BEYOND TOXICS

BENEATH THE PUMP: THE THREAT OF PETROLEUM CONTAMINATION

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A BEYOND TOXICS REPORT

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EXECUTIVE SUMMARY

The sales of gasoline cars are plummeting across the state of Oregon as consumer preferences shift toward electric vehicles. Urban areas, including Eugene, are leading the change in transportation choices, which will leave many gas stations unprofitable in the near future. The Eugene Water and Electric Board (EWEB) projects the number of gas-powered, passenger vehicles on the road to drop 80% from over 100,000 vehicles in 2018 to approximately 20,000 in 2040.

Gas stations currently pose a threat to public health, especially to nearby residents exposed to petroleum based pollutants in the ground, water, and air. New gas station infrastructure is more likely to be built in low-income neighborhoods and communities of color and causes increased exposures to carcinogenic and asthma-causing vapors.

Gas stations will quickly become obsolete pieces of infrastructure leaving behind hazardous petroleum contamination for taxpayers and future developers to clean up.

Eugene, and other cities alike, have an opportunity to capitalize on current transportation advancements to meet their climate action goals by ending the construction of gas stations, and incentivizing the creation of electric vehicle charging infrastructure in its place.

This report summarizes the public health impacts of gas station pollution, the economic burdens of cleaning up gas station properties polluted with petroleum from leaking underground storage tanks, and policy solutions localities can embrace to move beyond fossil fuels in transportation.

PROJECT **DESCRIPTION**

Gas stations pose a sizable risk of lasting contamination to the surrounding environment and public health. Society has rationalized that risk given the importance of petroleum to transportation. However, we now have clean alternative technologies capable of powering cars, buses, and trucks.

As a result, there is a compelling set of facts demonstrating that gas stations are rapidly becoming a liability for public health, environmental protection, and economic stability. It is time to prepare for a clean transportation future by ending new construction and further expansion of fossil fuel gas stations.

This report details the high costs of cleanup for gas stations, chronic health risks to nearby residents, and the uncertain financial future for fossil fuel stations.

Encouraging a shift away from gas pumps is timely because local governments can take advantage of a wide variety of federal funding opportunities to enhance access to electric vehicle charging. We conclude that it is time that the City of Eugene end the "anything goes" policies that have led to a proliferation of gas station construction and accelerate the transition to electric alternatives to stop future economic, climate and public health harms.

This report summarizes the public health impacts of gas stations, the history of leaking underground storage tanks (LUSTs) in Eugene, and policy recommendations for transitioning the city's transportation paradigm by capping fossil fuel infrastructure and making it easier to construct electric vehicle charging stations.

PRIMARY **GOALS** AND **OBJECTIVES**

- **Address** how gas stations are sources of hazardous air pollution.
- **Explore** public health and environmental costs of petroleum contamination.
- **Discuss** specific ways the City of Eugene can prevent petroleum contamination and support the adoption of electric vehicles.

ENVIRONMENTAL AND HEALTH CONCERNS OF GAS STATIONS

Ambient Air Pollution - Volatile Organic Compounds (VOCs) in gasoline and diesel are known public health concerns. Benzene, Toluene, Ethylbenzene, and Xylene, collectively known as BTEX, are among the most studied VOC emissions involved in fossil fuel extraction, storage, and combustion.

Table 1 lists known human health impacts from contact with BTEX chemicals. **Increased exposure to ambient levels of BTEX is correlated with lower pulmonary function in elderly** (Yoon et al., 2010), **increased risk of being diagnosed with asthma** (Arif & Shah, 2007; Rumchev et al., 2004; Gordian et al., 2010), **increased severity and frequency of asthma symptoms** (Gordian et al., 2010; Delfino et al., 2003a; Delfino et al., 2003b; Billionnet et al., 2011; Hirsch et al., 1999), **wheezing** (Arif & Shah, 2007; Bentayab et al., 2013), **and bronchitis** (Hirsch et al., 1999; Bentayeb et al., 2013).

The primary source of BTEX in outdoor air is combusting gasoline and diesel followed by the storage and transferring of fossil fuels (JO & Moon, 1999). This is in large part due to the ability of these VOCs to become airborne, or “volatilize,” from a liquid or solid state, especially in higher temperatures.

For example, when petroleum is transferred from a tanker truck to an underground storage tank (UST) during refueling operations at gas stations, BTEX molecules can become airborne and drift away from their source and into the surrounding environment. This vapor drift also occurs when cars are refueling at gas pumps. BTEX emissions also escape during storage from USTs by evaporating and traveling up through release vents and processors. Lastly, BTEX volatilizes from drips of petroleum when spilled on the ground during refueling. Other ways BTEX gets into the air are detailed on Figure 1.

BTEX Chemicals	Carcinogenic Status	Other Health Concerns
Benzene	Known Carcinogen	• Infects bone marrow • Can reduce red blood cells • Can harm immune system • Increases asthma symptoms, wheezing, and Severity of asthma attacks • Decreases pulmonary function for elderly • Suspected to harm nervous system
Toluene	Not Enough Data to Know	• Increases asthma symptoms, wheezing, and severity of asthma attacks • decreases pulmonary function for elderly • Harms developing children • Suspected to harm immune system
Ethylbenzene	Possible Carcinogen	• Can damage hearing • Affects fetal development • Decreases pulmonary function for elderly • Suspected to harm immune system
Xylene	Not Enough Data To Know	• Increases asthma symptoms, wheezing, and severity of asthma attacks • Decreases pulmonary function for elderly • Suspected of harming childhood development, and damaging immune system

TABLE 1. KNOWN HUMAN HEALTH IMPACTS FROM BTEX EXPOSURE

Sources: Yoon et al., 2010; Arif & Shah, 2007; Rumchev et al., 2004; Gordian et al., 2010; Delfino et al., 2003a; Delfino et al., 2003b; Billionnet et al., 2011; Hirsch et al., 1999; Bentayab et al., 2013; Sierra Club, 2004; Bolden et al., 2015)

