BOARD OF DIRECTORS
EAST BAY MUNICIPAL UTILITY DISTRICT

375 - 11th Street, Oakland, CA 94607 Office of the Secretary: (510) 287-0440

Notice of Location Change

Sustainability/Energy Committee
Tuesday, April 26, 2022
9:00 a.m.
Boardroom
375 11th Street
Oakland, CA 94607

Notice is hereby given that the Tuesday, April 26, 2022 Sustainability/Energy Committee Meeting of the Board of Directors will be held in the Administration Building Boardroom, 375 - 11th Street, Oakland, California.

Dated: April 21, 2022

Rischa S. Cole

Rischa S. Cole, Secretary of the District

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BOARD OF DIRECTORS
EAST BAY MUNICIPAL UTILITY DISTRICT

375 - 11th Street, Oakland, CA 94607 Office of the Secretary: (510) 287-0440

AGENDA
Sustainability/Energy Committee
Tuesday, April 26, 2022
9:00 a.m.
Boardroom
375 11th Street
Oakland, CA 94607

Committee Members: Marguerite Young {Chair}, Andy Katz and Frank Mellon

***** Please see appendix for public participation instructions*****

ROLL CALL:

PUBLIC COMMENT: The Board of Directors is limited by State law to providing a brief response, asking questions for clarification, or referring a matter to staff when responding to items that are not listed on the agenda.

DETERMINATION AND DISCUSSION:

1. Main Wastewater Treatment Plant Workplace Electric Vehicle Charging Pilot Results (White)
2. Green Fleet Roadmap (Ambrose)
3. Annual Integrated Pest Management Program Update (Briggs)

ADJOURNMENT:

Disability Notice

If you require a disability-related modification or accommodation to participate in an EBMUD public meeting please call the Office of the Secretary (510) 287-0404. We will make reasonable arrangements to ensure accessibility. Some special equipment arrangements may require 48 hours advance notice.

Document Availability

Materials related to an item on this agenda that have been submitted to the EBMUD Board of Directors within 72 hours prior to this meeting are available for public inspection in EBMUD's Office of the Secretary at 375 11th Street, Oakland, California, during normal business hours, and can be viewed on our website at www.ebmud.com.

APPENDIX

Sustainability/Energy Committee Meeting
Tuesday, April 26, 2022 - 9:00 a.m.

EBMUD public Board meetings will be conducted in person in the Boardroom and via Zoom. These meetings are recorded, live-streamed, and posted on the District's website.

In Person

- In accordance with county health guidance and Cal/OSHA requirements, a completed COVID-19 symptoms checklist will be required before entering the building.
- In accordance with District safety protocols, masks are required while in the building and Boardroom regardless of vaccination status.

*Online**
https://ebmud.zoom.us/j/91818373049?pwd=MTl1UHpFaU54SjJzZmV0QlhmUkJTQT09
Webinar ID: 918 1837 3049
Passcode: 834363

*By Phone**
Telephone: 1 669 900 6833
Webinar ID: 918 1837 3049
Passcode: 834363
International numbers available: https://ebmud.zoom.us/u/kOEfToaYr

*To familiarize yourself with Zoom, please visit https://support.zoom.us/hc/en-us/articles/201362193-Joining-a-Meeting

Providing public comment - *The EBMUD Board of Directors is limited by State law to providing a brief response, asking questions for clarification, or referring a matter to staff when responding to items that are not listed on the agenda.*

- Each speaker is allotted 3 minutes to speak; the Board President has the discretion to amend this time based on the number of speakers
- The Secretary will track time and inform each speaker when the allotted time has concluded
- Comments on **non-agenda items** will be heard at the beginning of the meeting
- Comments on **agenda items** will be heard when the item is up for consideration
- The Secretary will call each speaker in the order received

In person

- Fill out and submit a blue speaker card which is available in the foyer of the Boardroom

Via Zoom

- Use the raise hand feature in Zoom to indicate you wish to make a public comment https://support.zoom.us/hc/en-us/articles/205566129-Raising-your-hand-in-a-webinar
  - If you participate by phone, press *9 to raise your hand
- When prompted by the Secretary, please state your name, affiliation if applicable, and topic

Submitting written comments or materials

- Email written comments or other materials for the Board of Directors to SecOffice@ebmud.com
- Please indicate the meeting date and agenda item number or non-agenda item in the subject of the email. Contact information is optional.
- **Please email by 4 p.m. the day prior to the scheduled regular meeting**; written comments and other materials submitted to the Board of Directors will be filed in the record.

To *observe* the Sustainability/Energy Committee Meeting, please visit: https://www.ebmud.com/about-us/board-directors/board-meetings/

EAST BAY MUNICIPAL UTILITY DISTRICT

DATE: April 21, 2022

MEMO TO: Board of Directors

THROUGH: Clifford C. Chan, General Manager CCC

FROM: Eileen M. White, Director of Wastewater EMW

SUBJECT: Main Wastewater Treatment Plant Workplace Electric Vehicle Charging Pilot Results

SUMMARY

Staff has completed a one-year pilot to study workplace electric vehicle (WEV) charging at the Main Wastewater Treatment Plant (MWWTP) as presented to the Sustainability/Energy Committee on July 28, 2020. Results of the pilot study indicate that WEV charging at this location supports multiple sustainability benefits and costs can be fully recovered within the lifetime of a full-scale program. WEV charging involves selling renewable electricity produced onsite as a cost-effective, low-carbon transportation fuel for employees who commute to the MWWTP. The pilot study was well used by District employees at the MWWTP. Staff will provide the pilot study results and recommendations for next steps at the April 26, 2022 Sustainability/Energy Committee meeting.

DISCUSSION

The pilot study was active between February 2021 and January 2022. Two dual-charging stations capable of charging four vehicles simultaneously were installed and dedicated for employee use. The chargers were installed by staff with an equipment cost of approximately $3,000. Employees using the chargers paid for their use and accessed the chargers using a keypad and code. Staff collected data on energy and cost, and conducted a user survey to gain additional information.

Operational Considerations and Feasibility

During the pilot study, staff tested two payment methods: a monthly unlimited subscription model and an hourly payment model. Both methods proved feasible. Nine employees participated in the pilot study, with an average of six employees charging each day. The hourly payment model is recommended for full-scale application because it is easier to administer and reduces charging station congestion. The user survey revealed that for some employees, having the chargers at the MWWTP was a significant factor in their purchase of an electric vehicle and that others plan to purchase an electric vehicle if the WEV chargers become permanent.

Financial Analysis

During the pilot study, the monthly revenue was sufficient to cover the cost of electricity and recover initial capital cost within the project lifetime. WEV charging at the MWWTP also creates value via generation of Low Carbon Fuel Standard (LCFS) credits. As part of the pilot study, 14 LCFS credits were generated representing avoided emissions of 14 metric tons of carbon dioxide equivalent (MT CO_2e). Potential sale of these LCFS credits, valued at approximately $120 per MT CO_2e, would further strengthen the financial viability of the WEV charging program and provide funding for additional stations at the MWWTP.

Sustainability

User feedback during the pilot study was overwhelmingly positive and the number of electric vehicles used to commute to the MWWTP increased over the pilot period, likely influenced by the WEV charging availability. Users reported that having the WEV charging provided an incentive to commute by electric vehicle and was also a great value. Users also appreciated being able to commute using renewable power generated at the MWWTP where they work.

