	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build	-	US$	54,784	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	33.7253	36.0861	38.6122	41.3150	44.2071	47.3015	50.6127	54.1555	57.9464	62.0027	66.3429	70.9869	75.9559	81.2729	86.9620	93.0493	99.5627	106.5321	113.9894
Reduction in SOx emission costs - Electrified yard tractor - Build - PV		US$	29,352	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																						
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV	-	US$	4,616,512	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build - PV	-	US$	325,401	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV	-	US$	584,429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build - PV	-	US$	29,352	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV		US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sustainability Elements

Model Period Ending				31 Dec 91	31 Dec 92	31 Dec 93	31 Dec 94	31 Dec 95	31 Dec 96	31 Dec 97	31 Dec 98	31 Dec 99	31 Dec 00	31 Dec 01	31 Dec 02	31 Dec 03	31 Dec 04	31 Dec 05	31 Dec 06	31 Dec 07	31 Dec 08	31 Dec 09
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109
Model Column counter	**Constant**	**Unit**	**Total**	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95
RUNNING HOURS																						
IY working hours per day	16	hours																				
Number of days per year	365	days / year																				
IY tractor utilization	65.00%	percent	3,796																			
Number of IY tractors	60	units																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IY tractor working hours		hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ECONOMIC COMPETITIVENESS BENEFITS - ELECTRIFIED YARD TRACTORS																						
Energy Costs																						
Diesel Consumption																						
Diesel unit cost	1.4200	US$ / liter																				
Conventional yard tractor fuel consumption per hour	9	liter / hour																				
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Electricity Consumptio																						
Electrical yard tractor energy consumption per hour	34.0	kWh																				
Electricity unit cost	0.1393	US$ / kWh																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Savings																						
Hourly fuel costs per diesel yard tractor	12	US$ / hour																				
Hourly electricity costs per electric yard tractor	5	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7.33	US$ / hour																				
Hourly energy savings per yard tractor due to electrification	7	US$ / hour																				
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build		US$	20,044,155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build	-	US$	20,044,155	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	121.9686	130.5065	139.6419	149.4168	159.8760	171.0673	183.0421	195.8550	209.5648	224.2344	239.9308	256.7260	274.6968	293.9255	314.5003	336.5154	360.0714	385.2764	412.2458
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in energy consumption costs with yard tractor electrification - Build - PV		US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ENVIRONMENTAL BENEFITS - ELECTRIFIED YARD TRACTORS																						
CO2 Emissions																						
Annual CO2 emission reduction per unit - Yard tractors - Build	8,339	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build		metric tons	100,065	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build	-	metric tons	100,065	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - CO2 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85	85
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build		US$	6,120,662	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build	-	US$	6,120,662	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 3 percent	-	factor	-	8.1554	8.4000	8.6520	8.9116	9.1789	9.4543	9.7379	10.0301	10.3310	10.6409	10.9601	11.2889	11.6276	11.9764	12.3357	12.7058	13.0870	13.4796	13.8839
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV		US$	4,616,512	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NOx Emissions																						
Annual NOx emission reduction per unit - Yard tractors - Build	3	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build		metric tons	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build	-	metric tons	35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - NOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Reduction in NOx emission costs - Electrified yard tractor - Build		US$	607,478	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build	-	US$	607,478	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	121.9686	130.5065	139.6419	149.4168	159.8760	171.0673	183.0421	195.8550	209.5648	224.2344	239.9308	256.7260	274.6968	293.9255	314.5003	336.5154	360.0714	385.2764	412.2458
Reduction in NOx emission costs - Electrified yard tractor - Build - PV		US$	325,401	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PM2.5 Emissions																						
Annual PM2.5 emission reduction per unit - Yard tractors - Build	0.1076	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build		metric tons	1.2906	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - PM2.5 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Reduction in PM2.5 emission costs - Electrified yard tractor - Build		US$	1,089,689	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build	-	US$	1,089,689	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	121.9686	130.5065	139.6419	149.4168	159.8760	171.0673	183.0421	195.8550	209.5648	224.2344	239.9308	256.7260	274.6968	293.9255	314.5003	336.5154	360.0714	385.2764	412.2458
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV		US$	584,429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SOx Emissions																						
Annual SO2 emission reduction per unit - Yard tractors - Build	0.0959	metric tons																				
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build		metric tons	1.1509	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - SOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100
Reduction in SOx emission costs - Electrified yard tractor - Build		US$	54,784	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build	-	US$	54,784	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	121.9686	130.5065	139.6419	149.4168	159.8760	171.0673	183.0421	195.8550	209.5648	224.2344	239.9308	256.7260	274.6968	293.9255	314.5003	336.5154	360.0714	385.2764	412.2458
Reduction in SOx emission costs - Electrified yard tractor - Build - PV		US$	29,352	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total																						
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV	-	US$	4,616,512	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build - PV	-	US$	325,401	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV	-	US$	584,429	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build - PV	-	US$	29,352	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV		US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Sustainability Elements

				31 Dec 10	31 Dec 11	31 Dec 12	31 Dec 13	31 Dec 14	31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20
Model Period Ending														
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Model Column counter	**Constant**	**Unit**	**Total**	96	97	98	99	100	101	102	103	104	105	106
RUNNING HOURS														
IY working hours per day	16	hours												
Number of days per year	365	days / year												
IY tractor utilization	65.00%	percent	3,796											
Number of IY tractors	60	units												
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-
IY tractor working hours		hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-
ECONOMIC COMPETITIVENESS BENEFITS - ELECTRIFIED YARD TRACTORS														
Energy Costs														
Diesel Consumption														
Diesel unit cost	1.4200	US$ / liter												
Conventional yard tractor fuel consumption per hour	9	liter / hour												
Hourly fuel costs per diesel yard tractor	12	US$ / hour												
Electricity Consumptio														
Electrical yard tractor energy consumption per hour	34.0	kWh												
Electricity unit cost	0.1393	US$ / kWh												
Hourly electricity costs per electric yard tractor	5	US$ / hour												
Savings														
Hourly fuel costs per diesel yard tractor	12	US$ / hour												
Hourly electricity costs per electric yard tractor	5	US$ / hour												
Hourly energy savings per yard tractor due to electrification	7.33	US$ / hour												
Hourly energy savings per yard tractor due to electrification	7	US$ / hour												
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build		US$	20,044,155	-	-	-	-	-	-	-	-	-	-	-
Energy savings per yard tractor due to electrification - Build	-	US$	20,044,155	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	441.1030	471.9802	505.0188	540.3701	578.1960	618.6697	661.9766	708.3150	757.8970	810.9498	867.7163
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-
Reduction in energy consumption costs with yard tractor electrification - Build - PV		US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-
ENVIRONMENTAL BENEFITS - ELECTRIFIED YARD TRACTORS														
CO2 Emissions														
Annual CO2 emission reduction per unit - Yard tractors - Build	8,339	metric tons												
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build		metric tons	100,065	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emissions - Electrified yard tractor - Build	-	metric tons	100,065	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - CO2 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	85	85	85	85	85	85	85	85	85	85	85
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build		US$	6,120,662	-	-	-	-	-	-	-	-	-	-	-
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build	-	US$	6,120,662	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 3 percent	-	factor	-	14.3005	14.7295	15.1714	15.6265	16.0953	16.5782	17.0755	17.5878	18.1154	18.6589	19.2186
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV		US$	4,616,512	-	-	-	-	-	-	-	-	-	-	-
NOx Emissions														
Annual NOx emission reduction per unit - Yard tractors - Build	3	metric tons												
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build		metric tons	35	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emissions - Electrified yard tractor - Build	-	metric tons	35	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - NOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100	18,100
Reduction in NOx emission costs - Electrified yard tractor - Build		US$	607,478	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build	-	US$	607,478	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	441.1030	471.9802	505.0188	540.3701	578.1960	618.6697	661.9766	708.3150	757.8970	810.9498	867.7163
Reduction in NOx emission costs - Electrified yard tractor - Build - PV		US$	325,401	-	-	-	-	-	-	-	-	-	-	-
PM2.5 Emissions														
Annual PM2.5 emission reduction per unit - Yard tractors - Build	0.1076	metric tons												
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build		metric tons	1.2906	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - PM2.5 - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600	867,600
Reduction in PM2.5 emission costs - Electrified yard tractor - Build		US$	1,089,689	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build	-	US$	1,089,689	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	441.1030	471.9802	505.0188	540.3701	578.1960	618.6697	661.9766	708.3150	757.8970	810.9498	867.7163
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV		US$	584,429	-	-	-	-	-	-	-	-	-	-	-
SOx Emissions														
Annual SO2 emission reduction per unit - Yard tractors - Build	0.0959	metric tons												
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build		metric tons	1.1509	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emissions - Electrified yard tractor - Build	-	metric tons	1	-	-	-	-	-	-	-	-	-	-	-
Damage costs for emissions - SOx - 2020 US$	-	US$ / metric ton	Benefit Cost Analysis Guidance 2022 (Revised).pdf (transportation.gov)	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100	49,100
Reduction in SOx emission costs - Electrified yard tractor - Build		US$	54,784	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build	-	US$	54,784	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	441.1030	471.9802	505.0188	540.3701	578.1960	618.6697	661.9766	708.3150	757.8970	810.9498	867.7163
Reduction in SOx emission costs - Electrified yard tractor - Build - PV		US$	29,352	-	-	-	-	-	-	-	-	-	-	-
Total														
Reduction in carbon dioxide emission costs - Electrified yard tractor - Build - PV	-	US$	4,616,512	-	-	-	-	-	-	-	-	-	-	-
Reduction in NOx emission costs - Electrified yard tractor - Build - PV	-	US$	325,401	-	-	-	-	-	-	-	-	-	-	-
Reduction in PM2.5 emission costs - Electrified yard tractor - Build - PV	-	US$	584,429	-	-	-	-	-	-	-	-	-	-	-
Reduction in SOx emission costs - Electrified yard tractor - Build - PV	-	US$	29,352	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV		US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-

Project Costs

Model Period Ending				31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20	31 Dec 21	31 Dec 22	31 Dec 23	31 Dec 24	31 Dec 25	31 Dec 26	31 Dec 27	31 Dec 28	31 Dec 29	31 Dec 30	31 Dec 31	31 Dec 32
Pre-forecast vs Forecast				Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast
Financial Year Ending				2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Model Column counter	**Constant**	**Unit**	**Total**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
PROJECT COSTS																					
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	24,112,450	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	-	0.7130	0.7629	0.8163	0.8734	0.9346	1.0000	1.0700	1.1449	1.2250	1.3108	1.4026	1.5007	1.6058	1.7182	1.8385	1.9672	2.1049	2.2522
Electric vs diesel yard tractor costs - 60 units - CPV		US$	#########		-	-	-	-	-	-	-	19,682,942	-	-	-	-	-	-	-	-	-
MAINTENANCE & OPERATING COSTS																					
Conventional yard tractor maintenance cost per hour	9.00	US$ / hour																			
Electrical yard tractor maintenance cost per hour	6.30	US$ / hour																			
Maintenance cost savings per hour	2.70	US$ / hour																			
Maintenance cost savings per hour	2.70	US$ / hour																			
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	227,760	227,760	227,760	227,760	227,760	227,760	227,760	227,760	227,760
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	1	1	1	1	1	1	1	1	1
Maintenance cost savings - Build		US$	7,379,424		-	-	-	-	-	-	-	-	614,952	614,952	614,952	614,952	614,952	614,952	614,952	614,952	614,952
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	614,952	614,952	614,952	614,952	614,952	614,952	614,952	614,952	614,952
Maintenance cost savings - Build - Annual average	614,952	US$																			
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	614,952	614,952	614,952	614,952	614,952	614,952	614,952	614,952	614,952
Discount rate multiplier - 7 percent	-	factor	-	-	0.7130	0.7629	0.8163	0.8734	0.9346	1.0000	1.0700	1.1449	1.2250	1.3108	1.4026	1.5007	1.6058	1.7182	1.8385	1.9672	2.1049	2.2522
Maintenance cost savings - Build - PV		US$	3,987,102		-	-	-	-	-	-	-	-	-	469,144	438,452	409,768	382,961	357,908	334,493	312,610	292,159	273,046
RESIDUAL VALUE																					
O&M																					
Maintenance cost savings - Build - Annual average	614,952	US$																			
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements		US$	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	-	0.7130	0.7629	0.8163	0.8734	0.9346	1.0000	1.0700	1.1449	1.2250	1.3108	1.4026	1.5007	1.6058	1.7182	1.8385	1.9672	2.1049	2.2522
Post analysis period maintenance and operating costs - Sustainability elements - PV		US$	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual Value																					
Length of BCA period (operating)	12	years																			
Project design life	12	years																			
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	24,112,450	-	-	-	-	-	-	-	-	-
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements		US$	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	-	0.7130	0.7629	0.8163	0.8734	0.9346	1.0000	1.0700	1.1449	1.2250	1.3108	1.4026	1.5007	1.6058	1.7182	1.8385	1.9672	2.1049	2.2522
Residual value - Sustainability elements - PV		US$	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV		US$	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