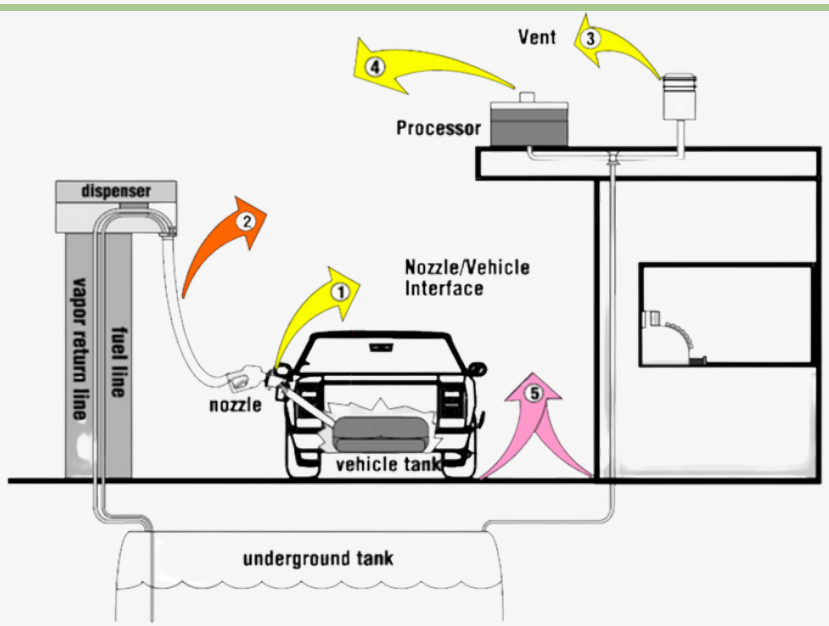

FIGURE 1. SOURCES OF ESCAPING OR LEAKING HAZERDOUS VAPORS AT GAS STATIONS

BTEX VOCs spread passively from gas stations through: **1.** Vapors escaping during refueling; **2.** Permeation of vapors through microscopic holes in the pumps hose; **3 & 4.** Escaping vapors through the processor and vent due to evaporation and refilling UST, and; **5.** Vapors from spillage during refueling. Original image is from the California Air Resources Board (2018).

Researchers have garnered substantial evidence that ambient BTEX concentrations increase as distance to refueling stations is decreased. In other words, **proximity to gas stations increases the likelihood of exposure to BTEX pollution** (Jo & Moon, 1999; Morales Terrés et al., 2010; Hajizadeh).

One study demonstrated levels of Methyl Tert-Butyl Ether (MTBE), another harmful volatile organic compound found in fossil fuels, were higher inside and outside of homes closer to gas stations (Jo & Oh, 2011). It is more difficult to track increased indoor concentrations of BTEX because this group of chemicals is associated with many indoor sources, such as solvents, paints, carpets, gas stoves, and cigarettes. Due to the ubiquitous presence of BTEX in consumer products, researchers are unable to confidently determine the impact of gas stations on indoor air quality.

Benzene, the first chemical in the BTEX combination of VOCs, is a known carcinogen and most frequently causes blood-related cancers. (Information on the carcinogenicity, among other health effects of BTEX VOCs are in Table 1.) Studies have found higher rates of cancer in residents living closer to gas stations than houses farther away, especially for children (Infante, 2017; Brosselin et al., 2009; Steffin et al., 2004; Harrison et al., 1999).

Researchers documented acutely hazardous levels of benzene up to 524 feet away from pumps (Hilpert et al., 2018). This exposure risk is a concern for any residences and schools located within 524 feet of gas stations (see Figure 2).

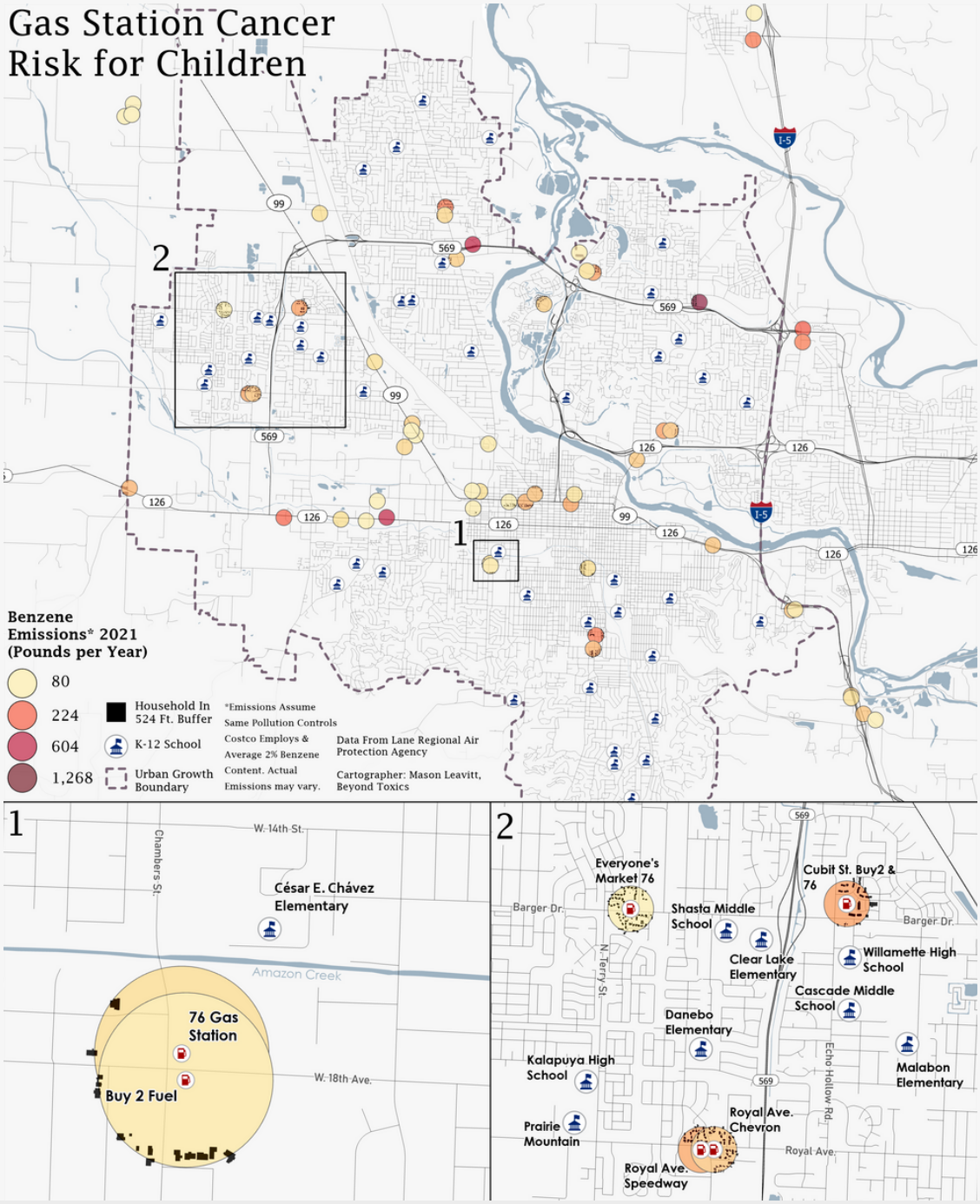

FIGURE 2. GAS STATION CANCER RISK FOR CHILDREN

The map features circular buffers with a radius of 524 feet around gas stations to symbolize areas of possible high benzene exposure. The buffers are colored based on the amount of benzene produced by a given gas station in 2021 using equations provided by the Lane Regional Air Protection Agency, using Costco as a model. Two insets look at closely situated gas stations and schools along Chambers Street (left), and Bethel School District (right).

In summary, ambient levels of BTEX are higher near gas stations, particularly within a 524 ft. radius. Chronic BTEX exposure increases health burdens such as lung illness, cardiovascular functioning, and cancer risk.