NEXT STEPS

Staff recommends continued use of the dual chargers at the MWWTP for WEV charging with the hourly payment system. Given the strong interest among MWWTP employees, staff recommends installation of additional charging stations at the MWWTP to increase the number of users, ease charging congestion, and to use more renewable energy as low-carbon fuel. Staff will continue to investigate potential grant opportunities to support expanding WEV charging at the MWWTP and will pursue the sale of LCFS credits generated by WEV charging at the MWWTP.

CCC:EMW

EAST BAY MUNICIPAL UTILITY DISTRICT

DATE: April 21, 2022

MEMO TO: Board of Directors

THROUGH: Clifford C. Chan, General Manager

FROM: Michael R. Ambrose, Manager of Maintenance and Construction

SUBJECT: Green Fleet Roadmap

SUMMARY

The District operates a fleet of over 1,200 vehicles and equipment. All passenger vehicles are either hybrid, plug-in hybrid, or fully-electric. However, the remaining 1,188 vehicles and equipment are powered by internal combustion engines. The District's goal is to be carbon neutral for its greenhouse gas (GHG) emissions, including direct emissions from the fleet. Draft regulations will require more zero emission (battery electric or hydrogen fuel cell) vehicles in public and private fleets to help California meet its statewide emission reduction goals. Staff will present the District's approach to lowering direct emissions from the fleet and meet future regulations at the April 26, 2022 Sustainability/Energy Committee meeting.

DISCUSSION

The transportation sector is the largest single contributor of GHGs in California, accounting for over 40 percent of statewide emissions in 2018. California and other states are promulgating regulations mandating increased zero-emission vehicle (ZEV) truck purchases beginning in 2024. These new regulations will impact future District vehicle procurement.

The District operates a diverse fleet of vehicles and equipment to meet its operational needs. The fleet's GHG emissions have steadily declined from 7,523 metric tons (MT) in 2012 to 4,089 MT in 2020, and accounted for approximately 15 percent of the District's overall GHG inventory. The District's goal is to be carbon neutral for its indirect and direct GHG emissions for the Water System by 2030 per Policy 7.07 – Energy.

The District has been investing in more fuel-efficient, light-duty vehicles to reduce operating costs and carbon emissions. In 2020, the District purchased eight battery-electric Chevrolet Bolts for the vehicle pool. Advanced technologies for medium and heavy-duty vehicles have not been readily available, so the District's strategy has been limited to use of lower-emission alternative fuels. ZEVs can be very costly and require significant investment in new fueling or charging infrastructure. To help accelerate the development of medium and heavy-duty vehicles, the District is engaging with industry groups (CALSTART, East Bay Clean Cities, and the California Municipal Utilities Association) and manufacturers (John Deere, Freightliner, Zeus Electric Chassis, Ford, and Volvo) to communicate District requirements.

Staff has prepared the Green Fleet Roadmap (attached) to describe strategies to meet the District's goals and comply with future regulations including:

- Leveraging alternative fuels to minimize use of fossil fuels and reduce GHG emissions
- Collecting better fleet operational data to identify appropriate replacement technologies and support future planning
- Piloting ZEV technologies
- Incorporating green fleet technology into facility capital planning and future vehicle and equipment procurement
- Collaborating with internal and external stakeholders to gather knowledge, successfully innovate, catalyze development of medium and heavy-duty vehicles, and incorporate new technologies into the District's operations

The roadmap will be used to communicate both internally and externally the process for meeting the District's goal to be carbon neutral for its fleet operation.

NEXT STEPS

Staff will begin implementing the strategies in the Green Fleet Roadmap and educating stakeholders on the District's plan to ensure the fleet can meet the District's goals and regulatory requirements.

CCC:MRA:sd

Attachment: Green Fleet Roadmap

GREEN FLEET ROADMAP

East Bay Municipal Utility District

April 2022

East Bay Municipal Utility District

Contents

Green Fleet Roadmap
April 2022

INTRODUCTION

The District operates and maintains a large fleet of vehicles that needs to be reliable, sustainable, and resilient in support of the Districts operations in normal and emergency conditions. The District has a goal to reduce greenhouse gas emissions (GHGs) including from its fleet operations, which is consistent with regulatory mandates to move towards Zero Emission Vehicles (ZEVs). Reducing emissions and converting a fleet to ZEVs will require a culture shift and significant investment in new vehicles, equipment, and infrastructure.

It is essential to develop a strategic plan to achieve the goals efficiently and cost-effectively. This roadmap defines and communicates the major steps and strategies to meet the District's goals and upcoming regulatory requirements. This plan is a high-level document for informing the organization, presenting strategies for implementation, and aligning stakeholders. This roadmap will be used to guide future capital improvement plans, facility plans, and fleet procurements.

1. BACKGROUND

1.1 Current Fleet Inventory

The District's current fleet is comprised of various vehicles and equipment for transportation and construction). The fleet includes hybrid electric vehicles, fully-electric vehicles, as well as many internal combustion powered vehicles for both on and off-road use. The current book value of the fleet is about $88 million; however, the replacement value is much more due to depreciation.

Most of the fleet's emissions are from gasoline (3,668 MT) with the remainder from petroleum diesel (451 MT). Biogenic fuels such as renewable diesel are considered to be emissions-free.

Fuel	Quantity (gal)	Emissions (MT)
Gasoline	414,396	3,668
Diesel	37,858	451
Renewable Diesel	361,994	0
Total		4,089

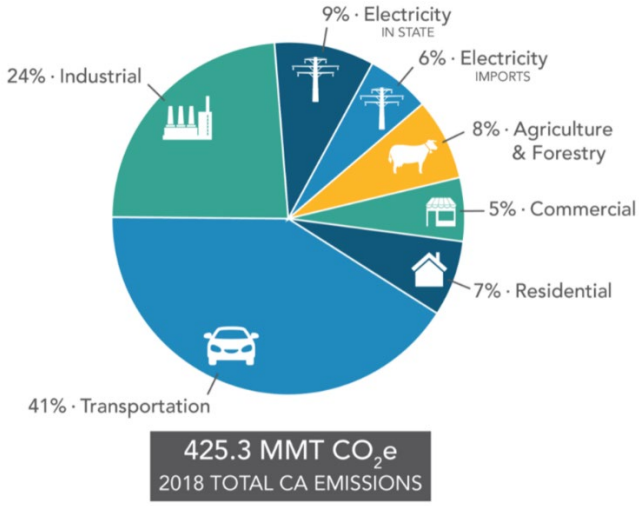
The District has 22 gasoline and diesel fueling facilities at District locations to ensure reliable fuel access and allow the District to leverage a tax exemption for fuel, which reduces the District's operating costs.

1.2 Main Drivers to Green the Fleet

The District is an environmental steward and part of our mission is to preserve and protect the environment for future generations. In September 2020, the District updated its energy policy to be carbon neutral for its operations by 2030 for the water system operations, which includes the operation of the District's fleet. Reducing vehicle emissions and increasing fuel economy/vehicle efficiency helps the environment and reduces costs.