:t Costs

Model Period Ending				31 Dec 33	31 Dec 34	31 Dec 35	31 Dec 36	31 Dec 37	31 Dec 38	31 Dec 39	31 Dec 40	31 Dec 41	31 Dec 42	31 Dec 43	31 Dec 44	31 Dec 45	31 Dec 46	31 Dec 47	31 Dec 48	31 Dec 49	31 Dec 50	31 Dec 51
Pre-forecast vs Forecast				Forecast	Forecast	Forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051
Model Column counter	**Constant**	**Unit**	**Total**	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
COSTS																						
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	2.4098	2.5785	2.7590	2.9522	3.1588	3.3799	3.6165	3.8697	4.1406	4.4304	4.7405	5.0724	5.4274	5.8074	6.2139	6.6488	7.1143	7.6123	8.1451
Electric vs diesel yard tractor costs - 60 units - CPV		US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCE & OPERATING COSTS																						
Conventional yard tractor maintenance cost per hour	9.00	US$ / hour																				
Electrical yard tractor maintenance cost per hour	6.30	US$ / hour																				
Maintenance cost savings per hour	2.70	US$ / hour																				
Maintenance cost savings per hour	2.70	US$ / hour																				
IY tractor working hours	-	hours	2,733,120	227,760	227,760	227,760	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build		US$	7,379,424	614,952	614,952	614,952	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build	-	US$	7,379,424	614,952	614,952	614,952	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build - Annual average	614,952	US$																				
Maintenance cost savings - Build	-	US$	7,379,424	614,952	614,952	614,952	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	2.4098	2.5785	2.7590	2.9522	3.1588	3.3799	3.6165	3.8697	4.1406	4.4304	4.7405	5.0724	5.4274	5.8074	6.2139	6.6488	7.1143	7.6123	8.1451
Maintenance cost savings - Build - PV		US$	3,987,102	255,183	238,489	222,887	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VALUE																						
Maintenance cost savings - Build - Annual average	614,952	US$																				
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	2.4098	2.5785	2.7590	2.9522	3.1588	3.3799	3.6165	3.8697	4.1406	4.4304	4.7405	5.0724	5.4274	5.8074	6.2139	6.6488	7.1143	7.6123	8.1451
Post analysis period maintenance and operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ıl Value																						
Length of BCA period (operating)	12	years																				
Project design life	12	years																				
Remaining service life at end of analysis period - Sustainability elements	-	years																				
Project design life	12	years																				
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	2.4098	2.5785	2.7590	2.9522	3.1588	3.3799	3.6165	3.8697	4.1406	4.4304	4.7405	5.0724	5.4274	5.8074	6.2139	6.6488	7.1143	7.6123	8.1451
Residual value - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

:t Costs

Model Period Ending				31 Dec 52	31 Dec 53	31 Dec 54	31 Dec 55	31 Dec 56	31 Dec 57	31 Dec 58	31 Dec 59	31 Dec 60	31 Dec 61	31 Dec 62	31 Dec 63	31 Dec 64	31 Dec 65	31 Dec 66	31 Dec 67	31 Dec 68	31 Dec 69	31 Dec 70
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070
Model Column counter	**Constant**	**Unit**	**Total**	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
COSTS																						
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	8.7153	9.3253	9.9781	10.6766	11.4239	12.2236	13.0793	13.9948	14.9745	16.0227	17.1443	18.3444	19.6285	21.0025	22.4726	24.0457	25.7289	27.5299	29.4570
Electric vs diesel yard tractor costs - 60 units - CPV		US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCE & OPERATING COSTS																						
Conventional yard tractor maintenance cost per hour	9.00	US$ / hour																				
Electrical yard tractor maintenance cost per hour	6.30	US$ / hour																				
Maintenance cost savings per hour	2.70	US$ / hour																				
Maintenance cost savings per hour	2.70	US$ / hour																				
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build		US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build - Annual average	614,952	US$																				
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	8.7153	9.3253	9.9781	10.6766	11.4239	12.2236	13.0793	13.9948	14.9745	16.0227	17.1443	18.3444	19.6285	21.0025	22.4726	24.0457	25.7289	27.5299	29.4570
Maintenance cost savings - Build - PV		US$	3,987,102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VALUE																						
Maintenance cost savings - Build - Annual average	614,952	US$																				
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	8.7153	9.3253	9.9781	10.6766	11.4239	12.2236	13.0793	13.9948	14.9745	16.0227	17.1443	18.3444	19.6285	21.0025	22.4726	24.0457	25.7289	27.5299	29.4570
Post analysis period maintenance and operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ıl Value																						
Length of BCA period (operating)	12	years																				
Project design life	12	years																				
Remaining service life at end of analysis period - Sustainability elements	-	years																				
Project design life	12	years																				
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	8.7153	9.3253	9.9781	10.6766	11.4239	12.2236	13.0793	13.9948	14.9745	16.0227	17.1443	18.3444	19.6285	21.0025	22.4726	24.0457	25.7289	27.5299	29.4570
Residual value - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

:t Costs

Model Period Ending				31 Dec 71	31 Dec 72	31 Dec 73	31 Dec 74	31 Dec 75	31 Dec 76	31 Dec 77	31 Dec 78	31 Dec 79	31 Dec 80	31 Dec 81	31 Dec 82	31 Dec 83	31 Dec 84	31 Dec 85	31 Dec 86	31 Dec 87	31 Dec 88	31 Dec 89
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089
Model Column counter	**Constant**	**Unit**	**Total**	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
COSTS																						
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	31.5190	33.7253	36.0861	38.6122	41.3150	44.2071	47.3015	50.6127	54.1555	57.9464	62.0027	66.3429	70.9869	75.9559	81.2729	86.9620	93.0493	99.5627	106.5321
Electric vs diesel yard tractor costs - 60 units - CPV		US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCE & OPERATING COSTS																						
Conventional yard tractor maintenance cost per hour	9.00	US$ / hour																				
Electrical yard tractor maintenance cost per hour	6.30	US$ / hour																				
Maintenance cost savings per hour	2.70	US$ / hour																				
Maintenance cost savings per hour	2.70	US$ / hour																				
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build		US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build - Annual average	614,952	US$																				
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	31.5190	33.7253	36.0861	38.6122	41.3150	44.2071	47.3015	50.6127	54.1555	57.9464	62.0027	66.3429	70.9869	75.9559	81.2729	86.9620	93.0493	99.5627	106.5321
Maintenance cost savings - Build - PV		US$	3,987,102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VALUE																						
Maintenance cost savings - Build - Annual average	614,952	US$																				
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	31.5190	33.7253	36.0861	38.6122	41.3150	44.2071	47.3015	50.6127	54.1555	57.9464	62.0027	66.3429	70.9869	75.9559	81.2729	86.9620	93.0493	99.5627	106.5321
Post analysis period maintenance and operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ıl Value																						
Length of BCA period (operating)	12	years																				
Project design life	12	years																				
Remaining service life at end of analysis period - Sustainability elements	-	years																				
Project design life	12	years																				
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	31.5190	33.7253	36.0861	38.6122	41.3150	44.2071	47.3015	50.6127	54.1555	57.9464	62.0027	66.3429	70.9869	75.9559	81.2729	86.9620	93.0493	99.5627	106.5321
Residual value - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

:t Costs

Model Period Ending				31 Dec 90	31 Dec 91	31 Dec 92	31 Dec 93	31 Dec 94	31 Dec 95	31 Dec 96	31 Dec 97	31 Dec 98	31 Dec 99	31 Dec 00	31 Dec 01	31 Dec 02	31 Dec 03	31 Dec 04	31 Dec 05	31 Dec 06	31 Dec 07	31 Dec 08
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108
Model Column counter	**Constant**	**Unit**	**Total**	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
COSTS																						
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	113.9894	121.9686	130.5065	139.6419	149.4168	159.8760	171.0673	183.0421	195.8550	209.5648	224.2344	239.9308	256.7260	274.6968	293.9255	314.5003	336.5154	360.0714	385.2764
Electric vs diesel yard tractor costs - 60 units - CPV		US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NCE & OPERATING COSTS																						
Conventional yard tractor maintenance cost per hour	9.00	US$ / hour																				
Electrical yard tractor maintenance cost per hour	6.30	US$ / hour																				
Maintenance cost savings per hour	2.70	US$ / hour																				
Maintenance cost savings per hour	2.70	US$ / hour																				
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build		US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build - Annual average	614,952	US$																				
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	113.9894	121.9686	130.5065	139.6419	149.4168	159.8760	171.0673	183.0421	195.8550	209.5648	224.2344	239.9308	256.7260	274.6968	293.9255	314.5003	336.5154	360.0714	385.2764
Maintenance cost savings - Build - PV		US$	3,987,102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VALUE																						
Maintenance cost savings - Build - Annual average	614,952	US$																				
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	113.9894	121.9686	130.5065	139.6419	149.4168	159.8760	171.0673	183.0421	195.8550	209.5648	224.2344	239.9308	256.7260	274.6968	293.9255	314.5003	336.5154	360.0714	385.2764
Post analysis period maintenance and operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ıl Value																						
Length of BCA period (operating)	12	years																				
Project design life	12	years																				
Remaining service life at end of analysis period - Sustainability elements	-	years																				
Project design life	12	years																				
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	113.9894	121.9686	130.5065	139.6419	149.4168	159.8760	171.0673	183.0421	195.8550	209.5648	224.2344	239.9308	256.7260	274.6968	293.9255	314.5003	336.5154	360.0714	385.2764
Residual value - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

:t Costs

Model Period Ending				31 Dec 09	31 Dec 10	31 Dec 11	31 Dec 12	31 Dec 13	31 Dec 14	31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Model Column counter	**Constant**	**Unit**	**Total**	95	96	97	98	99	100	101	102	103	104	105	106
COSTS															
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	412.2458	441.1030	471.9802	505.0188	540.3701	578.1960	618.6697	661.9766	708.3150	757.8970	810.9498	867.7163
Electric vs diesel yard tractor costs - 60 units - CPV		US$	#########	-	-	-	-	-	-	-	-	-	-	-	-
NCE & OPERATING COSTS															
Conventional yard tractor maintenance cost per hour	9.00	US$ / hour													
Electrical yard tractor maintenance cost per hour	6.30	US$ / hour													
Maintenance cost savings per hour	2.70	US$ / hour													
Maintenance cost savings per hour	2.70	US$ / hour													
IY tractor working hours	-	hours	2,733,120	-	-	-	-	-	-	-	-	-	-	-	-
Operating period flag	-	flag	12	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build		US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build - Annual average	614,952	US$													
Maintenance cost savings - Build	-	US$	7,379,424	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	412.2458	441.1030	471.9802	505.0188	540.3701	578.1960	618.6697	661.9766	708.3150	757.8970	810.9498	867.7163
Maintenance cost savings - Build - PV		US$	3,987,102	-	-	-	-	-	-	-	-	-	-	-	-
VALUE															
Maintenance cost savings - Build - Annual average	614,952	US$													
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	412.2458	441.1030	471.9802	505.0188	540.3701	578.1960	618.6697	661.9766	708.3150	757.8970	810.9498	867.7163
Post analysis period maintenance and operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-
ıl Value															
Length of BCA period (operating)	12	years													
Project design life	12	years													
Remaining service life at end of analysis period - Sustainability elements	-	years													
Project design life	12	years													
Electric vs diesel yard tractor costs - 60 units - Constant dollars	-	US$	#########	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period remaining service life flag	-	flag	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements		US$	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-
Discount rate multiplier - 7 percent	-	factor	-	412.2458	441.1030	471.9802	505.0188	540.3701	578.1960	618.6697	661.9766	708.3150	757.8970	810.9498	867.7163
Residual value - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-
Post analysis period maintenance and operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-

Benefit-Cost Analysis

Model Period Ending				31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20	31 Dec 21	31 Dec 22	31 Dec 23	31 Dec 24	31 Dec 25	31 Dec 26	31 Dec 27	31 Dec 28	31 Dec 29	31 Dec 30	31 Dec 31	31 Dec 32	31 Dec 33	31 Dec 34	31 Dec 35	31 Dec 36	31 Dec 37
Pre-forecast vs Forecast				Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Pre-forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Forecast	Post-forecast	Post-forecast
Financial Year Ending				2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037
Model Column counter	**Constant**	**Unit**	**Total**	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
PROJECT BENEFITS																										
Reduction in energy consumption costs with yard tractor electrification - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	1,274,299	1,190,934	1,113,022	1,040,208	972,157	908,558	849,119	793,569	741,654	693,134	647,789	605,410	-	-
[Stretch row]																										
Economic competitiveness benefits - Build - PV		US$	10,829,854		-	-	-	-	-	-	-	-	1,274,299	1,190,934	1,113,022	1,040,208	972,157	908,558	849,119	793,569	741,654	693,134	647,789	605,410	-	-
[Stretch row]																										
Safety outcome benefits - Build - PV		US$	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	511,072	501,343	491,694	482,206	479,473	470,134	461,107	450,927	441,050	431,460	422,143	413,084	-	-
[Stretch row]																										
Environmental sustainability benefits - Build - PV		US$	5,555,693		-	-	-	-	-	-	-	-	511,072	501,343	491,694	482,206	479,473	470,134	461,107	450,927	441,050	431,460	422,143	413,084	-	-
Economic competitiveness benefits - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	1,274,299	1,190,934	1,113,022	1,040,208	972,157	908,558	849,119	793,569	741,654	693,134	647,789	605,410	-	-
Safety outcome benefits - Build - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental sustainability benefits - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	511,072	501,343	491,694	482,206	479,473	470,134	461,107	450,927	441,050	431,460	422,143	413,084	-	-
Maintenance cost savings - Build - PV	-	US$	3,987,102	-	-	-	-	-	-	-	-	-	469,144	438,452	409,768	382,961	357,908	334,493	312,610	292,159	273,046	255,183	238,489	222,887	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total project benefits - No-build - PV		US$	20,372,648		-	-	-	-	-	-	-	-	2,254,515	2,130,729	2,014,484	1,905,375	1,809,538	1,713,185	1,622,836	1,536,656	1,455,750	1,379,778	1,308,421	1,241,381	-	-

