Exhibit 40B - 1

From: Anthony Porrazzo
To: Samra Seymour
Subject: Gas Station @ Campus Glen and Willamette
Date: Tuesday, March 29, 2022 10:23:51 AM

[You don't often get email from anthony.porrazzo@icloud.com. Learn why this is important at http://aka.ms/LearnAboutSenderIdentification.]

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I oppose the gas station and convenience store. There is to be an elementary school built to the east of the park. Nobody appears to have taken this in consideration. Salish Middle School is to the west on Campus Glen. In your city guidlines you wish to encourage pedestrian traffic. Why then are you encouraging more vehicular traffic. It is being encouraged in front of a future elementary school, an existing middle school and a park. There is talk about a roundabout being built at Campus Glen And Willamette. These are designed to keep traffic moving, not to make it safer for the children and other pedestrians in the area. This is but one reason based on fact that I oppose this project.
Best regards: Anthony Porrazzo
Sent from my iPhone

Exhibit 40B - 2

From: Anthony Porrazzo
To: Samra Seymour
Subject: Project # 20-310 Hearing Examiner
Date: Sunday, April 03, 2022 9:10:20 PM

April 3, 2022

Dear Hearing Examiner,

I am writing in protest and with concerns for project 20-310 Meridian Market and Gas Station.
One area of concern is the storm vault, which is to be installed at the Meridian Campus gas station, at Campus Glen and Willamette. Being a retired employee of 38 years for the Los Angeles Department of Water and Power, I have some background with the dangers of spills of flammable liquids. Some of these dangers during the off-loading of tankers, as we would see at a gas station. I am very familiar with BMP's relating to the handling of flammable pollutants. I have also witnessed serval explosions and resulting in concrete vault lids being blown off. This was due to the accumulation of flammable vapors.

It concerns me that a 15,104 cubic. ft. vault has no monitoring system to determine the accumulation of explosive vapors. Also, the ventilation of the vault is to be accomplished by way of a single 5'X10' grate. This may or may not be sufficient to guarantee adequate exchange of the atmosphere in the vault. Two vents , one each on opposite sides of the vault lid would have been a better and safer design.

The tanker delivery area is outside of the fueling island containment area, which has a dedicated oil separator system prior to being discharged to the sewer. This means any spillage, minor or catastrophic will go into the storm catch basins, and then into the storm vault. That is the best case scenario, as some may exit by way of the driveway and go to the nearby gutter catch basin. I have seen this happen, when a large transformer ruptured. The fluid overwhelmed the storm grate and flowed into the street.

Back to the catch basin. I realize they are to be fitted with "ZPG" filter cartridges from Contech and then activated carbon, will absorb a limited amount of PAH's (polycyclic aromatic hydrocarbon) such as Naphthalene and benzene. Their entrainment is limited and not infinite. This makes changeout of these expensive filter cartridges imperative on a regular basis. The consequences of not doing this is they will still pass water and fluids ie: gasoline once they have been expended. This will especially be true during a spill. After entering the storm vault, vapors

my accumulate. The oil pollution control device may or may not prevent the flow of gasoline or a microemulsion of gasoline and water directly into the storm drain. This vault's main purpose is sediment storage, as is stated on print "C3." From the storm vault, it will travel 3400' to the Meridian Campus regional infiltration pond west of Willamette Dr. This pond is 2800' from the LOTT ground water reclamation site. **These areas recharge our well water that we drink!!!!** I feel this has not been addressed or resolved.

There is also going to be an issue with the fuel tanker entering the Campus Glen Driveway as this is a right turn, right turn out driveway. The fuel truck will either have to enter from the east on Campus Glen Dr thru a residential neighborhood or thru the Campus Point neighborhood via Madrid St and London Loop. Going ease on Campus Glen and left on London Loop to the London Loop driveway will not be desirable as fuel trucks are set up to off load from the passenger side. We must be mindful that fuel tankers are 8' wide and a minimum of 70' long (for a single tanker) another 45' for a double tanker. That is almost 120' in that tight lot. Please consider the dangers to our residents, ground water and safety when considering this permit. I think you will agree that the reports, and safety issues have not been adequately resolved. I appreciate the opportunity to share my concerns.

Respectfully,

Anthony Porrazzo

Exhibit 40B - 3

From: Anthony Porrazzo
To: Samra Seymour
Subject: Fwd: Attention Hearing Examiner
Date: Monday, April 11, 2022 10:40:18 AM

April 8, 2022

Re: Regarding Project 20-310 Meridian Market Gas Station.

Dear Hearing Examiner,

I am a retired employee of Los Angeles Department of Water and Power. I was employed there for 38 years. I have a great deal of experience with large underground storage tanks and with underground substructures (vaults). I am also familiar with the problems presented with water ground intrusion. This was gained by working at all of their hydroelectric plants. I have seen first-hand, what perched ground water seepage can do to the stability of soil. Structures have to be built to account for this. The Zipper Geo Survey was done May 22, 2020 for a single story learning center, and not a two story commercial building with underground storage tanks for gasoline and a 15,104 cu ft storm detention vault. In the report for the learning center, it was noted that there was perched groundwater on the parcel. According to the NRCS "A perched groundwater is a saturated zone in the soil, that reportedly forms 1.5 to 3.3 feet below the ground surface during the wet season". The test pit survey was done in May. "Groundwater, flow rates and moisture conditions should be expected to vary." At test site #6 dug to a depth of 10 feet, perched groundwater seepage was encountered between 6 and 61/2 feet below the surface. "Along with moderate caving, 3-6 1/2 feet. This is the approximate area the underground storage tanks (UST) are to be installed. UST's have been observed to become buoyant in situations such as these. One such occurrence, even though Deadman anchors were set, the UST rose 4" and became out of spec. See (www.Eng-Tips.com UST rises 4" Thread 274-421606) This is not an isolated incident. Situations such as these are readily seen where high groundwater exists. Remember the specific

gravity of gasoline is less than water. The tanks will not always be full, and therefore heavy enough to overcome their buoyancy. The Zipper Geo report for the "proposed learning center" also stated "The existing fill encountered in several test pits should be considered unsuitable for foundations, floor slabs and pavement support." They are recommending the removal of the soil, and any foreign material. Then repacking in suitable weather conditions. Of course there was no consideration for UST's or vaults. It was also suggested the concrete and rebar had to be adjusted for the soil conditions. We do not see this requirement being followed for project 20-310. This project desperately needs a geo report for today's requirements and special concerns for a gas station.

This proposed gas station abuts 6 single family homes directly. It is adjacent to another 100 single family homes in the Campus Point neighborhood. It is also across the street from a public park and a future elementary school. Communities in Washington and other concerned cities are pushing for and receiving larger setbacks for gas stations. The City of Lacey is not fighting for a larger setback, BUT allowing **less** of a setback which is normally required! Cities are also looking to the future. Petaluma California has become the first city to ban new construction of gas stations altogether! www.Fossilfuels.com posted an article from The Columbia University Mailman School of Public Health findings. Stating in the study, "Vapors from gas station vent pipes often emit ten times the amount of emissions that were originally used to determine setback regulations for playgrounds, public parks and schools." The article goes onto highlight that nearby communities are being exposed to carcinogens from these UST vent pipes. Parcel # 11936340200 is 1.5 acres in area. From the 6 homes back fence across the property to the sidewalk is approximately 249 feet! The vent pipes will be dangerously close to these home and their community. Do we allow a business to effect the health of the people in this community for a few minutes of convenience?

I therefor express my greatest concern and protest the granting of a conditional use permit for this proposed gas station.

Best regards,

Anthony Porrazzo

Campus Ridge resident

Exhibit 40B - 4

From: Stephanie Ballou
To: Samra Seymour
Subject: Meridian Market & Gas Proposal
Date: Monday, March 28, 2022 11:06:54 AM

[You don't often get email from srballou9813@yahoo.com. Learn why this is important at http://aka.ms/LearnAboutSenderIdentification.]

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Good morning:

I am writing to voice my concerns about the proposed market and gas station site at the Campus Glen area.

I do not live in that neighborhood, but live in the Continental Crest neighborhood less than a mile away. We've lived here over 20 years. My husband and I frequently ride our bikes and run along Willamette, as do many folks in this area. This is already a high-traffic foot area for folks like us, as well as kids who attend the nearby middle school. With cars driving in and out of a gas station/market, I believe this could create a potential hazard for pedestrians.

Putting in a gas station and market in this location does not make sense, since there are several gas stations in the area. There is one at the roundabouts off of Marvin and South Bay Road (less than five minutes from Campus Glen), one at the roundabouts at Marvin and Britton Parkway (about five minutes from Campus Glen), two at the corners of Martin and Meridian (about ten minutes away), and several across the highway and at the bottom of Nisqually hill. Another one does not need to go in, especially in a residential setting like Campus Glen. I also question the safety factor in installing some sort of petroleum line so close to residences. As for grocery shopping, there is shopping just across the highway. With the new overpass recently installed over I-5, the traffic flows quicker and it's much faster to get across the highway now than in the past. If people need to go to a smaller market, the above-mentioned service stations offer those conveniences.

Another, and I think the most important reason, to not build on this site is you will be taking away from the small, pleasant residential feel to this area. There was a quote from someone connected with this development several weeks ago in The Olympian who said this would be a similar look and feel to the Met Market in Proctor. This is most definitely NOT the same. I've been to that market and neighborhood many times. That area is busier and geared towards shopping and dining, with homes surrounding the core. While there are dedicated parking lots for the markets there, parking can be atrocious on the side streets (a lot of that parking overflows into nearby neighborhoods, by the way). I realize the market being proposed will not be on the scale of a Met Market (at least I hope not), but any amount of extraneous traffic could - as mentioned above - create a pedestrian hazard, as well as clog up streets for folks traveling in and out of the adjoining neighborhood there.

I urge you to please abandon this potential project. There are so few areas in the city anymore that can be called "quiet communities". We would like to retain the sanctity of this one. Thank you for your time.

Stephanie Ballou
(360) 556-4275

Sent from my iPad

Exhibit 40B - 5

Meridian Market and Gas Project

Hearings Examiner
April 4, 2022

Carmel Healthy Neighborhoods Alliance

Goal of the Alliance:

- "to enact a 500-foot public health safety zone between new gas stations and homes, schools and senior care facilities"
  - Benzene and other compounds released to the air from gas stations can increase cancer among those living within 500- to 1,000-feet
  - proliferation of carry-out liquor stores in West Clay and other neighborhoods. Researchers have documented that as the number of carry out stores increase, so do crime rates and health issues

Articles Sited:

- **Hydrocarbon Release During Fuel Storage and Transfer at Gas Stations: Environmental and Health Effects** Markus Hilpert 1 & Bernat Adria Mora1 & Jian Ni2 & Ana M. Rule 1 & Keeve E. Nachman
- Curr Envir Health Rpt 2015

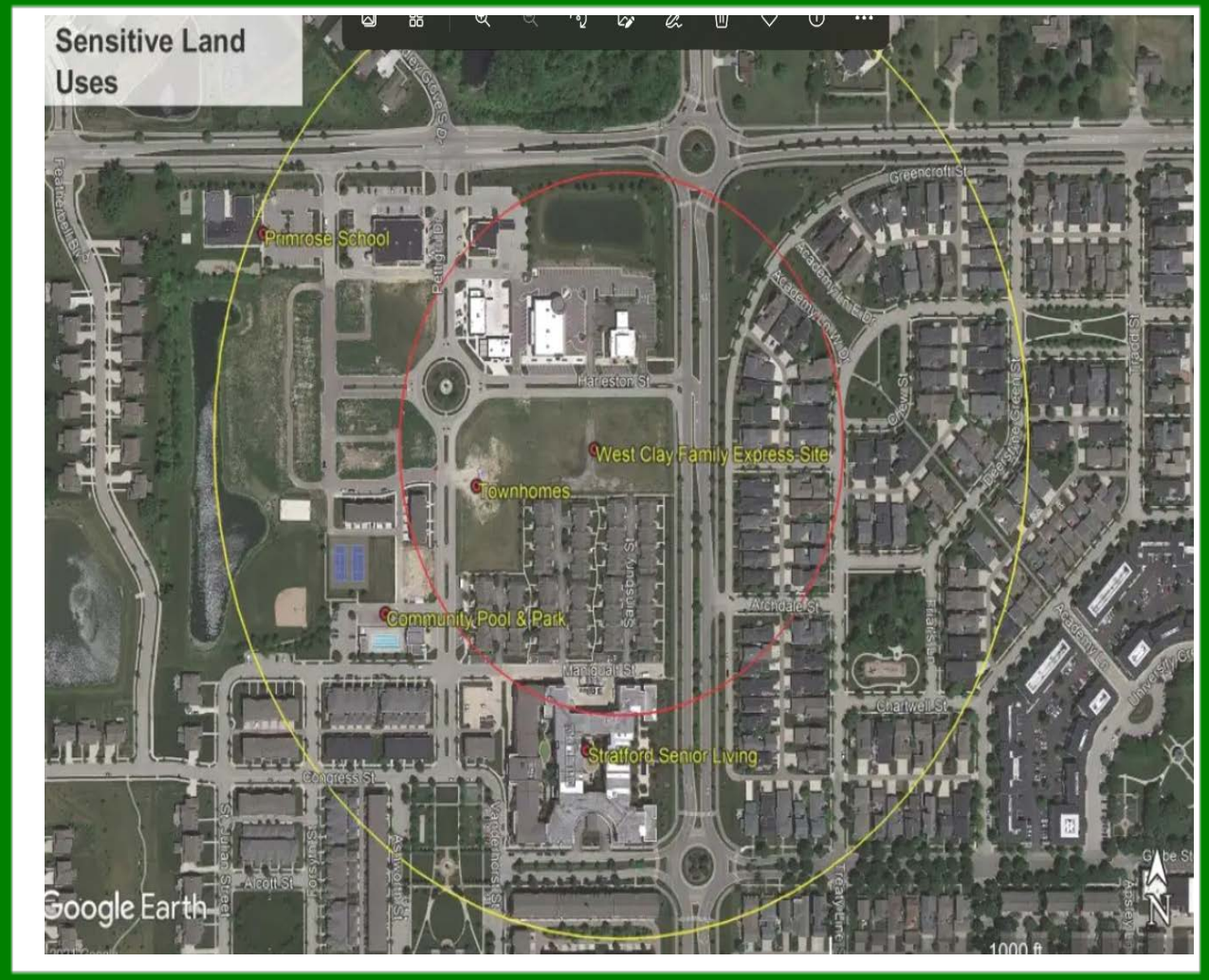
- **Vent pipe emissions from storage tanks at gas stations: Implications for setback distances**
- Science of the Total Environment 2019

- **Gasoline Vapor Emissions During Vehicle Refueling Events in a Vehicle Fleet Saturated With Onboard Refueling Vapor Recovery Systems: Need for an Exposure Assessment**
- Published online 2020 Feb 7
- National library of Medicine
- National Center for Biotechnology Information

Assessments:

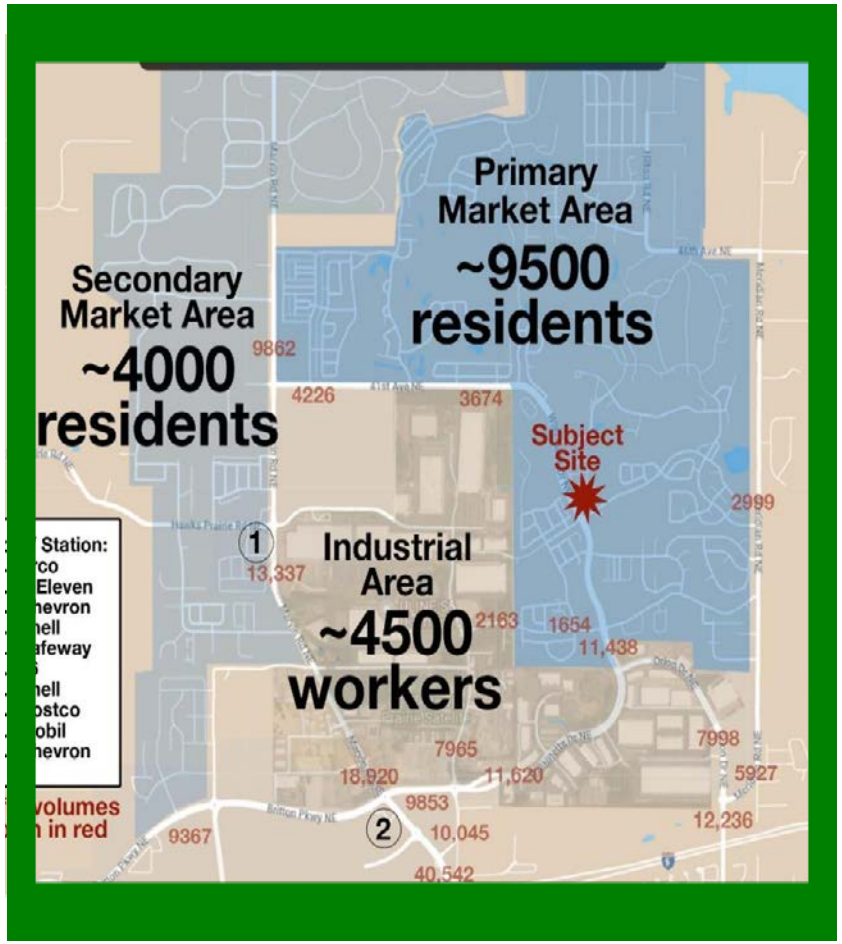
- 1) there is no safe level for benzene (2015)
- 2) vent emission factors were 10 times higher than previous estimates when more extensive testing occurred (2019)
- 3) The researchers found that 88% of vehicles with Onboard Refueling Vapor Recovery systems released vapors during refueling despite the presence of Onboard Refueling Vapor Recovery systems (2020)

Carmel (West Clay)



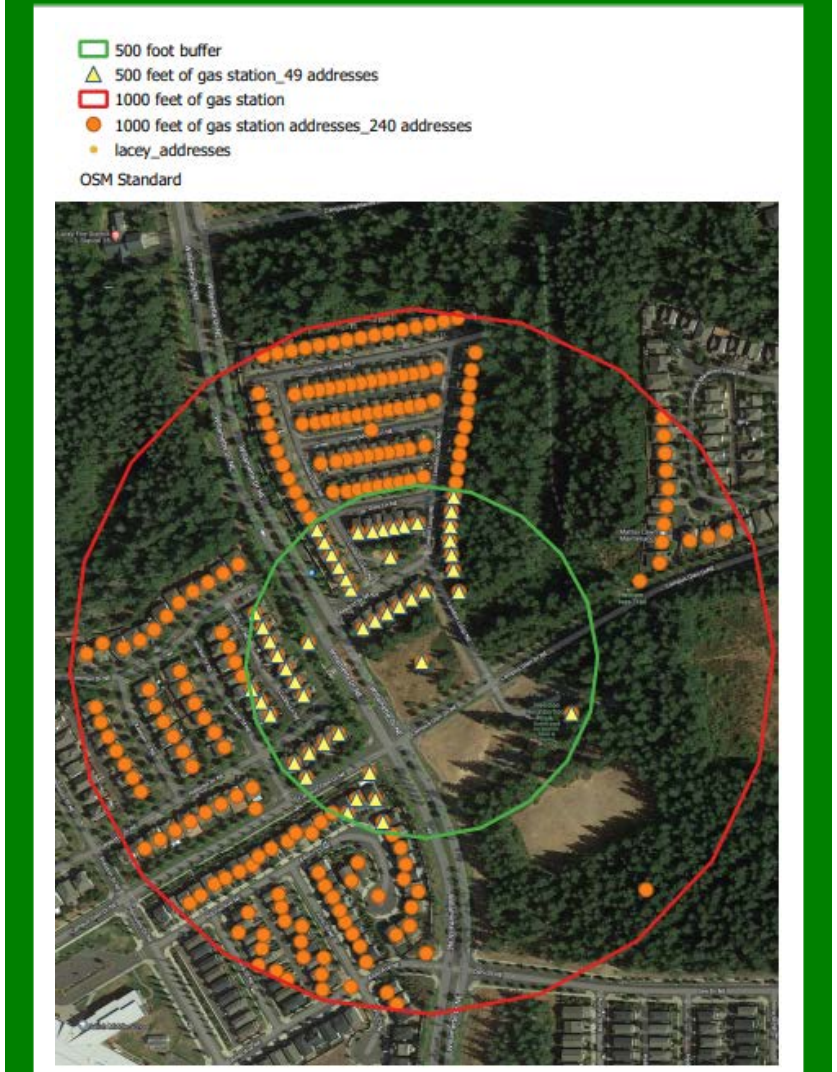
Impact on the neighborhood:

Market analysis



Aerial Development

Commercial land use encroachment into a residential area

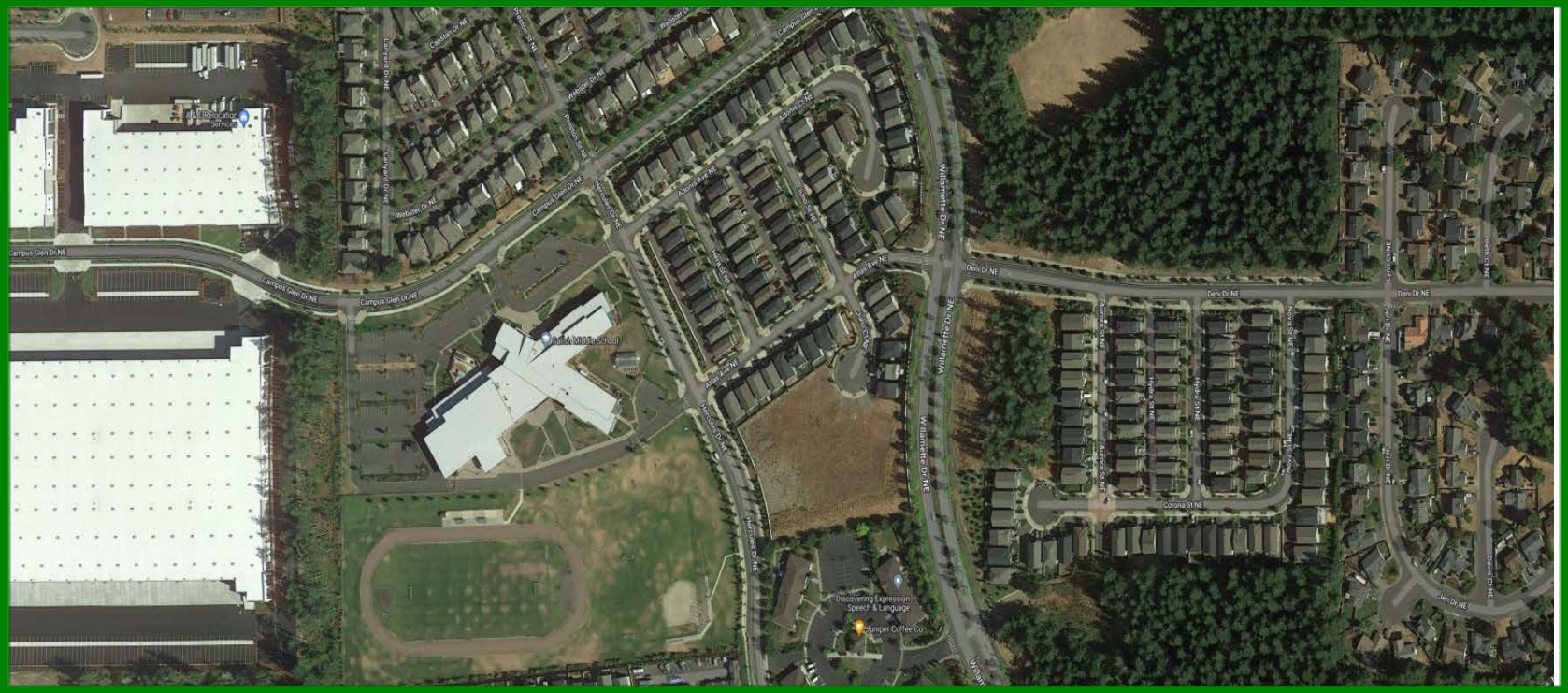


ANALYSIS

49 ADDRESS POINTS WITHIN 500 FEET

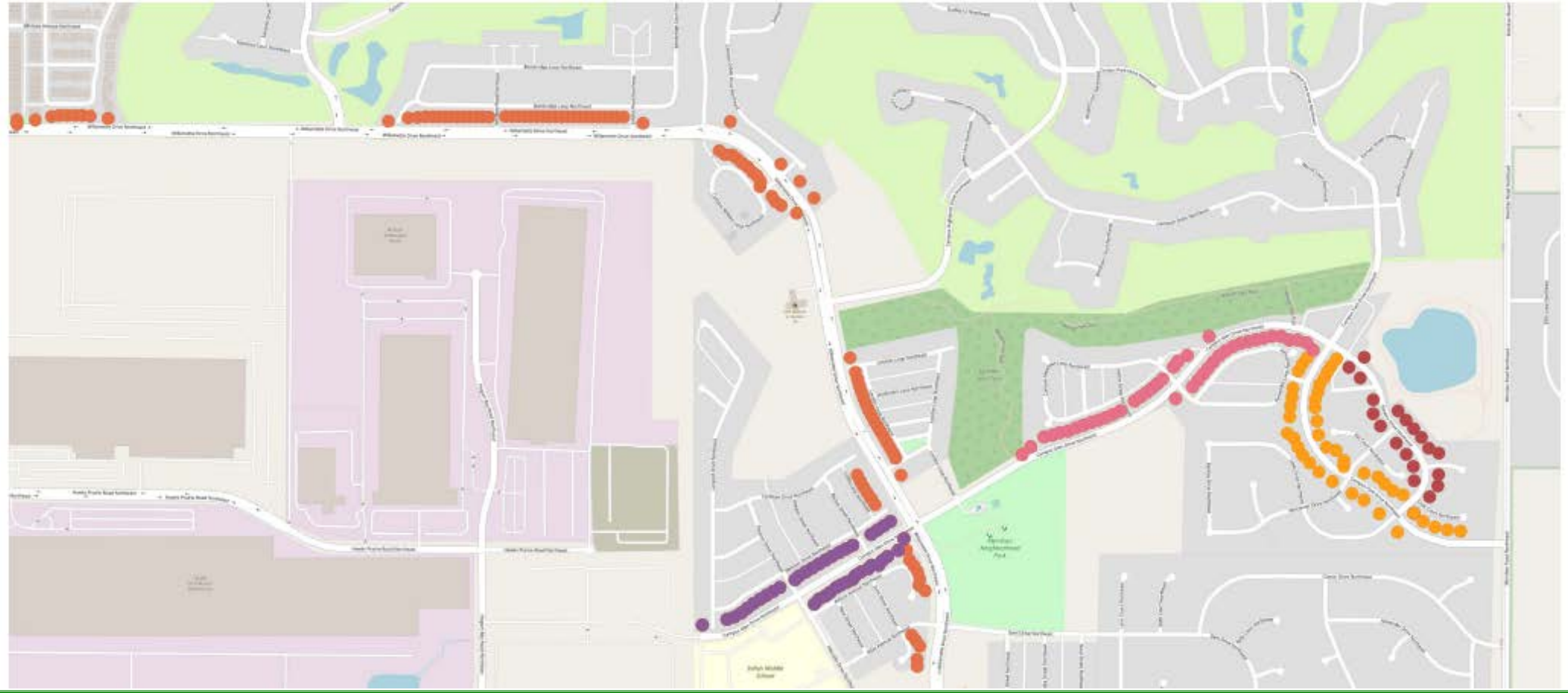
240 ADDRESS POINTS WITHIN 1000 FEET

390 feet from a park with outdoor play structures and basketball courts.