1.2.1 Legal/Regulatory drivers to adopt ZEVs in California

The California Air Resources Board (CARB) conducts an annual statewide GHG emission inventory as a tool for establishing historical emission trends and tracking California's progress in reducing GHGs. The inventory provides estimates of anthropogenic GHG emissions within California, as well as emissions associated with imported electricity; natural (biogenic) sources are not included in the inventory. The 2018 inventory is shown below.



The transportation sector, including all passenger cars and light trucks, heavy-duty trucks, off-road vehicles, and the fuels needed to power them, is responsible for the highest percentage of California's GHG emissions. In September 2020, Governor Newsom issued Executive Order N-79-20 which established goals and measures to eliminate harmful emissions from the transportation sector including:

- 100 percent of in-state sales of new passenger cars and trucks will be ZEVs by 2035.
- 100 percent of medium- and heavy-duty vehicles in the State will be ZEVs by 2045 for all operations where feasible and by 2035 for drayage trucks.
- Transition to 100 percent ZEVs for off-road vehicles and equipment by 2035 where feasible

The order directed specific state agencies to develop regulations in support of these goals. The CARB Advanced Clean Trucks rule requires increasing ZEVs for purchases from 2024 to 2035 by public fleets for vehicles with manufacturer's gross vehicle weight rating greater than 8,500 pounds purchases. This includes some light- duty and all medium- and heavy-duty vehicles. CARB's Advanced Clean Fleets rule which is currently being developed will require:

- ZEV purchases required when adding to the fleet
    - 50 percent of 2024-2026 model year vehicles must be ZEVs
    - 100 percent of 2027 and newer model years must be ZEVs
- Plug-in hybrids (NZEVs) count as ZEVs until 2035

The state is making significant efforts to promote ZEVs and create new markets, and its leadership and ability to catalyze markets could be very impactful. The District must be ready to leverage these changes as they occur.

1.2.2 District Commitments and Actions

District Policy 7.07 –Energy has a GHG reduction goal for the water system to eliminate GHG emissions for indirect and direct emissions by 2030. For the purposes of GHG tracking, the fleet is considered part of the water system. In 2020, fleet emissions were 4,089 Metric Tons or 15 percent of the District's emissions overall. Most of the fleet's emissions are from gasoline (3,668 MT from 414,396 gallons) with the remainder from petroleum diesel (451 MT from 37,858 gallons). In addition, 361,994 gallons of renewable diesel was used; these emissions are considered biogenic which means they do not count against the District's inventory. In general, the light-duty and some medium-duty vehicles use gasoline, diesel fuel is used in some medium-duty and all heavy-duty equipment.

District Policy 7.15 – Climate Action acknowledges the impacts of climate change and directs staff to take appropriate action to understand, mitigate and adapt to those impacts through sustainable activities. The policy has several objectives relevant to this plan including the following:

- Reduce GHG emissions consistent with the District's Energy Policy;
- Collaborate with public agencies, researchers, regulators, utilities and communities to develop sustainable solutions;
- Educate communities and employees on the impacts of climate change; and
- Take a leadership role in the industry and the community in addressing climate change.

This plan describes a path forward to support the goals and objectives of these District policies.

1.2.2.1 CALSTART

In 2020, the District joined CALSTART, which is a nonprofit organization working with businesses and government agencies to develop clean, efficient transportation solutions. CALSTART provides members with a network of clean transportation businesses, researchers, and government entities. Its goals are to provide information on leading-edge technologies, funding sources, and policy guidance. The District joined this organization to identify medium- and heavy-duty vehicle technologies that will help the District meet its GHG reduction goal and comply with current and future regulations.

1.2.2.2 Drive to Zero Pledge

In 2020, the District became the first water utility to sign the Drive to Zero pledge, committing our support to accelerate the growth of global zero- and near-zero-emission commercial vehicles. The Drive to Zero effort envisions that ZE technology will be commercially viable by 2025 and dominate by 2040 in specific vehicle segments and regions. The pledge includes working with others to coordinate activities, share strategies and best practices and build supporting actions to drive change. Pledge partners include cities, national and regional government agencies, manufacturers, fleets, fuel/energy suppliers such as

East Bay Community Energy, and regulators including CARB and the Bay Area Air Quality Management District.

2. PROGRAM GOALS

The projects and actions identified in this plan must support several specific goals to make the fleet more sustainable and resilient:

- Eliminate use of fossil fuels
- Reduce GHG emissions to meet District goals and reduce air pollution in the communities we serve.
- Ensure District can support mission
- Maintain resilience of fleet operations
- Ensure compliance with CARB fleet regulations regarding ZEVs

3. RISKS AND CHALLENGES

In implementing this plan, there are risks that must be identified and mitigated, and challenges that need to be addressed. The most significant risks and challenges to transforming the fleet include:

- Regulations such as Advanced Clean Fleets rule are not final or are not sustained.
- ZEV technology is still developing, and markets are just now emerging.
- There are very few or no ZEVs or NZEVs available for medium- and heavy-duty vehicles including construction equipment.
- Vehicles that power ancillary equipment are difficult to convert to EVs because electric Powered Take-Offs (PTOs) are not widely available (only for boom trucks).
- The District fleet has multiple uses for vehicles that have high variability not ideal for moving to ZEVs.
- Many vehicles are not located near District facilities during off hours for charging (e.g., take-home vehicles and construction equipment).
- The cost and complexity of developing District facility fueling/charging infrastructure to support ZEVs is high.
- The fueling/charging supply infrastructure (especially hydrogen) is not well developed.
- Events such as an earthquake could disrupt the fueling/charging infrastructure and hinder emergency response.

4. AREAS OF FOCUS FOR SUSTAINABILITY AND RESILIENCE

This plan focuses on several critical areas to manage the efficient and effective transition of the fleet while meeting the District's long-term operational needs and environmental goals.

4.1 Vehicles and Equipment

ZEVs are still a nascent technology and transient. There are many new vehicle and equipment manufacturers, vehicle and equipment manufacturers are expanding their product lines, and updated models are being developed. The technology is improving battery capacity, charging speeds, and enhancing vehicle capabilities. However, vehicle longevity and product support are somewhat uncertain.

The District must ensure the vehicles and equipment meet operational needs which includes understanding the range and power requirements, cargo capacity, passenger capacity, towing capability, and duty cycle. Some current District practices and operations may be altered to avoid certain vehicle requirements (e.g., PTO). Some vehicles operate only during business hours, some support continuous operations, and a third group must support emergency response operations. All these factors will determine the key specification requirements for procurement.

There are certain factors that will drive ZEV adoption in the industry including:

- Price of diesel and gasoline fuel
- Falling costs for batteries and fuel cells
- Rising costs for ICE powertrain emission controls as regulations become more stringent
- Rising battery pack energy density
- ZEV sales and/or purchase mandates

Ultimately, market demand will drive manufacturers to provide the vehicles and equipment. Current demand is high for light duty EVs (i.e., sedans, SUVs, and pickups), cargo vans, and box trucks. The demand for other vehicles and construction equipment (e.g., utility trucks, dump trucks, and excavators) that the District uses are lower which may result in less opportunities for conversion to ZEV technology. In addition, there are few suppliers of low emission or ZEVs for certain types of vehicles and equipment (e.g., vacuum excavator and dump trucks).