BENEFIT-COST RATIO

Economic competitiveness benefits - Build - PV	-	US$	10,829,854
Safety outcome benefits - Build - PV	-	US$	-
Environmental sustainability benefits - Build - PV	-	US$	5,555,693
Maintenance cost savings - Build - PV	-	US$	3,987,102
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-
Total benefits		US$	20,372,648
Electric vs diesel yard tractor costs - 60 units - CPV	-	US$	19,682,942
Net present value		US$	689,707
Benefit-cost ratio			1.04

Benefit-Cost Analysis

				31 Dec 38	31 Dec 39	31 Dec 40	31 Dec 41	31 Dec 42	31 Dec 43	31 Dec 44	31 Dec 45	31 Dec 46	31 Dec 47	31 Dec 48	31 Dec 49	31 Dec 50	31 Dec 51	31 Dec 52	31 Dec 53	31 Dec 54	31 Dec 55	31 Dec 56	31 Dec 57	31 Dec 58	31 Dec 59	31 Dec 60
Model Period Ending				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Pre-forecast vs Forecast																										
Financial Year Ending				2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060
Model Column counter	**Constant**	**Unit**	**Total**	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
PROJECT BENEFITS																										
Reduction in energy consumption costs with yard tractor electrification - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																										
Economic competitiveness benefits - Build - PV		US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																										
Safety outcome benefits - Build - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																										
Environmental sustainability benefits - Build - PV		US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Economic competitiveness benefits - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Safety outcome benefits - Build - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental sustainability benefits - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build - PV	-	US$	3,987,102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total project benefits - No-build - PV		US$	20,372,648	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BENEFIT-COST RATIO																										
Economic competitiveness benefits - Build - PV	-	US$	10,829,854																							
Safety outcome benefits - Build - PV	-	US$	-																							
Environmental sustainability benefits - Build - PV	-	US$	5,555,693																							
Maintenance cost savings - Build - PV	-	US$	3,987,102																							
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-																							
Total benefits		US$	20,372,648																							
Electric vs diesel yard tractor costs - 60 units - CPV	-	US$	19,682,942																							
Net present value		US$	689,707																							
Benefit-cost ratio			1.04																							

Benefit-Cost Analysis

Model Period Ending				31 Dec 61	31 Dec 62	31 Dec 63	31 Dec 64	31 Dec 65	31 Dec 66	31 Dec 67	31 Dec 68	31 Dec 69	31 Dec 70	31 Dec 71	31 Dec 72	31 Dec 73	31 Dec 74	31 Dec 75	31 Dec 76	31 Dec 77	31 Dec 78	31 Dec 79	31 Dec 80	31 Dec 81	31 Dec 82	31 Dec 83
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083
Model Column counter	**Constant**	**Unit**	**Total**	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69
PROJECT BENEFITS																										
Reduction in energy consumption costs with yard tractor electrification - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																										
Economic competitiveness benefits - Build - PV		US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																										
Safety outcome benefits - Build - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																										
Environmental sustainability benefits - Build - PV		US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Economic competitiveness benefits - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Safety outcome benefits - Build - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental sustainability benefits - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build - PV	-	US$	3,987,102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total project benefits - No-build - PV		US$	20,372,648	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BENEFIT-COST RATIO																										
Economic competitiveness benefits - Build - PV	-	US$	10,829,854																							
Safety outcome benefits - Build - PV	-	US$	-																							
Environmental sustainability benefits - Build - PV	-	US$	5,555,693																							
Maintenance cost savings - Build - PV	-	US$	3,987,102																							
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-																							
Total benefits		US$	20,372,648																							
Electric vs diesel yard tractor costs - 60 units - CPV	-	US$	19,682,942																							
Net present value		US$	689,707																							
Benefit-cost ratio			1.04																							

Benefit-Cost Analysis

Model Period Ending				31 Dec 84	31 Dec 85	31 Dec 86	31 Dec 87	31 Dec 88	31 Dec 89	31 Dec 90	31 Dec 91	31 Dec 92	31 Dec 93	31 Dec 94	31 Dec 95	31 Dec 96	31 Dec 97	31 Dec 98	31 Dec 99	31 Dec 00	31 Dec 01	31 Dec 02	31 Dec 03	31 Dec 04	31 Dec 05	31 Dec 06
Pre-forecast vs Forecast				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Financial Year Ending				2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106
Model Column counter	**Constant**	**Unit**	**Total**	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92
PROJECT BENEFITS																										
Reduction in energy consumption costs with yard tractor electrification - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																										
Economic competitiveness benefits - Build - PV		US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																										
Safety outcome benefits - Build - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																										
Environmental sustainability benefits - Build - PV		US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Economic competitiveness benefits - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Safety outcome benefits - Build - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental sustainability benefits - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build - PV	-	US$	3,987,102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total project benefits - No-build - PV		US$	20,372,648	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BENEFIT-COST RATIO																										
Economic competitiveness benefits - Build - PV	-	US$	10,829,854																							
Safety outcome benefits - Build - PV	-	US$	-																							
Environmental sustainability benefits - Build - PV	-	US$	5,555,693																							
Maintenance cost savings - Build - PV	-	US$	3,987,102																							
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-																							
Total benefits		US$	20,372,648																							
Electric vs diesel yard tractor costs - 60 units - CPV	-	US$	19,682,942																							
Net present value		US$	689,707																							
Benefit-cost ratio			1.04																							

Benefit-Cost Analysis

				31 Dec 07	31 Dec 08	31 Dec 09	31 Dec 10	31 Dec 11	31 Dec 12	31 Dec 13	31 Dec 14	31 Dec 15	31 Dec 16	31 Dec 17	31 Dec 18	31 Dec 19	31 Dec 20
Model Period Ending				Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast	Post-forecast
Pre-forecast vs Forecast																	
Financial Year Ending				2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120
Model Column counter	**Constant**	**Unit**	**Total**	93	94	95	96	97	98	99	100	101	102	103	104	105	106
PROJECT BENEFITS																	
Reduction in energy consumption costs with yard tractor electrification - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																	
Economic competitiveness benefits - Build - PV		US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																	
Safety outcome benefits - Build - PV		US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental benefits - Electrified yard tractor - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-
[Stretch row]																	
Environmental sustainability benefits - Build - PV		US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Economic competitiveness benefits - Build - PV	-	US$	10,829,854	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Safety outcome benefits - Build - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Environmental sustainability benefits - Build - PV	-	US$	5,555,693	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance cost savings - Build - PV	-	US$	3,987,102	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total project benefits - No-build - PV		US$	20,372,648	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BENEFIT-COST RATIO

Economic competitiveness benefits - Build - PV	-	US$	10,829,854
Safety outcome benefits - Build - PV	-	US$	-
Environmental sustainability benefits - Build - PV	-	US$	5,555,693
Maintenance cost savings - Build - PV	-	US$	3,987,102
Residual value including future maintenance & operating costs - Sustainability elements - PV	-	US$	-
Total benefits		US$	20,372,648
Electric vs diesel yard tractor costs - 60 units - CPV	-	US$	19,682,942
Net present value		US$	689,707
Benefit-cost ratio			1.04

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Project Cost Items	Quantity	Unit Cost	Totals
1 Utility Distribution Infrastructure (SCE)*			
2 MHT Site Infrastructure (Equipment & Installation)			**$ 8,835,450**
2.1 Low Power Conversion Transformer	6	$ 40,500	$ 243,000
2.2 Trenching, Conduit, & Conductors	6	$ 200,000	$ 1,200,000
2.3 Electrical Equipment Foundation	60	$ 5,000	$ 300,000
2.4 Charging Station Units (Power, User, & Connection)	60	$ 85,000	$ 5,100,000
2.5 Electrical Equipment Protection (guard posts)	60	$ 5,000	$ 300,000
2.6 Vehicle Alignment (Vehicle Stall Paint, Signage, & Wheel Stops)	60	$ 3,000	$ 180,000
2.7 Vehicle Concrete Pad	60	$ 6,000	$ 360,000
2.8 Contingency (15%)		15%	$ 1,152,450
3 Equipment			**$ 25,533,900**
3.1 Yard Tractors	60	$ 350,000	$ 21,000,000
3.2 Operator & Maintenance Training	60	$ 5,000	$ 300,000
3.3 Terminal Operating System Network Connectivity (NOW System)	60	$ 38,000	$ 2,280,000
3.4 Terminal Operating System Network Connectivity (On-Board Computer)	60	$ 5,400	$ 324,000
3.5 Terminal Operating System Network Connectivity (ICTF YardEye)	60	$ 6,900	$ 414,000
3.6 Contingency		5%	$ 1,215,900
4 Design & Management			**$ 3,307,000**
4.1 Site Design (7% of Construction)		7%	$ 619,000
4.2 Construction Supervision (10% of Construction)		10%	$ 884,000
4.3 Permitting (5% of Construction)		5%	$ 442,000
4.4 Project & Grant Management (5% of Award)		5%	$ 1,362,000
Total Project Cost			**$ 37,676,350**
Delta Between Electrical and Diesel			**$ 24,112,450**

*SCE cost not included in Project costs nor PIDP funding considerations.

UTR utilization		
utilization	annual hours	running hours
65%	5,824	**3,786**

Diesel UTR		
Quantity	**Unit Cost**	**Totals**
		$ 13,563,900
60	$ 165,000	$ 9,900,000
60		
60	$ 38,000	$ 2,280,000
60	$ 5,400	$ 324,000
60	$ 6,900	$ 414,000
	5%	$ 645,900

Project Component		**Cost**	**Funding Allocation**		
			PIDP	**LBCT**	**SCE**
1	Utility Distribution Infrastructure*				
			80%	20%	
2	MHT Site Infrastructure	$ 8,835,450	$ 7,068,360	$ 1,767,090	
3	Equipment	$ 11,970,000	$ 9,576,000	$ 2,394,000	
4	Design & Management	$ 3,307,000	$ 2,645,600	$ 661,400	
	Total	**$ 24,112,450**	**$ 19,289,960**	**$ 4,822,490**	
	*SCE cost not included in Project costs nor PIDP funding considerations.				

Project Component		**Cost**	**Funding Allocation**	
			PIDP	**LBCT**
			80%	20%
1	MHT Site Infrastructure	$ 8,835,450	$ 7,068,360	$ 1,767,090
2	Equipment	$ 11,970,000	$ 9,576,000	$ 2,394,000
3	Design & Management	$ 3,307,000	$ 2,645,600	$ 661,400
	Total	**$ 24,112,450**	**$ 19,289,960**	**$ 4,822,490**

LBCT Emissions Comparison
2021 vs 2015 annual emissions comparison, tpy
Units: tons per year for criteria pollutants

Emissions Comparison through the years

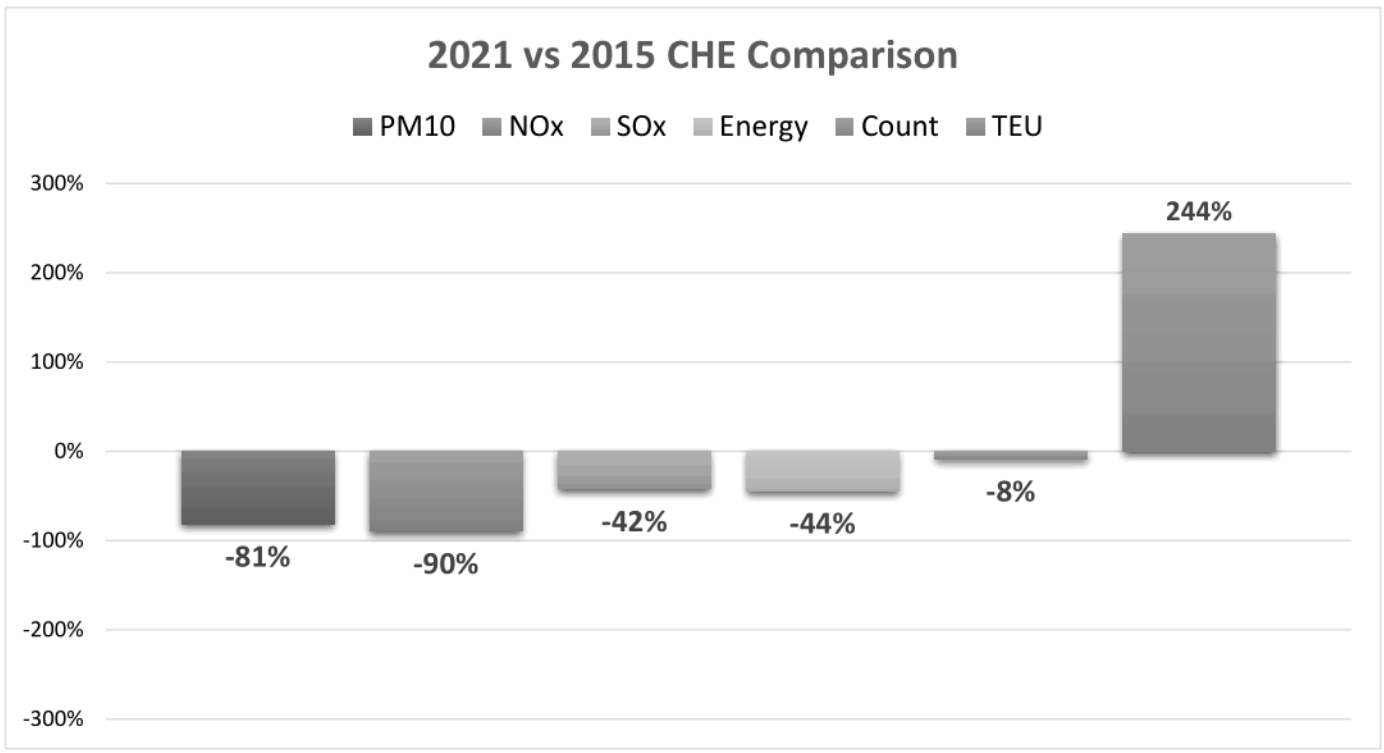
Equipment Type	PM_{10} tons	NO_x tons	SO_x tons	Energy kW-hr	Fossil Fueled CHE Count	All CHE Count	TEU Throughput
2021	0.11	3.97	0.08	8,094,168	99	264	2,422,422
2020	0.07	2.87	0.05	5,603,907	101	246	1,954,047
2019	0.10	3.43	0.07	7,081,012	101	237	1,075,058
2016	0.40	27.14	0.11	12,095,354	153	272	986,065
2015	0.58	37.78	0.13	14,483,209	108	108	703,715
2021-2015 Change	**-81%**	**-90%**	**-42%**	**-44%**	**-8%**	**144%**	**244%**