Distance from gas station to school is .361 miles or 1581 feet

Potentially 380 address points will be effected by increased traffic and deliveries



Final Thoughts:

1) Who does this site actually serve

2) More discussion of the actual retail landuse
    1) What retail will be included:
        1) Dry cleaners (more toxic issues)
        2) Food and liquor store
        3) Laundromats

3) Increased costs due to inflation of infrastructure and fire/police services

4) Crime Analysis

Exhibit 40B - 6

From: pat barte
To: Samra Seymour
Subject: Proposed gas station on Williamette
Date: Wednesday, March 30, 2022 1:47:57 PM

You don't often get email from bartep417@gmail.com. Learn why this is important

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As a resident and taxpayer of Lacey, I strongly urge you NOT to allow the proposed gas station to proceed. This is a residential neighborhood, not conducive to gas stations. Let them build their station down by the Marconi's business complex, not in our back yards.

Exhibit 40B - 7

From: Elaine Briggs
To: Samra Seymour
Subject: In case time runs out and I do not get to speak -- Exact Briggs comments for 4.12. Examiner"s Hearing Public Record
Date: Saturday, April 09, 2022 12:09:48 PM

Hello Ms Seymour,
I know the hearing is only one hour & you may have many speakers. If I do not get to speak due to time, please enter the brief comments into the public record. Thank you.

Elaine Briggs
9204 Periwinkle LP NE
98516
509-225-0345

Thank you. I would like to make three points:

1. This proposal is within a planned neighborhood which developed over the past 15 years across the street from the only publicly protected park and trail in Meridian Campus, and adjacent to a busy intersection in the walk zone for a public school; therefore, the ultimate use of this parcel will impact the character and livability of the area for years to come. People have always bought or rented homes here because of the safe, walkable, attractive environment with easy access to the I-5 corridor and related services, not because a gas station is so close by. Of the hundreds of comments sent to the City, I found not one favoring the project who would actually see, hear or smell the gas station from their home.

2. Real estate experts list gas stations along with strip clubs and funeral homes as neighbors that cause existing homes to sell for less money. Today, Meridian Campus property values are increasing, crime is low, residents walk safely to and from the park & school. The parcel currently poses NONE of the documented health and environmental risks inherent with gas stations.

3. The proposed project is within the City of Lacey Hawks Prairie Planning Area. The City's Comprehensive Plan (Section 5-7) states:
Goal 1: The Hawks Prairie Planning Area shall develop consistent with the vision provided in Lacey's Northeast Area Plan and associated design requirements.
Policy A: The goals and policies adopted in Lacey's Northeast Area Plan are considered applicable to the entire Hawks Prairie Planning Area and are hereby referenced and adopted in this document.

Most important, Lacey Municipal Code 16.37.070 specifies Design Standards for Convenience Stores and Service Stations. I quote the section related to Hawks Prairie Business District:

- **Convenience stores and service stations shall not be permitted on any parcel adjacent to an intersection.**

It seems on this basis alone, the proposed project should never have been considered. Thank you.

Exhibit 40B - 8

From: Ernest Byford
To: Samra Seymour
Subject: Project # 20-310
Date: Sunday, April 03, 2022 3:52:06 PM
Attachments: Lacey City Chevron Station.doc

Good Afternoon, Samra Seymour

I have taken the weekend to review the sent information from your office. Yes it was helpful to read and reread aspects of our cities policies and procedural requests of any proposed application submittals. It is unfortunate I will not be unable to contribute in a verbal / audio meeting on Monday the 4th. My apologies yet an appointment that was made did unsuspectedly to my surprise come up and must not be delayed as well.

This email letter covers my concerns with this project, # 20-310 Meridian Market and Gas Station, by the applicant Northwest Investors LLC, of Federal Way, Wa. Instead of singley putting in text every detailed concern of each stated Goal and / or Policy of the City of Lacey they were collectively listed. Including the concerns of our future residents, and children whom suffer our short sighted vision of what their future will hold. The narrative was kept short and concise as to my objection of this particular Project # 20-310

Thank you for being informative and forthwith in dealing with the Campus Meridian Community and neighbors in this matter.

Respectfully Submitted, E. Byford

To Whom It May Concern,

In regards to Lacey City Project 20-310 Meridian Market and Gas Station, various Goals and Policies noted under: V1. Applicable Comprehensive Goals and Policies

A. Chapter 111 Community Vision;
a. Section C. / V. Goal 2.
b. Section F Transportation and Land Use; 1. Goal1.
c. Section H. Utilities and Land Facilities; Policy B.
d. Section J. Health and Human Services; 11. Policy A.

Washington State Senate Bill passed for current Climate Control, in regards to emission controls SB 5974-2021-2022, in conjunction with HB 2119. In essence the sale of fossil fuel propelled vehicles being prohibited after 2030. This now is current legislation in accordance to 1287-S2.E AMS ENGR S2584.E the Climate Control Senate Bill.

After reviewing the information sent from your offices, it seems unlikely the City will rescind the applicant's permit on Project # 20-310 for another Chevron gas station. Yet as a resident who resides not more than a mile from this project in which I object to, it seems unfair that it will proceed without regard to our voices. An EV station is a better solution than this applicant's suggestion.

It has been said why we object to this project, for if the City Council or ombudsman who reviews applicants and citizens concerns where to reread the listed items above in an open context from my perspective these items are not being met. The Goals and Policies are not being adhered to and fail to meet this specific Meridian Campus / Hawks Prairie lifestyle concerns. In not considering the "Green Zones" and trail ways, the current middle school, a projected elementary school, the adjacent family Meridian Park, the "Safety Concerns" of both child and pedestrians and vehicle drivers.

The Northwest Investors LLC of Federal Way, WA, and their concerns put mildly "do not live here", do not contribute to our community, they do not worry about our, neighborhood, and this beautiful city needs not this fuel filling facility. Our area has been quite safe without introducing the subject of more extensive policing for abject possible crimes of thievery, vandalism, perhaps worse. We in our area have seen Tacoma, and currently what the local fueling station at Willamette @ Marvin has exhibited in our community. No thanks.

Respectfully Submitted,
E. V. Byford (retired)

Exhibit 40B - 9

From: Charles Callis
To: Samra Seymour
Subject: Re: gas station proposal at 8808 Campus Drive NE
Date: Friday, April 01, 2022 9:22:34 AM

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No to a gas station in the proposed Meridian Market location. It is inappropriately located. The other amenities proposed seem satisfactory to the area, especially a small market (like Spuds)and a casual dining area.

Respectfully,
Charles Callis (A Jubilee Resident)

Exhibit 40B - 10

From: nancy callis
To: Samra Seymour
Subject: Re: gas station proposal at 8808 Campus Drive NE
Date: Friday, April 01, 2022 9:17:23 AM

Dear S Seymour and the Hearings Examiner,

I have great concerns about this proposed fueling station being built next to a park and near the Middle School. Please do not allow this to proceed.

We have many gas stations with markets very close already and do not want or need another one, especially in a residential neighborhood.

This side of the freeway does need some amenities suitable to the area (many of us would like to let you know what we really want and could support if you are willing to hear from your constituents)

But we don't want or need this gas station.

Sincerely Sent,
Nancy Callis
5103 Herron St NE
Lacey WA, 98516

Exhibit 40B - 11

From: cort0711
To: Samra Seymour
Subject: I support the Willamette gas station
Date: Monday, March 28, 2022 10:07:26 AM

[You don't often get email from cort0711@aol.com. Learn why this is important at http://aka.ms/LearnAboutSenderIdentification.]

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Hello Samra,

As a resident of the Campus Pointe neighborhood which sits directly behind the proposed gas station location, I write to let you know I support the decision to place a gas station and convenience store at the intersection of Willamette and Campus Glen drive. Every reason the opposition has to not having the gas station isn't founded in substantiated fact. It's simply fear mongering. "It'll be unsafe for kids to cross" or "it'll attract the homeless population" are simply statements to scare people into not supporting a great use of this otherwise ugly undeveloped plot of land. For example, the Arco station at the intersection of Hawks Prairie Rd and Marvin Rd is kept in great condition with no homeless issues to speak of. Dangerous for children crossing the street? There is a large, lit, visible, and safe crosswalk that connects the west side of Willamette to the east side of Willamette just north of Campus Glen drive. The protest of this convenience store caused more trouble than the gas station ever would. The protestors holding signs blocking sight lines turning from Campus Glen onto Willamette drive made entering the intersection extremely dangerous. The protestors are the problem, not the gas station. This convenience store has been billed as a miniature metropolitan market and I couldn't be happier to see it be built and thrive in our neck of the woods. I support the Willamette gas station.

Regards,

Cort Campbell
Campus Pointe resident

Exhibit 40B - 12

From: Kristina Cox
To: Samra Seymour
Subject: 8808 Campus Glen Drive NE
Date: Tuesday, March 29, 2022 7:40:19 PM

You don't often get email from kristinawarriorprincess@gmail.com. Learn why this is important

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RE: Meridian Market and Gas

Dear Lacey Council Members,

I am writing as a member of the community in a nearby neighborhood to the proposed gas station and convenience store development at the planned site in the subject line. I am concerned that the city of Lacey would allow development of this green space so close to a municipal park and crosswalks in a residential area with many families and their children using the park, sidewalks and crosswalks.
Not only are Lacey families walking, jogging and bicycling and enjoying the park, but many children cross the road daily in this area to go to and from school. The added traffic and possibility of car and pedestrian or bicycle collisions is a likelihood. Furthermore, the light pollution, noise pollution and environmental impact of an additional gas station in this area when there are already accessible gas stations within a couple of miles, is unacceptable.
When I lived in Lacey as a teen, we received the honor of being an All American City and were named the City of Trees. I moved to Olympia's west side while attending Evergreen State College, but I still had roots in Lacey.
When life's circumstances changed, and our family grew, my husband and I purchased a home just outside of what is currently Lacey's city limit. It is my understanding we will soon be one of the neighborhoods that will be absorbed in the event of an extended city boundary. I don't recognize the Lacey of today. So much development has occurred that it saddens me. While we need housing, is it necessary to cut down more trees to build another storage center, some big box stores, or a third gas station within a short distance to another? I ask you to please reconsider your approval of the development of 8808 Campus Glen Drive NE as a gas station and convenience store. It's irresponsible as city managers to allow this business to be situated in an area that could lead to the endangerment of children.

Sincerely,

Kristina, Brodie and Beatrice Cox

Exhibit 40B - 13

From: James Fellows
To: Samra Seymour
Subject: Development of the parcel on the corner of Williamette Dr NE and Campus Glen NE
Date: Monday, April 11, 2022 9:30:19 AM

Dear Samra,

I am writing this to you in hopes that my comments will make it into the official record regarding the development of the parcel on the corner of Williamette Dr NE and Campus Glen NE which proposes to build a gasoline refueling station along with other associated offices/retail facilities.

Attention Hearing Examiner.

Please officially record that as a taxpayer, member of the local community, and an active voter, I strongly oppose the development of this lot for the purposes proposed by Northwest Investors LLC.

I object to this project for several reasons:

1. Public safety. This lot is directly across the street (Campus Glen Dr NE) from a very active neighborhood park. This park generates a significant amount of vehicle and foot traffic. Much of this foot traffic is from young children crossing the road going to and from the l the park and the school across Williamette. Building a gasoline station with its associated increased vehicle traffic in close proximity to this park would create a significant hazard to the children of this community.

2. Lack of need. With numerous gasoline stations with associated “convenience” stores currently located within 2 miles or less from this location, it provides little or no benefit to the local surrounding neighborhoods. There are at least 8 existing gasoline refueling stations with convenience stores within walking distance of this proposed location. In addition, Washington State has recently passed law that no new vehicle with an internal combustion engine will be able to be sold within the state by 2030. This action follows similar action by the federal government. With our own government forcing less dependence on fossil fuels, how can Lacey planners justify the need for more gasoline stations?

3. Environmental hazard. It is an established fact that gasoline refueling stations create high potential for environmental hazards from: 1) Burying tanks that hold thousands of gallons of toxic fuel and chemicals underground (which eventually corrode and leak into the surrounding ground water) to 2) Run-off of spilled gasoline products into our local gutter systems and eventually into the local ground water and eventually into the Puget Sound which is less than a mile from this location. Why would the Lacy City Council propose creating an environmental hazard in a neighborhood so close to family housing and a busy city park and school?. This suggests a blatant disregard for the health and welfare of this neighborhood's residence.

4. Consideration of the future. The timing of building a new gasoline refueling station is out of step with current governmental mandates and societal trends. The entire world is moving away from gasoline fueled vehicles and rushing toward electric powered transportation. Several states have already mandated that gasoline powered vehicles will not be sold in their state in the next eight years, and our state governor and legislature have already passed restrictive legisalation as mentioned in para 2 above. Every day we see more and more electric vehicles on our roads and highways, and this neighborhood is no exception. If the Lacy City Council wanted to be in step with current and future state, national, and world desires and mandates, they would be looking at ways to also promote the move toward electric powered transportation, rather than considering putting our neighborhood at risk of significant environmental hazards by building more gasoline refueling facilities.

Thank you for your attention.
Respectfully,

James A. Fellows
4241 Bogey Dr NE
Lacey, WA 98516

Exhibit 40B - 14

From: Darren Healey
To: Samra Seymour
Subject: Proposed Meridian Market and Gas Station
Date: Friday, April 08, 2022 3:18:04 PM

I strongly oppose allowing a gas station to be built at Willamette and Campus Glen.

For unknown reasons, this plot of land was zoned as Neighborhood Commercial back in 2003. At this time there would have only been a fraction of the neighborhoods that there are now. The opinions and concerns of the families that live in these neighborhoods should have greater weight than a questionable decision made by a city planning entity nearly 20 years ago.

Even by the standards of the Neighborhood Commercial zone, a gas station is not a good fit:

> **16.36.010.C**
> Limit such development to areas where **local economic demand**, **local citizen acceptance** and appropriate design solutions assure compatibility with the neighborhood.

"Local citizen acceptance" is severely lacking or altogether absent. The opposite is true. Regular protests against this gas station have been made on this corner over the last few months. I have personally attended and seen that most people that drive through the area agree with the protests.

"Local economic demand" is highly questionable, especially considering that gas can be obtained by driving an extra couple of minutes south or west of this location. There are a number of gas stations that are passed on the way to any of the nearest I-5 interchanges. Additionally, any convenience factor gained by having a relatively small market slightly closer does not justify the problems that come along with it: increased traffic, litter, crime, just to name a few.

> **16.36.030.B**
> General Character. Developments in this district shall be characterized by small buildings (uses with less than ten thousand square feet), **low traffic generation**, considerable walk-in trade, **moderate lighting**, and quiet operations.

"Low traffic generation" does not fit with this location. Adding any type of market or gas station here will increase traffic, period. This increase in traffic is actually documented by research that was posted on the city's pending planning website.

The last time I looked, documents posted on the Lacey pending projects website contained over 300 emails of people that were against having a gas station built here (**Exhibits 40 and 41.pdf**). It's reasonable to assume that this only represents a fraction of the people that are opposed. Many more people may not be aware of what is going on or know who to contact.

“Neighborhood Commercial” zoning is an oxymoron. A gas station will not provide a safe, active living space. Gas fumes from the pumps and increased traffic will spill over into the nearby houses, park, and wildlife trails. The gas station is located less than 75 feet from park and trail areas. This is unprecedented. Gas stations should stay closer to the freeway, off Hogum Bay or Marvin Road next to other commercial zoning areas where trees have already been removed. What protection is in place for the birds and wildlife that frequent or live in the greenbelt adjacent to the proposed gas station?

There is already a growing homeless population growing throughout an increasingly large number of areas in Lacey and Olympia. A market and gas station will provide a means to conveniently get food for homeless people that decide to move into the nearby green spaces. Homelessness brings many other safety concerns such as drug use, crime, and large amounts of litter. The neighborhoods here should be protected first and foremost by not allowing commercial businesses to be built this close by.

I implore anyone that has any hand in making these decisions to please protect and stand up for the people that live in this area by turning down this project. Even if you personally disagree with these residents, or are somehow unable to imagine a change occurring against your wishes in your own neighborhood, the safety and wishes of these residents should come before the monetary ambitions of companies and any increased tax revenue.

Exhibit 40B - 15

From: Helenann Hyytinen
To: Samra Seymour
Subject: Meridian Market and Gas
Date: Tuesday, March 29, 2022 9:52:36 AM

TO WHOM IT MAY CONCERN:

No way is a convenience store with gas pumps acceptable at Campus Glen Drive NE. Why are you even thinking of surrendering to this horrible, no-good, very bad idea?

Be fair with us and our children. We bought in this area because it was controlled residential area.

You have already demanded us to adjust to Paul-Bunyan-sized semis and an enormous number of warehouses. This is a residential section. What more can you ask from us. We have done our share. Protect us, please.

Next you will want to build a round about to create an entrance to that facility. Do you need that expense? Also sorry to say, but that facility will require security checks nowadays. If a child is injured in that area, the city will be sued. We are asking you to protect us and yourselves and our schools.

Do you read the murders and crime stats for convenience stores? You want that life for our children or for Lacey's reputation. We hear Yelm is already working to NOT become another Lacey. Stay out of residential areas.

**This area does not need another high-priced Chevron or Shell gas station.
We have too many gas stations. Build in an industrial area in the warehouse campus not here. Be fair and protect our real estate value.**

Hoping to thank you very much.

**Raymond L. Hyytinen
253-221-5446**

Exhibit 40B - 16

From: Sylwia Jarosz
To: Samra Seymour
Subject: Hearing Statement
Date: Monday, April 04, 2022 12:18:59 AM
Attachments: Hydrocarbon-Release-During-Fuel-Storage-and-Transfer-at-Gas.pdf
Vent-pipe-emissions-from-storage-tanks-at-gas-stations.pdf

Dear Samra,

I am beginning a new job and will not be able to attend the hearing today concerning the Meridian gas station project.

Below is my statement to share with you and the city council. I appreciate you delivering these concerns on my behalf.

The Meridian gas station project is a proven high risk danger to the health and safety of residents adjacent to the property, families who visit Meridian Park, and the many children who attend Salish Middle school 1 block away and would be walking home towards the proposed gas station. Hundreds of local children would be exposed to extremely toxic chemicals from exhaust and gasoline, particularly benzine, toluene, ethyl benzene, and xylene (BTEX), which studies have shown cause brain damage, leukemia, and possible death. Benzene is of special concern because it is causally associated with different types of cancer. It is a human carcinogen identified by ARB as a toxic air contaminant. Benzene also can cause non-cancer health effects above a certain level of exposure. Brief inhalation exposure to high concentrations can cause central nervous system depression. Acute effects include central nervous system symptoms of nausea, tremors, drowsiness, dizziness, headache, intoxication, and unconsciousness. Not only are the fumes from fuel nozzles dangerous, but the gasoline from the vent pipes in storage tanks. During delivery, storage, and dispensing of fuel at gas stations, unburned fuel can be released to the environment in either liquid or vapor form. Fuel is a complex mixture of chemicals, several of them toxic and carcinogenic. Of these chemicals, the health consequences of chronic benzene exposure are best understood. Occupational studies have linked benzene exposures to numerous blood cancers, including acute myeloid leukemia and acute nonlymphocytic leukemia.

At gas stations, fuel is stored and transferred between tanker trucks, storage tanks, and vehicle tanks. During both storage and transfer, a small fraction of unburned fuel is typically released to the environment unless pollution prevention technology is used. While the fraction may be small, the cumulative release can be substantial because of the large quantities of fuel sold. The cumulative release of unburned fuel is a public health concern because gas stations are widely distributed in residential areas and because fuel contains toxic and carcinogenic chemicals.

According to the *World Health Organization Guidelines for Indoor Air Quality*, there is no safe level for benzene. A 2019 study of U.S. gas stations found that benzene emissions from underground gasoline storage tank vents were sufficiently high to constitute a health concern at a distance of up to 518-feet.

Many cities have developed rules to restrict gas stations a minimum of 1000ft. from residential homes and parks/playgrounds. I ask for the City of Lacey to impose these restrictions as well, and deny the permit of the Meridian Gas Station project. It is absolutely necessary in order to protect the health and safety of our city's families, children, and residents. Children are especially vulnerable to these toxic chemicals and it is our moral and civic duty to provide a safe environment near our homes, schools, and parks. As a modern, growing city, I am counting on the Lacey City council to do what is right and model these values through proper safety restrictions.

Thank you for your time,
Sylwia Jarosz
Mother of a 3 year old who loves Meridian Playground

Curr Envir Health Rpt (2015) 2:412–422
DOI 10.1007/s40572-015-0074-8

Hydrocarbon Release During Fuel Storage and Transfer at Gas Stations: Environmental and Health Effects

Markus Hilpert[1] · Bernat Adria Mora[1] · Jian Ni[2] · Ana M. Rule[1] · Keeve E. Nachman[1]

Published online: 5 October 2015

Abstract At gas stations, fuel is stored and transferred between tanker trucks, storage tanks, and vehicle tanks. During both storage and transfer, a small fraction of unburned fuel is typically released to the environment unless pollution prevention technology is used. While the fraction may be small, the cumulative release can be substantial because of the large quantities of fuel sold. The cumulative release of unburned fuel is a public health concern because gas stations are widely distributed in residential areas and because fuel contains toxic and carcinogenic chemicals. We review the pathways through which gasoline is chronically released to atmospheric, aqueous, and subsurface environments, and how these releases may adversely affect human health. Adoption of suitable pollution prevention technology should not only be based on equipment and maintenance cost but also on energy- and health care-saving benefits.