LEAKING UNDERGROUND STORAGE TANKS

An 8-12 pump gas station typically has 2-3 high capacity, cylindrical underground storage tanks (USTs) to store gasoline and diesel. Tank sizes in Eugene range from 200 to 30,000 gallons. These tanks release BTEX emissions through evaporation or vapor displacement, especially when being refilled. However, most tanks eventually develop leaks through wear and tear.

Leaking Underground Storage Tanks (LUSTs) release petroleum products through cracks in the tank, in the piping, or where the piping connects to the pumps. Leaking petroleum contaminates soil, groundwater, and air with BTEX and hydrocarbons. In worse situations, contaminants infiltrate living or working spaces in nearby buildings, increasing health risks or potentially leading to a fire or explosion.

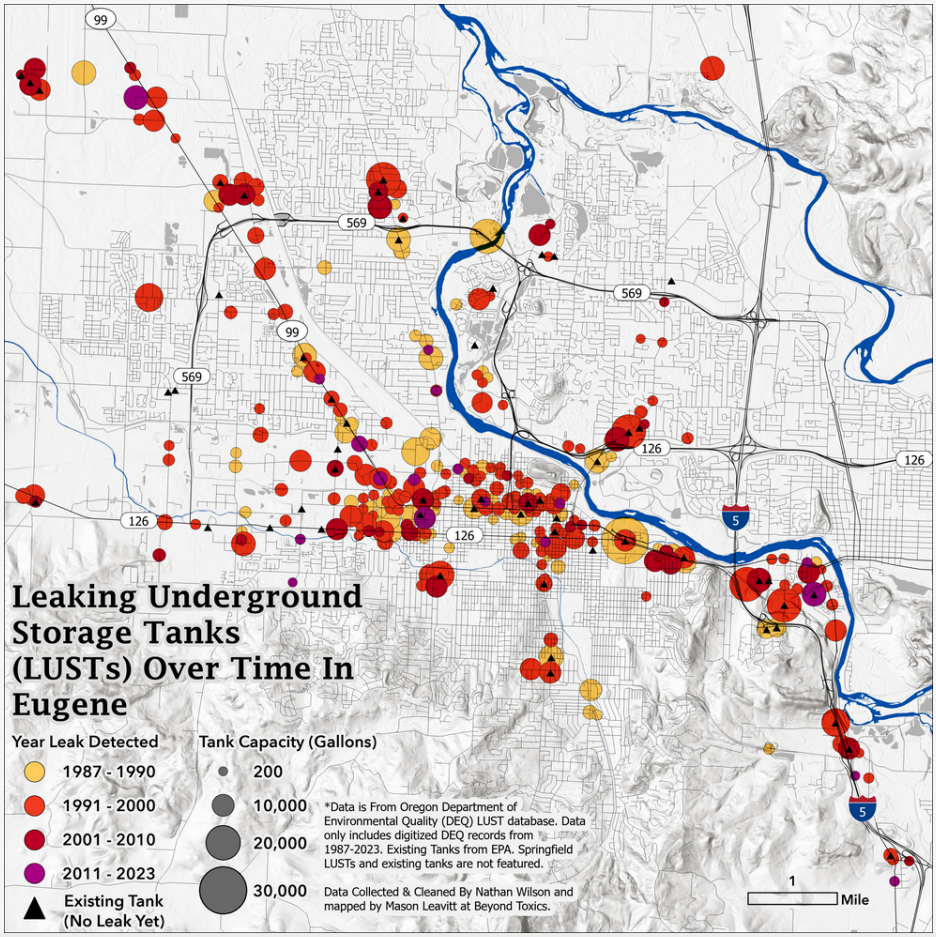

FIGURE 3. LUSTS SINCE 1987 IN EUGENE

The map features 303 LUSTs in Eugene symbolized by the decade the leak was found and the capacity of tanks onsite at the time. LUSTs are located near a variety of land uses including residential, schools, parks, industry, and commercial properties. This map only includes LUSTs after 1987 and may not reflect every LUST in Eugene since 1987. Data source: digitized records in the DEQ LUST database. Data collected and organized by Nathan Wilson and Mason Leavitt.

LUST IMPACT ON **SOIL, WATER & AIR**

LUST Impact on Soil - Petroleum leaking from underground storage tanks will seep into nearby soil and can contaminate surrounding properties.

Typical contaminants are petroleum, polycyclic aromatic hydrocarbons (PAHs), lead, cadmium, Polychlorinated Biphenyls (PCBs), MTBE, BTEX, and other VOCs associated with fuel storage (DEQ, 2023; Sierra Club, 2004). In many cases, soil contamination is severe enough that it needs to be removed and deposited in a landfill site. Through a search of DEQ digitized records of LUST cleanups, we documented 179 Eugene sites that mentioned Petroleum Contaminated Soil (PCS) removal (Oregon DEQ, 2023).

The total volume of PCS removed in Eugene since 1987 could create a 3-story tall football field (Oregon DEQ, 2023). PCS remains hazardous even after removal. Soils will require sequestering in a landfill, making removal very expensive. Additionally, neighboring properties might also have contaminated soil. It can be difficult or impossible to remove PCS without damaging existing buildings when the contamination is below the foundation of the structure.

LUST Impact on Water - A leak as small as 10 gallons of gasoline can contaminate 12 million gallons of drinking water because extremely low amounts of benzene can make water unsafe (Meegoda & Hu 2011). Forty-five states have designated LUSTs as a major threat to groundwater quality, including Oregon (Sierra Club, 2006).

Currently, most Eugene residents are served by EWEB, and thus do not rely on groundwater for drinking water. However, plenty of LUSTs in Eugene have threatened the Willamette River, McKenzie River, Amazon Creek, and Millrace (see Figure 4).