Note: all equipment includes the electric equipment that was added as part of the expansion to increase throughput and become more efficient

Metrics - tons of emissions per 10,000 TEU

Equipment Type	PM_{10} tons	NO_x tons	SO_x tons	10,000 TEU
2021	0.0005	0.0164	0.0003	242
2020	0.0004	0.0147	0.0003	195
2019	0.0009	0.0319	0.0006	108
2016	0.0041	0.2753	0.0011	99
2015	0.0083	0.5369	0.0019	70
2021-2015 Change	**-95%**	**-97%**	**-83%**	

LBCT
2021 vs 2015 Baseline Year Comparison for Cargo Handling Equipment
Source: Port of Long Beach Annual Emissions Inventory reports
As of May 2022, 2021 POLB EI report is not published, 2021 emissions are draft, not final
The chart shows absolute emissions change, energy, fossil fuel equipment count and TEU change



2021 vs 2015 Emissions	PM_{10}	NO_x	SO_x	Energy	Count	TEU
Emissions Change	**-81%**	**-90%**	**-42%**	**-44%**	**-8%**	**244%**

LBCT Emissions - 2021 current year

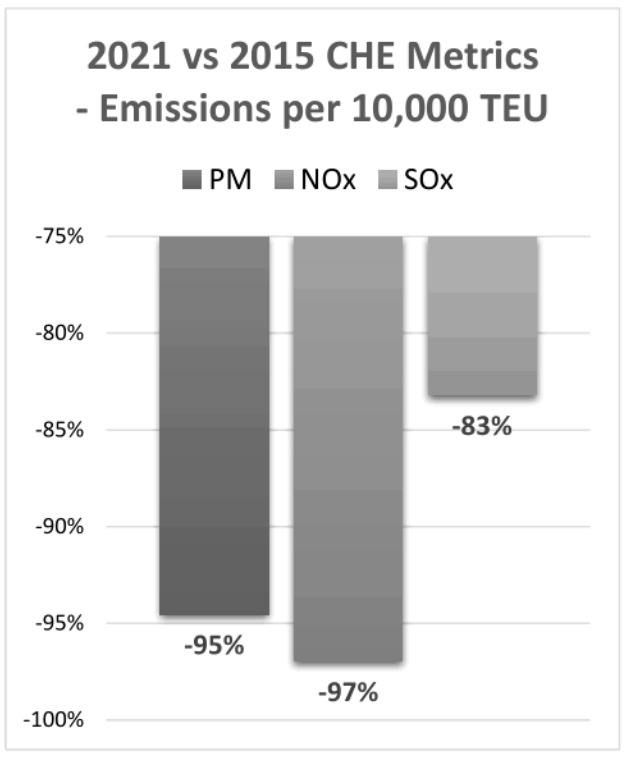
2021 Cargo Handling Emissions

Equipment Type	CHE Count	PM_{10} tons	$PM_{2.5}$ tons	NO_x tons	SO_x tons	CO_2e MT	Energy kW-hr
Yard tractor	61	0.09	0.08	2.20	0.07	5,771	7,541,186
Cone Vehicle	8	0.01	0.01	1.09	0.00	166	214,892
Top handler	5	0.00	0.00	0.41	0.00	147	191,182
Forklift	24	0.01	0.01	0.20	0.00	102	120,654
Man Lift	4	0.00	0.00	0.05	0.00	8	9,772
Sweeper	2	0.00	0.00	0.01	0.00	14	16,483
AGV	72					0	0
ASC	69					0	0
Crane	5					0	0
STS Crane	14					0	0
Total	**264**	**0.11**	**0.10**	**3.97**	**0.08**	**6,207**	**8,094,168**

There may have been methodology changes since previous years as CARB changes methodology from time to time.
The emissions provided for previous years are only to be used for percent change, high level comparison.
The emissions are from POLB's portwide annual emissions inventory reports.
The CO_2 emissions provided are tons, not CO_2e as metric tons (tonnes).
CO_2 emissions below will not match GHG quaterly emissions (fuel consumption method) due to differences in methodology.
The POLB annual EI follows CA methodology (using energy in kW-hr), while quarterly GHG emissions follow GHG protocol.
Emissions are for fossil fueled CHE only (tailpipe), electric equipment emissions are shown as zero emissions

LBCT
2021 vs 2015 Metrics

The chart shows the metrics for emissions per 10,000 TEU for the cargo handling equipment (CHE)



2021 vs 2015 Metrics	PM	NO_x	SO_x
Change	**-95%**	**-97%**	**-83%**

LBCT Emissions - 2021 current year

Equipment Type	CHE Count	PM_{10} tons	$PM_{2.5}$ tons	DPM tons	NO_x tons	SO_x tons	CO tons	HC tons	CO_2e MT	Energy kW-hr
Yard tractor	61	0.09	0.08	0.09	2.20	0.07	13.39	0.49	5,771	7,541,186

Equipment Type	PM2.5 tons	NOx tons	SOx tons	CO2e MT
Yard tractor	0.08	2.20	0.07	5,771

Throughput base yea	2021	2,422,422	TEU/yr
Throughput during Project		3,500,000	TEU/yr
tons/MT	1.102		

Use Below for BCA (included in emsision write-up)		
Emission	per TEU (g/yr)	Annual Reduction (MT/yr)
CO2e	2,383	8,339
NOx	0.825	2.89
PM2.5	0.031	0.11
SOx	0.0274	0.10

Clean Air Action Plan - Electrification of Equipment

Maintenance and Energy cost savings

	Diesel*		Electric*		Relative Savings	
	Liter/hr	USD/hr	Kwh	USD/hr	Energy	Maint**
UTR	9	$ 10.21	34	$ 8.16	$ 2.05	30%

Cost base	$ 1.20	USD/liter	$ 0.24	USD/Kwh

* Diesel includes costs for delivery to terminal and fulleing CHE

* Electricity includes add. charges like peak or demand charges.

** Maintenance savings are an estimate give limited and wide spread in data points

** Maintenance does not include batery pack replacement (~ 10 year battery life)

Source Moffatt & Nichol

Table 1.1.9. Implicit Price Deflators for Gross Domestic Product
[Index numbers, 2012=100]
Bureau of Economic Analysis
Last Revised on: February 24, 2022 - Next Release Date March 30, 2022

Line		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Line																													
1	**Gross domestic product**	70	72	73	74	75	76	78	80	81	83	85	88	90	93	94	95	96	98	100	102	104	105	106	108	110	112	114	118
2	**Personal consumption expenditures**	70	72	73	74	75	76	78	80	81	82	84	87	89	92	94	94	96	98	100	101	103	103	104	106	108	110	111	116
3	Goods	87	87	88	88	87	87	89	89	88	88	89	91	92	93	96	94	95	99	100	99	99	96	94	95	95	95	94	99
4	Durable goods	139	140	138	135	132	128	126	123	120	116	113	112	110	108	106	104	102	101	100	98	95	93	91	89	88	86	86	91
5	Nondurable goods	67	67	69	70	69	71	74	75	75	76	79	82	85	87	92	89	92	98	100	100	101	97	96	97	99	99	99	103
6	Services	63	64	66	68	69	71	73	75	77	80	82	85	88	91	93	94	96	98	100	102	105	107	109	112	115	118	120	124
7	**Gross private domestic investment**	85	86	86	86	86	86	87	87	88	89	91	95	98	100	101	99	98	99	100	101	103	104	104	105	107	109	110	113
8	Fixed investment	84	85	85	86	85	85	86	87	88	88	91	95	98	99	100	99	98	99	100	101	103	104	104	106	108	110	111	115
9	Nonresidential	95	96	95	95	93	92	93	92	92	91	92	94	97	98	100	99	97	99	100	100	101	102	101	102	103	104	105	106
10	Structures	44	46	48	49	52	53	55	58	61	63	67	76	85	90	94	93	92	95	100	101	107	109	110	113	114	119	121	128
11	Equipment	135	134	131	127	121	117	114	111	109	106	105	105	104	103	103	103	99	99	100	100	99	99	98	98	98	98	97	98
12	Intellectual property products	90	93	94	94	94	95	98	98	96	96	95	96	97	98	100	99	98	100	100	100	101	101	100	101	102	103	105	106
13	Residential	62	64	66	67	69	72	75	79	81	84	90	97	102	104	102	99	98	99	100	105	111	114	118	123	130	134	139	153
14	Change in private inventories	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
15	**Net exports of goods and services**	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
16	Exports	81	83	82	81	79	78	80	79	78	80	82	85	88	91	95	90	93	99	100	100	100	95	93	96	99	99	96	107
17	Goods	85	87	85	82	80	79	80	80	79	79	82	85	88	91	96	89	93	100	100	99	98	91	88	90	93	92	88	101
18	Services	73	74	75	76	76	77	79	77	77	80	83	86	89	92	95	92	94	98	100	102	104	104	106	109	112	114	115	121
19	Imports	79	81	79	77	72	73	76	74	73	75	79	84	87	90	99	88	93	100	100	99	98	90	87	89	92	90	88	95
20	Goods	80	83	80	77	72	73	76	74	73	74	78	83	86	89	99	87	92	100	100	98	97	88	84	86	88	86	84	90
21	Services	70	72	74	74	72	75	74	73	75	80	84	87	90	93	98	94	96	99	100	102	104	103	103	105	108	109	110	116
22	**Government consumption expenditures and gross investment**	58	60	61	63	64	66	69	71	72	75	78	82	86	90	93	93	95	98	100	102	104	105	105	107	111	113	115	120
23	Federal	64	66	67	68	69	71	73	74	77	80	83	86	89	92	94	94	96	99	100	101	103	103	104	106	109	111	112	116
24	National defense	63	65	66	67	68	70	72	73	76	80	82	86	89	92	95	94	96	99	100	101	102	102	103	104	107	109	110	114
25	Nondefense	65	67	68	70	71	72	75	76	78	81	84	87	89	91	94	94	97	99	100	101	104	104	105	108	111	114	115	119
26	State and local	55	57	58	59	61	63	66	68	70	72	75	80	84	88	93	92	95	98	100	103	106	106	106	109	113	115	117	123
	Addendum:																												
27	Gross national product	70	72	73	74	75	76	78	80	81	83	85	87	90	93	94	95	96	98	100	102	104	105	106	108	110	112	114	---
		1.6155	1.5823	1.5539	1.5275	1.5106	1.4896	1.4566	1.4245	1.4026	1.3755	1.3395	1.2988	1.2599	1.2267	1.2037	1.1960	1.1818	1.1577	1.1365	1.1169	1.0964	1.0856	1.0748	1.0548	1.0302	1.0121	1.0000	
			2.10%	1.83%	1.72%	1.13%	1.41%	2.27%	2.25%	1.56%	1.97%	2.68%	3.14%	3.09%	2.70%	1.92%	0.64%	1.20%	2.08%	1.87%	1.75%	1.87%	1.00%	1.00%	1.90%	2.39%	1.79%	1.21%	4.16%
		1.0000	1.0210	1.0397	1.0576	1.0695	1.0846	1.1091	1.1341	1.1518	1.1745	1.2061	1.2439	1.2823	1.3169	1.3422	1.3508	1.3670	1.3954	1.4215	1.4464	1.4735	1.4882	1.5031	1.5317	1.5682	1.5963	1.6155	1.6827

Report Name: **Asset Report**
Generation Time: 2022-Feb-09 11:37:54
Filter: Repair Internally: All
Sort By: Asset No. (Descending Order)