Keywords Gas stations · Vapor emissions · Fuel spills · Adverse health effects · Pollution prevention

Introduction

The primary function of gas stations is to provide gasoline and diesel fuel to customers, who refill vehicle tanks and canisters. Operating a gas station requires receiving and storing a sufficient amount of fuel in storage tanks and then dispensing the fuel to customers. During delivery, storage, and dispensing of fuel at gas stations, unburned fuel can be released to the environment in either liquid or vapor form. Fuel is a complex mixture of chemicals, several of them toxic and carcinogenic [1]. Of these chemicals, the health consequences of chronic benzene exposure are best understood. Occupational studies have linked benzene exposures to numerous blood cancers, including acute myeloid leukemia and acute non-lymphocytic leukemia [2]. Concerns have been raised that gasoline vapor exposures incurred by gas station attendants [3] and tanker truck drivers [4] may result in health risks.

The potential for fuel released to the environment at gas stations, in the form of liquid spills or vapor losses, to elicit adverse health outcomes could be substantial due to the widespread distribution of gas stations across communities and the intensive usage of vehicle fuel in industrialized nations. For example, the USA consumed about 137 billion gallons of gasoline, or about 430 gallons per US citizen, in 2014 [5]. If only a small fraction of this gasoline was to be released to the environment in the form of unburned fuel, for instance 0.1 %, then about 1.6 L of gasoline would be released per capita per year in the USA. In Canada, a study estimated that evaporative losses at gas stations in 2009 amounted to 58,300,000 L [6]. With a population of about 34 million, we estimated that about 1.7 L of gasoline was released per capita per year in Canada from evaporative losses, without counting the liquid spills. While personal intake of this quantity of gasoline would result in serious adverse health effects, environmental dilution can decrease personal exposure. An overarching question is under which conditions dilution in the aqueous and atmospheric environments can limit personal exposures to acceptable levels. For example, cumulative adverse health effects could be more pronounced in metropolitan areas where more people

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are exposed and where the density of gas stations is larger than in rural areas.

Engineers and regulators have paid a lot of attention to leaking underground storage tanks (LUSTs) and leaky piping between storage tanks and gasoline-dispensing stations, which can result in catastrophic fuel release to the subsurface [7]. For instance, double-walled tanks have become standard in order to minimize accidental release of liquid hydrocarbon. Technologies that prevent pollution due to non-catastrophic and unreported releases of hydrocarbon that occur during fuel storage and transfer (hereafter referred to as "chronic releases"), however, have not been uniformly implemented within the developed world. The state of California in the USA has the strictest policies to minimize chronic releases, either in liquid or in vapor form. Other US states and industrialized nations, however, have not uniformly adopted California's standards, potentially because comprehensive economic and public health analyses to inform policy making are not available. This paper focuses on chronic hydrocarbon releases at gas stations (including both liquid spills and vapor losses), their contributions to human exposures and potential health risks, and factors that influence the adoption of suitable pollution prevention technology.

Chemical Composition of Fuel

Fuels have historically contained significant fractions of harmful chemicals, some of which have been documented as contributing to morbidity and mortality in exposed persons. Crude oil, from which fuels have historically been refined, already contains toxic chemicals such as benzene [8]. Fuel additives including anti-knocking agents and oxygenates have historically also been a health concern [9]. Fuel composition has changed over time, primarily due to environmental and health concerns [9]. Fuel composition also depends on geographic location and fuel type (e.g., conventional versus reformulated gasoline) [10]. In the 1920s, lead was added to gasoline as an anti-knocking agent to replace added benzene because of its carcinogenicity [11]. Due to the massive release of lead to the environment and its neurotoxicity [12], lead was replaced in the 1970s by less toxic anti-knocking agents including methyl tert-butyl ether (MTBE) [13]. To reduce formation of ground-level ozone and associated adverse respiratory health effects [14], cleaner burning of fuel was sought in the 1990s by adding oxygenates to gasoline. This was accomplished by increasing the concentrations of MTBE, which acts as an oxygenate [9]. However, MTBE accidentally released to the subsurface [15] contaminated downstream drinking water wells relatively quickly, moving almost with the speed of groundwater, because MTBE is hydrophilic and poorly biodegradable [16]. MTBE was later on identified as a potential human carcinogen [16]. In the USA, MTBE was therefore phased out in the 1990s; at the same time, refineries began supplementing fuel with ethanol as an oxygenate [17].

In current gasoline formulations, benzene, toluene, ethylbenzene, and xylene (BTEX) and particularly benzene are the most studied chemicals and are currently believed to be of greatest health concern [18]. Table 1 shows that fuels have historically contained large fractions of toxic and carcinogenic chemicals. In many countries, lead and MTBE are no longer used. Benzene levels in gasoline are currently much lower in most countries (e.g., on average 0.62 % by volume in the USA), though the chronic health effects of benzene and other BTEX chemicals at relevant exposure levels are not well understood.

Chronic Release and Environmental Transport of Contaminants from Fuel

At gas stations, fuel can be released in both liquid and vapor phases during delivery, storage, and dispensing. Direct vapor release is usually associated with atmospheric pollution, while liquid spillage is commonly associated with soil and groundwater contamination. However, spilled liquid fuel also evaporates into the atmosphere. Hypothetically, hydrocarbon vapors can also condense back into liquid form; however, this appears to be unlikely due to quick dilution in a typically turbulent atmosphere. Figure 1 depicts how releases of unburned fuel contaminate the atmospheric, subsurface, and surface water environments (omitting LUST and leaky piping as well as marine gas stations which may release fuel directly to surface water).

Liquid Fuel Spills

Liquid fuel spills at the nozzle have received less attention than liquid releases due to LUSTs. These fuel spills occur when the dispensing nozzle is moved from the dispensing station to the vehicle tank and vice versa, when the automatic shutoff valve fails, due to spitback from the vehicle tank after the shutoff has been activated, and when the customer tops off the tank.

Table 1 Historical content of non-negligible amounts of toxic and carcinogenic chemicals in fuel

Chemical of concern	Fraction	Health effects
Benzene	Up to 5 % [75]	Carcinogenic [2]
Lead	Up to 2 g per gallon [76]	Central nervous system [12]
MTBE	Up to 15 % [77]	Potential human carcinogen [78]

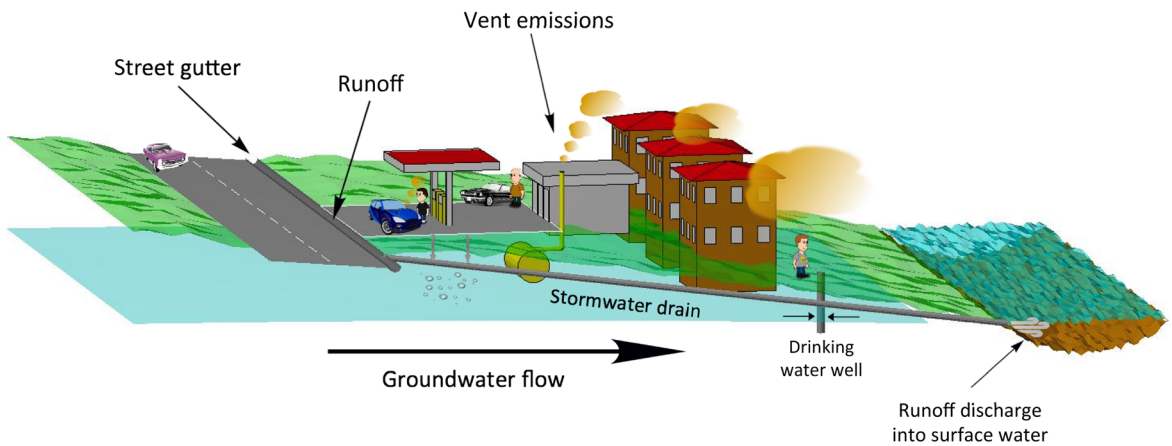

Fig. 1 Gas stations are embedded into the natural environment and can consequently release pollutants to the atmosphere, the subsurface including soil and groundwater, and surface water

In a study quantifying fuel spill frequencies and amounts at gas stations in California, about 6 L of gasoline was spilled per 16,200 gallons of gasoline dispensed at gas stations without stage II vapor recovery compared to 3.6 L at gas stations per 14,043 gallons of gasoline dispensed at gas stations with stage II vapor recovery (at the nozzle) [19]. This would mean that about 0.007 and 0.01 % of dispensed gasoline are spilled in liquid form during vehicle refueling at gas station with and without stage II recovery (numbers calculated using the assumed fuel density of 6.2 pounds/gallon). On the other hand, a study sponsored by the American Petroleum Institute found that more spills occurred at gas stations with stage II recovery [20].

We have recently performed laboratory experiments to examine the fate of liquid spill droplets. Following our previous protocol [21•], we spilled fuel droplets onto small concrete samples and measured the mass added to the concrete as a function of time. This added mass is the sum of the masses of the sessile fuel droplet and the infiltrated fuel. Figure 2 shows results for diesel and gasoline. After a certain period of time, the sessile droplet vanishes and the measured mass levels off. The remaining mass represents the infiltrated portion. The evaporated mass can be obtained by subtracting the infiltrated mass from the initial droplet mass m_0. Evaporation is greater for gasoline, while infiltration is greater for diesel spills. This is because gasoline is more volatile than diesel. Diesel has therefore a higher potential for soil contamination because of the higher infiltrated mass.

Spilled fuel may move downward in liquid or vapor phase and potentially reach the groundwater table. The physical mechanisms that govern subsurface movement of spilled fuel are the same as for fuel released due to LUST, except that spilled fuel must first penetrate relatively impermeable pavement underneath fuel-dispensing stations. Gasoline and diesel will not penetrate the groundwater table as a liquid, because they have densities lower than that of water. Released fuel may also evaporate within the sediment, and a portion of it will move downward as a vapor and potentially reach the groundwater table [22]. Whether the fuel reaches groundwater in liquid or vapor form, the fuel will then partition into groundwater and become a dissolved chemical that is carried away by molecular diffusion and groundwater flow and associated hydrodynamic dispersion [23]. Therefore, the spills can contaminate downstream drinking water wells [24]. Biodegradation can decrease contaminant concentrations significantly; however, its efficiency depends on many factors including the chemical composition of the fuel and the presence of suitable microbial species that can metabolize a given contaminant, bioavailability, and electron acceptor availability [25]. Partitioning of the contaminant into other phases will cause

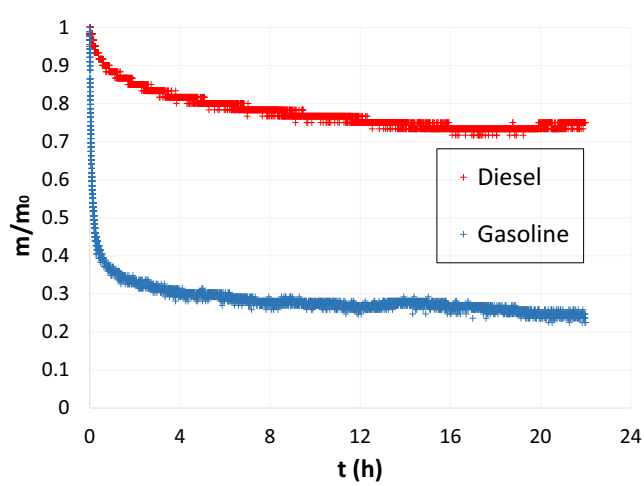

Fig. 2 Results from laboratory experiments, in which we spilled a mass m_0=1 g of diesel or gasoline onto concrete samples. The measured mass m represents the masses of the sessile droplet and infiltrated liquid

retarded transport of the contaminant within groundwater. For instance, hydrophobic contaminants such as benzene tend to sorb to the sediment. For this reason, large-scale contamination of aquifers and associated adverse health effects due to the ingestion of contaminated drinking water from these aquifers are often considered a lesser concern for hydrophobic contaminants [16].

Stocking et al. [26] evaluated the potential of groundwater contamination due to small one-time releases of liquid gasoline. In a case study, they assumed a spill volume much bigger than the ones typically measured by the study of gas stations in California [19], i.e., 0.5 L, and they concluded the risk to groundwater to be small. This analysis, however, did not include consideration of a key mechanism for fuel spillage; namely, that much smaller droplets are typically released during vehicle refueling [19]. To address this question, Hilpert and Breysse [21•] calculated cumulative spill volumes due to repeated small spillages that occur at gasoline-dispensing facilities and estimated that a gas station selling about 400,000 L of gasoline per month would spill at least 150 L each year. They also developed a model that shows that the fraction of spilled gasoline that infiltrates into the pavement increases as the droplet size decreases. Therefore, repeated small spills could be of greater concern for groundwater contamination than an instantaneous release of the cumulative spill volume; thus, a risk to groundwater may not be as small as previously estimated.

Laboratory experiments and modeling have shown that gasoline from small-volume spills can infiltrate into the concrete that usually covers the ground underneath gasoline-dispensing stations—despite the low permeability of concrete and the high vapor pressure of gasoline [21•]. It is unlikely that liquid fuel fully penetrates a concrete slab to contaminate the underlying natural subsurface due to the low permeability of concrete [27], although preferential pathways for fluid flow such as cracks and faulty joints between concrete slabs can allow for such liquid penetration. It has been hypothesized that evaporation of infiltrated gasoline and subsequent downward migration of the vapor through the concrete may lead to contamination of underlying sediment and groundwater [21•]. Consistent with these two proposed pathways of subsurface contamination, soil/sediment underneath concrete pads of a gas station in Maryland was contaminated by diesel oil and gasoline (leaky piping could have also contributed to the contamination) [28].

Runoff water that flows over pavement can also get contaminated with hydrocarbons spilled onto the pavement [29–31], and such contamination has specifically been linked to gas stations [32–34]. If a spill occurs while runoff occurs, the hydrocarbon can be expected to float on top of the water sheet, because gasoline, diesel oil, and lubricants are typically less dense than water (light non-aqueous phase liquids or LNAPLs). While runoff water is not directly ingested, it is funneled into the stormwater drainage system, and may be released to natural water bodies, often without treatment. Whereas volatilization decreases contaminant levels in the stormwater within hours depending on the exact environmental conditions [35], and biodegradation will further decrease levels, significantly contaminated stormwater might be released to natural water bodies if they are close by. Finally, fuel spilled at marine gas stations may directly enter natural water bodies.

Vapor Fuel Releases

Fuel evaporative losses have received more attention than liquid fuel spills (even though they are related) [6, 36]. These losses are related to the fact that the headspace above liquid fuel in vehicle and storage tanks tends to approach thermodynamic equilibrium with the liquid. Consequently, almost saturated gasoline vapors can be released to the atmosphere when tanks are refueled, unless a suitable vapor recovery system is in place. Since saturated gasoline vapors have a density that is three to four times larger than the one of air, i.e., 4 kg/m^3, and the density of liquid gasoline is about 720 kg/m^3 [37], about 0.5 % of liquid gasoline dispensed to a tank is released to the atmosphere if the entire headspace is in equilibrium with the liquid fuel. This is true for any type of tank, whether it is a vehicle tank, a canister, an underground storage tank (UST), or an above-storage tank. The percentage loss is less if a tank received clean air relatively recently, e.g., when the fuel level in a storage tank drops because of gasoline-fuel dispensing.

It is important to note that vapor recovery at the nozzle can cause vapor releases at the storage tank, because vapors recovered at the nozzle are typically directed into the storage tank. The storage tank, in turn, can "breathe" and potentially release recovered vapors immediately or at a later time. A tank sucks in relatively uncontaminated air as the liquid fuel level drops in the tank due to vehicle refueling, and it releases vapors through the vent pipe into the atmosphere if the gas pressure increases and exceeds the cracking pressure of the pressure/vacuum valve, when fuel evaporates into unequilibrated gas in the headspace.

As discussed in the "Liquid Fuel Spills" section above, we note that liquid spills also contribute to air pollution because spilled droplets form sessile droplets on pavement that can then evaporate into the atmosphere. On concrete, most of spilled gasoline droplets evaporate into the atmosphere (Fig. 2). This, however, does not mean that the small fraction that infiltrates into the concrete is not of concern.

Exposure and Risks to Human Populations

Gas stations exist as part of the built environment and are widely distributed across communities. As a result, they may be surrounded by residential dwellings, businesses, and other

buildings such as schools. Operation of gas stations may thus create opportunities for a variety of human populations to be exposed to vapors during station tank filling and vehicle refueling. These human populations can be broadly grouped into three groups: populations exposed occupationally as a result of employment in various capacities at the service station; those exposed as customers engaging in vehicle refueling; and those passively exposed either by residing, attending school, or working near the refueling station. The exposures to benzene and other components of refueling vapors and spills experienced by these populations vary based on a number of factors, including the size and capacity of the refueling station, spatial variation in pollutant concentrations in ambient air, climate, meteorological conditions, time spent at varying locations of the service station, changing on-site activity patterns, physiological characteristics, and the use of vapor recovery and other pollution prevention technologies.

Employees at service stations (such as pump attendants, on-site mechanics, and garage workers) are among those with greatest exposure to benzene originating from gas stations [3]. These receptors spend the most time on site (potentially reflecting approximately 40 h per week, for decades) and intermittently spend time where vapors from the pump are at their highest concentrations, with benzene concentrations measuring between 30 and 230 ppb in the breathing zone [38–40]. Gas station patrons can also be exposed to vapors when refueling. Compared to station employees, their exposures are brief and transient. A Finnish study reported a median time spent refueling of approximately 1 min, whereas 3 min was the median duration in the USA [41, 42]. The same US study reported an average benzene personal exposure concentration at the pump of 910 ppb, with the strongest predictors of benzene levels being fuel octane grade, duration of exposure, and season [42].

Those occupying residences, businesses, and other structures neighboring gas stations can also be exposed to fuel vapors originating in the gas station, though typically at lower concentrations than those measured at the pump. While vapor concentrations will drop as the distance from the service station increases, exhaust fumes from waiting customers and fuel delivery trucks can also contribute to vapors in proximity to gas stations. A small number of studies have examined benzene concentrations at the fenceline of the service station and beyond. A study published by the Canadian petroleum industry found average benzene concentrations of 146 and 461 ppb at the gas station property boundary in summer and winter, respectively [43]. A South Korean study examined outdoor and indoor benzene concentrations at numerous residences within 30 m and between 60 and 100 m of gas stations and found median outdoor benzene concentrations of 9.9 and 6.0 μg/m^3 (about 3.1 and 1.9 ppb), respectively. Median indoor concentrations at these locations were higher, reaching 13.1 and 16.5 μg/m^3 (about 4.1 and 5.2 ppb), respectively [44]. Another study found median ambient benzene levels of 1.9 ppb in houses both <50 and >100 m from a service station [45]. Yet, another study [46] found that benzene and other gasoline vapor releases from service stations can be discerned from traffic emissions as far as 75 m from service stations and that the contribution of service stations to ambient benzene is less important in areas of high traffic density. This is because vehicle exhaust is usually the most abundant volatile organic compound (VOC) in urban areas, often followed by gasoline vapor emissions from fuel handling and vehicle operation [47].

Beyond contact with surface-level gasoline vapors, fuel releases may result in other exposure pathways. Soil and groundwater contamination is common at gas stations. Drinking water wells proximate to gas stations, which in rural areas are often the only drinking water source, can become contaminated, potentially exposing well users to benzene and other chemicals [48, 49]. In addition, runoff from rain and other weather events can carry spilled hydrocarbons, which can contaminate surface waters; those using surface waters, either recreationally or for other purposes, may be exposed to these contaminants through dermal contact or incidental ingestion.

In the USA, the Environmental Protection Agency (EPA) regulates releases of benzene under the Clean Air Act as a hazardous air pollutant, and benzene is listed as number 6 on the 2005 priority list of hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act and any release greater than 10 pounds triggers a reporting requirement. Different quantitative toxicity metrics exist for benzene inhalation. The EPA Integrated Risk Information System (IRIS) has published a reference concentration of 0.03 mg/m^3 (about 9.4 ppb), corresponding to decreased lymphocyte counts [50], whereas the NIOSH recommended exposure limit (REL) is a time-weighted average concentration (for up to a 10-hour workday during a 40-hour workweek) of 0.319 mg/m^3 (about 100 ppb) [51].

While research attention has been paid to measurement of gasoline vapor constituent concentrations in air at and near service stations, less is known about the health consequences faced by those that are exposed to gasoline vapors. Of the limited literature examining these exposures, service station workers have received the greatest attention, and exposure is often assessed as a function of job title, rather than specific measurements of vapor constituent concentrations. An older study looking broadly at leukemia incidence in Portland, Oregon, found that gas station workers were at significantly increased risk for lymphocytic leukemia [52]. A proportionate mortality ratio analysis of all deaths recorded in New Hampshire among white men from 1975 to 1985 found elevated leukemia mortality in service station workers and auto mechanics [53]. The type of leukemia was not specified. An Italian occupational cohort study of refilling attendants that examined risks among workers at smaller gas stations reported

non-significant increases in mortality for non-Hodgkin's lymphoma and significantly elevated mortality for esophageal cancer in men, as well as increased brain cancer mortality in both sexes [54]. A different cohort of 19,000 service station workers in Denmark, Norway, Sweden, and Finland examined an array of cancer end points and found increased incidence for multiple sites (nasal, kidney, pharyngeal, laryngeal, and lung) among workers estimated to be occupationally exposed to benzene in the range of 0.5–1 μg/m^3 (0.16 - 0.31 ppb). Non-significant increased incidence was found for acute myeloid leukemia in men and for leukemia different from acute myeloid leukemia and chronic lymphocytic leukemia in women [55]. A case–control study of multiple occupations including subjects from the USA and Canada found significant increases in rates of total leukemia and acute myeloid leukemia but not acute lymphocytic leukemia in gas station attendants [56]. A 2015 review of studies examining potential relationships between benzene exposures and hematopoietic and lymphatic cancers among vehicle mechanics yielded inconclusive results, although it suggested that if an effect was to exist, it would be small and difficult to rigorously ascertain with existing epidemiologic methods [57].

The health consequences of nearby residents of gas stations have not been studied. However, it is known that contaminated groundwater can affect large numbers of people if the groundwater is used as drinking water, as was the case in Camp Lejeune (North Carolina, USA) where thousands were exposed to a range of chemicals including gasoline released from LUSTs [58]. A study of Pennsylvania residents residing in close proximity to a large gasoline spill from a LUST found evidence of increased leukemia risks [49, 59••]. The health consequences of chronic fuel releases at gas stations that can, for example, occur due to ingestion of contaminated groundwater, fuel vapor intrusion from contaminated soil and groundwater into dwellings [60], and atmospheric vapor releases during fuel transfer and storage have not been studied. While limited measurements of ambient concentrations of vapor constituents in communities were identified, literature searches did not identify studies of the health consequences of inhalation exposures to gasoline vapors among community residents [61].