4.2 Fueling/Charging Infrastructure

Providing an appropriate fueling and charging infrastructure is as important as selecting the correct vehicles. The fueling/charging infrastructure must be in place before investing in ZEVs. Alternative fuels (e.g., renewable diesel) can be a bridge until new technologies are more readily available and may be a longer-term solution in certain cases.

4.2.1 Alternative fuels

Alternative fuels provide more sustainable options to traditional petroleum gasoline or diesel fuel that generate lower GHG emissions.

4.2.1.1 Renewable diesel

Renewable diesel is a biomass-derived transportation fuel suitable for use in diesel engines. It meets the same standards (ASTM D975) as petroleum diesel and is a "drop-in" replacement which requires no modification to the fueling infrastructure or vehicles.

Renewable diesel and biodiesel are not the same fuel. Renewable diesel is a hydrocarbon produced through various processes such as hydrotreating, gasification, pyrolysis, and other biochemical and thermochemical technologies. It meets ASTM D975 specification for petroleum diesel. Biodiesel is a mono-alkyl ester produced via transesterification. Biodiesel meets ASTM D6751 and is approved for blending with petroleum diesel.

The District is using renewable diesel in nearly every diesel-powered vehicle. Renewable diesel is readily available and can be purchased through the California Department of General Services (DGS) state contracts as R99 (99 percent renewable diesel). The price has been competitive with petroleum diesel. Since renewable diesel is completely biogenic, the emissions are not counted in the District's GHG inventory.

4.2.1.2 Renewable gasoline

Renewable gasoline (also known as biogasoline or "green" gasoline) is a biomass-derived transportation fuel suitable for use in spark-ignition engines. It meets the ASTM D4814 specification in the United States.

Renewable gasoline has been successfully piloted at 50 percent with petroleum gasoline in the City of Seattle. Two firms are developing production facilities. It is anticipated to be in commercial production in the next two or three years. Another company, Neste, is testing their renewable gasoline product in Sweden with potential for possible commercialization internationally. It is anticipated renewable gasoline will be available around 2023 or 2024.

So far, renewable gasoline has only been blended with petroleum gasoline and only up to 50 to 60 percent renewable gasoline. It is expected to completely replace petroleum gasoline when commercially available so the emissions would be biogenic and not counted against the District's GHG inventory.

4.2.2 Electricity

Using electricity to charge a large traction battery to power electric motors instead of an internal combustion engine has several advantages. Because it runs on electricity, the vehicle emits no exhaust from a tailpipe (i.e., no direct emissions) and requires less maintenance because there is no engine, oil filters, fuel pumps, etc. The disadvantages are the vehicles can take hours to charge, the charging infrastructure can be costly and require valuable space, and the batteries may need replacement before the vehicle has reached its end of useful life.

Although converting fleet vehicles and equipment to battery electric vehicles will reduce the District's overall emissions and reliance on fossil fuels, this action will transfer the District's fleet GHG emissions from direct to indirect emissions because electricity is not completely carbon free at this time. However, electric vehicles' emissions continue to decrease as the grid moves toward zero carbon energy sources whereas the fuel economy (and associated GHG emissions) of an ICE vehicle is fixed. California's electricity sector currently accounts for 15 percent of statewide GHG emissions. The 100 Percent Clean Energy Act of 2018 (SB 100, De León) sets a goal to power all retail electricity sold in California and state agency electricity needs with renewable and zero-carbon resources by 2045. In addition, the state's Renewables Portfolio Standard was updated to ensure that by 2030 at least 60 percent of California's electricity is renewable.

There are currently three different types of EV chargers: Level 1, Level 2, and Direct Current Fast Charging (DCFC or Level 3). In Level 1 and 2, the EV is connected to AC power, 120V or 240V respectively, and a battery charger in the EV converts the AC power to the DC needed to charge the battery and controls the charging process. In DCFC, the charger converts the AC power to DC and the DC power is sent directly to the EV battery bypassing the onboard battery charger. This allows the DCFC to charge the EV battery directly. DCFC charging delivers a lot of power, which can create heat that will "stress" batteries more than Level 1 or 2 charging and potentially reduce the battery's life. The charge rate, range of the EV, vehicle use case, electricity rate structure, and the amount of time that the EV is available to recharge, known as the dwell time, together determine the best type of EV charging system needed for the application.

The plugs used for charging vehicles can be complicated and must be considered in expansion of the EV fleet and charging infrastructure. Every electric vehicle manufacturer in the US (except Tesla) uses the SAE J1772 standard connector, also known as the J-plug, for Level 1 and Level 2 charging. Unfortunately, instead of only two different connectors, DC Fast Chargers use three different types of connectors. The CCS (Combined Charging System) Type 1 connector uses the J1772 charging inlet with two more pins. It "combines" the J1772 connector with the high-speed charging pins. CCS Type 1 is the accepted standard in North America and was developed and endorsed by the Society of Automotive Engineers (SAE). Just about every automaker today has agreed to use the CCS Type 1 standard in North America.

When choosing and deploying EVs, fleets can choose to charge at their own depot, public charging, or charging at home. This document will only consider charging at District facilities at this time. Charging infrastructure and energy services are a significant part of the equation. Charging infrastructure is much more energy intensive for fleet operations especially for locations with many light-duty vehicles or medium and heavy vehicles. Upgrading District facilities will require electrical infrastructure modifications (e.g., new PG&E service lines, transformers, and upgraded switchgear to handle extra loads). Vehicle charging requires active management to minimize energy costs and ensure availability. Active charging management uses the vehicle's data to determine the EV's state of charge combined with information about available charging locations, the vehicle's use schedule, and energy rates to begin charging at a time that charges the EV to meet operational needs, while also saving money on power. Vehicles required for emergency response (e.g., main breaks) should have fast charging (DCFC)

to support readiness, but this infrastructure has significantly higher capital costs than a standard Level 2 charger.

Lithium-ion batteries are used to power electric cars and trucks because these batteries store a large amount of energy for their weight. The life of an EV battery, measured by the ability to recover full charge capacity, varies with age, exposure to high temperatures, operating at high and low states of charge, charging practices, and usage (number of charging/discharging cycles). EV batteries can last 10 to 20 years but may need to be replaced sooner depending on these factors.

In 2019, the state created the Lithium-ion Car Battery Recycling Advisory Group to develop recovery and recycling policies for lithium-ion vehicle batteries sold with motor vehicles within the state. The group is led by the California Environmental Protection Agency, the Department of Toxic Substances Control, and the Department for Resources Recycling and Recovery. The environmental community, auto dismantlers, public and private representatives involved with EV batteries, and other interested parties are also part of the advisory group. The advisory group must submit policy recommendations to the Legislature by April 1, 2022 to ensure nearly all lithium-ion batteries in the state are reused or recycled in a safe and cost-effective manner.

4.2.3 Hydrogen

Hydrogen is an alternative fuel that can be produced from several domestic resources. The market for hydrogen as a transportation fuel is still developing for widespread use in fuel cell electric vehicles (FCEVs). Although the production of hydrogen may generate emissions affecting air quality, an FCEV running on hydrogen emits only water vapor and warm air as exhaust and is considered a ZEV. In addition, FCEVs are much more efficient than conventional vehicles. Internal combustion engines operate at about 20 to 25 percent efficiency. By contrast, fuel cells generally operate at efficiency levels of 80 to 90 percent.