Asset No.	Asset Group	Asset Description	Asset Status	Serial Number	Asset Manufacturer	Model	notes	Year	Fuel
Bison	SV - Service Truck	Urea Truck	In Use		Chevrolet	3500		1980	Gasoline
CL001	CL - Combi Lift	Combi Lift	In Use	25052	CombiLift	SC3T	136 hp	2014	Diesel
EG01	SU - General Terminal Support	Emergency Generator NOIT	In Use	FST00845	Caterpillar	C-18		2012	Diesel
EG02	SU - General Terminal Support	Emergency Generator AMF	In Use	G130528609	Cummins	DFEH-1332757		2013	Diesel
EG03	SU - General Terminal Support	Emergency Generator SADM	In Use		Cummins		Ref. No. A042W166FR0527100		Diesel
FL071	FL - Forklift/Heavy Lift	Forklift	In Use	AF13D-35247	Mitsubishi	FG30K		2000	Propane
FL095	FL - Forklift/Heavy Lift	Forklift	Retired		Hyster		Equipment does not exist.		
FL075	FL - Forklift/Heavy Lift	Forklift	In Use	L177V15881M	Hyster	H60FT	20.6 kW	2014	Propane
FL076	FL - Forklift/Heavy Lift	Forklift	In Use	L177V15882M	Hyster	H60FT	20.6 kW	2014	Propane
FL077	FL - Forklift/Heavy Lift	Forklift	In Use	S005V03827M	Hyster	H80FT	20.6 kW, equipment installed:	2014	Propane
FL078	FL - Forklift/Heavy Lift	Forklift	In Use	N177V02365M	Hyster	H60FT	20.6 kW	2014	Propane
FL079	FL - Forklift/Heavy Lift	Forklift	In Use	N177V02722M	Hyster	H60FT	20.6 kW	2014	Propane
FL080	FL - Forklift/Heavy Lift	Forklift	In Use	N177V01698M	Hyster	H60FT	20.6 kW	2014	Propane
FL082	FL - Forklift/Heavy Lift	Forklift	In Use	P177V02595N	Hyster	H60FT	20.6 kW	2015	Propane
FL083	FL - Forklift/Heavy Lift	Forklift	In Use	P177V02596V	Hyster	H60FT	20.6 kW	2015	Propane
FL084	FL - Forklift/Heavy Lift	Forklift	In Use	P177V02610N	Hyster	H60FT	20.6 kW	2015	Propane
FL085	FL - Forklift/Heavy Lift	Forklift	In Use	P177V02611N	Hyster	H60FT	20.6 kW	2015	Propane
FL086	FL - Forklift/Heavy Lift	Forklift	In Use	P177V02628N	Hyster	H60FT	20.6 kW	2015	Propane
FL087	FL - Forklift/Heavy Lift	Forklift	In Use	P177V02592N	Hyster	H60FT	20.6 kW	2015	Propane
FL088	FL - Forklift/Heavy Lift	Reach forklift	In Use	0160070656	JLG Skytrak	8042 T4F		2015	Diesel
FL089	FL - Forklift/Heavy Lift	Reach forklift	In Use	0160070348	JLG Skytrak	8042 T4F		2015	Diesel
FL092	FL - Forklift/Heavy Lift	Forklift	In Use	U005V02044N	Hyster	H80FT	20.6 kW, Equipment installed:	2015	Propane
FL093	FL - Forklift/Heavy Lift	Forklift	In Use	U005V02047N	Hyster	H80FT	20.6 kW, Equipment installed:	2015	Propane
FL094	FL - Forklift/Heavy Lift	Forklift	In Use	P005V04150J	Hyster	H80FT	75 Kw	2011	Propane
FL096	FL - Forklift/Heavy Lift	Forklift	In Use	U005V12466V	Hyster	H80FT	Cascade Fork Clamp Revolving	2021	Propane
FL310	FL - Forklift/Heavy Lift	Forklift	In Use	A238E01604M	Hyster	H360-48HD2		2015	Diesel
FL311	FL - Forklift/Heavy Lift	Forklift	In Use	A238E01602M	Hyster	H360-48HD2		2015	Diesel
FL312	FL - Forklift/Heavy Lift	Forklift	In Use	A238E01590M	Hyster	H360-48HD2		2015	Diesel
FL313	FL - Forklift/Heavy Lift	Forklift	In Use	A238E01596M	Hyster	H360-48HD2		2015	Diesel
IBC001	IB - IBC Cart	IBC Cart	In Use	1138266	Motrec	RR662	Roof and equipment mast mod	2012	Diesel
MF054	MF - Fuel Truck	Mobile Fueler	Retired		Ford/Bosserman	Diesel/Gasoline		2007	Diesel
IBC002	IB - IBC Cart	IBC Cart	In Use	1138267	Motrec	RR662		2012	Diesel
IBC003	IB - IBC Cart	IBC Cart	In Use	1138268	Motrec	RR662		2012	Diesel
IBC004	IB - IBC Cart	IBC Cart	In Use	1138265	Motrec	RR662	Roof and equipment mast mod	2015	Diesel
IBC005	IB - IBC Cart	IBC Cart	In Use	1138270	Motrec	RR662		2015	Diesel
MF052	MF - Fuel Truck	Mobile Fueler	In Use	3FRXF75G37V505465	Ford/Bosserman	F-750	Vapor recovery certification tes	2007	Diesel
MF053	MF - Fuel Truck	Mobile Fueler	In Use	3FRXF75G07V505469	Ford/Bosserman	F-750	Vapor recovery certification tes	2007	Diesel
ML001	ML - Man Lift	Boom Lift	Retired	300099175	JLG	1350SJP	EQUIPMENT MOVED OFF SITE I	2006	Diesel
ML002	ML - Man Lift	Boom Lift	In Use	300177289	JLG	1500SJ		2013	Diesel
ML003	ML - Man Lift	Boom lift	In Use	0300270217	JLG	1200SJP		2021	Diesel
ML316	ML - Man Lift	80' Boom Lift	In Use	300053292	JLG	JLG 800AJ	Re-powered in 2013 to include	2000	Diesel

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PU473	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D12PA59974	Ford	Ranger	Old Ford Ranger - AGV	2001	Gasoline
PU476	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D72PA59977	Ford	Ranger	Old Ford Ranger - Security	2001	Gasoline
PU482	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D22PA59983	Ford	Ranger	Old Ford Ranger - Security	2001	Gasoline
PU485	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D53PA22797	Ford	Ranger	Old Ford Ranger - Security	2002	Gasoline
PU492	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D33PB15236	Ford	Ranger	Old Ford Ranger - Security	2003	Gasoline
PU506	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D65PA47419	Ford	Ranger	Old Ranger - Mechanic Transpo	2005	Gasoline
PU508	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D45PA47421	Ford	Ranger	Service Vehicle	2005	Gasoline
PU513	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D55PA65332	Ford	Ranger	Old Ford Ranger - Security	2005	Gasoline
PU517	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D96PA46573	Ford	Ranger	Service Vehicle	2006	Gasoline
PU521	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D46PA49686	Ford	Ranger	Service Vehicle	2006	Gasoline
PU522	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10DX6PA49689	Ford	Ranger	Old Ford Ranger - Reefer Mech	2006	Gasoline
PU523	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D86PA49691	Ford	Ranger	Old Ford Ranger - Security	2006	Gasoline
PU532	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D97PA10559	Ford	Ranger	Service Vehicle	2006	Gasoline
PU533	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D57PA10560	Ford	Ranger	Old Ford Ranger - Security	2006	Gasoline
PU534	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D07PA10563	Ford	Ranger	Old Ford Ranger - Security	2006	Gasoline
PU535	PU - Pickup Truck	Pickup Truck	In Use	1FTYR10D27PA10564	Ford	Ranger	Old Ford Ranger - Mechanic Us	2006	Gasoline
PU536	PU - Pickup Truck	Pickup Truck	In Use	1FTPW1258FA30335	Ford	F-150 Crew Cab	Management (License Plate 8R	2008	Gasoline
PU537	PU - Pickup Truck	Pickup Truck	In Use	1FTRF12218XC95927	Ford	F-150	Mechanic - Parts Room	2008	Gasoline
PU539	PU - Pickup Truck	Pickup Truck	In Use	5TFJX4CN5CX018049	Toyota	Tacoma Crew Cab	Mechanic - AGV	2012	Gasoline
PU540	PU - Pickup Truck	Pickup Truck	In Use	5TFJX4GN5CX011564	Toyota	Tacoma Crew Cab	Gearman	2012	Gasoline
PU541	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM8DKD54623	Ford	F-150	M&R Management - Jon (Licen	2013	Gasoline
PU542	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM6DKE17993	Ford	F-150	IT (License Plate 40240K1)	2013	Gasoline
PU543	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM3DKE04702	Ford	F-150	Management - Safety/Security	2013	Gasoline
PU544	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM6DKD96305	Ford	F-150 Long Bed	Crane Service Vehicle - Tool Be	2013	Gasoline
PU545	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM2DKD90484	Ford	F-150	Security	2013	Gasoline
PU546	PU - Pickup Truck	Pickup Truck	In Use	1FTEW1CM8DFD69104	Ford	F-150 Crew Cab	Management (License Plate 55	2013	Gasoline
PU547	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM5EKD11178	Ford	F-150	Vessel Ops	2013	Gasoline
PU548	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM8EKD54250	Ford	F-150	Mechanic - AGV	2014	Gasoline
PU549	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM3EKD54255	Ford	F-150	Yard Ops	2014	Gasoline
PU550	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM6EKD54251	Ford	F-150	Vessel Ops	2014	Gasoline
PU551	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CMXEKD54253	Ford	F-150	Mechanic - Reefer	2014	Gasoline
PU552	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM8EKD54252	Ford	F-150	Mechanic - Reefer	2014	Gasoline
PU553	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM7EKE70512	Ford	F-150	Yard Ops	2014	Gasoline
PU554	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM6EKD45534	Ford	F-150 Long bed	Crane Service Vehicle - Tool Be	2014	Gasoline
PU555	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM6EKD15109	Ford	F-150 Long bed	Crane Service Vehicle - Tool Be	2014	Gasoline
PU556	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM2EKE64794	Ford	F-150	Rail Ops	2014	Gasoline
PU557	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM0EKE84249	Ford	F-150	Yard Ops	2014	Gasoline
PU558	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM8EKF11083	Ford	F-150	Yard Ops	2014	Gasoline
PU559	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CMXEKF11084	Ford	F-150	Rail Ops	2014	Gasoline
PU560	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM4EKF11081	Ford	F-150	Yard Ops	2014	Gasoline
PU561	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM2EFD13074	Ford	F-150	Yard Ops	2014	Gasoline

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PU562	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM5EFD13070	Ford	F-150	Vessel Ops	2014	Gasoline
PU563	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM8EFD13077	Ford	F-150	Rail Ops	2014	Gasoline
PU564	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1CM7EFD13071	Ford	F-150	Yard Ops	2014	Gasoline
PU565	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C8XFKD18258	Ford	F-150	IT (License Plate 12025C2)	2015	Gasoline
PU566	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C81FKD18259	Ford	F-150	Rail Ops	2015	Gasoline
PU567	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C82FKD18271	Ford	F-150	IT	2015	Gasoline
PU568	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C86FKD18273	Ford	F-150	M&R? Kevin's Old Truck	2015	Gasoline
PU569	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C80FKD18267	Ford	F-150	ODT (License Plate 85941A2)	2015	Gasoline
PU570	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C80FKD18253	Ford	F-150	Vessel Ops	2015	Gasoline
PU571	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C88FKD18257	Ford	F-150	Management - Rail (License Pla	2015	Gasoline
PU572	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C85FKD18278	Ford	F-150	M&R Management - Rob	2015	Gasoline
PU573	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C87FKD18279	Ford	F-150	M&R Management - Jeff	2015	Gasoline
PU574	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C87FKD18251	Ford	F-150	M&R Management - Brian	2015	Gasoline
PU575	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C84FKD18269	Ford	F-150	Yard Ops	2015	Gasoline
PU576	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C8XFKD18275	Ford	F-150	Rail Ops	2015	Gasoline
PU577	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C88FKD18274	Ford	F-150	M&R Management - Faith	2015	Gasoline
PU578	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C82FKD18254	Ford	F-150	Vessel Ops	2015	Gasoline
PU579	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C83FKD18277	Ford	F-150	Vessel Ops	2015	Gasoline
PU580	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C83FKD18263	Ford	F-150	Sweeper	2015	Gasoline
PU581	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C82FKD18268	Ford	F-150	M&R Management - George	2015	Gasoline
PU582	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C84FKD18255	Ford	F-150	Vessel Ops	2015	Gasoline
PU583	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C84FKD18272	Ford	F-150	ODT (License Plate 85939A2)	2015	Gasoline
PU584	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C85FKD18250	Ford	F-150	Yard Ops	2015	Gasoline
PU585	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C87FKD18265	Ford	F-150	Yard Ops	2015	Gasoline
PU586	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C80FKD18270	Ford	F-150	Gearman	2015	Gasoline
PU587	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C86FKD18256	Ford	F-150	IT	2015	Gasoline
PU588	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C81FKD18276	Ford	F-150	Gearman	2015	Gasoline
PU589	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C89FKD18252	Ford	F-150	M&R Management - Bjorn	2015	Gasoline
PU590	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C89FKD18266	Ford	F-150	Vessel Ops	2015	Gasoline
PU591	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C85FKD18264	Ford	F-150	Vessel Ops	2015	Gasoline
PU592	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C85FKD18281	Ford	F-150	Gate Ops	2015	Gasoline
PU593	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C83FKD18280	Ford	F-150	Gate Ops	2015	Gasoline
PU594	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C89FKD18249	Ford	F-150	M&R Management - Dane	2015	Gasoline
PU595	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C8XGKE19382	Ford	F-150	Sweeper	2016	Gasoline
PU596	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C85GKE19385	Ford	F-150	Yard Ops	2016	Gasoline
PU597	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C80GKE19388	Ford	F-150	Yard Ops	2016	Gasoline
PU598	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C82GKE19389	Ford	F-150	Vessel Ops	2016	Gasoline
PU599	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C82GKE19392	Ford	F-150	Vessel Ops	2016	Gasoline
PU600	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C86GKE19394	Ford	F-150	Mechanic - Parts Room	2016	Gasoline
PU601	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C8XGKE19396	Ford	F-150	Rail Ops	2016	Gasoline
PU514	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D75PA65331	Ford	Ranger	Service Vehicle	2005	