Pollution Prevention

Pollution prevention technologies have been developed that can efficiently reduce the releases of unburned fuel to the environment that routinely occur during fuel storage and transfer (see Fig. 3):

1. Stage I vapor recovery collects vapors that would be expelled from USTs during fuel delivery [62]. Without stage I vapor recovery, about 80 kg of gasoline vapor would be released from a 40 m^3 UST if one assumes a saturated vapor density of 4 kg/m^3 [37] and vapors in the headspace

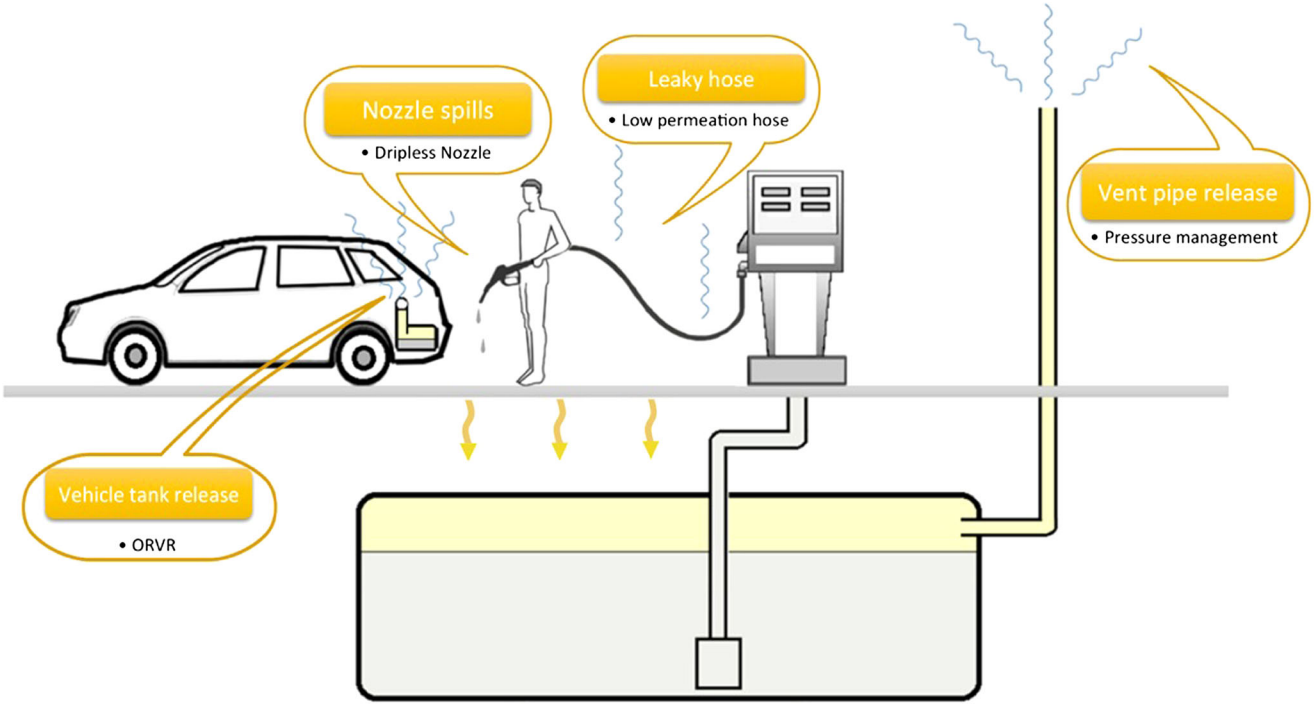

Fig. 3 There are several sources of chronic release of unburned fuel at gas stations that occur due to fuel storage and dispensing: vapor release through the vent pipe of the storage tank, vapor release from the vehicle tank during refueling, leaky dispensing hoses, liquid spills during vehicle refueling, and vapor emissions through evaporation of this spilled fuel. As indicated, suitable pollution prevention technology can minimize the releases. Onboard refueling vapor recovery (ORVR)

to be at half saturation. Stage I vapor recovery can thus prevent substantial fuel vapor releases that would occur within a short period of time. Such releases might expose tanker truck drivers and persons in the proximity of a gas station to significant doses of fuel vapors. Stage I vapor recovery is accomplished by establishing a closed loop between the UST and the tanker truck. Through a fuel delivery hose, liquid fuel is pumped into the UST, while a vapor recovery hose directs vapors displaced from the UST into the headspace of the tanker truck. Stage I vapor recovery is currently required for high-throughput gas stations in all states in the USA and in most countries.

2. Stage II vapor recovery technology can efficiently collect vapors expelled from vehicle tanks during refueling, thereby minimizing personal exposure of customers and workers to fuel vapors during dispensing of gas [63]. Recovered vapors are directed into the UST. Two technologies for stage II vapor recovery have been developed, the vaccum-assist method and the balance method. In the vacuum-assist method, contaminant-laden air is actively removed/pumped from the nozzle into the UST. In the balance method, displaced vapors are passively withdrawn by connecting the vapor recovery hose to the inlet of the vehicle tank via an airtight seal. The pressure increase in the headspace of the vehicle tank provides a driving force that seeks to push the vapors into the storage tank. Stage II vapor recovery has been required in many states of the USA and in other countries, although there is currently an effort to decommission stage II vapor recovery (see below).
3. Technology development at the hose and nozzle level can also contribute to reduced fuel releases. Low-permeation hoses, for instance, limit the release of gasoline vapors through the wall of the refueling hoses [64]. Dripless nozzles have been developed to minimize liquid spills that occur when the nozzle is moved between the fill pipe and the dispensing unit.
4. Passenger vehicles and trucks can be equipped with onboard refueling vapor recovery (ORVR) systems which direct vapors that, during vehicle refueling, would be released to the atmosphere into an activated carbon-filled canister in the vehicle [65, 66]. Collected vapors are later reintroduced into the vehicle's fuel system. However, canisters, motorcycles, and boats are not equipped with ORVR.
5. Impermeable liners underneath the concrete pads can reduce the risk of soil and groundwater contamination once environmental fuel releases, in liquid or vapor phase, have occurred. However, this technology might eventually result in air pollution, because liquid fuel that is hindered from moving downward in the concrete pad will tend to saturate the pavement and eventually evaporate into the atmosphere.
6. Finally, unburned fuel vapor can be released from an UST when the tank pressure exceeds the cracking pressure of the pressure/vacuum valve and it can be prevented by two pressure management techniques, burning or separation of air and fuel vapors. Released air/fuel vapors can be burned, however, which results in the release of combustion-related pollutants into the atmosphere. Alternatively, a semi-permeable membrane can be used to separate the air from the fuel vapors. Depressurization of the tank is then achieved by releasing the relatively clean air through the pressure/vacuum valve to the atmosphere.

When it comes to evaluating the efficiency of vapor recovery during liquid transfer between tanks, it is of upmost importance to consider potential releases from all tanks; they form a system. Otherwise, the overall efficiency of stage II vapor recovery cannot be understood. For instance, stage II vapor recovery based on the vacuum-assist method can negatively interfere with ORVR. In that case, no vapors are released from the vehicle tank and the stage II pump draws relatively clean air from the atmosphere into the storage tank. In the UST, this air will become saturated with fuel vapors that evaporate from the stored fuel. This results in pressurization of the UST and release of contaminant-laden air if the tank pressure exceeds the cracking pressure of the pressure/vacuum valve of the UST. This might occur immediately or at a later point in time. However, there are stage II systems that do not negatively interfere with ORVR including the balance method.

Estimates for the efficiency of pollution technologies are usually provided by the manufacturers. However, adoption of these technologies by gas station owners usually relies on the certification and quantification of efficiencies by independent parties. In the USA, the California Air Resources Board and EPA typically assume this role [36]. Consultants and environmental agencies have used these estimates to determine current releases of unburned fuel to the environment and to evaluate the effects of pollution prevention technology [67].

While many studies have found health benefits from pollution prevention technology intended to minimize chronic gasoline spills, these studies typically do not quantify overall financial benefits and costs. Instead, only equipment and maintenance cost are typically considered [68]. Adopting the new equipment can reduce fuel losses and reduce environmental cost and health risks. However, this new equipment comes with non-trivial upfront costs. It is therefore a concern that the related policy-making process of chronic fuel spills relies only on non-comprehensive cost estimates. Studies are needed that account for health care cost due to released pollutants and energy-saving benefits due to pollution prevention. Such econometric studies have, for example, been performed in the context of pollutant emissions from coal-fired power plant and commercial real estate development [69••, 70]. At times, there is also the perception that pollution prevention

costs are only carried by the specific industry [71]. Adoption of the environmentally friendly technology could be slow when the firms have long equipment replacement cycles or when the firms do not have sufficient information to evaluate whether or not a switch to an environmentally friendly technology is in their private interests. It is, however, not clear that this apparent investment, in the form of prevention cost, might also be partly shouldered by customers and that this apparent cost might actually (at least in the long run) be beneficial to customers, gas station workers, nearby residents, and other populations that spend significant amounts of times in the proximity of gas stations (e.g., school children in nearby schools). Policy intervention is often expected to expedite the adoption of such environmental friendly technologies, in order to reduce the difference in the private and social values of adoption.

Efforts are currently underway that could potentially allow decommissioning stage II vapor recovery in the USA due to the widespread use of ORVR in the motor vehicle fleet [68]. However, the remaining legacy fleet without ORVR and all motorcycles and boats (lacking ORVR) can produce significant emissions during vehicle refueling, emissions that could be avoided by stage II vapor recovery. For the State of Maryland, it has been estimated that fuel consumption of non-ORVR-equipped vehicles was about 10 % in 2015 (Table 4 in [67]). These emissions can result in direct hydrocarbon exposures among vehicle owners during vehicle refueling as well as in passive exposure of other populations. A comprehensive cost analysis of the decommissioning of stage II recovery represents an opportunity to inform policy makers on their recommendation with regards to stage II recovery.

Conclusions

Even if only a small fraction of unburned fuel is lost during vehicle refueling and fuel storage, the cumulative release of fuel to the environment can be large if large total amounts of fuel are dispensed at gas stations. For instance, about 0.01 % of fuel can be spilled during the refueling process and up to about 0.5 % can be lost in vapor form if equilibrated gasoline vapors are released from a tank to the atmosphere during refueling (worst-case scenario). For a medium-size gas station, which sells 400,000 L of gasoline per month, this results in 480 L of spilled gasoline and in 24,000 L of liquid gasoline that is anually released in vapor form to the environment. Even though dilution can reduce concentrations of released contamination, research is needed to assess whether such releases represent an environmental health concern.

The potential for pollution prevention, moreover, is substantial. Technology has already been developed and partially employed that can efficiently decrease vapor losses and liquid spills. Particularly, when it comes to vapor losses, it is crucial to consider not only vapor recovery at the vehicle tank/nozzle but also at the storage tank, since vapors recovered at the nozzle are directed into the storage tank, from which they might be potentially released. While California has implemented the strictest regulations when it comes to preventing chronic hydrocarbon releases at gas stations, other highly industrialized states and nations do not employ the same standards for different reasons. For instance, pressure/vacuum valves on vent pipes of fuel storage tanks are not common in Canada, because they might freeze in the wintertime, potentially causing a tank implosion [6].

Relatively little research has been done on potential soil and groundwater contamination due to chronic releases of liquid fuel during vehicle refueling. Unlike catastrophic releases, such as LUST, chronic spills are not reported. Limited field investigations suggest that spilled fuel may penetrate concrete underneath dispensing pads to contaminate underlying sediment. However, it is possible that such soil contamination occurs routinely over the life span of a gas station and that this contamination pathway is masked or erroneously explained by leaks in the piping from the USTs to the dispensers. Overall, large-scale soil and groundwater contamination by fuel appears to be a lesser problem, because many of the toxic compounds in fuel are hydrophobic (including BTEX) and can therefore be expected not to travel too far in groundwater. However, customers, gas station workers, and nearby residents may get exposed to the hydrocarbons if groundwater is used as a drinking water supply or if fuel vapor intrusion in dwellings occurs.

Health effects of living near gas stations are not well understood. Adverse health impacts may be expected to be higher in metropolitan areas that are densely populated. Particularly affected are residents nearby gas stations who spend significant amounts of time at home as compared to those who leave their home for work because of the longer period of exposure. Similarly affected are individuals who spend time close to a gas station, e.g., in close by businesses or in the gas station itself. Of particular concern are children who, for example, live nearby, play nearby, or attend nearby schools, because children are more vulnerable to hydrocarbon exposure [72].

Potential future changes in fuel composition might pose new environmental health challenges as there is a history of adding even large amounts of toxic substances to fuel (Table 1). Changes in fuel composition could occur due to an increasing usage of biofuels, or to comply with air quality standards, which might also change over time. Chemicals newly added to fuel or changes in chemical concentrations can have unforeseen ramifications. One could argue that future fuel composition changes will be performed with more care; however, it was only in the 1990s, decades after the Safe Drinking Water Act (SDWA) was passed in 1974, that MTBE was added to gasoline without critically evaluating its transport behavior in groundwater and toxicity, a mistake which

nowadays is considered avoidable [73]. Interestingly, ethanol, which has largely replaced MTBE, can inhibit biodegradation of BTEX, which is not the case for MTBE [74]. Given the complexities of chemical fate and transport in the environment and the potential for insufficient toxicity testing, using appropriate pollution prevention technology that minimizes release of unburned chemicals with known and unknown adverse health effects during fuel storage and transfer seems a wise, long-term, and cost effective idea given ever-changing fuel compositions.

Finally, employing efficient pollution prevention technology might be economically advantageous. The evaluation of economic benefits of pollution prevention technology needs to account not only for the cost of implementation and maintenance of such technology but also for public health burdens due to released pollutants and energy-saving benefits due to valuable hydrocarbons not wastefully released to the environment.

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Compliance with Ethics Guidelines

Conflict of Interest Markus Hilpert, Bernat Adria Mora, Jian Ni, Ana Rule, and Keeve Nachman declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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Vent pipe emissions from storage tanks at gas stations: Implications for setback distances

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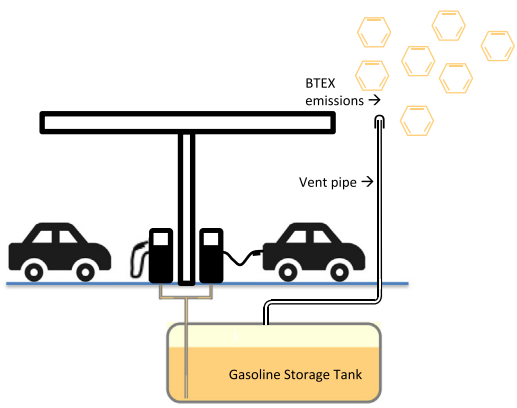
HIGHLIGHTS

- At gas stations, fuel vapors are released from storage tanks through vent pipes.
- We measured vent pipe flow rates and tank pressure at high temporal resolution.
- Vent emission factors were >10 times higher than previous estimates.
- Modeling was used to examine exceedance of benzene short-term exposure limits.

GRAPHICAL ABSTRACT



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ABSTRACT

At gas stations, fuel vapors are released into the atmosphere from storage tanks through vent pipes. Little is known about when releases occur, their magnitude, and their potential health consequences. Our goals were to quantify vent pipe releases and examine exceedance of short-term exposure limits to benzene around gas stations. At two US gas stations, we measured volumetric vent pipe flow rates and pressure in the storage tank headspace at high temporal resolution for approximately three weeks. Based on the measured vent emission and meteorological data, we performed air dispersion modeling to obtain hourly atmospheric benzene levels. For the two gas stations, average vent emission factors were 0.17 and 0.21 kg of gasoline per 1000 L dispensed. Modeling suggests that at one gas station, a 1-hour Reference Exposure Level (REL) for benzene for the general population (8 ppb) was exceeded only closer than 50 m from the station's center. At the other gas station, the REL was exceeded on two different days and up to 160 m from the center, likely due to non-compliant bulk fuel deliveries. A minimum risk level for intermediate duration (>14–364 days) benzene exposure (6 ppb) was exceeded at the elevation of the vent pipe opening up to 7 and 8 m from the two gas stations. Recorded vent emission factors were >10 times higher than estimates used to derive setback distances for gas stations. Setback distances should be revisited to address temporal variability and pollution controls in vent emissions.

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1. Introduction

In the US, approximately 143 billion gal (541 billion L) of gasoline were dispensed in 2016 at gas stations (EIA, 2017) resulting in release of unburned fuel to the environment in the form of vapor or liquid (Hilpert et al., 2015). This is a public health concern, as unburned fuel chemicals such as benzene, toluene, ethyl-benzene, and xylenes (BTEX) are harmful to humans (ATSDR, 2004). Benzene is of special concern because it is causally associated with different types of cancer (IARC, 2012). Truck drivers delivering gasoline and workers dispensing fuel have among the highest exposures to fuel releases (IARC, 2012). However, people living near or working in retail at gas stations, and children in schools and on playgrounds can also be exposed, with distance to the gas stations significantly affecting exposure levels (Terres et al., 2010; Jo & Oh, 2001; Jo & Moon, 1999; Hajizadeh et al., 2018). A meta-analysis (Infante, 2017) of three case-control studies (Steffen et al., 2004; Brosselin et al., 2009; Harrison et al., 1999) suggests that childhood leukemia is associated with residential proximity to gas stations.

Sources of unburned fuel releases at gas stations include leaks from storage tanks, accidental spills from the nozzles of gas dispensers (Hilpert & Breysse, 2014; Adria-Mora & Hilpert, 2017; Morgester et al., 1992), fugitive vapor emissions through leaky pipes and fittings, vehicle tank vapor releases when refueling, and leaky hoses, all of which can contribute to subsurface and air pollution (Hilpert et al., 2015). Routine fuel releases also occur through vent pipes of fuel storage tanks but are less noticeable because the pipes are typically tall, e.g., 4 m. These vent pipes are put in place to equilibrate pressures in the tanks and can be located as close as a few meters from residential buildings in dense urban settings (Fig. 1).

Unburned fuel can be released from storage tanks into the environment through “working” and “breathing” losses (Yerushalmi & Rastan, 2014). A working loss occurs when liquid is pumped into or out of a tank. For a storage tank, this can happen when it is refilled from a tanker truck or when fuel is dispensed to refuel vehicles (Statistics Canada, 2009) if the pressure in the storage tank exceeds the relief pressure of the pressure/vacuum (P/V) valve (EPA, 2008). P/V valve threshold pressures are typically set to around +3 and −8 in. of water column (iwc) (7.5 and −20 hPa). However, P/V valves are not always used, particularly in cold climates, as valves may fail under cold weather conditions (Statistics Canada, 2009).

Breathing losses occur when no liquid is pumped into or out of a tank because of vapor expansion and contraction due to temperature and barometric pressure changes or because pressure in the storage tank may increase when fuel in the tank evaporates (Yerushalmi & Rastan, 2014; EPA, 2008). Although delayed or redirected by the P/V valve, breathing emissions can be significant and represent an environmental and health concern (Yerushalmi & Rastan, 2014).

Fig. 1. The three vent pipes (enclosed by the red ellipse) on the right side of the convenience store of a gas station are <10 m away from the residential building. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Stage I vapor recovery systems, put in place to prevent working losses while delivering fuel to a station, collect the vapors displaced while loading a storage tank, redirecting them into the delivery truck. Stage II vapor recovery systems minimize working losses while delivering gas from the storage tank to the customer's car. During Stage II vapor recovery, gasoline vapors can be released through the vent pipe, if the sum of the flow rates of the returned volume and of the fuel evaporating within the storage tank is greater than the volume of liquid gasoline dispensed (Statistics Canada, 2009). We refer to this scenario as pressure while dispensing (PWD). In theory, a properly designed Stage II vapor recovery system should not have working losses, although in practice this is not typically the case (McEntire, 2000).

Regulations on setback distances for gas stations are based on lifetime cancer risk estimates. Several studies have assessed benzene cancer risk near gas stations (Atabi & Mirzahosseini, 2013; Correa et al., 2012; Cruz et al., 2007; Edokpolo et al., 2015; Edokpolo et al., 2014; Karakitsios et al., 2007). Based on cancer risk estimations, the California Air Resources Board (CARB) recommended that schools, day cares, and other sensitive land uses should not be located within 300 ft. (91 m) of a large gas station (defined as a facility with an annual sales volume of 3.6 million gal = 13.6 million L or greater) (CalEPA/CARB, 2005). This CARB recommendation has not been adopted by all US states, and within states setback distances can depend on local government. Notably, CARB regulations do not account for short term exposure limits and health effects. An important limitation of existing regulations is the use of average gasoline emission rates estimated in the 90s that do not consider excursions (CAPCOA, 1997).

The main objective of this study is to evaluate fuel vapor releases through vent pipes of storage tanks at gas stations based on vent emission measurements conducted at two gas stations in the US in 2009 and 2015, including the characterization of excursions at a high temporal resolution (~minutes) and meteorological conditions at an hourly temporal resolution. In addition, we performed hourly simulations of atmospheric transport of emitted fuel vapors to inform regulations on setback distances between gas stations and adjacent sensitive land uses by comparing modeled benzene concentrations to four 60-min benzene exposure limits: an acute Reference Exposure Level (REL) for infrequent (once per month or less) exposure (WHO, 2010) and Emergency Response Planning Guidelines ERPG-1, ERPG-2 and ERPG-3 (AIHA, 2016). Finally we compared simulated benzene levels to a Minimal Risk Level (MRL) for benzene for intermediate exposure duration (14 to 364 days) (ATSDR, 2018) because that duration window includes our duration of data collection. See Table 1 for the various benzene exposure limits and issuing agencies.

2. Methods

Although we provide SI unit conversions, we report some measures in English engineering units (ft, gal, and lb) as regulatory agencies such as CARB use these units.

2.1. Sites

Data for this study were obtained from vent release measurements conducted at two gas stations as part of technical assistance to the gas stations to quantify fuel vapor losses through the vent pipes of their storage tanks. A motivation for conducting the measurements was to perform a cost-benefit analysis to compare the economic losses due to the lost fuel versus the cost of technologies that reduce the emissions. The exact location of the two gas stations is not revealed for confidentiality reasons. The gas station managers and staff who authorized the

Table 1
Benzene exposure limits, to which we compared simulation results. For unit conversion, we assumed a temperature of 25 °C, i.e., 1 ppm = 3194 μg/m^3 (CAPCOA, 1997).

Agency	Name	Value (ppb)	Value (μg/m^3)	Exposure duration
California Office of Environmental Health Hazard Assessment (OEHHA)	REL	8	26	1 h
American Industrial Hygiene Association (AIHA)	ERPG-1	50	159,700	1 h
AIHA	ERPG-2	150	479,100	1 h
AIHA	ERPG-3	1000	3,194,000	1 h
Agency for Toxic Substances and Disease Registry (ATSDR)	MRL	6	19	14 to 364 days

ERPG = Emergency Response Planning Guidelines. The primary focus of ERPGs is to provide guidelines for short-term exposures to airborne concentrations of acutely toxic, high-priority chemicals.

collection and analysis of these data have not been involved in the current manuscript.

The first gas station, "GS-MW," was located in the US Midwest and is a 24-hour operation. The study was conducted from December 2014 to January 2015 for 20 full days, and fuel sales $\dot{V}_{sales}$ were about 450,000 gal (1.7 million L) per month. Fuel deliveries to the gas station usually took place during the nighttime. The second gas station, "GS-NW," was located on the US Northwest coast and closed at night. Hours of operation were between 6:00 am and 9:30 pm on weekdays and between 7 am and 7 pm on weekends. That study was conducted in October 2009 for 18 full days, and fuel sales were $\dot{V}_{sales}$ ~700,000 gal (2.6 million L) per month.

Both gas stations are considered to be high-volume, because they dispense >3.6 million gal of gasoline (both regular and premium) per year (CalEPA/CARB, 2005), and fuel was stored in underground storage tanks (USTs), which is typical in the US. Both gas stations had Stage II vapor recovery installed using the vacuum-assist method. In that method, gasoline vapors, which would be ejected into the atmosphere as a working loss during refueling of customer vehicle tanks, are collected at the vehicle/nozzle interface by a vacuum pump. The recovered vapors are then directed via a coaxial hose back into the combined storage tank ullage (head space) of the gas station. Stage I vapor recovery was also used at both gas stations during fuel deliveries. Both sites had a 3-inch diameter (7.5 cm) single above-grade vent pipe with below-grade manifold that connected the vent lines from several USTs; the cracking pressures of the P/V valves were set to +3 and −8 iwc (+7.5 and −20 hPa).

2.2. Vent emission measurements

To quantify evaporative fuel releases through the vent pipe of a storage tank, the volumetric flow of the mixture of gasoline vapor and air was measured in the vent pipe. A dry gas diaphragm flow meter (American Meter Company, Model AC-250) was used. For each cubic foot (28 L) of gas flowing through the meter, a digital pulse was generated. Every minute, the number of pulses was read out and stored together with date and time on a data logger. Gas flow meters were obtained from a distributor calibrated and equipped with temperature compensation and a pulse meter.

To determine the time-dependent volumetric flow rate $Q(t)$ of the gasoline vapor/air mixture through the vent pipe, the time series of measured flow volumes were integrated over an averaging period (15 or 60 min) and divided by the duration of that period. I.e., $Q(t)$ is given by the number of pulses registered by the gas flow meter in a time window multiplied by 1 cubic foot and divided by the averaging time. The 15-minute averaging time was chosen to visualize time-dependent data, while the 60-minute averaging time was chosen because air pollution simulations were performed at that resolution.

Gas pressure p in the ullage of the storage tank was measured to assess vent emission patterns. For instance, releases can occur when the pressure exceeds the cracking pressure of the P/V valve in the vent pipe (the dry gas flow meter was fitted with a P/V valve on the outlet). Pressure was measured with a differential pressure sensor (Cerabar PMC 41, Endress + Hauser) every 4 s, and 2-minute average values were stored. The sensor range was scaled from −15 to +15 iwc (−37 to +37 hPa), with a full scale accuracy of 0.20%. We also obtained 15- and 60-minute averaged tank pressure data $p(t)$ where averages represent the means of the 2-minute average pressure measurements taken during each time window.