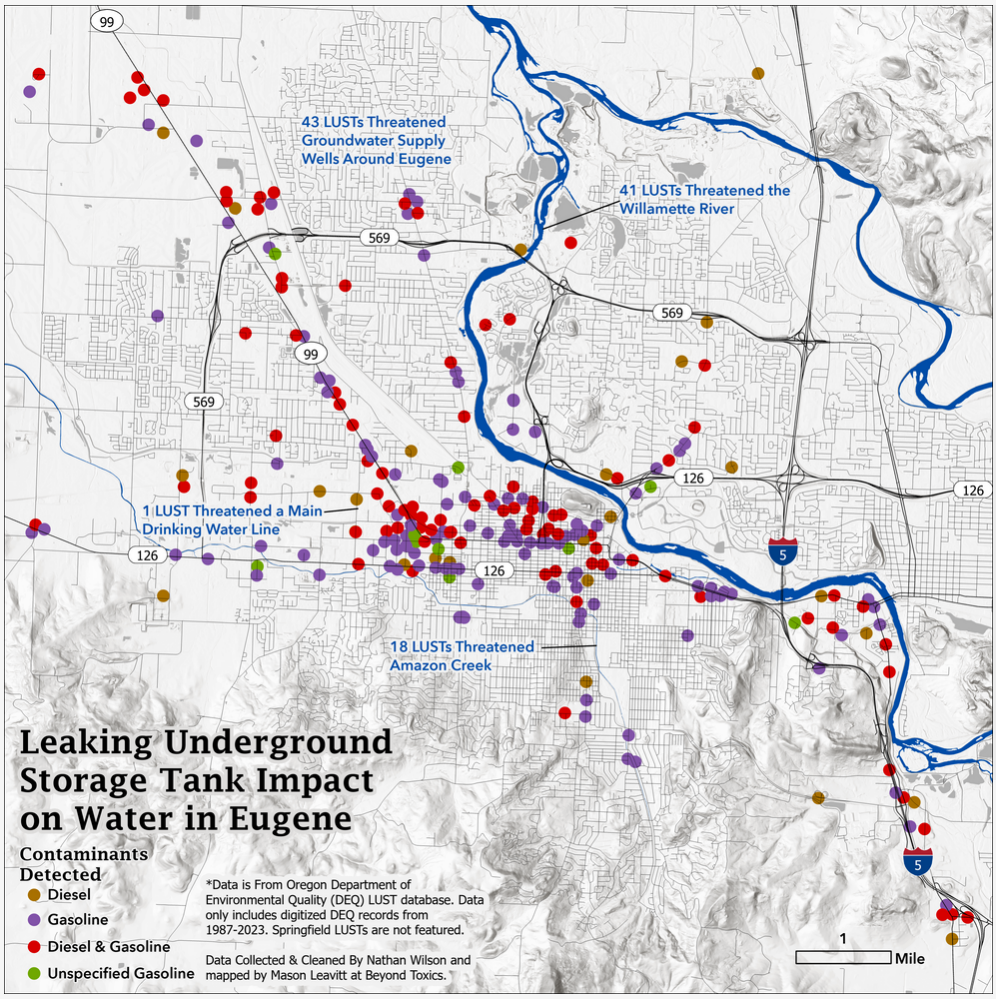

FIGURE 4: WATER SOURCES THREATENED BY LUSTS
The map features DEQ LUST cases by type of contaminant found in the soil upon the discovery of a petroleum leak. The most common body of water threatened is groundwater wells for drinking water followed by the Willamette River. Data collected and organized by Nathan Wilson and Mason Leavitt.

LUST Impact on Air Quality - The most concerning impacts of LUSTs on air quality usually occur in buildings on the service station property, neighboring buildings, or buildings constructed on the contaminated property after the service station is decommissioned. Vapors from petroleum contaminated soil can infiltrate nearby structures and expose building residents to high amounts of BTEX chemicals.

For example, before the cleanup of a Texaco in Beaverton (discussed below), gasoline vapors from leaking tanks were found in the plumbing stack vent at the nearby McBride Building at levels above explosivity (Clough & Schmidt, 2008). Additionally, LUSTs are known to contribute to higher BTEX concentrations outdoors on site, due to vapors permeating through contaminated soil and asphalt.

CLEAN-UP COSTS OF LUSTS

Initial Monetary Costs of Cleanups - The cost of remediating a gas station site ranges from tens of thousands to more than $2 million (Drummond, 2010). According to a 2004 survey conducted by the EPA, the average cost of cleaning up a LUST site was $243,299 per site in 2004 dollars, which is approximately $398,530 in 2023 (Wilson et al., 2004). It should be noted that calculating the exact total cost for a LUST cleanup is difficult. Some expenses are direct, such as the cost of extracting petroleum contaminated soil or hiring a consultant firm to measure and report contamination levels to environmental regulators. Some expenses not always documented include: regulatory agency staff time dedicated to managing cleanup or loss of property value due to contamination.

Additionally, Wilson et al., 2004 notes that "Frequently, the costs available are estimated and include only a portion of the capital, operation, and maintenance costs." Common sense suggests that cleanup costs are substantially underestimated, and are more likely to require tens of thousands of dollars more than a basic estimate. Some recent examples are below.

	**Former Franko #15 service station on Franklin Blvd in Eugene** • Abandoned after petroleum contamination was discovered on the site in 1991, and the facility's owner filed for Chapter 7 bankruptcy. • $197,520 EPA Brownfields Cleanup Grant. • $50,000 from the state of Oregon. • Loan of $1.2 million dollars.
	**Texaco Station on Hall Blvd in Beaverton** • A leak was discovered at the in 1997. • DEQ Determined the site owners could not pay for the cleanup, and took over the site. This is after the owners sunk $59,000 into removing petroleum contaminated soil. • The site was abandoned and designated as a brownfield. • Cleanup costs were about $300,000 of a total cost of $1.2 million to revitalize the site from a gas station to a coffee roaster in 2006.

TABLE 2. EXAMPLE COST OF TWO LUST CLEANUPS

EXTERNALIZED COSTS OF LUSTS

Currently, LUSTs are cleaned up based on the system of Risk Based Corrective Action (RBCA). RBCA operates on a paradigm of minimizing the costs of a cleanup, rather than restoring a site to fully protect public health. Matthew Small, an EPA science liaison, characterizes RBCA practices as asking the question "How much of the [BTEX] compounds of concern can we safely leave in place?" (Small, 2008). This type of approach is based on a risk analysis rather than a standard that prioritizes human or environmental health.

The EPA adopted RBCA policies because polluters argued that cleaning up LUSTs to their original state was too much of a financial burden. However, this system of analysis to save money comes with public health risks, residual costs to neighboring properties, and surprise contamination for future developers who decide to construct on a former LUST site.

Consider how RBCA was applied in the cleanup process of a former Chevron service station on West Broadway in Eugene where the 515 Apartments now stand. In 2004, consulting and construction companies began the cleanup of the 515 site, which would take well over a decade to finish.

In 2012, the petroleum contamination at the site was still so severe, the consulting company decided to remediate the problem by removing 12 vertical feet of soil from the entire property. Even after the intense cleanup process, the DEQ forbade construction of any residential properties on the property for fear of vapor intrusion into the building. Core Campus eventually bought the property to construct a high density residential apartment for students. DEQ approved the construction after Core Campus offered to not construct apartment units on the ground floor.

By the end of the cleanup of the 515 Franklin Blvd site, crews flushed out "several million gallons" of petroleum contaminated groundwater and enough PCS to fill over 550 dump trucks (Terzian, 2014).

FIGURE 6. PCS FOUND DURING 515 APARTMENT CONSTRUCTION

Despite removing 12 vertical feet of soil, Core Campus discovered more PCS during apartment foundation construction. DEQ barred residential development due to potential chemical vapor intrusion but allowed the project to move forward with the requirement to omit ground-floor apartments (DEQ, 2023). This highlights past contamination challenges hampering projects and occasionally compromising public health.

FIGURE 7: 515 APARTMENTS

Caption: Google Earth overview of the 515 Student Apartments along Broadway. PCS still lies below the foundation of the building.

The RBCA system can also externalize the costs of neighboring property damage. Take, for example, the former Central Lincoln Mercury Car dealership in Eugene, which was located at the southwest corner where Oak Street and 17th Avenue intersect. The dealership property was contaminated with a LUST which created an underground plume of hazardous chemicals. The plume extended far enough to contaminate multiple neighboring properties.