Because hydrogen has a low volumetric energy density, it is stored on a vehicle as a compressed gas to achieve the driving range of conventional vehicles. Most current applications use high-pressure tanks capable of storing hydrogen at either 5,000 or 10,000 pounds per square inch (psi). For example, the FCEVs in production by automotive manufacturers and available at dealerships have 10,000 psi tanks. Retail dispensers, which are mostly co-located at gasoline stations, can fill these tanks in about 5 minutes.

The challenge with hydrogen is producing it using methods that are environmentally friendly. The source (feedstock), energy input, and the treatment of any carbon emissions used to make hydrogen fuel is referenced by color to indicate its environmental impact. Most of the hydrogen that is widely used as an industrial chemical is either brown or gray. Brown hydrogen is produced by gasifying solid fossil fuels such as coal or lignite, then collecting hydrogen from the resulting gas via steam methane reformation. Fossil fuels are used as the energy input to heat up and gasify the solid fuel feedstock. Gray hydrogen results from using fossil fuels such as natural gas, ethanol, or propane as the feedstock and fossil fuels as

the energy source for the hydrogen separation process. Neither of these processes is climate friendly. A purportedly cleaner option is known as blue hydrogen, where the hydrogen gas is produced by steam methane reformation, and the emissions are partially mitigated using carbon capture and storage. Green hydrogen (sometimes called renewable hydrogen) is typically produced by electrolysis using renewable electricity from solar, wind, or hydropower. Other renewable energy sources, such as biogas or biomass, may be considered green, but this is still subject to debate at this time among various regulatory authorities and stakeholders in California. Currently, green hydrogen is more expensive to produce than other colors of hydrogen. However, costs are expected to decline as large production projects are deployed at scale.

There are currently only 5 retail hydrogen fueling stations in the East Bay and some public agencies such as AC Transit have their own hydrogen fueling stations. The District has executed a lease to develop a hydrogen fueling station on the property where the Main Wastewater Treatment Plant is located. The Lessee will be using the land to construct and operate a station that provides renewable hydrogen to fuel cell electric drayage trucks serving the Port of Oakland. The hydrogen fueling station installation will be paid for in part by grant funds from the California Energy Commission. As part of the lease, the District will have access to hydrogen fuel in the future.

Due to limitations in the distribution network and limited FCEV availability, the District will primarily focus on battery electric vehicles in the near term.

4.3 Culture Change and Employee Acceptance

The actions described in this plan will result in changes to operations, infrastructure, and equipment. ZEVs are a new technology especially for the District. Employees will need to become more knowledgeable on battery capacities, energy requirements for driving or other operations, charging infrastructure, charging management, utility tariffs, etc. As with any significant change, involving all stakeholders including facility owners, fleet mechanics, and employee operators who will be impacted by the changes in the development, planning, and implementation is critical. Fleet mechanics specifically will need additional training such as high voltage electrical safety, high voltage vehicle safety systems, AC induction electrical motors, power inverter systems, and battery management systems. Vehicle and equipment operators must have confidence in the vehicle's capabilities and the vehicle or equipment should meet the needs of the District. All efforts should build cooperation and support from employees by highlighting actual experience of EV users.

4.4 Economics

The existing fleet has substantial current and replacement values. The capital costs for replacing these vehicles can be significant. Light duty EVs are typically $5,000 to $20,000 more than their ICE counterparts. Medium- and heavy-duty EVs can be three to four times the initial cost of an ICE vehicle. In addition, the fueling/charging infrastructure can be a significant cost as well. However, the operating

costs (i.e., energy and maintenance) can be much lower than an ICE-powered vehicle especially for light-duty vehicles. Consequently, the total cost of ownership (TCO) can be lower for an EV.

In April 2021, the District worked with eIQ Mobility on a project funded by PG&E to evaluate near-term opportunities to convert vehicles to EVs. The study reviewed 815 existing ICE vehicles in the District's fleet that were on-road, non-specialty vehicles with sufficient vehicle and 2019 fuel data to be evaluated. Fuel costs for gasoline ranged from $1.70 to $3.02 per gallon and diesel costs ranged from $1.70 to $2.88 per gallon. The study identified 304 vehicles (mostly light-duty) that could be converted to EVs where the TCO was no more than 120 percent of an internal combustion vehicle and where others will have a TCO savings. The District will evaluate those vehicles for pilot projects.

Additional EVs will likely become technically and/or economically feasible in the coming years, especially in the medium- and heavy-duty market. Future economic evaluations will be completed as needed.

4.4.1 Financial Incentives

There are multiple incentive programs currently in place to promote adoption of ZEVs for private and commercial use. These incentives can offset capital costs for vehicles or infrastructure, operating costs for charging to reduce the TCO.

4.4.1.1 Federal EV Tax Credit

The federal government has offered an income tax credit for EV and PHEV purchased after 2010 of up to $7,500. EBMUD does not pay federal taxes, so this incentive is not available to the District.

4.4.1.2 California Low Carbon Fuel Standard (LCFS) Credits

To reduce greenhouse gas emissions, CARB maintains a program in which producers of high carbon fuels are required to purchase LCFS credits generated by low carbon fuel producers. Under this program, petroleum product producers can purchase credits from fleets using electricity to charge vehicles.

4.4.1.3 California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Program (HVIP)

The HVIP provides large point-of-sale discounts for certain medium- and heavy-duty electric vehicles to make clean vehicles more affordable for fleets. Incentives can range from $60,000 for straight truck to $120,000 for a semi-tractor.

4.4.1.4 California's Clean Off-Road Equipment Voucher Incentive Project (CORE)

CORE is a project intended to encourage California off-road equipment users to purchase or lease currently commercialized zero-emission off-road equipment such as forklifts and terminal tractors. This voucher incentive project helps offset the higher cost of zero-emission technology with a point-of-sale discount. There is no scrappage requirement, and additional funding is available for charging and fueling infrastructure and for equipment deployed in disadvantaged communities.

4.4.1.5 California's EnergIIZE Commercial Vehicles Infrastructure Incentives

The California Energy Commission (CEC) has initiated a $50 million-dollar, multi-year project administered by CALSTART to accelerate the deployment of infrastructure needed to fuel zero-emission trucks, buses and equipment. The EnergIIZE Commercial Vehicles (Energy Infrastructure Incentives for Zero-Emission Commercial Vehicles) project will work directly with eligible applicants to help plan and fund the purchase of charging and hydrogen fueling infrastructure. The EnergIIZE project will benefit communities most impacted by transportation-related pollution by meeting essential infrastructure needs of companies and public agencies committed to replacing old, polluting equipment with clean battery-electric and hydrogen options.

4.4.1.6 Marin Clean Energy EV Charging Program

Marin Clean Energy (MCE) is a public, not-for-profit electricity provider that gives PG&E electric customers (residential, commercial, and municipal) the choice of having 60 percent to 100 percent of their electricity supplied from renewable sources in 37 member communities across four Bay Area counties including Contra Costa.

MCE provides an incentive of $3,000 per Level 2 charging port for 2 to 20 ports at workplaces used to charge fleet vehicles in MCE's territory. The rebate may be combined with other rebates. The workplace must offer charging to employees and/or the fleet. The North Area Service Center, East Area Service Center, Walnut Creek Water Treatment Plant, North Richmond Water Reclamation Plant and Point Isabel Wet Weather Treatment Plant are all in the MCE service territory.