2.3. Descriptive analysis

For the 60-minute flow rate, we calculated medians and inter quartile ranges (IQRs). To illustrate diurnal fluctuations in vapor emissions, we created box plots for the 60-minute flow rate distribution that occurred during each hour of the day. Spearman correlation coefficients between the time series for pressure and flow rate were calculated to evaluate whether pressure can be used to infer vent emissions.

To estimate the mass flow rate of gasoline $\dot{m}_{gas}$ that is released through the vent pipe in the form of a mixture of gasoline vapors and fresh air, we assumed, following the protocol of a study by the California Air Pollution Control Officers Association (CAPCOA) that assessed risks from fuel emissions from gas station (Appendix D-2 (CAPCOA, 1997)), that the density of gasoline vapors in this mixture is given by $\rho_{gas}^{(v)} = 0.3 \times 65\ \text{lb} / 379\ \text{ft}^3 = 0.824\ \text{kg/m}^3$, i.e., the molar percentages of gasoline and air were 30% and 70%, respectively. Then the volumetric flow rate Q can be converted into a mass flow rate of the vaporized gasoline:

$$\dot{m}_{gas} = \rho_{gas}^{(v)}\ Q \tag{1}$$

To arrive at vent emission factors, we first calculated the mean volumetric flow rate $\overline{Q}$, and then the mean mass flow rate $\overline{\dot{m}}_{gas} = \rho_{gas}^{(v)}\ \overline{Q}$. From the latter, one can calculate the vent emission factor

$$\text{EF}_{vent} = \overline{\dot{m}}_{gas} / \dot{V}_{sales} \tag{2}$$

For EF_{vent}, CARB uses units of pounds of emitted gasoline vapors (also called total organic gases (TOG)) per 1000 gal dispensed, or more briefly lb/kgal where kgal stands for kilogallons.

As we were not able to measure benzene levels in the tank ullage, we assumed like the CAPCOA study (Section C) that the density of the mixture of gasoline vapors and fresh air was $\rho_{mix}^{(v)} = 1.05\ \text{lb/ft}^3 = 1.682\ \text{kg/m}^3$ and that the emitted gasoline vapor/air mixture contained 0.3% of benzene by weight (CAPCOA, 1997). Therefore, the mass flow rate of benzene through the vent pipe was estimated as follows:

$$\dot{m}_{benz} = 0.003\ \rho_{mix}^{(v)}\ Q \tag{3}$$

2.4. Air pollution modeling

We used the AERMOD Modeling System developed by the US Environmental Protection Agency (EPA) to model the dispersion of benzene vapors released into the environment through vent pipes of fuel storage tanks and from other sources (Cimorelli et al., 2005). AERMOD simulates atmospheric pollutant transport at a 1-hour temporal resolution. 3D polar grids were created with the gas station in the origin and potential receptors at different radial distances (up to 170 m) and angles (10°

increments). The grids were placed at the ground level ($z = 0$ m), in the breathing zone ($z = 2$ m), and at the 2nd floor level ($z = 4$ m) where the vent pipe emissions were assumed to occur. The topography was simplified for modeling purposes consistent with the CAPCOA study (CAPCOA, 1997), i.e., the terrain was assumed to be flat with no buildings present. Vent pipe emissions were modeled as a capped point source. Chemical reactions of benzene were not modeled, as residence times of atmospheric benzene are on the order of hours or even days (ATSDR, 2007), i.e. much longer than the travel time of benzene vapors across the 340-m diameter model domain.

For the period of time when vent emission measurements were made, we obtained meteorological data at a 1-hour temporal resolution that are representative for the geographic locations of the two gas stations. Table SI-1 provides descriptive statistics of that data. The time series were used in AERMOD to model the transport of benzene in the temporally varying turbulent atmosphere. We also used the 1-hour average time series of benzene emission rates (Eq. (3)) as an input into AERMOD.

To evaluate at each grid point whether OEHHA's acute REL or AIHA's ERPG levels were exceeded at least once, we determined maximum 1-hour average benzene concentrations that were simulated for about three weeks. To evaluate how often the OEHHA REL was exceeded at each grid point in the breathing zone, we created plots indicating the number of exceedances and the day when the maximum benzene level was observed.

To facilitate comparison to published benzene measurements around gas stations, we determined for each simulated radial distance from a gas station the mean of the average concentrations simulated for each ten degree increment on the radius around the gas station.

3. Results: vent releases

3.1. Times series of tank pressure and flow rate

Fig. 2 shows the time-series data for the volumetric flow rate Q of the gasoline vapor/air mixture through the vent pipe and tank pressure p that we collected at the two gas stations. At GS-MW, little vapor was typically released in the late night and in the very early morning, while releases were generally much higher during the daytime and evenings, presumably when more fuel was dispensed (Fig. 2a). Occasionally, no vapor releases occurred for several hours. While we do not have access to time of fuel delivery records, field visits indicate that time periods with no releases coincide with fuel deliveries. For instance, fuel delivery likely occurred on January 6 at 7 pm (see Fig. 3a; an amplification of data shown in Fig. 2a). As a result, the UST pressure dropped by about 10 hPa, far below the cracking pressure of the P/V valve. The decreased gas pressure in the ullage increased until the cracking pressure of the P/V valve was reached. A very small vapor release (~2 L/min) was observed briefly on the next day at 2 am. The vapor flow rate becomes relatively large again, ~12 L/min, only after 6 am, i.e., 11 h after fuel delivery.

Fig. 3b amplifies a major vapor release at GS-MW. The UST pressure significantly exceeded the cracking pressure of the P/V valve and rose rapidly up to 37 hPa, which coincides with vapors being released at a high flow rate (15-min average) of about 470 L/min.

At GS-NW, vapor releases followed a quite different pattern (Fig. 2b). Contrary to GS-MW, vapor releases occurred in a cyclical pattern, and tended to be higher in the late night and in the very early morning when the gas station was closed.

3.2. Statistics of vapor emissions

The average volumetric flow rate $\overline{Q}$ through the vent pipe for the entire period of time during which measurements were taken was $\overline{Q} = 7.9$ L/min for GS-MW and $\overline{Q} = 15.4$ L/min for GS-NW, which is consistent with the higher sales volume $\dot{V}_{sales}$ of GS-NW. These emissions consist of a mixture of gasoline vapors and air. Using Eq. (1), the volumetric flow rates were converted into average mass flow rates of gasoline: $\overline{\dot{m}}_{gas} = 0.39$ kg/h for GS-MW and $\overline{\dot{m}}_{gas} = 0.76$ kg/h for GS-NW. Using Eq. (2), we determined a vent emission factor EF_{vent}= 0.17 kg per 1000 L = 1.4 lb/kgal for GS-MW and EF_{vent}= 0.21 kg per 1000 L = 1.7 lb/kgal for GS-NW.

The medians (IQRs) for the 60-minute averaged flow rate Q (L/min) were 6.1 (1.9, 10.9) for GS-MW and 16.0 (12.7, 18.4) for GS-NW. For GS-MW, the mean is larger than the median, indicating a more skewed distribution of flow rates when compared to GS-NW. Also the first quartile is much lower than the median for GS-MW, indicating that there are periods of time during which little emissions occurred. Conversely, GS-NW was releasing emissions more consistently.

Fig. 4a shows boxplots illustrating the distribution of flow rate Q for each hour of the day at GS-MW. Less vapor was released between 10 pm and 4 am, even though the gas station was in operation, albeit at lower activity levels. The flow rate Q at GS-NW (Fig. 4b) had fewer outliers, and the highest outlier was an order of magnitude lower than the highest one at GS-MW. Emissions were highest between 1 and 3 am, when the gas station was closed.

The Spearman correlation coefficients between tank pressure p and vent flow rate Q were $r = 0.58$ for GS-MW and $r = 0.85$ for GS-NW. Thus, vent releases are moderately and strongly correlated with tank pressure, respectively. Table 2 summarizes statistical properties of vent emissions at the two gas stations.

4. Results: air pollution modeling

4.1. Emission sources and rates

Vent pipe emissions of benzene were modeled at a 1-hour temporal resolution as described in Section 2.4. However, they are not the sole source of gasoline emissions at gas stations. Accidental spills from nozzles regularly occur near the dispensers, “refueling losses” can occur when gasoline vapors are released from the vehicle tank during refueling due to the rising liquid levels in the tanks, fuel vapors are released from permeable dispensing hoses, and “fugitive” or leakage emissions occur with driving force derived from storage tank pressure. In Section A of Supporting material, we detail how these other emission sources were modeled. Table 3 summarizes estimated mean emission rates. Note that the vent pipe losses are much greater than other losses.

4.2. Predicted benzene levels

Fig. 5 shows for both gas stations and at each grid point the maximum 1-hour average benzene concentration observed during the simulated periods in time. Benzene levels depend significantly on elevation within a 50-meter radius around the centers of the gas stations. Close to the centers of the gas stations, benzene levels are higher at the 4-m elevation and at ground level due to vent pipe emissions, which represent the largest emission source (Table 3). Further than 50 m away from the center, the vertical concentration differences become less obvious due to dispersion causing vertical mixing of benzene vapors.

At GS-MW, the 1-hour acute REL of 26 μg/m^3 was exceeded 160 m away from the center of the gas station, at the location ($x = 158$ m, $y = 28$ m) both at ground level and in the breathing zone. At grid points with a distance >50 m from the center of the gas station, the REL was exceeded at most once (Fig. SI-1a). However, the exceedance at different grid points did not occur on the same day (Fig. SI-1b). Within the 20 days during the measurement campaign, exceedances occurred on the 4th and 13th of January.

At GS-NW, the furthest REL exceedance occurred at 50 m from the center of the gas station at the grid point ($x = -38$ m, $y = 32$ m) as

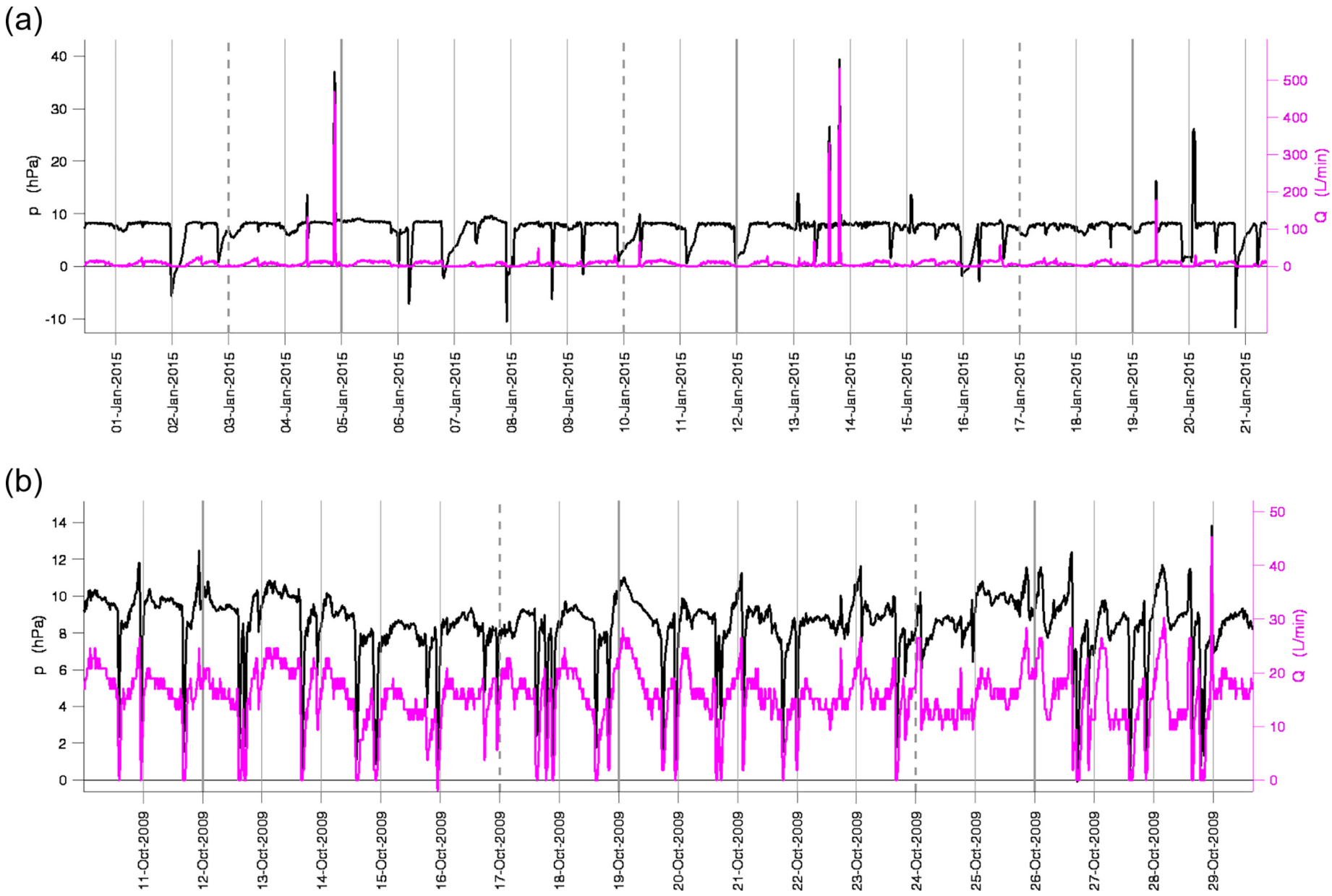

Fig. 2. Time series of ullage pressure p (left ordinate) and volumetric flow rate Q (right ordinate) for (a) GS-MW and (b) GS-NW. Horizontal tick marks indicate midnights. The vertical dashed and thick solid gray lines enclose weekends.

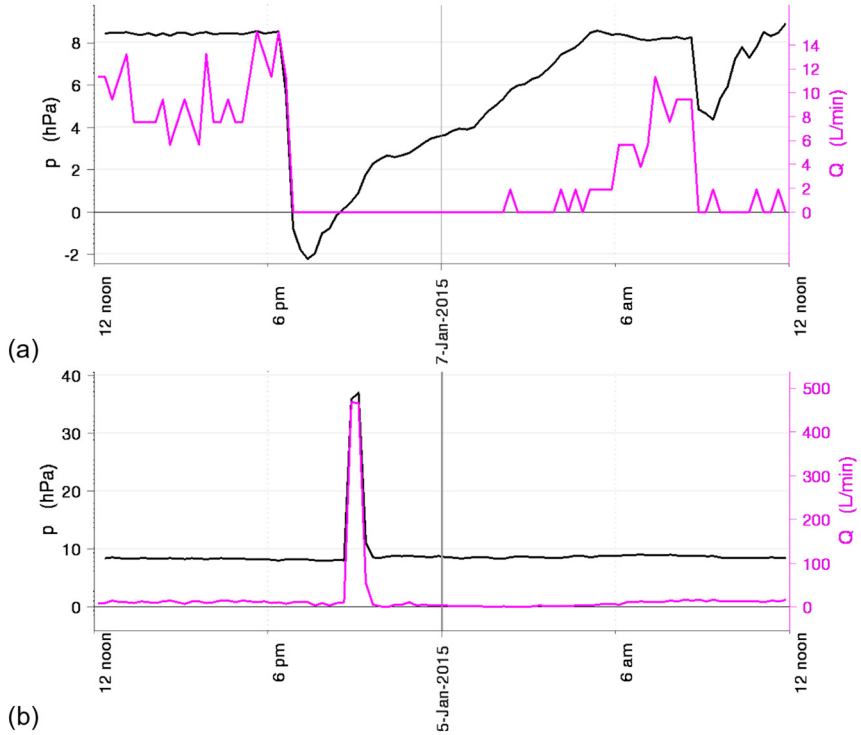

Fig. 3. Amplifications of time series data (15-minute averages) for GS-MW. (a) Tank pressure *p* became negative after fuel delivery. As a result, vent emission ceased for several hours. (b) A major vapor release (burst) likely occurred when the cracking pressure of the P/V valve was significantly exceeded at around 9 pm during a non-compliant bulk fuel delivery.

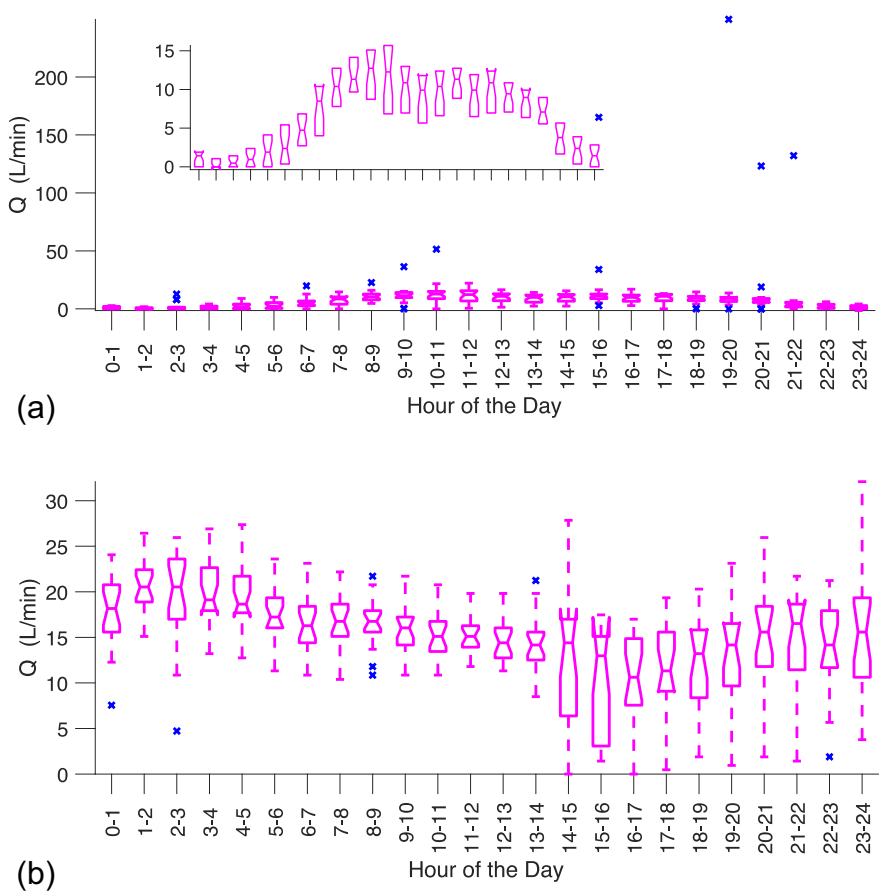

Fig. 4. Distribution of vent emissions *Q* observed for each hour of the day at (a) GS-MW [insert shows the IQRs of *Q*] and (b) GS-NW gas stations. In (a), outliers make it difficult to recognize variations in median hourly emissions. We therefore plotted in the inset only the IQRs. Boxes indicate median and IQR, whiskers values within 1.5 the IQR, and asterisks outliers.

Table 2
Summary of gas station characteristics and vent emissions.

	GS-MW	GS-NW	Units
Sales volume $\dot{V}_{sales}$	450,000	700,000	gal/month
Volumetric flow rates (of gasoline vapor/air mixture)			
Mean $\overline{Q}$	7.9	15.4	L/min
Median (IQR) of 60-min average	6.1 (1.9, 10.9)	16.0 (12.7, 18.4)	L/min
Maximum of 60-min average	250	32.1	L/min
Vent emission factor EF_{vent}	1.4	1.7	lb/kgal
Mass flow rates of gasoline (w/o air)			
Mean $\overline{\dot{m}}_{gas}$	0.39	0.76	kg/h
Maximum of 60-min average	12.3	1.6	kg/h
Correlation coefficient			
Between Q and p	0.58	0.85	–

shown in Fig. SI-2a. At a distance of 40 m, the REL was exceeded three times at one grid point (260° angle), and at 35 m four times at two grid points (250° and 260° angles) (Fig. SI-2b). At a distance of 20 m, the REL was exceeded at 30 (out of 36) grid points, and on nine different days.

Average benzene levels are shown in Fig. 6 for both gas stations. The MRL is exceeded at the elevation of the vent pipe opening, $z = 4$ m, up to 7 m away from for GS-MW and up to 8 m from GS-NW. Fig. 7 shows the average benzene concentration as a function of distance at an elevation of 2 m. Close to the center, benzene levels first increase and then decrease.

5. Discussion

5.1. Vent emission factors

We present unique data on vent emissions from USTs at two gas stations. Emissions can be compared to vent losses assumed by CAPCOA (CAPCOA, 1997). For a gas station with Stage I and II vapor recovery technology and a P/V valve on the vent pipe of the UST (Scenario 6B), the CAPCOA study assumed loading losses of 0.084 and breathing losses of 0.025 lb/kgal dispensed. The total loss of gasoline through the vent pipe is the sum of the two and amounts to a vent emission factor EF_{vent}= 0.109 lb/kgal. Based on actual measurements in two fully functioning US gas stations, we obtained EF_{vent} values of 1.4 lb/kgal for GS-MW and 1.7 lb/kgal for GS-NW, more than one order of magnitude higher than the CAPCOA estimate. While the difference between our measurements and the CAPCOA estimates may appear surprising, it is important to consider that the CAPCOA estimates are based on relatively few measurements and some unsupported assumptions (Aerovironment, 1994), particularly with regard to uncontrolled emissions due to equipment failures or defects (Appendix A-5 (CAPCOA, 1997)).

5.2. Pressure measurements

Tank ullage pressure p was moderately to strongly positively correlated with vent flow rate Q, likely because exceedance of the cracking pressure of the P/V valve causes a vent release. Thus pressure measurements can be used to infer vent releases. Real-time detection of equipment failures and leaks via so-called in-station diagnostics systems is based on our observed correlations between p and Q.

Table 3
Mean benzene emission rates $\dot{m}_{benz}$ for the two gas stations.

Emission source	Benzene emissions (mg/s)	
Gas station	GS-MW	GS-NW
Vent pipe	0.80	1.55
Spillage	0.39	0.65
Refueling	0.41	0.69
Hose permeation	0.06	0.10
Total	1.67	2.90

5.3. Diurnal fluctuations in vent emissions

Diurnal vent emissions were quite different at the two gas stations. At GS-MW, a 24-hour operation, vent emissions were high during the daytime, presumably due to PWD. Emissions ceased at night, likely because less gasoline was dispensed and fuel deliveries with relatively cool product were frequent. Evaporative losses could also have been lower at night because the cooler delivered fuel would cause slight contraction of the liquid phase with corresponding growth in the ullage volume while at the same time lowering the vapor pressure of gasoline in the UST.

At GS-NW, vent pipe releases occurred most of the time, during the daytime when fuel was dispensed (PWD) and at night when the gas station was closed. Vent releases were higher when the gas station was closed, suggesting that during the day-time Stage II vapor recovery resulted in the injection of vapors into the storage tank that were not completely equilibrated with the liquid gasoline. During night-time, the gradual equilibration of unsaturated air in the ullage of the UST with gasoline vapors could then have caused exceedance of the cracking pressure of the P/V valve and consequently vapor release. It seems counterintuitive that less nighttime emissions occurred at the gas station where fuel was dispensed. However, while fuel is being dispensed, the outgoing liquid creates additional ullage volume, and depending on excess air ingestion rate, a negative pressure could result that lowers vent pipe emissions.

Dispensing fuel to customer vehicles and the associated Stage II vapor recovery system interact with vent emissions and can even cause vent emission during PWD, because the vacuum-assist method can negatively interfere with Onboard Refueling Vapor Recovery (ORVR) installed in customer vehicles (EPA, 2004). However, Stage II vapor recovery is not obsolete. It can be used in conjunction with ORVR to minimize exposure of gas station customers and workers to benzene due to working losses (Cruz-Nunez et al., 2003), particularly when customer vehicles are not equipped with ORVR (e.g., older vehicles, boats, motorcycles) or small volume gasoline containers are refueled. Enhanced Stage II vapor recovery technology can significantly reduce vapor emissions both at the nozzle and from UST vent pipes (CARB, 2013).