The initial plume was discovered in 1998, and the methodology to assess risk to human health and property damage was presented to the DEQ in 2000. In 2001, a PCS removal was proposed to prevent human exposure to BTEX fumes off-gassing from the contaminated soil. In 2004, the soil cleanup was executed. This means there was a gap of six years between discovering the petroleum plume and taking action to reduce public health risks via removing contaminated soil (Lawn, 2004).

During the 2004 PCS removal, contaminated soil was also found underneath the building which currently contains Plato's Closet, Full Circle Fitness, Papa Murphy's, and other businesses. The consulting firm in charge of the cleanup argued it would be too expensive to remove that soil, as well as more PCS extending under the sidewalk on Oak Street and natural gas pipelines to the south of the property near the Les Schwab Tire Center (Lawn, 2004). Instead, hydrogen peroxide injections were employed to reduce hazardous pollutants in 2005.

In 2013, 15 years after the Central Lincoln Mercury car dealership leak, consultants assessed groundwater and soil for petroleum contamination and BTEX exposure risk. Benzene and ethylbenzene levels continued to surpass safe thresholds for vapor intrusion (BB&A Environmental, 2013). DEQ demanded additional tests to gauge contamination extent.

In 2021, 23 years after the discovery of a leak, the same consulting firm was hired to do further testing on groundwater and soil. High levels of benzene exceeding the DEQ's standards for indoor building vapor intrusion were found again. However, the consultant argued that the measurements were flawed.

Perhaps in an effort to avoid further remediation, they also argued the area where people may be exposed to petroleum toxins should not include the Les Schwab Tire Center and Wells Fargo building despite finding high readings of benzene less than 10 feet away. See Figure 8. (BB&A Environmental, 2022).

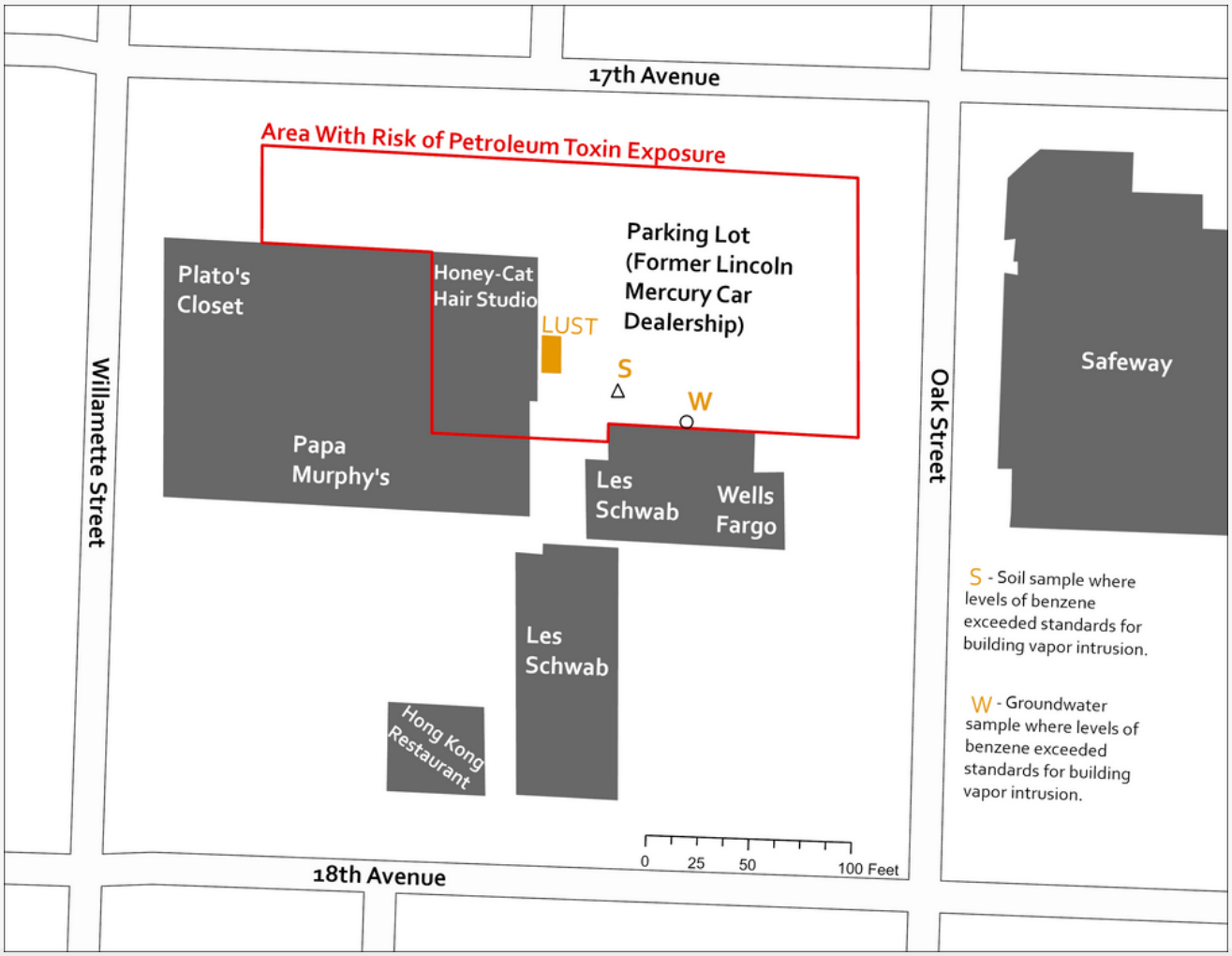

FIGURE 8. VAPOR INTRUSIONS IMPACTING ADJACENT BUILDINGS NEAR A FORMER CAR DEALERSHIP

After consultants for a former car dealership found benzene levels that still exceeded safe levels of indoor vapor exposure in soil and groundwater samples, they argued that remediation was not required for buildings as close as 10 feet from the contaminated area, despite being occupied by active businesses.

Ultimately, it is up to neighboring properties of LUST cleanups to show the DEQ proof that their property was contaminated or they are in danger of being exposed to petroleum toxins. This process places the burden of proof on nearby property owners, and not the owner of the contaminated property. As a result, addressing contamination spreading from leaking underground gas tanks can be time consuming and expensive for other property owners, especially if it's necessary to hire consultants for environmental testing and submitting reports to state regulators.

It has also been demonstrated that the perceived risk of contamination on commercial, industrial, and residential

properties near LUST sites cause a loss in property value (Zabel, 2012; Jackson, 2002; Jackson, 2001). Studies have shown that residents living next to highly publicized LUST cleanups lose up to 12.8% of their homes' value.

The Lincoln Mercury car dealership example illustrates the lack of polluter accountability, which places financial burdens of the contaminated property on future property owners and doesn't pay for measures to protect future construction workers from chemical exposure on the contaminated property (BB&A Environmental, 2022; BB&A Environmental, 2013).

In some cases, LUSTs can pose an extreme danger to life and property through the risk of fire and explosion. This was the case in 2021 when a Union 76 gas station located in Monmouth was the site of a massive gasoline leak.