4.4.1.7 PG&E's EV Fleet Program Incentives

PG&E offers three incentives through their EV Fleet Program. PG&E will construct and maintain all electrical infrastructure from the transformer to the customer's meter and provide all upgrades at their expense. There is a $4,000 to $9,000 per vehicle incentive to assist with behind the meter (BTM) infrastructure to make it ready for charging medium- or heavy-duty vehicles. Finally, there are charger rebates of up to 50 percent for charging medium- and heavy-duty vehicles at locations in disadvantaged communities (Census tracts in PG&E's service territory with a top quartile score according to California Environmental Protection Agency's CalEnviroScreen 3.0, or current version). These incentives are currently approved for vehicles purchased, operating, and energized prior to December 31, 2024.

5. STRATEGIES

5.1 Leverage Alternative Fuels

Alternative fuels can be a viable alternative for both short- and long-term solutions to offset and/or reduce fossil fuel consumption and improve emissions. Renewable diesel is a drop-in, biogenic replacement for petroleum diesel which the District is using in nearly 100 percent of the fleet. Renewable gasoline provides similar benefits. These fuels help reduce GHG emissions during the transition to ZEVs. They could also be a long-term option for vehicles that are NZEVs or those that

cannot be replaced by ZEVs. Alternative fuels also provide resilience since they can be quickly replaced by petroleum fuel based on availability.

Renewable diesel has been a proven product that has been successfully incorporated into District operations. The District should work with vendors to pilot renewable gasoline until the product is in mass production (currently expected by 2024).

These fuels may be a bridge until other technologies or replacement fuels (e.g., electrofuels) become viable or they may be considered the best long-term solution for certain applications.

5.2 Collect Operational Data to Identify Appropriate Technologies

Data is necessary to perform a thorough analysis to model each fleet use case including operating range, duty cycles, charging load, and power needs. Understanding idling durations, auxiliary power consumption such as air conditioning, tools, cranes, compressors, etc., will help calculate energy draw. This data is needed to select the correct vehicle, battery size, chargers, and electric service.

Telematics is a method of gathering real-world data from connected vehicles such as location, movement, and behavior to provide insights on operations, help fleet operators efficiently manage their fleets, and support informed decisions around fleet electrification. The District has a telematics system (sometimes called AVL) for a portion of the fleet. The telematics system should be expanded to gather more information on individual uses to make better-informed decisions.

The District should also categorize vehicles by operational need to identify criticality for emergencies, continuous operations, etc. Then, power requirements and size of a suitable backup system can be calculated.

5.3 Pilot First, Scale Later

Piloting EVs helps determine if new technologies can support critical operations, define upfront equipment costs, calculate savings on maintenance and fuel costs, and gather feedback from staff regarding operation and maintenance. A successful pilot program allows an organization to evaluate the true benefits of fleet vehicle electrification for its business and provides a foundation for determining how a full electric conversion might be approached, avoid investing in assets that will become obsolete before the end of their useful lifetime. Pilots will also allow time for the District to build necessary infrastructure, and technologies markets to develop before significant investment.

The key pilots to investigate include:

- Develop business case to convert a sludge tractor from diesel to EV

  The District uses two Freightliner Cascadia truck tractors (vehicles 08042 and 08043) to haul sludge in tanker trailers from water treatment plants to the Main Wastewater Treatment Plant for treatment and disposal. This is an ideal application for an EV. The trucks drive a stable, predictable route during regular hours. They are parked in the same locations each night. Freightliner has developed the eCascadia tractor as a fully electric replacement.

While the diesel-powered Cascadia sells for somewhere in the $139,000 range, the eCascadia costs around $350,000 depending on configuration. In addition, new EVSE infrastructure would be required for charging. The California HVIP program currently offers a $120,000 incentive for the eCascadia to offset the additional capital costs. This case study will evaluate the necessary resources for this conversion and an evaluation of the TCO.

- Ford Lightning to replace an F-150 or similar vehicle

  The 2022 Ford F-150 Lightning is the electric version of the F-150 light duty pickup which will go on sale in spring 2022. The vehicle will have two battery packs available targeting EPA-estimated ranges of 230 and 300 miles, and all models have a dual-motor all-wheel-drive. The price is expected to range from $42,000 for the base model up to $90,000 for a loaded Platinum model. The Lightning is only available as a SuperCrew model with a short (5.5-foot) box, which is not a configuration typically used by the District. Staff will look for opportunities to pilot a Lightning if the configuration will work for a District function.

- Ford e-Transit to replace a Ford Transit

  The District currently uses Ford Transit vans for various applications. The Ford e-Transit has been developed for commercial applications. The e-Transit comes in three roof heights and three body lengths. The expected range is 126 miles in the low-roof cargo van variant. This vehicle will also be available in 2022 at a cost of around $45,000 for the entry-level version. This vehicle could be very cost competitive with the ICE equivalent.

- Pilot electric or hybrid excavation equipment

  As a utility, the District uses excavating equipment (primarily backhoes) to install, repair, and replace infrastructure. These excavators and backhoes have been traditionally powered by diesel engines. Some of that equipment returns to a District facility each day where it can be fueled and some is staged remotely and fueled in the field using a fuel truck.

  Some vendors such as Volvo, Case, and John Deere are developing hybrid-electric and all-electric replacements. National Grid, an electric and natural gas utility serving more than 20 million people on the East Coast has partnered with several companies including John Deere and Case to pilot electric backhoes. The benefits are reduced maintenance, zero tailpipe emissions, and reduced job site noise. The challenges are the current models are not currently commercially available, do not match District requirements, and/or do not provide sufficient operating durations (around 4 hours of operation before charging).

  Staff will continue to work with vendors to emphasize District requirements and identify opportunities to pilot equipment to test functionality, mobile charging, and confirm operating durations.

These pilots represent light, medium, heavy, and off-road vehicles and equipment. The results will help evaluate resource requirements, infrastructure needs, financial incentives, benefits, limitations, TCO etc.

5.4 Incorporate the Green Fleet into Planning Processes

5.4.1 Facility Master Plans

It is critical to have the appropriate fueling/charging infrastructure in place before vehicles are purchased. Preemptively installing EVSE wherever possible at District facilities is essential to accelerating the fleet transition. Due to the numbers of light-duty vehicles in the fleet and the amount of power required to charge the medium- and heavy-duty vehicles (i.e., three to four times that required for light duty vehicles), long-term planning must incorporate EVSE infrastructure to ensure sufficient power and accessibility of charging stations, as well as evaluate opportunities for supplemental power (e.g. solar), energy storage, and backup generators required for emergency response.

Separate electrical services are typically required to separate building loads from fleet loads to better manage and track demands. New services can take six months to a year for installation by PG&E.

Because the District operates and maintains critical infrastructure, a resilient power supply for the EV fleet is important similar to ensuring a dependable fuel supply for ICE vehicles. Based on the number of EV's, operational needs, site constraints, and location, there are a few alternatives that will be considered including:

- Moving vehicles to another location for charging,
- Self-generation (e.g., emergency generator, solar, or fuel cell),
- Standby energy storage (e.g., fixed battery storage or charging from other vehicles), and
- Spare vehicles.