5.4. Fuel deliveries and accidental vent releases

Based on observations and interpretation of time series of the tank pressure data, it is likely that the peak vent emissions (e.g., Fig. 3b) were partly due to non-compliant bulk fuel drops where the Stage I vapor recovery system either was not correctly hooked up by the delivery driver or to hardware problems with piping and/or valves. This

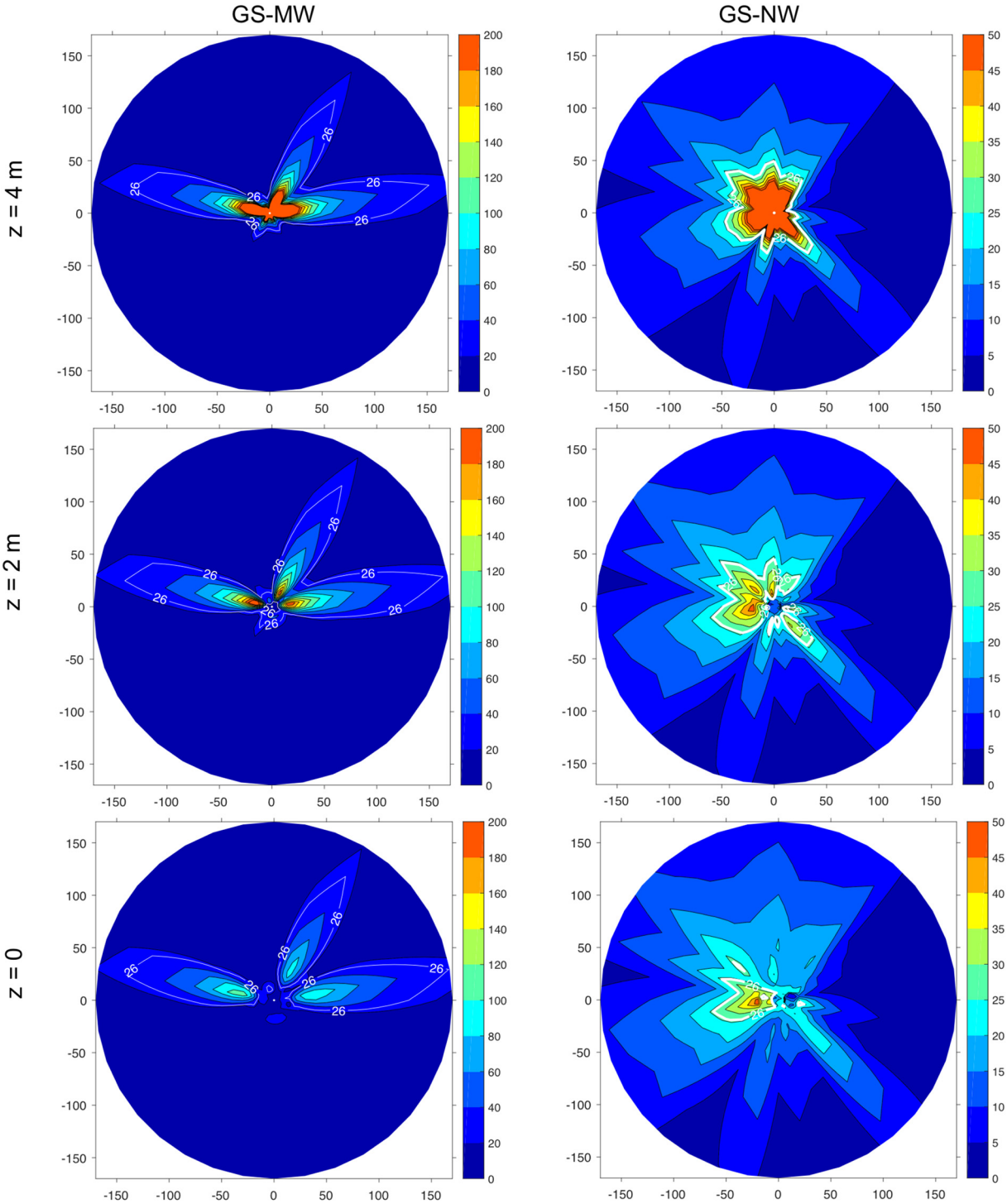

Fig. 5. Modeled maximum benzene concentrations for GS-MW and GS-NW at three different elevations *z*. The *x*- and *y*-axes indicate horizontal coordinates in meters. The color indicates benzene levels in units of μg/m^3. Left column: time series of benzene emission rates were used. Right column: average benzene emission rate was used in the modeling. The white isoline indicates OEHHA's acute REL of 26 μg/m^3 = 8 ppb.

conjecture is consistent with typical US storage tank volumes (~10,000 to 30,000 gal). Assuming that Phase I vapor recovery did not work at all and that 10,000 gal (~38,000 L) of fuel were delivered, the working loss (volume of gasoline vapor/air mixture released to the atmosphere through the vent pipe) is 38,000 L. It is also reasonable to assume that delivery lasted less than 1 h. According to Table 2, the maximum hourly flow rate through the vent pipe was 250 L/min at GS-MW, which would result in a maximum cumulative vapor release of 15,000 L within this hour. The measured maximum cumulative release underestimates the assumed working loss of 38,000 L. This could be due to a fuel delivery, which involved dropping fuel from multiple compartments of a tanker truck, with the vapor return hose not being correctly hooked up for only some of the emptied compartments.

At GS-MW, UST pressure decreased after fuel delivery (causing vent emissions to cease for several hours) during the climatic conditions prevalent during the observation period, behavior not observed at GS-NW. In practice, it is possible to observe both positive and negative pressure excursions, even during the same fuel delivery (when multiple fuel

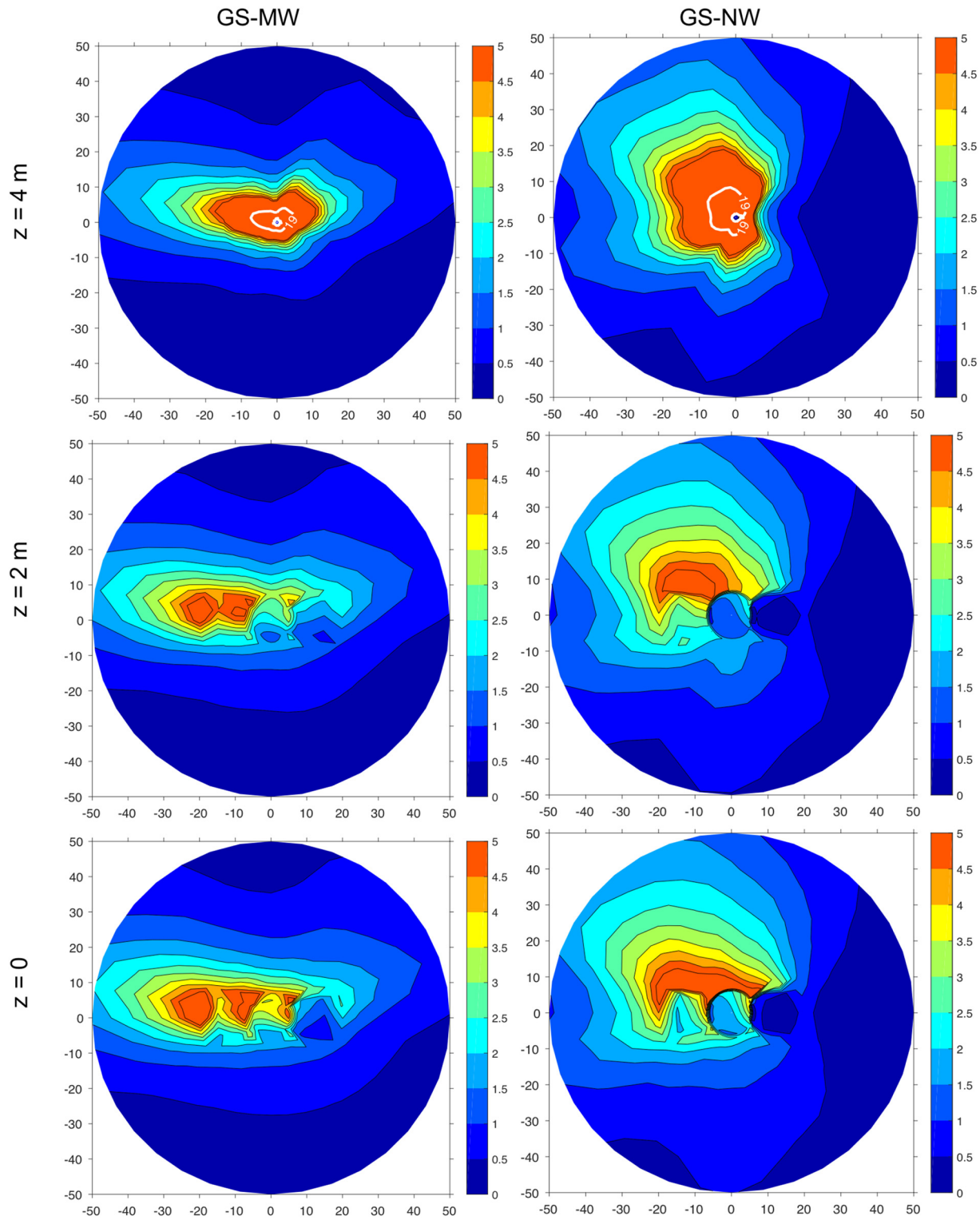

Fig. 6. Modeled average benzene concentrations for GS-MW and GS-NW at three different elevations *z*. The *x*- and *y*-axes indicate horizontal coordinates in meters. The color indicates benzene levels in μg/m^3 and the white isoline the MRL of 19 μg/m^3 = 6 ppb.

compartments of tanker trucks are unloaded), when Stage I vapor recovery is in place (personal observation by TT).

5.5. Exceedance of 1-hour exposure limits

AERMOD air pollution modeling suggests that at GS-MW the 1-hour acute REL was exceeded at one grid point 160 m (525 ft) from the center of the gas station once in 20 days (Fig. 5). This distance is larger than the 300-ft (91 m) setback distance recommended by CARB for a large gasoline dispensing facility (CalEPA/CARB, 2005). Assuming the gas station's fence line is <225 ft. (69 m) from its center (where the vent pipe was assumed to be located), our study shows that sensitive land uses at a distance further than 300 ft from the fence line of the gas station would represent a health concern despite compliance with the CARB guidelines because of non-compliance with the acute REL.

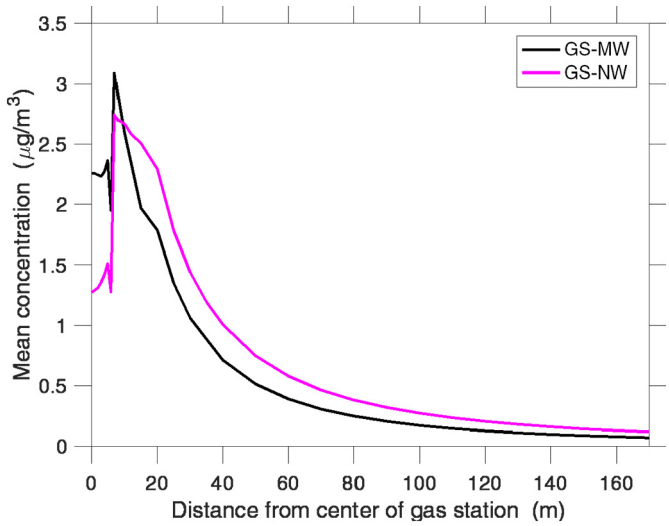

Fig. 7. Mean benzene concentrations as a function of distance from the center of the gas stations.

At any location further than 50 m from the gas station's center, the REL was exceeded at most once during the 20-day measurement campaign (Fig. SI-1a). However, exceedance occurred at several locations, and on two different days (Fig. SI-1b). E.g., at a distance of 120 m from the center, the REL was exceeded at three grid points, and the number of grid points increased with closer proximity to the gas station. This suggests that it was not just a single worst-case scenario or a single accidental vapor release that led to REL exceedance; rather exceedance may occur more frequently than is anticipated. Prevalent wind directions during the measurement campaign explained the directional patterns of exceedances (see the wind rose in Fig. SI-3a).

At GS-NW, despite its higher sales volume, the REL was exceeded only closer than 50 m from the gas station's center. However, exceedance occurred much more frequently (Fig. SI-2), likely because of the higher sales volume of GS-NW. Again, the wind rose for GS-NW (Fig. SI-3b) explains spatial patterns of REL exceedance.

None of AIHA's three ERPG levels were exceeded, meaning that individuals, except perhaps sensitive members of the public, would not have experienced more than mild, transient adverse health effects.

5.6. Average benzene levels

The initial increase in average benzene levels when moving away from the gas stations' centers (Fig. 7) is likely due to the vent emissions (at 4 m) which represent the largest benzene source, and which require a certain transport distance until they reach the 2-m level through dispersion. Further away from the gas station, benzene levels are higher for GS-NW than for GS-MW likely because of the higher sales volume of GS-NW. However, close to the center, benzene levels are higher at GS-MW. This can be attributed to the higher wind speeds at GS-NW (Table SI-1), which result in greater initial dilution of emitted pollutants in the incoming airstream and also in greater subsequent pollutant dispersion.

Modeled average benzene concentrations are generally lower (~10 μg/m^3 or less) than those measured in the surroundings of gas stations, likely because our simulations do not account for traffic-related air pollution (TRAP). For instance, a study published by the Canadian petroleum industry found average benzene concentrations of 146 and 461 ppb (466 and 1473 μg/m^3) at the gas station property boundary in summer and winter, respectively (Akland, 1993), values orders of magnitudes higher than ours. A South Korean study examined outdoor and indoor benzene concentrations at numerous residences within 30 m and between 60 and 100 m of gas stations and found median outdoor benzene concentrations of 9.9 and 6.0 μg/m^3, respectively (Jo & Moon, 1999), while we simulated benzene levels on the order of 1 μg/m^3 (Fig. 7). In a study on atmospheric BTEX levels in an urban area in Iran, the three highest BTEX levels were measured near gas stations (~150 m away); the measured benzene levels (64 ± 36, 31 ± 28, 52 ± 26 μg/m^3) were again much higher than ours simulated at that distance, likely due to TRAP. Our modeled average benzene levels at a distance of about 50 m are on the same order as background benzene levels of 1.0 μg/m^3 that were measured in 2010 in the National Air Toxics Trend Sites (NATTS) network of 27 stations located in most major urban areas in the US (Strum & Scheffe, 2016). However, our modeled levels at a distance of 170 m were 0.07 at GS-MW and 0.12 at GS-NW, a non-negligible addition to urban background levels.

At both gas stations, the MRL was exceeded at the level of the vent pipe opening in the vicinity of the gas stations, up to 7 m away from the vent pipe at GS-MW and 8 m at GS-NW. Therefore there might be an appreciable risk of adverse noncancer health effects for individuals living at the 2nd-floor level relatively close to high-volume gas stations such as GS-MW and GS-NW.

5.7. Limitations

A limitation of our study is that data were collected only in fall and winter. Results cannot be easily extrapolated to other seasons, because vent pipe emissions are seasonally dependent, e.g., due to seasonally dependent gasoline formulations and meteorological conditions. However, modeled exceedance of the OEHHA acute REL in the winter season is already of concern, because that REL was developed for once per month or less exposures.

Another limitation is that we did not directly measure benzene levels in the vent pipe, and instead made assumptions about vapor composition that were also made in the CAPCOA study (CAPCOA, 1997) of gas station emissions. In practice it may be difficult to obtain permission from gas station owners to measure benzene levels directly.

In part because we did not want to reveal the locations of the gas stations, we did not use site-specific topography information in the air dispersion modeling and instead assumed flat terrain. While this simplification results in less accurate air pollution predictions for the two sites, using a "generic" gas station is perhaps more representative of other gas station sites, and is consistent with an approach used in a previous study (CAPCOA, 1997).

Finally, our study did not predict benzene levels in indoor environments. Even though indoor air pollution levels may substantially differ from outdoor levels due to indoor sources (e.g., smoking, photocopying) (El-Hashemy & Ali, 2018), our study can still inform exposure levels in indoor environments as outdoor sources may be the main contributors to indoor air pollution, e.g., in buildings situated in urban areas and close to industrial zones or streets with heavy traffic (Jones, 1999). This is relevant to workers and customers in C-stores or other fast-food/gasoline station combination facilities.

6. Conclusions

Our study is to the best of our knowledge the first one to (1) report hourly vent emission data for gasoline storage tanks in the peer-reviewed literature and (2) use these data in hourly simulations of atmospheric benzene vapor transport. This allowed us to examine potential exceedance of short-term exposure limits for benzene. Prior studies including CAPCOA's (CAPCOA, 1997) could not do so as average emission rates were used (only meteorological data was used at an hourly resolution).

Our findings support the need to revisit setback distances for gas stations, which are based on >2-decade old estimates of vent emissions (Aerovironment, 1994). Also, CARB setback distances are based on a binary decision, related to whether the gasoline sales volume $\dot{V}_{sales}$ is >3.6 million gal per year. Our data support, however, that setback

distances should be a continuous function of sales volume $\dot{V}_{sales}$ and also include the type of controls installed at the facility. Setback distances should also address health outcomes other than cancer. OEHHA's acute REL for benzene could be used to inform setback distances as it accounts for non-cancer adverse health effects of benzene and its metabolites (Budroe, 2014). ATSDR's MRL could also be considered since it is a health-based limit.

We note that CARB recommended their setback distances in 2005, presumably assuming pollution prevention technology yielding a 90% reduction in benzene emissions (CalEPA/CARB, 2005). Since then, CARB further promoted use of second-generation vapor recovery technology (Enhanced Vapor Recovery, EVR) to reduce emissions further. EVR includes technology that is supposed to prevent fuel vapors in overpressurized tanks from being expelled into the atmosphere (CARB, 2017). To that end, "bladder tanks" have been proposed, into which the gasoline vapor/air mixture is directed as the pressure in the combined ullage space of the storage tank increases, and from which the mixture is redirected into the fuel storage tanks if the ullage pressure becomes negative (when fuel is dispensed). The challenge with such a system is to ensure that the bladder tank capacity is not exceeded by the fuel evaporation rate. Alternatively, fuel vapor release can be reduced by processing the fuel/air mixture through either a semi-permeable membrane which selectively exhausts clean air and returns enriched fuel vapor (Semenova, 2004) or an activated carbon filter which adsorbs hydrocarbons (and water vapor) and exhausts air into the atmosphere, or by combusting the fuel/air mixture which would otherwise be released through the P/V valve. Therefore, current CARB setback distances might be adequate for gas stations in California but less so for the other 49 US states, and other countries—depending on pollution prevention technology requirements.

The larger areal extent of modeled REL exceedance at GS-MW is due to "accidental" releases of gasoline vapors. Even though regulations appear generally not to be driven by accidental releases, at GS-NW such releases likely led on two different days to REL exceedances at distances beyond CARB's recommended setback distances. Policies should address accidental fuel vapor releases that depending on pollution prevention technology (here Stage I vapor recovery) and its proper functioning can occur on a frequent basis (twice at GS-MW within about three weeks).

In future work, potential exceedance of other shorter-term exposure limits should be examined, e.g., the 15-minute short-term exposure limits (STELs) and the 8-hour time-weighted averages (TWAs) used for occupational exposures.

Acknowledgements

This work was supported by NIH grant P30 ES009089 and the Environment, Energy, Sustainability and Health Institute at Johns Hopkins University.

Competing financial interest declaration

TT directs a company (ARID), which develops technologies for reducing fuel emissions from gasoline-handling operations. AMR, BAM and MH have no conflicts of interests to declare.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.scitotenv.2018.09.303.

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Exhibit 40B - 17

From: Robert and Lori JOHNSON
To: Samra Seymour
Subject: proposed gas station
Date: Monday, March 28, 2022 1:00:36 PM

We have lived in Jubilee and Edgewater for the past 9 years. Our granddaughter attends Salish Middle School. We wish to protest the proposed gas station/covenience store planned across from Meridian Neighborhood Park and down the street from the school. A gas station among housing seems very inappropriate, let alone dangerous, given the amount of traffic already at that corner from the school and park goers. Who is not able to drive a few miles to one of the many already established gas stations and mini marts? This area has already been inundated with warehouses and trucks that are loud and disruptive. Gas stations can be loud and dangerous with unregulated cars and people coming and going at all hours. Please consider keeping the surrounding neighborhoods a safe place for families and not an incident waiting to happen at that corner. Lori and Robert Johnson 7825 Greenview Dr. NE

Exhibit 40B - 18

From: BruceKoty
To: Samra Seymour
Subject: No Gas Station needed
Date: Sunday, April 03, 2022 12:27:51 PM

You don't often get email from bwkoty@gmail.com. Learn why this is important

Caution: This is an external email. Please take care when clicking links or opening attachments. When in doubt, contact the IS Department

No reason to build a service station on Willamette, across from a community park. The park always has lots of children playing on the equipment. There is also a public school just a block up Campus Glen Street. It will not be a safe area if you cause a lot more traffic at that intersection. We do not need is another "mini mart" either on this side of hwy 5. What is needed is a full grocery store.

BTW I understand it is a Chevron gas station. Note there are 2 Chevrons and several other stations within 2 miles of that location.

Come on do something productive for our community that is north of the freeway. Not a gas station. But, YES we need a grocery store.

Bruce Koty
Board member of Hawks Prairie Homeowners Association.

Exhibit 40B - 19

From: RL LaM
To: Samra Seymour
Subject: TO City of Lacey HEARINGS EXAMINER
Date: Wednesday, March 30, 2022 1:30:32 PM

30 March 2022

Dear Sir or Madam:
My husband and I wish to register our opposition to approving Project # 20-310, regarding a gas station with convenience store and
associated retail space. We think that the resulting noise, trash and artificial light from it will contaminate the ambience of the
neighborhood, making it a less desirable, even less safe, place to live. A mile or so down Willamette Road from this Project's address,
a larger strip mall is already slated to go in - trees are cut and land is being cleared. It will presumably supply the same services (plus
more) that the proposal for our neighborhood will offer, further lessening the desirability of going through with Project # 20-310. We think
the neighborhood generally doesn't want or need it. Those who do soon will get desired services nearby in a much more suitable location.

So, we ask you to vote against approving Project # 20-310 as currently proposed. Removing the gas pumps would be a starting point to
come up with a win-win solution between neighbors and Developer. We urge the city to look to desirable long-term outcomes over quick
profits lacking foresight and/or common sense.

Respectfully,

LeRoy LaMar and Regina LaMar,
* Campus Meadows

*Our full address is already on file via a letter sent to Lacey City Planner Seymour earlier this month.

Exhibit 40B - 20

From: Patricia Le Roy
To: Samra Seymour
Subject: Meridian Markey- additional comments
Date: Tuesday, March 29, 2022 11:34:26 AM

Ms. Seymour,
Good morning. As I read the paper this morning regarding the hearing, I had some additional thoughts and concerns I would like to share for the record. I am a senior, a grandmother(who takes her grandsons to this park) and a very concerned homeowner.

As I mentioned in my first letter, my husband and I live in Jubilee which is a 55 +, community that is just beyond the Meridian and Campus Glen neighborhoods. We travel Willamette to access our neighborhood. There is a cross walk in place for students, parents with strollers, dog walkers etc. to get from one side of this busy street to the other.

If one were to drive out here and sit at the stop light while others crossed, you could see what I'll describe. Factor in the market and gas station on the corner of Campus Glen. Increased vehicle traffic, increased foot traffic and increased opportunity for accidents. Accidents that would involve vehicles, people, families and pets. Children going back and forth to the school, using the park, walking dogs or riding bicycles are especially vulnerable.

Willamette has become even busier during the past 3 years with city bus traffic, 18 wheeler trucks and frequent CDL training trucks coming up and down that street, they like to use the roundabouts for driver training purposes, it seems.

I am also beginning to wonder what the proposed market and fuel station could do to our property values? Who wants to purchase a residence in an area that feels like a commercial neighborhood, which it has become on some levels.

We dont want to see an increase in traffic, potential for increase in crime - people who dont reside in our neighborhoods, increased speeding vehicles, environmental hazards and negative impact on our property values.

Please make our second letter a part of the record and plea to stop this project!

Sincerely,
Patricia and Robert Le Roy

Patricia K. Le Roy
206-687-3470
leroyp08@gmail.com

Exhibit 40B - 21

From: Gail MacLean
To: Samra Seymour
Subject: Attention Hearings Examiner
Date: Friday, April 08, 2022 11:45:06 AM

You don't often get email from egfox37@gmail.com. Learn why this is important

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PLEASE do not put another gas station near the playground and schools that are nearby. I live in Jubilee and there are many other stations that are nearby. This is an unsafe place for another gas station. Please listen to others that this is a safety issue. Thank you for listening.

Gail MacLean
360-762-5887

Exhibit 40B - 22

From: Gail Maddocks
To: Samra Seymour
Subject: Gas Station
Date: Sunday, April 03, 2022 12:23:55 PM

[You don't often get email from gailmaddocks@comcast.net. Learn why this is important at http://aka.ms/LearnAboutSenderIdentification.]

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We oppose the building a gas station in Lacey across from Meridian park due to traffic and the environment. Gail Maddocks Steve Maddocks

Exhibit 40B - 23

From: Peter Manibusan
To: Samra Seymour
Subject: Re: City of Lacey Project 20-310: MDNS
Date: Friday, March 18, 2022 6:41:08 PM
Attachments: 20-310 MDNS.pdf

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We the people do not care.