Over the course of five days, 14 thousand gallons of fuel spilled from underground fuel tanks, creating an extreme risk of fire and explosion for the downtown area. Neighboring properties had to be evacuated.

Workers at Monmouth's sewage treatment facility initially discovered the spill almost a mile away from the Union 76 station. The gas station itself had to be torn down immediately, and the streets stripped back to excavate PCS. The DEQ file summarizes the situation in stark terms.

These worst-case scenarios are not uncommon when looking at a nationwide scale (Yoder, 2023). While some of the costs will undoubtably be paid for by the owner of the 76 station, the costs of shutting down businesses in the city center, reconstructing two main roads, and a currently massive underground plume and associated property damage could be difficult to fully recover, if at all.

"It is not an exaggeration to say that, had things gone differently, the center of Monmouth could have been destroyed in an explosion, with horrible loss of life." ... "[W]hen investigators managed to pry open a sump cover sealed shut by partial vacuum, they barely escaped being soaked by a fountain of gasoline. A spark or a lit cigarette would have caused a disaster." - DEQ, 2021

LACK OF COMMUNITY INPUT ON NEW GAS STATION CONSTRUCTION

Eugene's zoning codes discourage transparency and public input during the process of approving construction permits to build new gas stations. Many of the recent requested permits for new gas stations in Eugene were submitted under the guise of a 7-11 convenience store. The gasoline pumps were listed as a secondary use.

Reviewing Eugene's building permit or zoning change application process, we found that permit applications for convenience stores that also include gas station pumps seem to deemphasize or minimize the size of the gasoline dispensing footprint on the site. This could serve to conceal the main use of the site for gasoline pumps and underground fuel storage tanks, a use that is much more invasive and could reduce nearby property values. Permitting the construction of gas stations near or within residential neighborhoods results in increases of fugitive gasoline vapors and vehicle exhaust fumes.

Furthermore, permits posted for a convenience store instead of a gas station have a dampening effect on public input into local land use decisions. Nearby neighbors are less likely to object to an application for a convenience store to be built near homes and schools than a gas station with multiple pumps.

Eugene's planning system is flawed in that threats to health and well-being and neighboring property values are not always considered during land use decisions involving industrial or commercial businesses. Updating land use decisions to incorporate clearly protective criteria to avoid public health risks must become central to the decision-making process.

Eugene city code disregards community concerns related to permitting zoning changes that allow gas station construction. A case in point is the newly constructed 76 station at Everyone's Market on Barger Drive. The initial application to up-zone this site changed the property from C-1 Neighborhood Commercial to C-2 Community Commercial.

However, the application did not specify what future development would occur at the site, although there was a vague reference that a gas station could be allowed if the C-2 zone change was approved. Despite residents citing concerns over a potential gas station development, the applicant's representatives noted

that the city could not consider those concerns for a zoning change decision (Eugene City Staff, 2021).

After the zoning change was approved, the business owner then applied to construct a gas station at the site.

Due to the fact that gas stations are a permitted use in C-2 zoning, neighbors no longer had a pathway to give input or object to the addition of a gas station within yards of their homes (City of Eugene Planning & Development, 2022).

Essentially, public comment was curtailed and trivialized during both phases of the land use decision-making process.

GAS STATION **LOCATION SATURATION** AND **ELECTRIC VEHICLE TRANSITION**

There are no economic, environmental or public health benefits to constructing new gas stations in Eugene. As is shown in Figure 9, with the 56 gas stations within the city limits, Eugene has ample gas station location coverage. In fact, everyone driving a vehicle inside the urban growth boundary has access to at least one of the city's nearly five dozen stations in a five-minute drive. In some areas of Eugene, a person can reach over 20 stations within a five-minute drive.

As Oregon continues to achieve reductions in greenhouse gas emissions, the next generation is predicted to increasingly rely on electric vehicles and bicycles, ride-hailing services, scooters and public transportation.

Given these significant changes in transportation preferences combined with the current saturation of gas stations throughout the city, community members can anticipate that gas stations will likely become outdated, decaying, and polluting structures.