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PU602	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C81GKE19397	Ford	F-150	Rail Ops	2016	Gasoline
PU511	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D75PA65329	Ford	Ranger		2005	
PU603	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C83CKE19384	Ford	F-150	Rail Ops	2016	Gasoline
PU604	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C80GKE19391	Ford	F-150	Vessel Ops	2016	Gasoline
PU497	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10DX5PA22251	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2005	
PU494	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D73PB1515238	Ford	Ranger		2003	
PU605	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C81GKE19383	Ford	F-150	Vessel Ops	2016	Gasoline
PU486	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D63PA02641	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2002	
PU606	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C88GKE19395	Ford	F-150	Vessel Ops	2016	Gasoline
PU484	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D53PA17714	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2002	
PU607	PU - Pickup Truck	Pickup Truck	In Use	1FTMF1C89GKE19390	Ford	F-150	M&R Management - Aulton	2016	Gasoline
PU481	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D02PA59982	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2001	
PU480	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D92PA59981	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2001	
PU478	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D02PA59979	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2001	
PU477	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D92PA59978	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2001	
PU608	PU - Pickup Truck	Pickup Truck	In Use	1FTER1EH1MLD11313	Ford	Ranger	Assigned to security	2021	Gasoline
PU475	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D52PA59976	Ford	Ranger		2001	
PU474	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D32PA59975	Ford	Ranger		2001	
PU609	PU - Pickup Truck	Pickup Truck	In Use	1FTER1EH3MLD11314	Ford	Ranger	Assigned to security	2021	Gasoline
PU469	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10D42PA59970	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2001	
PU468	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10C9YPA54084	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2000	
PU467	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10C8YPA89215	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2000	
PU462	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10C1YPA14727	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	2000	
PU452	PU - Pickup Truck	Pickup Truck	Retired	1FTYR10C2WUB41789	Ford	Ranger	EQUIPMENT MOVED OFF SITE I	1998	
PU610	PU - Pickup Truck	Pickup Truck	In Use	1FTER1EH5MLD11315	Ford	Ranger	Assigned to security	2021	Gasoline
PU611	PU - Pickup Truck	Pickup Truck	In Use	1FTER1EH7MLD11316	Ford	Ranger	Assigned to security	2021	Gasoline
PU612	PU - Pickup Truck	Pickup Truck	In Use	1FTER1EH9MLD11317	Ford	Ranger	Assigned to security	2021	Gasoline
SB16	SB - Shuttle Bus	Security Shuttle Bus	Retired	1T7YL2571276202	Thomas Built	HDX	EQUIPMENT MOVED OFF TERM	2004	Diesel
SB15	SB - Shuttle Bus	Security Shuttle Bus	Retired	1T7YL2371276201	Thomas Built	HDX	EQUIPMENT MOVED OFF TERM	2005	Diesel
PU613	PU - Pickup Truck	Pickup Truck	In Use	1FTER1EH0MLD11318	Ford	Ranger	Assigned to security	2021	Gasoline
RS001	RS - Reach Stacker	Reach Stacker	In Use	C222E01738L	Hyster	RS 45-31CH		2013	Diesel
SB01	SB - Shuttle Bus	Security Shuttle Bus	In Use	1T7YL2E25E1272192	Thomas Built	HDX	300 Hp, EPA Model name: DCE	2013	Diesel
SB02	SB - Shuttle Bus	Security Shuttle Bus	In Use	1T7YL2E29E1272308	Thomas Built	HDX	300 Hp, EPA model name: DCE	2013	Diesel
SB03	SB - Shuttle Bus	Security Shuttle Bus	In Use	1T7Y32D27N1186397	Thomas Built	HDX-D	300 HP @ 2600 RPM, Emission	2022	Diesel
SB04	SB - Shuttle Bus	Security Shuttle Bus	In Use	1T7Y32D29N1186398	Thomas Built	HDX-D	300 HP @ 2600 RPM, Emission	2022	Diesel
SB17	SB - Shuttle Bus	Tour Bus	In Use	1FBSS31S55HA71907	Ford	E-350	Passenger Van -	2013	Gasoline
SB20	SB - Shuttle Bus	Tour Bus	In Use	1FDWE3FL9EDA13422	Ford	E-350	VIP bus -	2014	Gasoline
SV040	SV - Service Truck	Service Truck	In Use	IFTNFLOL8VEC1529	Ford	F-250			Gasoline
SV041	SV - Service Truck	Service Truck	In Use	3FTNF20L7YMA37694	Ford	F-250		2000	Gasoline
SV042	SV - Service Truck	Service Truck	In Use	1FTNF20L5YEA89010	Ford	F-250		2000	Gasoline
SV043	SV - Service Truck	Service Truck	In Use	TPL3263600234	GMC	N/A		2001	Gasoline

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SV044	SV - Service Truck	Service Truck	In Use	3FTNF20L71MA77327	Ford	F-250		2001	Gasoline
SV045	SV - Service Truck	Service Truck	In Use	1FTNF20L41ED40413	Ford	F-250		2001	Gasoline
SV046	SV - Service Truck	Service Truck	In Use	3FTNF20L61MA76959	Ford	F-250		2001	Gasoline
SV049	SV - Service Truck	Service Truck	In Use	1FDSF30L33EC64402	Ford	F-350		2003	Gasoline
SV050	SV - Service Truck	Service Truck	In Use	1FDSF30L43EC64411	Ford	F-350		2003	Gasoline
SV051	SV - Service Truck	Service Truck	In Use	1FDSF30L93EC64422	Ford	F-350		2003	Gasoline
SV054	SV - Service Truck	Service Truck	In Use	1FDRF3E60DEB59741	Ford	F-350		2013	Gasoline
SV055	SV - Service Truck	Service Truck	In Use	1FDRF3E63DEA57821	Ford	F-350		2013	Gasoline
SV056	SV - Service Truck	Service Truck	In Use	1FDRF3E69DEB59740	Ford	F-350		2013	Gasoline
SV057	SV - Service Truck	Service Truck	In Use	1FDRF3E62DEB59739	Ford	F-350		2013	Gasoline
SV058	SV - Service Truck	Service Truck	In Use	1FDRF3E69FEA65182	Ford	F-350		2014	Gasoline
SV059	SV - Service Truck	Service Truck	In Use	1FDRF3E66FEA42152	Ford	F-350		2014	Gasoline
SV060	SV - Service Truck	Service Truck	In Use	1FDRF3E6XFEA42154	Ford	F-350		2014	Gasoline
SV061	SV - Service Truck	Service Truck	In Use	1FDRF3E68FEA42153	Ford	F-350		2014	Gasoline
SV062	SV - Service Truck	Service Truck	In Use	1FDRF3E64FEA42151	Ford	F-350		2014	Gasoline
SV063	SV - Service Truck	Service Truck	In Use	1FDBF3A68FEB08434	Ford	F-350		2014	Gasoline
SV064	SV - Service Truck	Service Truck	In Use	1FDBF3A6XFEB08435	Ford	F-350		2014	Gasoline
SV065	SV - Service Truck	Service Truck	In Use	1FDBF3A60FEA84422	Ford	F-350		2014	Gasoline
SV066	SV - Service Truck	Service Truck	In Use	1FDBF3A61FEB08436	Ford	F-350		2014	Gasoline
SV067	SV - Service Truck	Service Truck	In Use	1FDBF3A65FEB13378	Ford	F-350		2014	Gasoline
SV070	SV - Service Truck	Service Truck	In Use	1FDUF5GYXFEB82838	Ford	F-550	Stake Bed - License plate - 8418	2014	Gasoline
SV071	SV - Service Truck	Service Truck	In Use	NM0LS6E71F1180931	Ford	Transit Connect		2015	Gasoline
SV072	SV - Service Truck	Service Truck	In Use	NM0LS6E75F1180477	Ford	Transit Connect		2015	Gasoline
SV075	SV - Service Truck	Service Truck	In Use	1FMZK1ZM0GKA01852	Ford	150LR Club Wagon		2015	Gasoline
SV076	SV - Service Truck	Service Truck	In Use	1FMZK1ZM2GKA01853	Ford	150LR Club Wagon		2015	Gasoline
SV077	SV - Service Truck	Service Truck	In Use	1FMZK1ZM4GKA01854	Ford	150LR Club Wagon		2015	Gasoline
SV078	SV - Service Truck	Service Truck	In Use	1FDBF2A6XLED51121	Ford	F-250		2020	Gasoline
SV079	SV - Service Truck	Service Truck	In Use	1FDBF2A64LED51115	Ford	F-250		2020	Gasoline
SV080	SV - Service Truck	Service Truck	In Use	1FDBF2A66LED51116	Ford	F-250		2020	Gasoline
SV081	SV - Service Truck	Service Truck	In Use	1FDBF2A62LED51114	Ford	F250		2020	Gasoline
SV082	SV - Service Truck	Service Truck	In Use	1FDBF2A68LED51117	Ford	F250		2020	Gasoline
SV083	SV - Service Truck	Service Truck	In Use	1FDBF2A6XLED51118	Ford	F250	Assigned to power shop 10-26-	2020	Gasoline
SV084	SV - Service Truck	Service Truck	In Use	1FDBF2A61LED51119	Ford	F250	Assigned to Crane shop on 10-2	2020	Gasoline
SV085	SV - Service Truck	Service Truck	In Use	1FDBF2A68LED51120	Ford	F250	Assigned to crane shop 10-26-2	2020	Gasoline
SV086	SV - Service Truck	Service Truck	In Use	1FDBF2A61LED51122	Ford	F250	Assigned to crane shop 10-26-2	2020	Gasoline
SV087	SV - Service Truck	Service Truck	In Use	1FDBF2A65MED07934	Ford	F-250 XL		2021	Gasoline
SV088	SV - Service Truck	Service Truck	In Use	1FDBF2A64MED07939	Ford	F-250 XL		2021	Gasoline
SV048	SV - Service Truck	Service Truck	Retired	1FDSF30LX3EC73050	Ford	F-350		2003	Gasoline
SV047	SV - Service Truck	Service Truck	Retired	3FTNF20L11MA76982	Ford	F-250		2001	Gasoline
SV089	SV - Service Truck	Service Truck	In Use	1FDBF2A61MED07932	Ford	F-250 XL		2021	Gasoline
SV090	SV - Service Truck	Service Truck	In Use	1FDBF2A6XMED07931	Ford	F-250 XL		2021	Gasoline

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SV091	SV - Service Truck	Service Truck	In Use	1FDBF2A63MED07933	Ford	F-250 XL		2021	Gasoline
SV092	SV - Service Truck	Service Truck	In Use	1FDBF2A67MED07935	Ford	F-250 XL		2021	Gasoline
SV093	SV - Service Truck	Service Truck	In Use	1FDBF2A60MED07940	Ford	F-250 XL		2021	Gasoline
SV094	SV - Service Truck	Service Truck	In Use	1FDBF2A69MED07936	Ford	F-250 XL		2021	Gasoline
SV095	SV - Service Truck	Service Truck	In Use	1FDBF2A62MED07938	Ford	F-250 XL		2021	Gasoline
SV028	SV - Service Truck	Service Truck	Retired	1FTEF15NXLLA55458	Ford	F-150	EQUIPMENT MOVED OFF SITE I	1989	gasoline
SV024	SV - Service Truck	Service Truck	Retired	not available	Ford	F-350	EQUIPMENT MOVED OFF SITE I	1990	
SV096	SV - Service Truck	Service Truck	In Use	1FDBF2A60MED07937	Ford	F-250 XL		2021	Gasoline
SW105	SW - Sweeper	Sweeper	In Use	1000060744	Advance	SW800077LPG	20.6 kW	2015	Propane
SW106	SW - Sweeper	Sweeper	In Use	JS41355	Elgin	Peterbilt Crosswind	VIN: 3BPPHM7XXKF592724	2019	Diesel
TP963	TP - Top Pick	Top Handler	In Use	G117E01593L	Hyster	H1150HD-CH		2014	Diesel
TP964	TP - Top Pick	Top Handler	In Use	G117E01597L	Hyster	H1150HD-CH		2014	Diesel
TP965	TP - Top Pick	Top Handler	In Use	G117E01599L	Hyster	H1150HD-CH		2014	Diesel
TP966	TP - Top Pick	Top Handler	In Use	G117E01611M	Hyster	H1150HD-CH		2014	Diesel
UTR195	YT - Yard Tractor	UTR Yard Tractor	Retired	329496	Ottawa	Terminal Tractor	EQUIPMENT MOVED OFF SITE I	2012	Diesel
UTR194	YT - Yard Tractor	UTR Yard Tractor	Retired	329495	Ottawa	Terminal Tractor	EQUIPMENT MOVED OFF SITE I	2012	Diesel
UTR001	YT - Yard Tractor	UTR Yard Tractor	In Use	334082	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR002	YT - Yard Tractor	UTR Yard Tractor	In Use	334083	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR003	YT - Yard Tractor	UTR Yard Tractor	In Use	334084	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR004	YT - Yard Tractor	UTR Yard Tractor	In Use	334085	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR005	YT - Yard Tractor	UTR Yard Tractor	In Use	334086	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR006	YT - Yard Tractor	UTR Yard Tractor	In Use	334087	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR007	YT - Yard Tractor	UTR Yard Tractor	In Use	334088	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR008	YT - Yard Tractor	UTR Yard Tractor	In Use	334089	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR009	YT - Yard Tractor	UTR Yard Tractor	In Use	334090	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR010	YT - Yard Tractor	UTR Yard Tractor	In Use	334091	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR011	YT - Yard Tractor	UTR Yard Tractor	In Use	334092	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR012	YT - Yard Tractor	UTR Yard Tractor	In Use	334093	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR013	YT - Yard Tractor	UTR Yard Tractor	In Use	334094	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR014	YT - Yard Tractor	UTR Yard Tractor	In Use	334095	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR015	YT - Yard Tractor	UTR Yard Tractor	In Use	334096	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR016	YT - Yard Tractor	UTR Yard Tractor	In Use	334097	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR017	YT - Yard Tractor	UTR Yard Tractor	In Use	334098	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR018	YT - Yard Tractor	UTR Yard Tractor	In Use	334099	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR019	YT - Yard Tractor	UTR Yard Tractor	In Use	334100	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR020	YT - Yard Tractor	UTR Yard Tractor	In Use	334101	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR021	YT - Yard Tractor	UTR Yard Tractor	In Use	334102	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR022	YT - Yard Tractor	UTR Yard Tractor	In Use	334103	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR023	YT - Yard Tractor	UTR Yard Tractor	In Use	334104	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR024	YT - Yard Tractor	UTR Yard Tractor	In Use	334105	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR025	YT - Yard Tractor	UTR Yard Tractor	In Use	334106	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel

Report Name: **Asset Report**
Generation Time: 2022-Feb-09 11:37:54
Filter: Repair Internally: All
Sort By: Asset No. (Descending Order)

Asset No.	Asset Group	Asset Description	Asset Status	Serial Number	Asset Manufacturer	Model	notes	Year	Fuel
UTR026	YT - Yard Tractor	UTR Yard Tractor	In Use	334107	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR027	YT - Yard Tractor	UTR Yard Tractor	In Use	334108	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR028	YT - Yard Tractor	UTR Yard Tractor	In Use	334115	Ottawa	Terminal Tractor	AUCOS/NOW Solutions, truck i	2014	Diesel
UTR029	YT - Yard Tractor	UTR Yard Tractor	In Use	334110	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR030	YT - Yard Tractor	UTR Yard Tractor	In Use	334111	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR031	YT - Yard Tractor	UTR Yard Tractor	In Use	334112	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR032	YT - Yard Tractor	UTR Yard Tractor	In Use	334113	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR033	YT - Yard Tractor	UTR Yard Tractor	In Use	334114	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR035	YT - Yard Tractor	UTR Yard Tractor	In Use	334116	Ottawa	Terminal Tractor	AUCOS/NOW Solutions	2014	Diesel
UTR036	YT - Yard Tractor	UTR Yard Tractor	In Use	334117	Ottawa	Terminal Tractor	Now solutions	2014	Diesel
UTR037	YT - Yard Tractor	UTR Yard Tractor	In Use	334118	Ottawa	Terminal Tractor	Now solutions	2014	Diesel
UTR038	YT - Yard Tractor	UTR Yard Tractor	In Use	334119	Ottawa	Terminal Tractor	Now solutions	2014	Diesel
UTR039	YT - Yard Tractor	UTR Yard Tractor	In Use	334120	Ottawa	Terminal Tractor		2014	Diesel
UTR040	YT - Yard Tractor	UTR Yard Tractor	In Use	334121	Ottawa	Terminal Tractor		2014	Diesel
UTR041	YT - Yard Tractor	UTR Yard Tractor	In Use	334200	Ottawa	Terminal Tractor		2014	Diesel
UTR042	YT - Yard Tractor	UTR Yard Tractor	In Use	334201	Ottawa	Terminal Tractor		2014	Diesel
UTR043	YT - Yard Tractor	UTR Yard Tractor	In Use	334202	Ottawa	Terminal Tractor		2014	Diesel
UTR044	YT - Yard Tractor	UTR Yard Tractor	In Use	334203	Ottawa	Terminal Tractor		2014	Diesel
UTR045	YT - Yard Tractor	UTR Yard Tractor	In Use	334204	Ottawa	Terminal Tractor		2014	Diesel
UTR046	YT - Yard Tractor	UTR Yard Tractor	In Use	334205	Ottawa	Terminal Tractor		2014	Diesel
UTR047	YT - Yard Tractor	UTR Yard Tractor	In Use	334206	Ottawa	Terminal Tractor		2014	Diesel
UTR048	YT - Yard Tractor	UTR Yard Tractor	In Use	334207	Ottawa	Terminal Tractor		2014	Diesel
UTR049	YT - Yard Tractor	UTR Yard Tractor	In Use	334208	Ottawa	Terminal Tractor		2014	Diesel
UTR050	YT - Yard Tractor	UTR Yard Tractor	In Use	334209	Ottawa	Terminal Tractor		2014	Diesel
UTR051	YT - Yard Tractor	UTR Yard Tractor	In Use	334210	Ottawa	Terminal Tractor		2014	Diesel
UTR052	YT - Yard Tractor	UTR Yard Tractor	In Use	334211	Ottawa	Terminal Tractor		2014	Diesel
UTR053	YT - Yard Tractor	UTR Yard Tractor	In Use	334212	Ottawa	Terminal Tractor		2014	Diesel
UTR054	YT - Yard Tractor	UTR Yard Tractor	In Use	334213	Ottawa	Terminal Tractor		2014	Diesel
UTR055	YT - Yard Tractor	UTR Yard Tractor	In Use	334214	Ottawa	Terminal Tractor		2014	Diesel
UTR056	YT - Yard Tractor	UTR Yard Tractor	In Use	334215	Ottawa	Terminal Tractor		2014	Diesel
UTR057	YT - Yard Tractor	UTR Yard Tractor	In Use	334216	Ottawa	Terminal Tractor		2014	Diesel
UTR058	YT - Yard Tractor	UTR Yard Tractor	In Use	334217	Ottawa	Terminal Tractor		2014	Diesel
UTR059	YT - Yard Tractor	UTR Yard Tractor	In Use	334218	Ottawa	Terminal Tractor		2014	Diesel
UTR060	YT - Yard Tractor	UTR Yard Tractor	In Use	334219	Ottawa	Terminal Tractor		2014	Diesel
UTR061	YT - Yard Tractor	UTR Yard Tractor	In Use	334220	Ottawa	Terminal Tractor		2014	Diesel

MEMORANDUM OF UNDERSTANDING

THIS MEMORANDUM OF UNDERSTANDING (MOU) is dated for reference purposes as of May 13, 2022 between the City of Long Beach, California, a municipal corporation, acting by and through its Board of Harbor Commissioners (POLB), and LBCT, LLC (LBCT), a Delaware limited liability company. The aforementioned parties to this MOU shall be referred to individually herein as a "Party" and collectively herein as "Parties."

I. RECITALS

This MOU is made with reference to the following recitals:

A. The Port Infrastructure Development Program (PIDP) is a discretionary grant program administered by the U.S. Maritime Administration (MARAD). Funds for the PIDP are awarded on a competitive basis to projects that improve the safety, efficiency, or reliability of the movement of goods into, out of, around, or within a port.

B. POLB is applying to the PIDP for the Middle Harbor Terminal (MHT) Zero Emission Conversion Project that includes the acquisition of 60 manually operated, electrified (battery-powered) yard tractors and the supporting battery charging equipment/infrastructure for a fully functional horizontal cargo transport system at Long Beach Container Terminal (the Project). The Project is designed to help Long Beach Container Terminal become the cleanest terminal in the world by meeting the aggressive goal of becoming the first Net Zero Marine Terminal and more directly supporting the San Pedro Bay Ports' Clean Air Action Plan goal of zero emissions terminal operations by 2030.

C. POLB and LBCT are partnering in the implementation of the Project. The two entities have participated in all phases of the state-of-the-art MHT development. MHT is also an integral part of the POLB and State of California zero emissions goals. Together, they provide a measure of cleaner air within the communities of the San Pedro Bay region.

D. By converting to zero emissions Cargo Handling Equipment (CHE), the Port of Long Beach and LBCT are helping to accomplish the PIDP program goals of improving the safety, efficiency, and reliability of the movement of goods into, out of and around the San Pedro Port Complex, and improving the air quality for the region. Acquisition of zero emissions CHE and construction of the fleet charging station infrastructure are projected to improve LBCT's ability to provide a high level of service to its customers and the region at large while reducing emissions for the community.

E. The Project seeks to support zero-emission goals established by LBCT, POLB, and the State of California. Specifically:

1. POLB's goal of zero emission cargo handling equipment by 2030 in the Clean Air Action Plan Update adopted in 2017;

2. LBCT's goal of net-zero operations by 2030; and

3. The State of California's goal, established through Executive Order N-79-20, of 100 percent zero-emission off-road vehicles and equipment operations in the State of California by 2035.

F. The Parties are hereby entering into this MOU in order to satisfy the requirement of MARAD and PIDP that partnership entities applying for and participating in PIDP-funded projects shall execute an MOU setting forth their roles and responsibilities.

II. NOW, THEREFORE, in consideration of the foregoing, and the mutual undertakings contained herein, the Parties hereby agree as follows:

A. POLB's Roles and Responsibilities: POLB shall be responsible for:

1. Being the lead applicant and being the primary point of contact for the award;

2. Financial administration of the Project;

3. Submission of the PIDP 2022 application;

4. Upon receipt of award, enter into a grant agreement with MARAD and a subgrant agreement with LBCT;

5. Submission of required PIDP reports, including, but not limited to:

   i. Progress Reports

   ii. Outcome Performance Reports

   iii. Port Performance Reports

6. Submission of PIDP reimbursement requests;

7. Review, consideration, and approval of Harbor Development Permit (HDP) pursuant to the California Environmental Quality Act and Certified Port Master Plan; and

8. Submitting changes to the scope of work or schedule to MARAD for its approval in accordance with the terms and conditions of the MARAD grant agreement.

B. LBCT, LLC's Roles and Responsibilities: LBCT, LLC shall be responsible for:

1. Being the primary recipient of the award;

2. Preparing the PIDP 2022 application package, including successful addressal of all of the PIDP 2022 eligibility requirements and evaluation criteria;

3. Provision of any supporting documentation required for contract execution between the Port and MARAD, or POLB and LBCT;

4. Execution of a subgrant agreement with POLB should POLB receive a PIDP grant award;

5. Collection of performance measurement data that is outlined in the Port contract with MARAD; Development and submission to the Port of any PIDP performance or progress reports, and Port Performance Reports as required by the terms and conditions of the Port contract with MARAD, and all required supporting documentation;

6. Development of timely PIDP reimbursement requests and supporting documentation to be submitted to POLB;

7. Non-federal cost share requirements of the PIDP award, including project cost overruns;

8. Ensuring the activities and contracts performed to execute this project comply with the contract between the Port and MARAD, and that funds provided under this MOU are not expended on costs that are not allowable under PIDP or not allocable to this funding.

9. Keep all project accounts and records that fully disclose the amount and disposition by LBCT LLC, the total cost of the project, and the amount or nature of that portion of the cost of the Project supplied by other sources, and any other financial records related to the project.

10. Keep accounts and records as required by the Port contract with MARAD to facilitate an effective and successful audit. Include in all contracts in excess of $2,000 for work on the Project that involves labor, provisions establishing minimum rates of wages, to be predetermined by the United States Secretary of Labor, in accordance with the Davis-Bacon Act, 40 U.S.C. 3141 to 3148, or 23 U.S.C. 113, as applicable, that contractors shall pay to skilled and unskilled labor, and such minimum rates shall be stated in the

invitation for bids and shall be included in proposals or bids for the work.

11. Project implementation, including design, bid, and build of the project;

12. Coordination with project partners including POLB, Southern California Edison, original equipment manufacturers, technology developers, and contractors;

13. Developing a schedule and implementing the Project in accordance with that schedule;

14. Meeting the obligations of the grant prior to the grant liquidation deadline, as defined by the master contract between POLB and MARAD;

15. Compliance with all applicable local, State, or Federal permitting requirements;

16. Payment for required permits;

17. Ensuring that all Electric Vehicle Supply Equipment deployed are UL certified or certified by an OSHA Nationally Recognized Training Laboratory;

18. Submission of an HDP application to POLB;

19. Applying for infrastructure dollars under the SCE Charge Ready Program; and

20. Overseeing and paying for any required data collection.

21. Notifying the Port within 15 calendar days of any change in key personnel identified in the grant application.

22. Compliance with the Buy American requirements outlined in the contract between the Port and MARAD.

23. Changes to the scope of the project or project schedule must be submitted to the Port and ultimately approved by MARAD.

24. Compliance with the Small and Disadvantaged Business Requirements outlined in the contract between the Port and MARAD.

25. Compliance with the Engineering and Design Services requirements outlined in the contract between the Port and MARAD.

26. Compliance with the Foreign Market Restrictions outlined in the contract between the Port and MARAD.

27. Compliance with the Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment outlined in the contract between the Port and MARAD.

28. Compliance with the Timing of Project Costs outlined in the contract between the Port and MARAD.

29. Request reimbursement only after the Port has entered into an obligation with MARAD.

C. Term: This MOU shall be in full force and effect when signed by all Parties and shall remain in effect for the full term of the grant.

D. Modification in Writing: The Parties anticipate amending this MOU upon award of a grant to POLB to ensure that the terms and conditions of the master contract between the Port and MARAD are included in the roles and responsibilities set forth in this MOU. This MOU may be modified, amended or terminated only by a written agreement signed by all the Parties.

E. Notice: All notices to be given under this MOU shall be in writing and either sent by a nationally recognized overnight courier service, in which case notice shall be deemed delivered as of the date shown on the courier's delivery receipt; or sent by telecopy during business hours of the recipient, with a copy of the notice also deposited in the United States mail (postage prepaid) the same business day, in which case notice shall be deemed delivered on transmittal by telecopier provided that a transmission report is generated reflecting the accurate transmission of the notices, or sent by United States mail, postage prepaid, in which case notice shall be deemed delivered as of two business days after deposit in the mail, addressed as follows:

The Port of Long Beach
415 W. Ocean Boulevard
Long Beach, CA 90802
Attention: Morgan Caswell

With a copy to:

Long Beach City Attorney
City of Long Beach, 9th Floor
411 W. Ocean Blvd.
Long Beach, CA 90802
Attn: Harbor Department

LBCT, LLC
1171 Pier F Avenue
Long Beach, California 90802

These addresses may be changed by written notice to the other party provided that no notice of a change of address shall be effective until actual receipt of the notice. Copies of notices are for informational purposes only, and a failure to give or receive copies of any notice shall not be deemed a failure to give notice.