This planning should be included as facilities are upgraded. There are some opportunities to include EVSE as facilities are upgraded (e.g., Fleet Maintenance East, the Main Wastewater Treatment Plant, and Walnut Creek Water Treatment Plant) and in new facilities (e.g., Willow Street Service Yard and Oakport) to be ready as ZEVs come into the fleet.

5.5 Vehicle and Equipment Procurement

Each vehicle or equipment procurement should be reviewed for sustainability and resilience by examining all fleet purchases (additions, upgrades, or replacements) for right sizing (vehicle type such as sedan versus SUV) and alternative technologies in a preferred hierarchy:

- ZEV
- PHEV (Plug in Hybrid Electric Vehicle)
- Hybrid
- ICE powered vehicle

These decisions will be driven by the availability of fueling/charging infrastructure. Leverage current technology including hybrid and plug-in hybrid vehicles as a bridge. For example, the District currently has eight Chevrolet Bolt EVs which have been relatively successful. There are 65 Toyota Prius hybrid

electric vehicles and six Chevrolet Volt PHEVs which could be replaced with Bolts at the end of their useful lives. However, replacements must be coordinated with installation of charging infrastructure.

Given the anticipated requirements of the Advanced Clean Fleets rule and infrastructure needs, staff will develop a three to five year vehicle and equipment schedule to help coordinate infrastructure needs and support regulatory compliance. The replacement plan will consider anticipated end of useful life, regulatory requirements, and anticipated available charging infrastructure.

5.5.1 Future Budgets

The results of these pilots could require significant investments in the fleet or infrastructure. The data from the pilots and telematics system should be evaluated and used to inform future budgets beginning with FY24/25.

5.6 Collaboration

Innovation happens through collaboration, and the best organizations are not only harnessing innovation from their employees, but also from outside organizations such as suppliers, and industry organizations. Collaboration helps employees and organizations pool their knowledge and perspectives to learn and innovate faster.

5.6.1 Internal Collaboration

Internal collaboration will focus on educating drivers, fleet mechanics, and support staff about EV operations, charging, and maintenance and to address challenges going forward. These groups include:

- Innovation Committee

  The Innovation Committee mission is to create a think-tank dynamic to identify issues, encourage creative thinking, and provide solutions to increase efficiencies and benefits for rate payers. Members represent various groups at the District. More details are included on the District's intranet, the Splashpad.

- Green Fleet Working Group

  The Green Fleet Working Group includes representatives from groups including Fleet, Regulatory Compliance, Facilities Engineering, Facility Maintenance and Construction, Operations and Maintenance, and the Wastewater Department that will be working on implementation of this Roadmap.

5.6.2 External Collaboration

External collaboration with industry organizations and vendors such as those listed below will help the District communicate our needs and identify appropriate EV models and technology:

- CALSTART

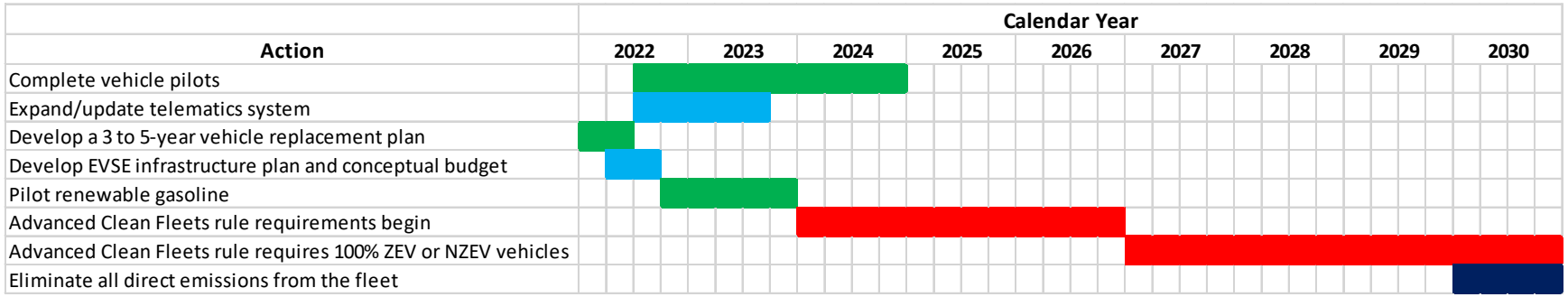
- California Municipal Utilities Association - Fleet Group
- CARB to create reasonable regulatory requirements
- Municipal Equipment Maintenance Association (MEMA)
    - http://www.memafleet.org/
- East Bay Clean Cities Coalition
    - https://cleancities.energy.gov/coalitions/east-bay
- Vendors
    - John Deere
    - Freightliner
    - Volvo
    - Zeus Electric Chassis
- Agencies
    - BART
    - SFPUC
    - City of Oakland

5.6.3 PG&E Engagement

Planning for charging infrastructure will require the District to engage with PG&E to ensure there is adequate power and it is reliable. PG&E planning can take 18 to 24 months to be reviewed and approved.

6. KEY ACTIVITY SCHEDULE

The following is a timeline showing the key activities in the process.



7. ADDITIONAL RESOURCES

A. Green Hydrogen Guidebook, Green Hydrogen Coalition, August 2020, https://www.ghcoalition.org/education

B. Federal Fleet Electrification Assessment, Atlas Public Policy, August 2021, https://atlaspolicy.com/rand/federal-fleet-electrification-assessment/

C. Managed Charging Accelerates Costs & Health Benefits, Amply Power, 2021 White Paper, https://amplypower.com/whitepaper2021/

D. PG&E EV Fleet Program, https://www.pge.com/en_US/large-business/solar-and-vehicles/clean-vehicles/ev-fleet-program/ev-fleet-program.page

8. GLOSSARY

BEV – Battery Electric Vehicle is a zero-emission vehicle that uses electricity stored in a battery to power one or more electric motors.

CARB - California Air Resources Board

DCFS – Direct Current Fast Charging uses DC to charge the EV battery without needing to go through the onboard AC battery charger. This charging level allows for a much higher capacity battery charging system. DCFC chargers are typically only used in commercial applications due to the higher cost and need for 480V electrical service.

ePTO - Electric power take-off is a system that powers a truck's onboard equipment using electricity. See also PTO.

EVSE - Electric Vehicle Supply Equipment (commonly called a charging station or charging dock) supplies electricity to an electric vehicle (EV) to recharge the batteries.

EV – Electric Vehicle is a vehicle powered by electricity from a fuel cell and/or battery driving electric motors.

FCEV - Fuel-Cell Electric Vehicle is a zero-emission vehicle that is powered by electricity generated by an on-board fuel cell that electrochemically combines hydrogen (from a tank) and oxygen (from the air), with only water vapor created as byproduct. Hydrogen is stored on-board the vehicle as a compressed gas.

GHG – Greenhouse Gas which are gases that drive climate change.

GVWR - Gross Vehicle Weight Rating is the maximum safe weight including the vehicle, added equipment, cargo, and passengers.

ICE - Internal combustion engine

LCFS - Low Carbon Fuel Standard is a CARB program designed to decrease the carbon intensity of California's transportation fuel pool and provide an increasing range of low-carbon and renewable alternatives.

Level 1 Charger –Level 1 charger is the simplest level of EV charging and consists of plugging the EV into a standard 120V AC receptacle using a unique electrical cord with the appropriate plugs in each end. The built-in battery charger in the EV then charges the battery.