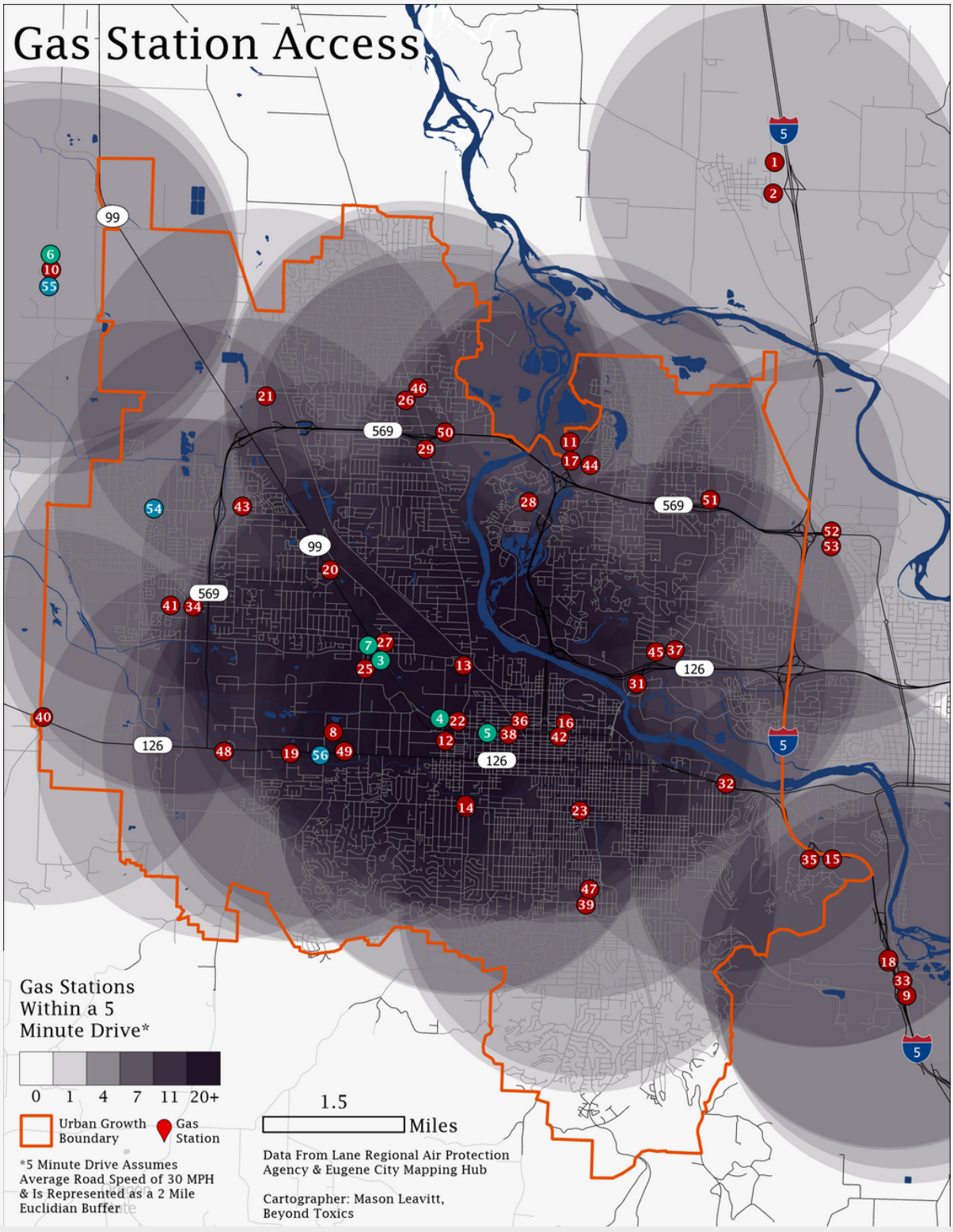

FIGURE 9. GAS STATION ACCESSIBILITY IN EUGENE

Fifty-six gas stations located within Eugene's urban growth boundary provide ample fueling coverage. This is increasingly true as our dependence on gas-powered vehicles continues to wane in future years.

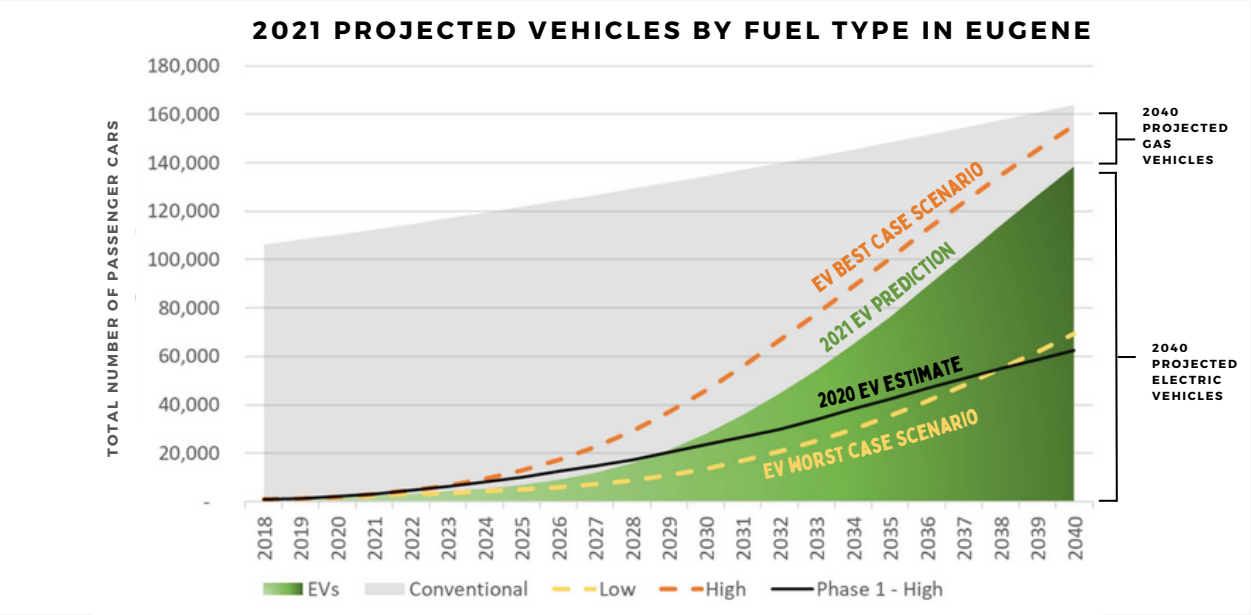

FIGURE 10. PROJECTED TOTAL ELECTRIC AND PASSENGER VEHICLES IN EWEB SERVICE AREA BY 2040

EWEB is forecasting a major increase in the number of EVs (green area) relative to gas-powered passenger vehicles (grey area) on the road by 2040. The graph forecasts a massive decrease in gas-powered passenger vehicles (grey area). Eugene's most recent sales are on track for the high adoption projection (orange line). Original graphic is from EWEB's Phase 2 Electrification Report (EWEB, 2021).

EWEB projects the number of gas-powered passenger vehicles on the road to drop approximately 80% from over 100,000 vehicles in 2018 to approximately 20,000 in 2040.

This forecast aligns with data from the Oregon Department of Energy, which shows Eugene is steadily increasing EV registrations, with the number of new registrations for EVs increasing 54% annually on average for the last 5 years (Oregon Department of Energy, 2023).

This rapid growth in EV registrations suggests Eugene is on a trajectory to surpass its target of 15,000 EVs by 2030 (City of Eugene, 2022).

The State of Oregon is also on track to reach its 2035 EV targets.

"[Oregon's] 2030 goal (25 percent of registrations and 50 percent of vehicle sales) and the 2035 goal (90 percent of sales) will almost certainly be met."

- Oregon Department of Energy in 2023 Biennial Zero Emission Vehicle Report

Given current trends of EV sales, Eugene's demand for petroleum will plummet.

Researchers have found that 80% of gas stations will be unprofitable in as little as 12 years (Ruebeis, 2019).