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[signatures on next page]

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This MOU has been entered into and executed by:

LBCT, LLC

May 5, 2022

By: _____
Name: Anthony Otto
Title: CEO

CITY OF LONG BEACH, California, acting by and through its Board of Harbor Commissioners

By: _____
Name: Mario Cordero
Title: Executive Director

The foregoing document is hereby approved as to form.

CHARLES PARKIN, City Attorney

May 13, 2022

Sudhir N. Lay

Sudhir N. Lay, Deputy

ATTACHMENTS FORM

Instructions: On this form, you will attach the various files that make up your grant application. Please consult with the appropriate Agency Guidelines for more information about each needed file. Please remember that any files you attach must be in the document format and named as specified in the Guidelines.

Important: Please attach your files in the proper sequence. See the appropriate Agency Guidelines for details.

1) Please attach Attachment 1	1235-POLB PIDP 2022 Applicati	Add Attachment	Delete Attachment	View Attachment
2) Please attach Attachment 2	1236-POLB PIDP BCA Spreadshee	Add Attachment	Delete Attachment	View Attachment
3) Please attach Attachment 3	1237-PIDP 2022 MOU Between th	Add Attachment	Delete Attachment	View Attachment
4) Please attach Attachment 4		Add Attachment	Delete Attachment	View Attachment
5) Please attach Attachment 5		Add Attachment	Delete Attachment	View Attachment
6) Please attach Attachment 6		Add Attachment	Delete Attachment	View Attachment
7) Please attach Attachment 7		Add Attachment	Delete Attachment	View Attachment
8) Please attach Attachment 8		Add Attachment	Delete Attachment	View Attachment
9) Please attach Attachment 9		Add Attachment	Delete Attachment	View Attachment
10) Please attach Attachment 10		Add Attachment	Delete Attachment	View Attachment
11) Please attach Attachment 11		Add Attachment	Delete Attachment	View Attachment
12) Please attach Attachment 12		Add Attachment	Delete Attachment	View Attachment
13) Please attach Attachment 13		Add Attachment	Delete Attachment	View Attachment
14) Please attach Attachment 14		Add Attachment	Delete Attachment	View Attachment
15) Please attach Attachment 15		Add Attachment	Delete Attachment	View Attachment

OMB Number: 4040-0004
Expiration Date: 12/31/2022

Application for Federal Assistance SF-424

* 1. Type of Submission:
- [ ] Preapplication
- [x] Application
- [ ] Changed/Corrected Application

* 2. Type of Application:
- [x] New
- [ ] Continuation
- [ ] Revision

* If Revision, select appropriate letter(s):

* Other (Specify):

* 3. Date Received: 05/15/2022

4. Applicant Identifier:

5a. Federal Entity Identifier:

5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: Long Beach, City of

* b. Employer/Taxpayer Identification Number (EIN/TIN): (b)(4)

* c. UEI: (b)(4)

d. Address:

* Street1: 415 W. Ocean Blvd.
Street2:
* City: Long Beach
County/Parish:
* State: CA: California
Province:
* Country: USA: UNITED STATES
* Zip / Postal Code: 90802-4511

e. Organizational Unit:

Department Name: Harbor Department

Division Name: Port of Long Beach

f. Name and contact information of person to be contacted on matters involving this application:

Prefix: Ms.
* First Name: Morgan
Middle Name:
* Last Name: Caswell
Suffix:

Title: Manager of Air Quality Practices

Organizational Affiliation: City of Long Beach, Harbor Department

* Telephone Number: 562-283-7138
Fax Number:

* Email: morgan.caswell@polb.com

Application for Federal Assistance SF-424

*** 9. Type of Applicant 1: Select Applicant Type:**

C: City or Township Government

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

Maritime Administration

11. Catalog of Federal Domestic Assistance Number:

20.823

CFDA Title:

Port Infrastructure Development Program

*** 12. Funding Opportunity Number:**

MA-PID-22-001

* Title:

2022 Port Infrastructure Development Program Grants

13. Competition Identification Number:

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

1234-Affected Areas Map (South Coast Air Ba | Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

Middle Harbor Terminal Zero Emissions Conversion Project

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant: CA-047 * b. Program/Project: CA-047

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 04/01/2025 * b. End Date: 09/30/2027

18. Estimated Funding ($):

* a. Federal	30,141,080.00
* b. Applicant	0.00
* c. State	0.00
* d. Local	0.00
* e. Other	7,535,270.00
* f. Program Income	0.00
* g. TOTAL	37,676,350.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☒ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

☐ Yes ☒ No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: Ms. * First Name: Morgan

Middle Name:

* Last Name: Caswell

Suffix:

* Title: Manager of Air Quality Practices

* Telephone Number: 562-283-7138 Fax Number:

* Email: morgan.caswell@polb.com

* Signature of Authorized Representative: Morgan Caswell * Date Signed: 05/15/2022

OMB Number: 4040-0008
Expiration Date: 02/28/2025

BUDGET INFORMATION - Construction Programs

NOTE: Certain Federal assistance programs require additional computations to arrive at the Federal share of project costs eligible for participation. If such is the case, you will be notified.

COST CLASSIFICATION	a. Total Cost	b. Costs Not Allowable for Participation	c. Total Allowable Costs (Columns a-b)
1. Administrative and legal expenses	$	$	$
2. Land, structures, rights-of-way, appraisals, etc.	$	$	$
3. Relocation expenses and payments	$	$	$
4. Architectural and engineering fees	$ 1,981,000.00	$	$ 1,981,000.00
5. Other architectural and engineering fees	$ 442,000.00	$	$ 442,000.00
6. Project inspection fees	$ 884,000.00	$	$ 884,000.00
7. Site work	$	$	$
8. Demolition and removal	$	$	$
9. Construction	$ 7,683,000.00	$	$ 7,683,000.00
10. Equipment	$ 24,318,000.00	$	$ 24,318,000.00
11. Miscellaneous	$	$	$
12. SUBTOTAL *(sum of lines 1-11)*	$ 35,308,000.00	$	$ 35,308,000.00
13. Contingencies	$ 2,368,350.00	$	$ 2,368,350.00
14. SUBTOTAL	$ 37,676,350.00	$	$ 37,676,350.00
15. Project (program) income	$	$	$
16. TOTAL PROJECT COSTS *(subtract #15 from #14)*	$ 37,676,350.00	$	$ 37,676,350.00

FEDERAL FUNDING

17. Federal assistance requested, calculate as follows: (Consult Federal agency for Federal percentage share.) Enter the resulting Federal share.	Enter eligible costs from line 16c Multiply X 80 %	$ 30,141,080.00

DISCLOSURE OF LOBBYING ACTIVITIES

Complete this form to disclose lobbying activities pursuant to 31 U.S.C.1352

OMB Number: 4040-0013
Expiration Date: 02/28/2025

1. * Type of Federal Action:
- [ ] a. contract
- [x] b. grant
- [ ] c. cooperative agreement
- [ ] d. loan
- [ ] e. loan guarantee
- [ ] f. loan insurance

2. * Status of Federal Action:
- [ ] a. bid/offer/application
- [x] b. initial award
- [ ] c. post-award

3. * Report Type:
- [x] a. initial filing
- [ ] b. material change

4. Name and Address of Reporting Entity:

[x] Prime [ ] SubAwardee

** Name:* City of Long Beach, Harbor Department

** Street 1:* 415 W. Ocean Blvd. *Street 2:*

** City:* Long Beach *State:* CA: California *Zip:* 90802-4511

Congressional District, if known: CA-047

5. If Reporting Entity in No.4 is Subawardee, Enter Name and Address of Prime:

6. * Federal Department/Agency:
Maritime Administration

7. * Federal Program Name/Description:
Port Infrastructure Development Program

CFDA Number, *if applicable:* 20.823

8. Federal Action Number, *if known:*

9. Award Amount, *if known:*
$

10. a. Name and Address of Lobbying Registrant:

Prefix: ** First Name:* Julie *Middle Name:*

** Last Name:* Minerva *Suffix:*

** Street 1:* Carpi & Clay Inc. *Street 2:* 601 New Jersey Ave. NW, Suite 300

** City:* Washington *State:* DC: District of Columbia *Zip:* 20001

b. Individual Performing Services (including address if different from No. 10a)

Prefix: ** First Name:* Susan *Middle Name:*

** Last Name:* Lent *Suffix:*

** Street 1:* Akin Gump Strauss Hauer & Feld LLP *Street 2:* 2001 K Street N.W.

** City:* Washington *State:* DC: District of Columbia *Zip:* 20006

11. Information requested through this form is authorized by title 31 U.S.C. section 1352. This disclosure of lobbying activities is a material representation of fact upon which reliance was placed by the tier above when the transaction was made or entered into. This disclosure is required pursuant to 31 U.S.C. 1352. This information will be reported to the Congress semi-annually and will be available for public inspection. Any person who fails to file the required disclosure shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

*** Signature:** Morgan Caswell

***Name:** *Prefix:* Ms. ** First Name:* Morgan *Middle Name:*

** Last Name:* Caswell *Suffix:*

Title: Manager of Air Quality Practices **Telephone No.:** 562-283-7138 **Date:** 05/15/2022

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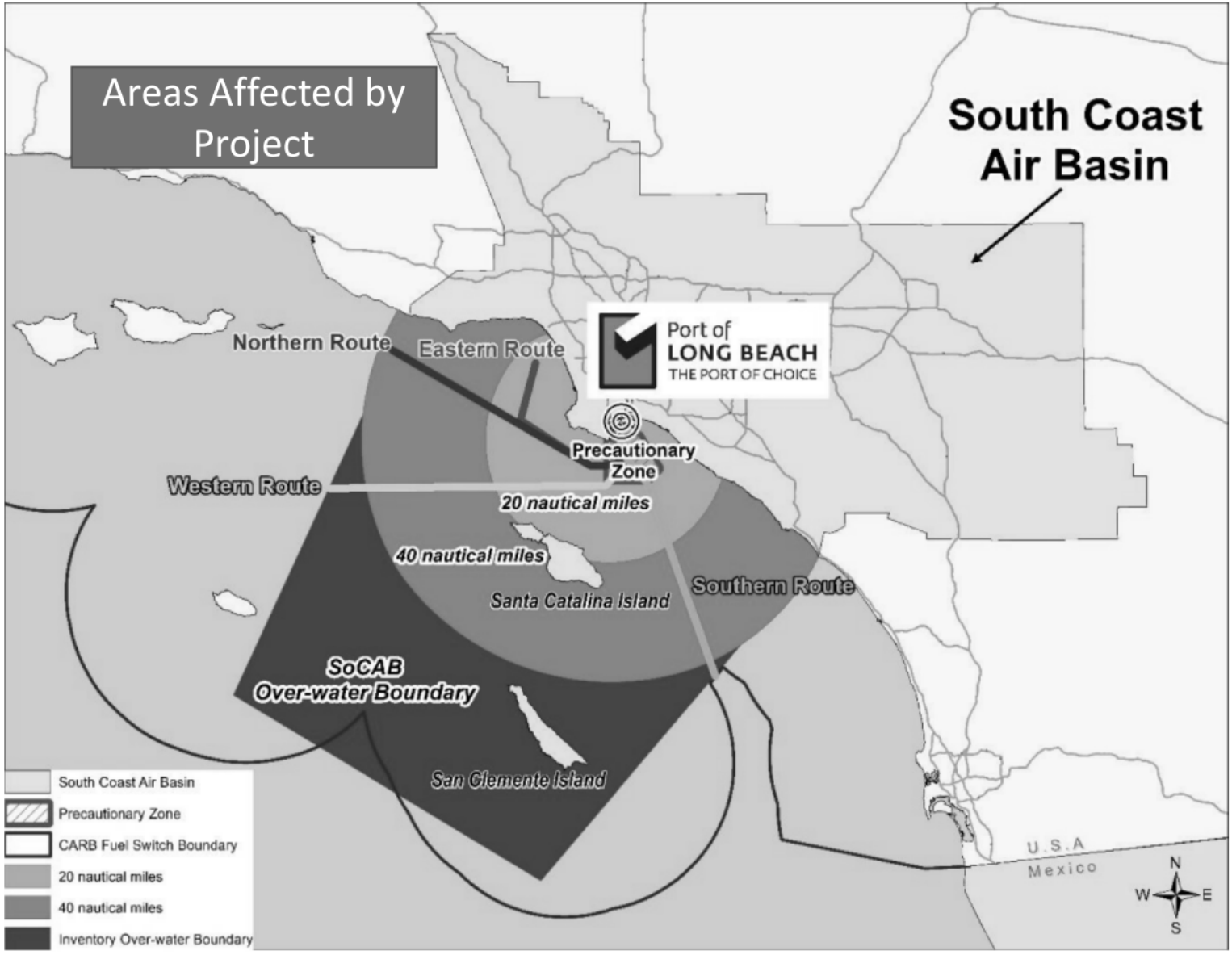
Areas Affected by Project
South Coast Air Basin
Port of LONG BEACH
THE PORT OF CHOICE
Northern Route
Eastern Route
Western Route
Precautionary Zone
20 nautical miles
40 nautical miles
Santa Catalina Island
Southern Route
SoCAB Over-water Boundary
San Clemente Island
U.S.A
Mexico
N
W
E
S
South Coast Air Basin
Precautionary Zone
CARB Fuel Switch Boundary
20 nautical miles
40 nautical miles
Inventory Over-water Boundary