Level 2 Charger – Level 2 chargers allow the EV to be connected to a 240V receptacle, like that used for an electric range or clothes dryer, which supports faster charging than a Level 1 charger.

NZEV – Near Zero Emission Vehicle is a plug-in hybrid electric vehicle powered by both an ICE and battery-electric powertrain that is capable of operating as a zero-emission vehicle for some distances. See also PHEV.

PHEV – Plug-in Hybrid Electric Vehicle is powered by both an internal combustion and battery-electric powertrain. A plug-in hybrid operates much like an electric vehicle when its battery has charge. The engine operates when the battery runs down, allowing the vehicle to continue uninterrupted as a regular hybrid.

PTO – Power take off is a mechanism used to transfer power from the engine to a secondary application such as a hydraulic pump, generator, or air compressor.

SUV – Sport Utility Vehicle

TCO - Total Cost of Ownership including purchase cost (Capex), maintenance, energy, and salvage costs.

ZEV – Zero Emission Vehicle which is a plug-in electric and hydrogen fuel-cell electric vehicle that produce no exhaust emissions of any criteria pollutant under any and all possible operational modes and conditions.

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EAST BAY MUNICIPAL UTILITY DISTRICT

DATE: April 21, 2022

MEMO TO: Board of Directors

THROUGH: Clifford C. Chan, General Manager CCC

FROM: David A. Briggs, Director of Operations and Maintenance DB

SUBJECT: Annual Integrated Pest Management Program Update

SUMMARY

The District established an Integrated Pest Management (IPM) Program in the mid-1990s to guide pest management practices across its many facilities and open spaces. An annual update is provided to the Board to share highlights from the prior year including program enhancements, application statistics, public feedback, and notable achievements. This item will be presented at the April 26, 2022 Sustainability/Energy Committee meeting.

DISCUSSION

The District's IPM Program addresses a broad range of pest control issues on watershed lands, along pipeline and aqueduct rights-of-ways, and at operating and administrative facilities. IPM is a comprehensive pest management process to determine the appropriate control methods based on the pest and site-specific conditions. The goal of the IPM Program is to minimize the impact to human health, the environment, and non-target organisms by requiring consideration of non-pesticide control methods before use of pesticide controls.

The District's IPM Guidelines were updated in 2020 after extensive public review. Based on comments received, the guidelines were updated to clarify the decision-making process and ensure the use of chemicals is minimized and only used as a last resort. The guidelines include a list of pesticides in active use by the District and is publicly available on the District's website.

This past year's focus areas for the IPM Program included the development and preliminary small group testing of a new GIS survey-based data collection tool, *IPM Tracker*. This database records staff and contractor IPM activities across all District sites to better track which methods are being used. The new system is scheduled to go live this summer. Additionally, a new professional services agreement was authorized in 2021 for subject matter support when needed, including a state licensed Pest Control Advisor who provides site and product reviews and recommendations. Lastly, annual training for staff included three days of workshops with an array of technical speakers including regulatory agencies and scientists sharing the latest research on effective methods for some District specific pests.

Each year the IPM Program methods used are presented to the Board including a list of pesticides and their quantities used in the prior reporting year. Pesticide use has historically been reported by volume in gallons. However. the District's IPM consultant has recently recommended reporting by weight of active ingredient used. Reporting in 2022 will follow this recommendation. The usage summary by pesticide type for 2021 is presented in Table 1.

Table 1: 2021 Usage Summary by Pesticide Type

Pesticide Type	Liquid Formulated Product Used (gals.)	Gel/Solid Formulated Product Used (lbs.)	Total Active Ingredient Applied (lbs.)
Herbicide	447.52	67.83	1551.42
Insecticide	1.18	0.09	0.59
Rodenticide	0.00	28.23	0.01

In 2020, the District used approximately 433 gallons of pesticide product and of this amount approximately 352 gallons were glyphosate-based. In 2021, the District used approximately 449 gallons of pesticide product and of this amount approximately 345 gallons were glyphosate-based. The slight increase in pesticides is due to variation in vegetation growth cycles and hydrology. However, glyphosate use decreased. The specific breakdown of pesticide products used in 2021 and their total amounts is presented in Table 2.

Table 2: 2021 Pesticide Use Totals

Product Name	Amount Product Used		Total Amount Active Ingredient Used
	gals.	lbs.	lbs.
ACCORD (62719-324)	16.45	-	49.36
ACCORD XRT II (62719-556)	2.50	-	10.00
ADVION ANT GEL (100-1498)	-	0.09	4.38E-05
CLEANTRAXX (62719-702)	1.16	-	4.54
DIMENSION 2EW (62719-542)	11.36	-	22.73
DITRAC (12455-80) [1]	-	19.88	9.94E-04
ESPLANADE 200 SC (432-1516)	16.35	-	27.30
GALLERY SC (62719-658)	3.45	-	14.35
GARLON 3A (62719-37)	3.50	-	10.50
GARLON 4 (62719-527)	10.38	-	41.50
GENERATION MINI BLOCKS (7173-218) [1]	-	1.25	3.13E-05
GOPHER GETTER (36029-23)	-	7.100	3.55E-04

[1] Indicates use of products not on the District's list of pesticides. This was due to contractor error and staff has been trained to prevent future occurrence.

Product Name	Amount Product Used		Amount Active Ingredient Used
	gals.	lbs.	lbs.
LANDMARK XP (432-1560)	-	28.75	21.56
MILESTONE SPEC. (62719-519)	23.60	-	47.21
MILESTONE VM (62719-537)	3.00	-	6.00
OPTIMATE CS (67760-104-AA-5)	0.00	-	1.95E-04
OUST (352-401)	-	1.63	1.22
OUST XP (352-601)	-	7.59	5.70
PREMISE PRO (432-1449)	0.02	-	0.08
RANGER PRO (524-517)	131.14	-	393.41
RODEO (62719-324)	176.85	-	707.38
RONSTAR FLO (432-1465)	28.03	-	88.85
ROUND UP PRO MAX (524-579)	17.08	-	76.84
ROUNDUP PRO (524-475)	0.05	-	0.14
ROUNDUP PRO CONCENTRATE (524-529)	1.25	-	4.63
SUSPEND POLYZONE (432-1514)	1.09	-	0.46
SUSPEND SC (432-763)	0.001	-	5.74E-04
TELAR XP (352-654)	-	18.72	14.04
TENGARD SFR (70506-6)	0.002	-	0.01
TERAD 3 BLOX (12455-106)	-	-	0.01
TRANSLINE (62719-259)	1.39	11.14	4.18
WISDOM TC (5481-520)	0.08	-	0.05

NEXT STEPS

The District will continue to refine IPM activities and perform the following tasks in 2022:

- Implement use of the new GIS based *IPM Tracker* for data collection
- Perform a pilot program using non-glyphosate alternative chemicals where appropriate
- Post annual pesticide use summary on District website
- Complete annual training for staff
- Ensure compliance with the District's list of pesticide products
- Continue open communication with the public when questions arise about IPM methods used across specific sites; evaluate alternatives as appropriate
- Review and test new IPM tools, methods, and products as needed
- Analyze data and evaluate IPM Program efficacy and update documents as needed

CCC:DAB:sd