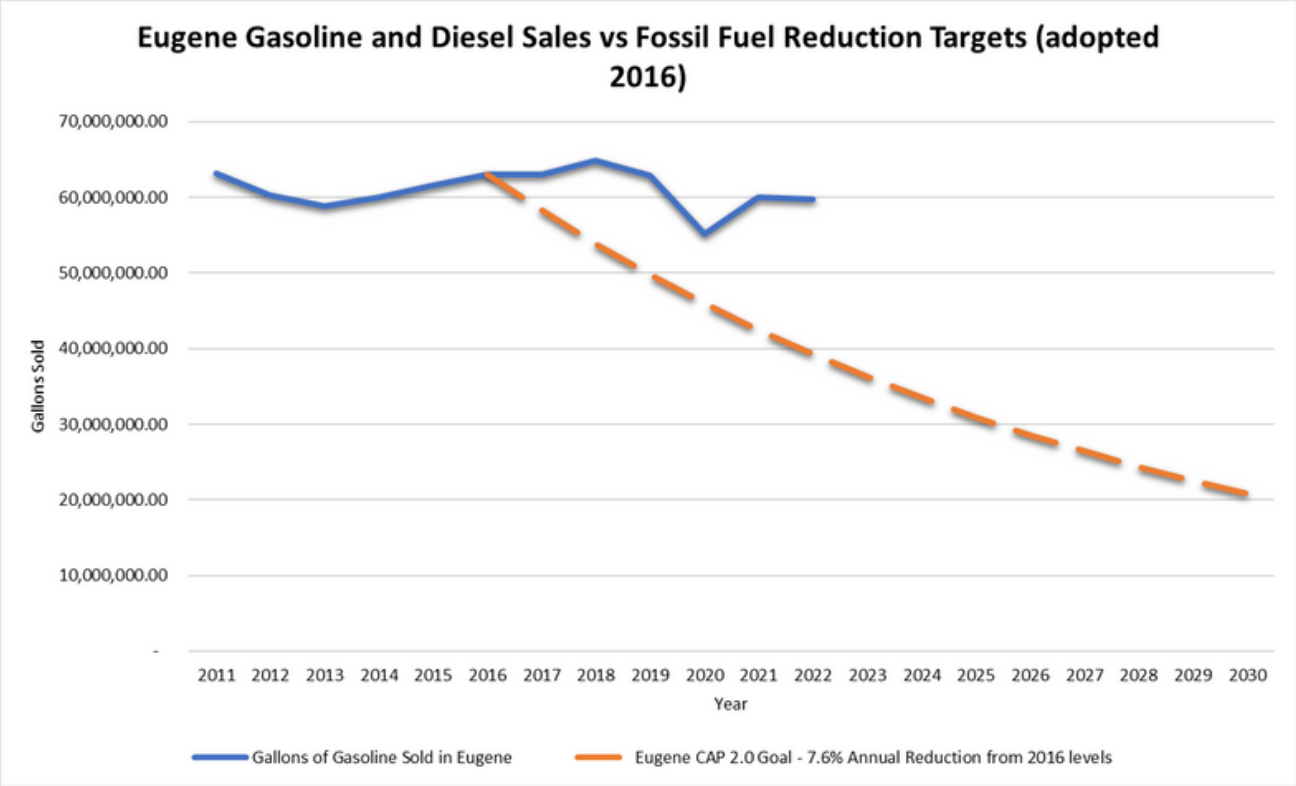

FIGURE 11. GASOLINE AND DIESEL SALES VS EUGENE'S FOSSIL FUEL REDUCTION GOALS

The graph illustrates a lack of progress towards Eugene's goal to reduce fossil fuel greenhouse gas emissions 7.6% per year from 2016 levels. After a significant drop in 2020 due to Covid-19, gasoline consumption levels have rebounded significantly. Graph created by Zach Mulholland. Data from Eugene's Climate Action Plan 2.0 (City of Eugene, 2022).

EXAMPLE OF TACKLING THE PROBLEM: PETALUMA, CALIFORNIA

The first city in the United States to ban new gas stations was Petaluma, California followed by four more cities. Six additional cities, including Los Angeles, are currently crafting similar policies (Taft, 2022). This policy started with a moratorium on new gas stations that was followed by an outright ban and additional policies to regulate existing gas stations and promote Zero Emission Vehicles (ZEVs).

"In March 2021, the Petaluma, CA City Council voted unanimously to prohibit the creation, expansion, reconstruction and relocation of gas stations, encouraging owners to transition to stations that serve electric and hydrogen-powered vehicles. The changes were tackled through the zoning code." - Arredondo, 2021

How does Petaluma's ban work?
The Petaluma policy banned service stations by prohibiting construction of service stations in all land use zones. In Petaluma's "Allowed Uses Table," which governs what land uses are allowed in each zoning type, the City deleted "fueling station/gas station" as an allowed use in all zones (Hines, 2021).

The City of Eugene also has an Allowed Uses Table in Chapter 9 of the City's Land Use Code and could regulate the construction of new gas stations in a similar way by removing "service stations" from all zoning code types.

Regulations of Existing Gas Stations in Petaluma
In addition to banning new gas stations, the Petaluma policy also created regulations for existing gas stations limiting their ability to increase fossil fuel storage or dispensing capacity. Simultaneously, Petaluma encouraged policies to support ZEV charging and allow expansions for convenience stores and amenities.

Petaluma Model Rules for existing gas stations:

- Prohibits new construction of gas stations as well as expanded storage or dispensing capacity.
- Allows for alterations that don't expand fossil fuel storage or dispensing.
- Encourages changes that help with transition to ZEV station.

Petaluma Model Rules for EV Infrastructure

- Defines EV Battery Charging Stations in the land use code.
- Allows EV Charging Stations as an accessory use in most zoning types, so any business could install EV Chargers on their property.
- Waives permitting fees and the need to apply for permits.

These changes make it easy for any business in Petaluma to add EV charging to their location. Petaluma also requires a certain percentage of spaces in large parking lots to have EV charging available, whereas Oregon only requires a certain percentage have electrical conduit capable of installing Level 2 EV Chargers.

CONCLUSION

There are three considerations that necessitate the prompt adoption of land use policy changes to curtail new gas station construction.

- **Economic risks** associated with decommissioning and cleanups of underground fuel storage tanks;
- **Public health** impacts associated with proximity to gas stations and exposure to harmful vapors from contaminated properties;
- **Eugene's commitment** to meet its Climate Action Plan goals and responsibility to reduce fossil fuel use.

The economic incentives for electric vehicles provided by the Inflation Reduction Act, changing public attitudes around mobility and transportation planning, and the heightened urgency for climate action will require a fundamental transformation of vehicle fueling business models.

City planners and decision-makers must anticipate the documented trends that are leading to unprofitability and disinvestment from the gasoline dispensing facilities. Strategists conclude that up to 80% of the fuel-retail network may be unprofitable in as little as 12 years (Rubeis et al., 2019).

As a result, gas stations, as currently managed, are on track to become decaying, risky and abandoned pieces of infrastructure. However, cities and current gas station owners could leverage the real estate owned by fuel retailers more effectively (Rubeis et al., 2019).

By rethinking how to utilize the often-centralized and valuable locations occupied by gas stations, urban planners could consider a myriad of other zoning options, from retail, to restaurants to rest areas (things people can enjoy while recharging their EVs).

Making policy choices now to end the construction or expansion of gas stations will reduce future public health risks, reduce the numbers of cleanups and removals of fossil fuel infrastructure like USTs, and accelerate progress towards Eugene’s Climate Action Plan 2.0 and 2016 Climate Recovery Ordinance.

In conclusion, the following policy reforms are offered which can set Eugene on a path towards transportation planning that manages the future decline of fossil fuels and moves beyond environmental damage.

RECOMMENDATIONS

- Modify Eugene's Allowed Uses table in Eugene Code Section 9.2160 to disallow the construction or expansion of gas stations in all zoning categories. See recommendations in Table 3.
- Create opportunities for building a network of ZEV recharging stations by establishing charging stations as an Accessory Use in all zoning types and waiving permit fees.
- Support a Citywide EV Charging Master Plan in order to assess and plan promising sites for EV charging stations; use that information to create a plan of action to install EV chargers leveraging state and federal funds.
- Phase in a requirement to install EV charging stations at all gas stations by 2030.

City of Eugene Zoning Type	Service Stations, includes quick servicing (current)	Service Stations, includes quick servicing (recommended)
C-1 Neighborhood Commercial	Use not Allowed	Use Not Allowed
C-2 Community Commercial	Permitted	Use Not Allowed
C-3 Major Commercial	Conditional Use Permitted	Use Not Allowed
General Office	Use not Allowed	Use Not Allowed

TABLE 3: EUGENE ALLOWED USES TABLE - CHANGES NEEDED TO BAN NEW GAS STATIONS

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