Just tell them they cant build.

Sent from my iPhone

On Mar 18, 2022, at 16:57, Samra Seymour <Sseymour@ci.lacey.wa.us> wrote:

Good afternoon,

Attached to this email is the mitigated determination of nonsignificance (MDNS). Please note, this is not a land use approval document or an exhaustive list of project conditions, rather an environmental threshold determination made under RCW 43.21C.240 that an Environmental Impact Analysis is not required. The MDNS identifies potential project impacts requiring mitigation that are not regulated under City of Lacey codes or other regulatory statutes of the State.

The MDNS will also become part of the official record for the project, that will be considered by the Hearings Examiner, and ultimately the City Council.

Also, this is a reminder that all parties of record (and if you're receiving this, you're a party of record) will be sent the official notice of hearing late next week.

Thank you,

Samra Seymour AICP | Senior Planner
(she/her)
City of Lacey
420 College St SE
Lacey, WA 98503
www.ci.lacey.wa.us www.locationlocationlacey.com

360.491.5642 department

360.413.3541 direct

Exhibit 40B - 24

From: Chris McAnnally
To: Samra Seymour; hearingsexaminer@ci.lacey.wa.us
Subject: Proposed gas station on corner of Willamette and Campus Glen Dr
Date: Wednesday, March 30, 2022 9:44:37 AM

I'm so disheartened by yet another decision by City of Lacey with little regard for the homeowners. Our residential areas are encroached upon by huge warehouses with often NO tree buffer left between them and homes. Now you are proposing a gas station in the middle of a residential area with a park across the street. WE DON"T WANT IT! WE WILL NOT USE IT! PLEASE hear us! It's a horrible idea-more traffic, more litter, enticement for kids to cross an already VERY busy street, and just down the street from a proposed elementary school.

As you allow forested area after forested area get cleared, I now hear the freeway louder and louder (I live in Classic Heights/13 years living ON Campus Glen Drive), fewer birds this spring (their habitat is disappearing), more traffic with uncontrolled speed limits (rarely patrolled). Clearly City of Lacey has little regard for the quality of life of our neighborhoods. You've shown this over and over again. For me, this is the tipping point with you. I'm angry you're allowing this project. It's a bad idea in so many regards.

Do any of you live in this area? I bet not! One day I encountered 12 trucks/semi's in the 3 roundabouts to get down Willamette toward I5 from my home. Who is their right mind would think mixing warehouses and homes is a good idea?????

There are several gas stations either direction just a mile down the road. And aren't we as a nation, trying to move away from fossil fuel???

I love going to the park - I walk there every morning with my dog. I love hearing the kids playing in the park. I've never seen such a utilized park by families, kids, walkers, sledders, etc. The thought of a gas station across the street repulses me. I implore you to turn this project down. Show us you actually care what we want, what we value, what we hope for our neighborhood.

Chris McAnnally
9317 Alexander Dr NE
Lacey, WA 98516

Exhibit 40B - 25

From: lukemcgowan@yahoo.com
To: Samra Seymour
Subject: Meridian Market and Gas
Date: Saturday, April 02, 2022 12:45:35 PM

Ms. Seymour,

Ma'am, as a resident of Meridian Campus, I would like to add my commentary to the record for this project. Ms. O'Halloran lays out several reasons for opposing this project, and I agree with each of them and applaud her dedication to the community. Personally, I find her assessment of public safety particularly compelling. The proposed location would be far too close to a busy public park and potentially obscure sight lines on an already-fraught intersection (Willamette and Campus Glen). I can only see increased risk of pedestrian-vehicle conflicts for marginal benefit to a community that already has access to multiple gas stations north of I-5. I urge you to reject this proposition.

Thank you for your time and consideration

Sincerely,

Luke McGowan

Exhibit 40B - 26

From: Sue Medeiros
To: Samra Seymour
Subject: Comment re Project# 20-310
Date: Monday, April 04, 2022 12:21:07 PM

We wanted to state our objections to the building of a gas station for Project# 20-310. We are concerned about this for several reasons:

- The property this is scheduled to go on is in an area that is very close to Puget Sound, and placing a gas station in this area poses an unacceptable risk to polluting our waters.
- NE Lacey has undergone a massive loss of trees and green space. This has to stop.
- This proposed station will generate a great deal of traffic in an area that is directly across the street from a park and next to a crosswalk across the busy street that leads from a neighborhood to Salish Middle School. This poses a threat for our children.
- This is a bad business decision, because all the residents in the surrounding area have vowed never to purchase gas at this station if it is built. There are several gas stations already in the area, and this one is totally unnecessary.

Thank you,
Sue and John Medeiros
4952 Cypress Dr NE
Lacey, WA

Exhibit 40B - 27

From: John Koch
To: Samra Seymour
Subject: FW: Project 20-310
Date: Tuesday, April 05, 2022 2:29:28 PM

From: Susan Moreland <smoreland62@gmail.com>
Sent: Tuesday, April 5, 2022 2:11 PM
To: John Koch <jkoch@ci.lacey.wa.us>
Subject: Project 20-310

> You don't often get email from smoreland62@gmail.com. Learn why this is important

> **Caution:** This is an external email. Please take care when clicking links or opening attachments. When in doubt, contact the IS Department

I live in Jubilee and along with my neighbors as well as those in Meridian Campus, I highly object to this project as a completely unnecessary and potentially harmful addition to the area. There are multiple similar facilities within 2 miles of this proposed location and dozens within 3 miles.

Who is this facility intended to serve? Clearly the citizens who live in the area are not the principle concern here.

If the expectation is to draw patrons from I-5 to the facility, this would only add to the already congested Marvin Rd where long haul trucks drive OVER the roundabout center structures trying to get to the freeway.

If the principle intention is to serve the industrial park, then place it inside the park, not on a residential street.

Thank you for considering my comments.

Susan Moreland
Shaw Ln NE
Lacey
--
Susan Moreland

Exhibit 40B - 28

From: Merja Mueller
To: Samra Seymour
Subject: Gas Station at Willamette Blvd & Campus Glen Drive
Date: Saturday, April 02, 2022 4:06:23 AM

The Lacey City Council and Planning Department staff are pushing through a business that risks the health and safety of the children in our community. A gas station has been proposed across the street from our widely used Meridian Community Park at the corner of Willamette Boulevard and Campus Glen Drive Northeast. This location endangers families who use the park and neighborhood Salish Middle School students who do not receive district transportation and would be required to walk directly in front of this gas station. This business would increase traffic into and out of the neighborhood from the nearby industrial park, channeling cars directly past Salish. And the potential for air, light, and noise pollution in a fully residential area also increases from the filling station tanks, fueling cars, and a commercial business open at all hours with signage, lighted fuel pump areas, and the traffic going in and out of the property which directly abuts a residential community.

This business is inappropriate for any neighborhood. We don't want it moved to someone else's backyard. No other city parks have gas stations so close to them. Many gas stations and mini-marts already exist on nearby Marvin Road and Martin Way. Once in a car, taking a few extra minutes to reach them is worth the safety of our neighborhood and our children. Stop the unneeded and unwanted gas station at Meridian Community Park!

Merja K Mueller
4708 Orcas Court NE
Lacey, WA 98516

Exhibit 40B - 29

To: City of Lacey Community and Economic Development Department
c/o Samra Seymour, Senior Planner
From: Janet O'Halloran Meridian Campus Resident
Re: Land Use Application 20-310 Meridian Market and Gas
April 1, 2022

Please include my comments in any upcoming consideration of this application. I previously submitted *comments*[1] directly related to the State Environmental Protection Act (SEPA) and prior to the mitigated determination of non-significance (MDNS) decision, but beyond a comment period deadline. ***These current comments relate directly to the Conditional Use Permit***.

My Position

As a resident of an adjoining neighborhood (Campus Highlands) to this proposed development and after reading all documents available for public review, **I cannot support this application** for reasons outlined below:

Applicable Lacey Municipal Code Language

The *current iteration* of this proposal is primarily governed by Lacey Municipal Code (LCM) 16.36 Neighborhood Commercial District, LCM 16.06.240 Conditional Uses, and LCM 16.66.050 Conditional Uses and Permits. LCM 16.06.240 states "Conditional uses" means certain uses which, because of special requirements, unusual character, size or shape, infrequent occurrence or possible detrimental effects on surrounding property and use for other similar reasons, may be allowed in certain use districts only by the granting of a conditional use permit by the city council. (Ord. 583 §2.09(C) (part), 1980). LCM 16.36.020 states a gas station is subject to conditional use review and approval.

1. LCM 16.36.010(C) stipulates, "It is the intent of this chapter is to limit such development to areas where local economic demand, local citizen acceptance and appropriate design solutions assure compatibility with the neighborhood. (Ord. 583 §2.22(A), 1980)."

    a. **There is no record of any *local economic demand***. No mandate, no petition, no survey results, no grant application to meet a need. The applicants' impetus is their "…frustration and difficulty of crossing I-5 bridge to shop for groceries. This is the main reason we are wanting to cater to the community of Meridian Campus."[2] The concept of local demand is not met. My research shows that Northwest Investors LLC's governor is Kulvinder Singh of Federal Way, whose Limited Liability Company (LLC) was founded in 2019 as a gas station and grocery business[3]. Navi Grewal's name is listed on the February 2021 *General Land Use Application*[4] as applicant/owner with a Federal Way address (with no secondary

[1] Land Use Application 20-310 pdf. Exhibit 41 *SEPA Comments of J. O'Halloran*
[2] Land Use Application 20-310 pdf. Exhibits 10-19 *Meridian Market Narrative*. Exhibit 18@¶1.
[3] Washington Secretary of State website search of Northwest Investors LLC UBI 604552098
[4] Land Use Application 20-310 pdf. Exhibits 1-9 *General Land Use Application*. Exhibit 3. Sections 2 and 3.

Note—italicized documents referenced in my comments may be found in the exhibits compiled by Ms. Seymour and posted in one of the five pdf groupings of documents related to Land Use Application 20-310.

sheet of multiple owners attached— as required). Shawn Hopkins of Shoreline is listed as both the non-emergency owner contact *and* the emergency Department of Ecology contact on the January 2021 *Stormwater Pollution Prevention Plan*[5]. **Federal Way and Shoreline are not local interests**. Tracking LLC interests can be complicated. But details matter because individuals may have many LLCs, commas can be misplaced, and order of names reversed. Kulvinder Singh's name appears on Washington State's Department of Revenue website site 18 times as principal of gas stations, minimarts, and taxis across the state. Navi Grewal's name is not recorded on the Washington Secretary of State's site regarding governors and principals of LLCs, nor the Department of Revenue site.

b. **The services this proposal offers are currently amply met within a reasonable distance among at six similar existing businesses**[6] at both entrance and exit locations on the main roads accessing the Meridian Residential neighborhood campuses. **Note that the applicants' inclusion and reliance of Exhibit 16, *Heath & Associates Land Use and Trip Generation Report* has a serious error that may impact other documents.** Specifically Heath's Figure 4 Capture Area[7] diagram and analysis states there is only one gas station and mart north of Interstate 5 that services this area. Identified is the ARCO on Hawks Prairie and Marvin. **Missing** is the 7-11 fuel and mart on Britton Parkway and Marvin.

c. **There is significant local citizen expression that this proposal is *unacceptable*.** I've lived in this community since 2007. This is the first time I've witnessed a local issue galvanize such widespread attention and resident/citizen participation in a Land Use Application process. Frankly, it's heartening to read the words of 345[8] (97% of *comments)* intentionally submitted by neighbors to the public record in this matter- all rallying around a decision that directly impacts the place we call home. I respect, but disagree with the nine (3% of *comments)* which support the proposal. Homeowners from every Meridian Campus neighborhood and the adjoining developments are represented in this united front. All of us made decisions to invest and live here for reasons that were not predicated upon the need to have a convenience store and 57-thousand gallons of fuel in underground storage tanks in residential backyards (quite literally in this case).[9]

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[5] Land Use Application 20-310 pdf. Exhibits 10-19 *Stormwater Pollution Prevention Plan*. Exhibit 12. Page 24.
[6] Marvin and Meridian—Mobile @ 9410 Martin Way E. *and* Chevron @ 9335 Martin Way E.
Hawks Prairie and Marvin—Arco @ 7455 Hawks Prairie Rd. NE
Britton Parkway and Marvin—7-11 @ 2425 Marvin Rd. NE
1-5 and Marvin—Chevron @ 1601 Marvin Rd. NE and Shell @ 1545 Marvin Rd. NE
[7] Land Use Application 20-310 pdf. Exhibits 10-19 *Heath and Associates Land Use and Trip Generator.* Exhibit 16. Figure 4, page 4.
[8] Land Use Application 20-310 pdf. Exhibits 40 *Community Comments*. Exhibit 40. These numbers come from the formal communication (as of March 25, 2022) directed to Ms. Seymour. I did not count screen shots of blog comments as those were not formally directed to the city planning department, nor comments included after 3-25-22.
[9] Land Use Application 20-310 pdf. Exhibits 1-9 *City of Lacey SEPA Environmental Checklist* Exhibit 5. 7(3). Environmental Health p.7. Note reader must click on the + icon to view entire response.

Note—italicized documents referenced in my comments may be found in the exhibits compiled by Ms. Seymour and posted in one of the five pdf groupings of documents related to Land Use Application 20-310.

2. *Lacey's Community and Economic Development Staff Report*[10] dated April 4, 2022 cites ***twenty-eight* Conditions of Project Approval—Conditions Unique to this Application** and ***forty-two* General Conditions**. Staff suggests that the Hearings Examiner consider ***waivers* in at least *three* aspects**: setbacks, parking, and hours of operation. Other approval entities are encouraged to address canopy height and lighting. **This signals that the appropriate design solutions element is extensive and problematic. I personally note six other design concerns**:

    a. **Where is refuse and recycling situated?** LCM 14.23.082(H)(2) states no refuse container shall be permitted between a street and the front of the building. Previous schematics pinned an area for both needs between Campus Glen and the storefront. It has all but disappeared in the current schematic. Locating refuse behind the proposed store would be unbearable for homeowners abutting the property line and be very difficult for a large refuse truck to access. Perhaps the error is because this design is for the **Pacific Avenue Project**[11] (maybe at The Landing) in which case a ubiquitous design good enough for the corner of heavily commercialized intersection of Sleater-Kinney and Pacific is considered good enough for Meridian Campus residential neighborhoods?

    b. **Condition #26** on page 17 of Ms. Seymour's *Staff Report*[12] addresses an expectation of **traffic access** such as right-in, right-out for vehicles entering the site from Campus Glen. Crossing Willamette can be a nail-biter as one calculates excessive speed, site lines, and additional turn lanes from both directions. Tossing in pedestrians, skaters, and bicyclists aiming to enter or leave the park **amplifies the safety challenges**. Should this application be approved, both then and especially once the anticipated roundabout is under construction, I can imagine the **traffic design impacting London Loop and Madrid in the Campus Pointe neighborhood in manners not previously analyzed**. Note that the streets in that neighborhood are quite narrow with many curbsides painted red as restricted. Paralleling Madrid is a small neighborhood tot-lot park. **Human-nature will prevail as people will ignore** the right-in, right-out from Campus Glen and cross over from the left. Or some will use London Loop and Madrid to avoid construction once exiting proposed business and continue on Willamette toward Fire Station 35. Complicating this concern even further is the unusual location (not at an intersection) of the lighted crosswalk near Madrid. Is this the concurrency failure mentioned in that report on page 12[13]?

    c. Another **design compatibility challenge** to meeting LCM 16.66.010(E) and LCM16.66.050(C)(5) is the visible, outside-the-store amenities described in the application packet's Meridian Market "Your friendly Neighborhood Market"

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[10] Land Use Application 20-310 pdf. Exhibits 1-9 Exhibit 2 *Staff Report*. Pages 13-17, p. 18-24, p. 9&11, p. 10, and p.11
[11] Land Use Application 20-310 pdf. Exhibits 1-9 Exhibit 6 KDA Site Plan A100 Project Pacific Avenue Market.
[12] Land Use Application 20-310 pdf. Exhibits 1-9 Exhibit 2 Staff Report. Land Use Application 20-310. Page 17
[13] Land Use Application 20-310 pdf. Exhibits 1-9 Exhibit 2 Staff Report. Land Use Application 20-310. Section IX E. *Traffic and Streets.* Page 12.

Note—italicized documents referenced in my comments may be found in the exhibits compiled by Ms. Seymour and posted in one of the five pdf groupings of documents related to Land Use Application 20-310.

Market Narrative.[14] I can't imagine large school-bus yellow Amazon/UPS lockers, Redbox movie kiosks, and cages for propane exchanges as compatible with our quiet neighborhood's aesthetic. Furthermore, this is not what any other commercial development under the auspices of the 1993 Declaration of Covenants, Conditions, and Restrictions for Meridian Campus Commercial Property are allowed to do.

d. **Lacey's 2017 Parks and Recreation Comprehensive Plan** values shaping our community together. My husband and I took a field trip one recent sunny Saturday ago. We found and visited all 26 municipal parks-from Avonlea, to Lake Lois Habitat Reserve, to Woodland. Some we were familiar with. Some have not been developed yet. Some we enjoyed for the first time. All were pristine and inviting. Most were embedded in a neighborhood. Pickle ball courts, baseball diamonds, ponds, grandparents resting on benches… *(I worry that the suggested site pedestrian benches may invite cardboard blankets and tarps as seen with a similar design near Lowes on Martin Way)*. With the exception of the undeveloped areas, all but one was being enjoyed by people of all ages and some pets. What else did we notice? **Only one, in fact the only one, the shady one-acre Brooks Park, (which we had a difficult time trying to figure out how to access through an alley or dead-end street) had a gas station nearby.** No one was there. That sends a powerful message. **I do not know how a gas station successfully design-mitigates itself around picnic blankets, toddlers, and soccer balls. They are not compatible. There is a reason that does not occur elsewhere in our community**.

e. **North Thurston Public School District (NTPSD)** is committed to constructing neighborhood schools and **maximizing walkability** to school buildings. *NTPSD Six Years Capital Facilities Plan 2017-2023*[15] identifies a property they own which abuts Meridian Park and is slated for future development of an elementary school. I do not know how a gas station traffic mitigates itself around such a significant increase in pedestrian traffic safety issues of vulnerable. My next field trip might be to all the local elementary schools to see which are across the street from a gas station.

f. Northwest Investors LLC have submitted a ***GeoTechnical Engineering Report***[16] completed in May 2020 by Zipper Geo of Lynnwood, WA. At that time, a different developer, LE-LACEY, WA-1UT, LLC, was considering the site for a 10,000 square foot day care center called the "Lacey Learning Experience," with a 5000 sq. ft. play area. **But the proposal being reviewed now is for a gas station and mini mart. The Geotech Report expressly indicates that "[i]n the event that changes in the nature, design or location of the project as outlined**

[14] Land Use Application 20-310 pdf. Exhibits 10-19 *Meridian Market Narrative*. Exhibit 18 @¶4.
[15] North Thurston Public School District Six Year Capital Facilities Plan 2017-2023. Page 40 and page 47.
[16] Land Use Application 20-310 pdf. Exhibits 10-19 GeoTechnical Engineering Report. Exhibit 13.

Note—italicized documents referenced in my comments may be found in the exhibits compiled by Ms. Seymour and posted in one of the five pdf groupings of documents related to Land Use Application 20-310.

in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Zipper Geo Associates, LLC reviews the changes and either verifies or modifies the conclusions of this report in writing." (Geotech Report, at 17.)

Despite this language, and despite the proposed change in use from a day care to a gas station, the *SEPA Checklist* completed by the applicants relies on the Geotech Report for the daycare center. (SEPA Checklist, page 2, response to question 8.) There are some big problems with this. First, **a day care center involves significantly different construction in the subsurface when compared to a gas station.** For example, the Geotech Report does not address the impact of the SEPA Checklist's statement that 25,000-gallon underground storage tank (UST) for 87 octane gasoline, the 22,000-gallon UST for 92 octane gasoline, and a third, 10,000-gallon UST for diesel will be on site (SEPA Checklist 7 Environmental Health (3) page 7). Yet of the 12 test pits Zipper Geo dug at the site, **six of the pits recorded perched groundwater at depths less than 12 feet.** (Geotech Report, at 4, and Appendix A, pits 1, 2, 4, 5, 6, and 7). **No evaluation has been done yet on the suitability of the subsurface geology for three USTs holding 57,000 gallons of fuel, particularly when these tanks will be sitting in groundwater**. This significant shortfall requires further study before the city. At a minimum, a new Geotech Report should be required of the applicant for the new project proposal, consistent with WAC 197-11-080 and WAC 197-11-335.

An additional problem demonstrating the May 2020 Geotech Report's inadequacy is its discussion of the pavement needs for the site. (Geotech Report, at 15-16.) The report indicates that only light traffic was expected for the day care center design. It says, **"[n]o traffic loading was provided for this report. We have assumed relatively low traffic volumes consisting primarily of passenger cars and trucks with occasional small delivery trucks for light and heavy-duty pavements. *If traffic routes are expected across the site that could increase the estimated traffic loading, ZGA should be notified so that we can re-analyze the pavement sections.*" (Geotech Report, at 15.)** Here, the Geotech Report did not assess the subsurface geology or construction needs associated with a gas station, which will require loaded tanker trucks in and out of the site. Again, a new Geotech Report is necessary for a proper environmental analysis and before any conditional use permit be considered. LCM 16.66.110 states the hearings examiner shall impose all requirements for such use, as prescribed by this title and other conditions as safeguards as are necessary to secure adequate protection for the locality in which the use is to be permitted. The hearings examiner shall recommend a time limit, within which, action for which the conditional use is required shall be begun, completed, or both. (Ord. 1192 §177, 2002). **If this report is not important, why include it?**

Clearly, many elements of LCM 16.66 are merit attention, and some simply can't be safely mitigated or designed away.

Opinion

I respect Northwest Investors LLC's interest in this community and the opportunity to develop this property. **But I can't confirm the sincerity about "giving back" to this neighborhood**. Their own vision sows its own confusion. The personal marketing narrative was not written until November 2021—months after significant initial public upset emerged at a **May 19, 2021 informational webinar hosted by the city**. It has morphed from eight-pumps, to a drive-through espresso, to six pumps, to four. But instead of listening and pivoting to something (other than a convenience mart and gas pumps), the developers attempted to market this as a Farmers' Market akin to the Metropolitan Market in Tacoma's Proctor District. Please note that Metropolitan Market is two blocks away from the Farmers' Market. That business doesn't stage Redbox kiosks, store propane tanks, and mount Amazon lockers around the perimeter of their store. There are no gas stations in that neighborhood. In addition, the applicants say that the mart will promote grab and go hot food items, self-serve coffee, soda, energy drinks, and packaged ice. They add, "…and more!" Perhaps strategically that means 57,000 gallons of fuel? *The only mention of fuel is in a subtitle of that document*.[17] This narrative is essentially the idiom, "Putting lipstick on a pig"—nothing like Metropolitan Market.

The site owner's business experience may be rooted in gas stations and convenience stores, but even his own ***Business Street Lacey Retail Market Assessment***[18] (completed in July 28, three months after the property was purchased in April 28, 2021) concedes that there is a long-term decline in fuel and tobacco sales. It continues there are ample fuel, convenience marts, and grocery stores in the area. Strikingly it acknowledges that nearby warehouses workers may not have the break time, nor the budget to frequent this business. That report recognizes that many of our campuses don't intersect with one another. As a result, many individuals use very different routes to access Interstate 5 (north or south) and would infrequently drive by this site. Further, it posits that gas pumps are only necessitated for "credibility" and financing of this venture.

I would find it remarkable if the applicants, the hearing examiner, or any City Council member would relish living in a home that is feet away from underground fueling tanks. Tanks that aren't necessary when energy initiatives are evolving away from fossil fuels. Yet, that is what is being asked of homeowners in Campus Pointe on Madrid and London Loop and several homes in Campus Glen along Willamette Drive to do. It should be obvious that nearly 350 residents are rallying around these particular homeowners and their families because we wish to remain a community where once we maneuver the roundabout on 31st and Willamette— the imaginary line of demarcation between the concrete commercial warehouses and residential homes—we see the respite of our green neighborhoods and our beloved Meridian Park. A gas station evokes neither respite, nor residential.

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[17] Land Use Application 20-310 pdf. Exhibits 10-19 *Meridian Market Narrative*. Exhibit 18 @¶4.

[18] Land Use Application 20-310 pdf. Exhibits 10-19 *Business Street Lacey Retail Market Assessment.* Exhibit 17.

Note—italicized documents referenced in my comments may be found in the exhibits compiled by Ms. Seymour and posted in one of the five pdf groupings of documents related to Land Use Application 20-310.

Desired Outcomes

Successful partnerships between commercial and residential entities begin with a conversation about what is needed. Otherwise, a business isn't sustainable. If you aren't listening to us, then to use your word, you aren't "catering"[19] to us. This doesn't need to be contentious with parties squaring off in a hearing, council meeting, or courtroom. This parcel could be a new business model for Northwest Investors LLC—one that becomes a genuine gold standard collaboration between neighbors and developers. **There is an opportunity here to be collaborative and innovative by withdrawing this application and sitting down with us. If you unwilling to do that, then I respectfully ask the Hearing Examiner to disapprove of this land use application.**

Respectfully submitted,

J. O'Halloran

[19] Land Use Application 20-310 pdf. Exhibits 10-19 *Meridian Market Narrative*. Exhibit 18 @¶1.

Note—italicized documents referenced in my comments may be found in the exhibits compiled by Ms. Seymour and posted in one of the five pdf groupings of documents related to Land Use Application 20-310.

Exhibit 40B - 30

From: ILA OLSON
To: Samra Seymour
Subject: Project #20-310
Date: Sunday, April 03, 2022 2:05:03 PM

I am totally against this project. Why would you place a gas station right in the middle of a neighborhood close to play grounds and schools? It is not fair to the families that will have that gas station/mini-mart in their backyard. It will be an eyesore to the beautiful area. This is already a high traffic area with people walking to the playground, walking to school , and just the normal cars and school bus traffic.

Ila Olson
Jubilee Resident

Exhibit 40B - 31

From: Chris Porrazzo
To: Samra Seymour
Subject: 20-310 Meridian Market and Gas Station
Date: Sunday, April 03, 2022 8:12:11 PM
Attachments: City of Lacey Proclamation.pdf
Salish Middle School Walk Zone.pdf
projected use.pdf
projected use.pdf
RCW 47.04.300.pdf

April 2, 2022

To: City of Lacey Community Development Department

c/o Samra Seymour, Senior Planner

From: Chris Porrazzo

RE: Land Use Application 20-310 Meridian Market and Gas

Dear Samra,

I would like to start by telling you we appreciate how welcome you have been to our questions, concerns and giving us updates as much as you could. It has been a long and stressful process to say the least, and we have learned a lot about how our local government works.

This process does have a positive side, we have come together as a community to voice our opposition to 20-310: Meridian Market and Gas Station. Our team has visited every home within Meridian Campus Residential Owners Association , had many well attended protests at the project site, and the city has received hundreds of emails in opposition! Some of the letters voiced personal concerns, some cited environmental concerns, traffic concerns, health and safety, concern about crime, location near our neighborhood park, noise and even the danger of having the gas station so close to our neighbors homes.

When you released the entire exhibit package, I was shocked to see there was not a response nor a report from Salish Middle School or North Thurston Public Schools. We had team members inquire this information from your office months ago and it sounded like you were going to follow up and get statements from them. What concerns do they have for the safety of their students as they walk to and from school? Does the potential of 4,500

workers from the industrial area speeding down Campus Glen to get their lunch, soda, gas (let's hope not), or a beer after work concern them? Are they going to place crossing guards at the different intersections to ensure a safe crossing? Also, the report failed to mention the future elementary school which is within eyesight of the potential gas station. Shouldn't existing schools and future schools be one of the top priorities when considering this project?

In 2009, the Washington State legislature passed RCW 47.04.300 that formalized the Safe Routes to School Program. On October 8, 2015, the City of Lacey introduced a proclamation, signed by Mayor Andy Ryder, supporting the importance of children walking to school. It states in part:

WHEREAS, the life and safety of the City of Lacey's youth can be protected if communities take steps to make pedestrian safety a priority, and

WHEREAS, a lack of physical activity plays a leading role in rising rates of obesity, diabetes, and other health problems among children, and being able to walk or bicycle to school offers an opportunity to build activity into daily routine, and

WHEREAS, regularly walking and biking to school are known to increase students' readiness to learn in the classroom, and etc.…

What would the added risks be for the children walking or riding to school? What added traffic and danger to students walking would be as people hurry in and out of the gas station or convenience store location? What kind of crime would the children be exposed to? With a gas station/convenience store there will of course be a new flow of traffic from the industrial area. Why was this not in the report. The report failed to get input from the police too concerning the students.

Since reference project 20-310 falls within the Salish Middle School Walk Zone, conflicts with the City of Lacey's goal to have children walk and ride to school, and the State of Washington's passing of RCW 47.04.300, it does not seem feasible to grant them a conditional use permit.

Regards,

Chris Porrazzo

CITY OF LACEY
Proclamation

WHEREAS, the life and safety of the City of Lacey's youth can be protected if communities take steps to make pedestrian safety a priority; and

WHEREAS, a lack of physical activity plays a leading role in rising rates of obesity, diabetes, and other health problems among children, and being able to walk or bicycle to school offers an opportunity to build activity into daily routine; and

WHEREAS, regularly walking and biking to school are known to increase students' readiness to learn in the classroom; and

WHEREAS, an important role for parents and caregivers is to teach children about pedestrian safety and become aware of the difficulties and dangers that children face on their trip to school each day and the health and environmental risks related to physical inactivity and air pollution; and

WHEREAS, parents, school employees, and community leaders can make a lasting impression among our community's youth by modeling fun, safe, and healthy behavior by accompanying students on walk to school events; and

WHEREAS, children, parents, and community leaders around the world are joining together to walk to school to increase awareness about the benefits of walking to school; and

WHEREAS, Intercity Transit, North Thurston Public Schools, Thurston County Safe Kids Coalition, Thurston Regional Planning Council, and local governments, have been collaborating to provide Safe Routes to School programming in the North Thurston Public Schools as implementation of Healthy Kids, Safe Streets Action Plan.

NOW, THEREFORE, I, Andy Ryder, Mayor of the City of Lacey, on behalf of the Lacey City Council, do hereby proclaim the month of October 2015 as

Walk to School Month

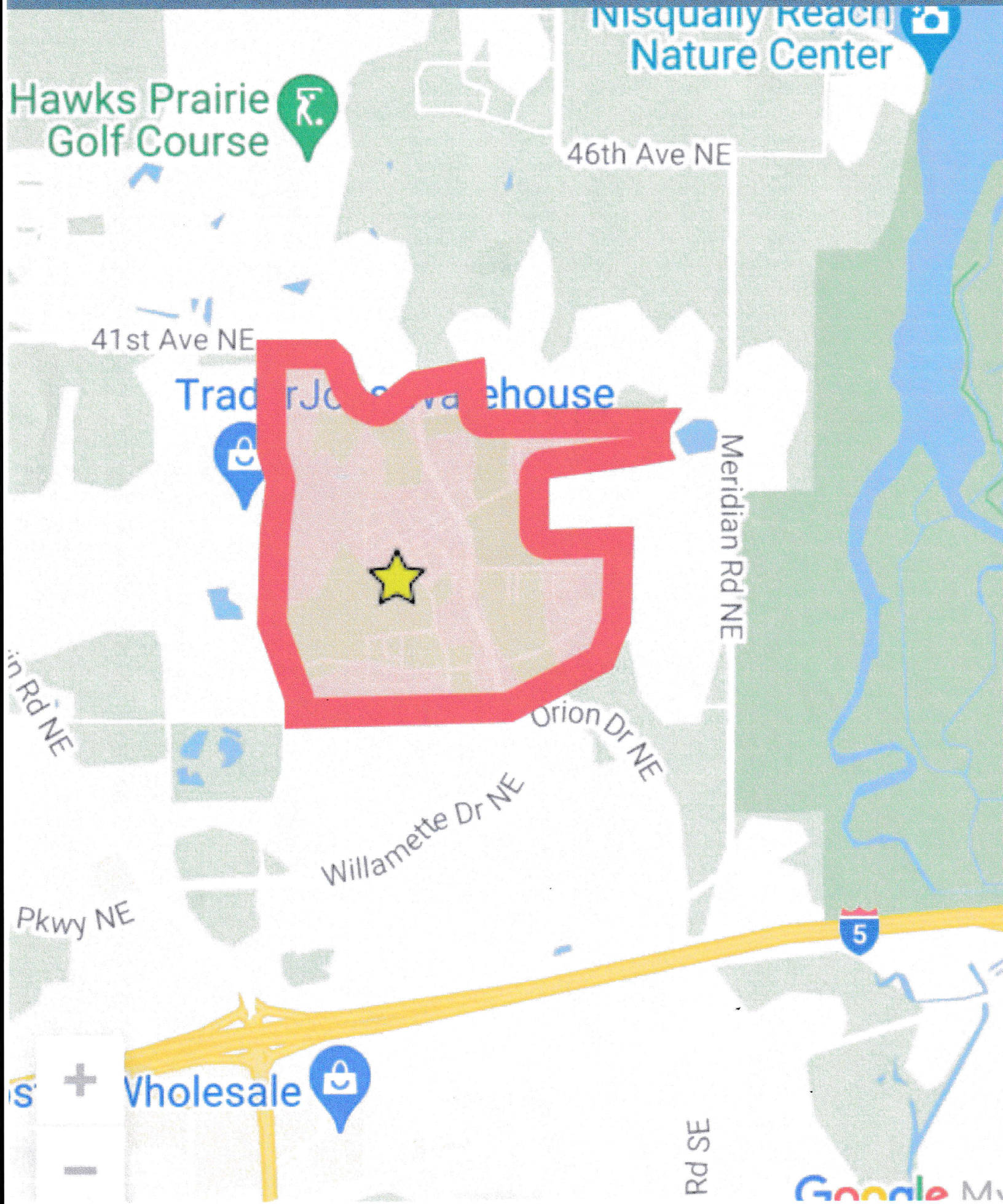
in the City of Lacey, and encourage all citizens to consider the health and safety of children this month and throughout the year.

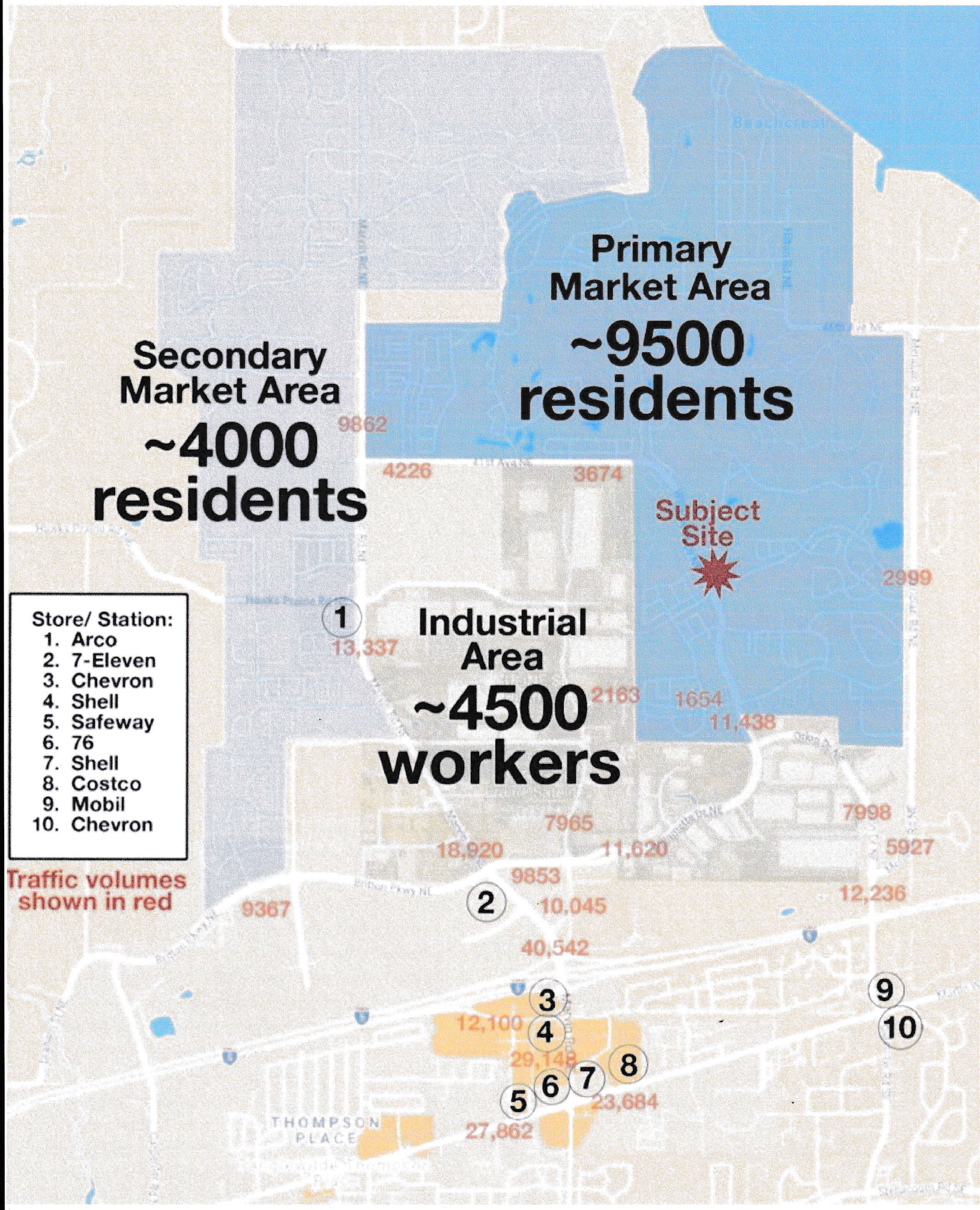
Andy D. Ryder

Mayor Andy Ryder
October 8, 2015

Salish Middle School Walk Zone

This map was made with Google My Maps. Create yo




Primary
Market Area
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residents
Secondary
Market Area
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residents
Industrial
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workers
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Site
Store/ Station:
1. Arco
2. 7-Eleven
3. Chevron
4. Shell
5. Safeway
6. 76
7. Shell
8. Costco
9. Mobil
10. Chevron
Traffic volumes
shown in red
9862
4226
3674
2999
13,337
2163
1654
11,438
7965
7998
18,920
11,620
5927
9853
12,236
9367
10,045
40,542
12,100
29,148
23,684
27,862
THOMPSON
PLACE

RCW 47.04.300

Safe routes to school program.

Concurrent with the federal safe, accountable, flexible, efficient transportation equity act of 2005, a safe routes to school program is established within the department. The purpose of the program is to:

(1) Enable and encourage children, including those with disabilities, to walk and bicycle to school;

(2) Make bicycling and walking to school a safer and more appealing transportation alternative, encouraging a healthy and active lifestyle from an early age; and

(3) Facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools.

Exhibit 40B - 32

From: CourtMike Pyrch
To: Samra Seymour
Subject: Attention Hearing Examiner
Date: Sunday, April 10, 2022 10:34:02 PM

[You don't often get email from pyrchcm@gmail.com. Learn why this is important at http://aka.ms/LearnAboutSenderIdentification.]

Caution: This is an external email. Please take care when clicking links or opening attachments. When in doubt, contact the IS Department

Hello, my name is Courtney and I live in the Campus Glen neighborhood. I want to start by saying thank you! I appreciate that you made time to hear our thoughts on this issue.

My husband and I have 2 dogs, 2 cats and 2 kids, an almost 4 year old, and a 1.5 year old. We all moved here 6 months ago; like many others who have moved in the last couple of years, we bought our house sight unseen. Fortunately, my parents were able to come to the home inspection for us and see what the house and surrounding area were like. When I asked my mom how it went and what she thought of the house, she said “eh, the house is a house but there is an amazing park super close, with sidewalks the whole way!” My mom was excited not only because my kids would love to live close to a park, but because it was clear the neighborhood was set up with families and their safety in mind. My mom was right! Meridian neighborhood park IS amazing! WE LOVE going to the park several times a week, and on days when it’s not rainy, we walk there, which brings us right by the lot where this gas station would go.

For some the decision to build yet another gas station may be completely business, but for myself and my family it’s personal.
When considering this development, it seems to me that a little bit of common sense can go a long way.

Does it make sense to put a gas station in the middle of so many homes?

Does it make sense for a gas station to be this close to a children’s playground?

Does it make sense for kids to walk by a gas station to get to and from school?

Does it make sense to have an elementary school bus stop at a gas station?

Common sense tells me that no, building a gas station here does not make any sense.

Having a gas station at this location will take away from the atmosphere of safety, and family friendliness that has been fostered by this community. We love our neighborhood and our park! Please don’t allow an unneeded gas station to change the place we call home.

Thank you,
Courtney Pyrch

Sent from my iPhone

Exhibit 40B - 33

From: Joe Rinehart
To: Samra Seymour
Subject: Re: Project# 20-310: Meridian Market & Gas - NOTICE OF HEARING
Date: Monday, March 28, 2022 11:01:15 AM

For the record: It should be noted that the list of development proposals for the City of Lacey shows the intent to destroy much more of the current tree cover in NE Lacey which has already been significantly deforested. Lacey government seems recklessly committed to supporting environmentally destructive development, even offering huge tax breaks in some instances. In light of all available knowledge and experience of climate change, this ongoing failure to fully and vigorously support mitigation efforts begs the question of what is motivating them. Ignoring the support of citizens for sustainable necessary development in favor of supporting unnecessary environmentally and quality of life destructive development cannot be considered rational let alone good government.

Joe Rinehart

On Mar 25, 2022, at 4:49 PM, Samra Seymour <Sseymour@ci.lacey.wa.us> wrote:

Good afternoon all,

Attached to this email is the official notice of public hearing, scheduled for April 4, 2022 @1pm. It includes a link for registering for the hearing. I will be following up shortly, with a link to the hearing materials, including staff report.

Thank you,

Samra Seymour AICP | Senior Planner
(she/her)
City of Lacey
420 College St SE
Lacey, WA 98503
www.ci.lacey.wa.us www.locationlocationlacey.com

360.491.5642 department
360.413.3541 direct

<Notice of Hearing - adj prop.pdf>

Exhibit 40B - 34

From: Bob ROTHWELL
To: Samra Seymour
Subject: OPPOSED to Meridian gas station permit
Date: Friday, March 25, 2022 7:31:58 PM

Dear Ms. Seymour,

I am a resident of Meridian Campus and would like to express my strong opposition to a conditional use permit being granted for this project. Please add me as a party of record to these proceedings, as I would like to be apprised of the notice of hearing date when it is issued. I would also ask that my comments below be made part of the record.

For reasons I am sure you have already been made aware of by my community, a conditional use permit for the gas station for this project should **not** be granted. From my reading of the Neighborhood Commercial District Ordinance, Ch. 16.36, as well as Conditional Uses and Permits, Ch. 16.66, I do not see anywhere that there is a presumption that a conditional use permit must or should be granted, and since in this case there are ample reasons to deny the permit, it should be denied. The hearing examiner appears to have wide discretion to deny the issuance of this permit, particularly if the detrimental impacts to the community cannot be mitigated, which in this case, they cannot, and he therefore must deny the permit application.

As has already been evidenced by statements from many others, this community has absolutely zero need for a gas station at this location. There are multiple other gas stations located within just a few minutes drive, so it serves no community need, and any need, if it were to exist (which it does not), is by far outweighed by the negative impacts it would cause to the community in which this developer proposes to place this gas station. The location of this proposed gas station is nestled between family homes, a busy 4 lane street, and directly across the street from a very busy community playground park. Throughout the day there are

children and families coming in and out of the park not only in cars, but on scooters, bikes, skateboards, moms with strollers, granparents with strollers. . Nowhere that I can think of in the City of Lacey has a gas station nor a store selling alcohol and tobacco been permitted to exist directly across the street or next to a city park. The concept is ridiculous, not only for the potential issues of locating a business whose primary function is selling alcohol and tobacco so close to such an area and within a very short walk to a middle school (we should all be highly skeptical of the developer's characterization of the mini mart as being similar to a Metropolitan Market), but the very obvious traffic **safety hazards** of cars quickly coming in and out of this relatively confined area. It is already a very problematic traffic area, as Willamette is a very busy street, and this is the same intersection that is used for traffic in and out of the Salish Middle School. We see accidents here frequently.

Based on the extreme proximity of the community playground park, there are simply no requirements or other conditions or safeguards which the hearing examiner could impose that would "secure adequate protection for the locality in which the use is to be permitted," and as such this permit application should be denied. *See* Lacey Municipal Code 16.66.100. Perhaps, if there were an actual legitimate need for this service to be located here, there might be some faintly plausible reason to impose conditions on the project and issue the permit, however again, in this case there is no need. As it is, there are multiple gas stations a very short distance away. It seems evident that this developer intends to include a gas station in this plan to ensure increased vehicle traffic to the businesses he hopes to entice into this location. However, any such business interests are far outweighed by the needs of the community to **keep the children and families in the area safe**.

Thank you so much for your kind attention to this matter. Unfortunately, I will be out of town on the hearing date, or I most surely would be there to voice my strong opposition to this totally unnecessary blemish on our neighborhood. I hope the city council will make the courageous decision to deny a business with gas

station to be built in our lovely community. I look forward to receiving further information from you concerning the hearing discussion, and especially each individual council member's and the mayor's comments, in order that each one can take full responsibility for the council's decision.

Sincerely,

Robert Rothwell
Meridian Campus Resident

Exhibit 40B - 35

From: Bob ROTHWELL
To: Samra Seymour
Subject: Re: Project# 20-310: Meridian Market & Gas - HEARING MATERIALS
Date: Friday, March 25, 2022 10:02:59 PM

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having listened to the webinar and seeing this exhibit,it appears that that the city staff is completely ignoring the wishes of the public who will be directly affected by by this eyesore and hazard to our pedestrian children, grandmothers and daycare providers using the campus glen walkways,a nd the community park directly across the street. You are ignoring what the public wants because youwant o provide business development in cityof Lacey, in an absolutel;y unnecessary location.
why then are you asking for public comment, when you are completely ignoring us.
Robert Rothwell
Meridian Campus resident

From: Samra Seymour <Sseymour@ci.lacey.wa.us>
Sent: Friday, March 25, 2022 6:21 PM
To: Samra Seymour <Sseymour@ci.lacey.wa.us>
Subject: Project# 20-310: Meridian Market & Gas - HEARING MATERIALS

Good evening (again),

The materials for the hearing are now posted to the City's website - HERE. You'll need to scroll down to this project's section. (I believe it's currently the fourth project down on the page.) There are a couple of things to note:

- These are large files, so you may need to give them time to load.
- There are a few minor formatting items related to the exhibits that still need to happen. Namely, Exhibit # 40, Public Comments, will be further labeled identifying each commenter. (All of the comments are posted now, they are just not labeled on the exhibit list yet.) Due to the volume of comments, staff just wasn't able to finish that all this week. But a revised version will be posted Monday. I will send another email to you when it is up.
- Also, you will notice exhibit #4, the conditional use permit application, is missing from the hearing packet. It will be fixed Monday when I have a more tech savvy person to help me figure out what's going on with that file! But it is still available on the website below the hearing materials. It's the same file – it just doesn't want to play nicely with the other files…

That is all for now, I promise you won't hear from me again until Monday.

Thank you,

Samra Seymour AICP | Senior Planner
(she/her)
City of Lacey
420 College St SE
Lacey, WA 98503
www.ci.lacey.wa.us www.locationlocationlacey.com

360.491.5642 department
360.413.3541 direct

Exhibit 40B - 36

Comments for Project# 20-310: Meridian Market & Gas:

A stated intent of the Neighborhood Commercial District is to limit development to areas where local citizen acceptance assures compatibility with the neighborhood (LMC 16.36.010). Citizens protesting against the gas station is clear evidence that the proposed development is not compatible with the neighborhood.

Another stated intent of the Neighborhood Commercial District is to locate neighborhood commercial facilities for pedestrian accessibility (LMC 16.36.010). The Market Assessment for the site indicates the proposed development would attract many of the 4,500 employees in the Meridian Campus industrial area in search of fast meals. Most of these employees would probably drive to the proposed development, as it would be more than a 10-minute walk each way. The automobile traffic generated by the proposed development would be detrimental to pedestrian accessibility on Campus Glen Drive, an area that includes a school zone, a park, and a trail, as well as at sidewalks, driveways, and intersections around the development.

The proposed development does not appear to comply with the stated Environmental Performance Standards (LMC 16.36.030), as it could not be characterized by low traffic generation. The high traffic generation of the proposed development could exceed the available parking on the site. At peak times, parking customers accessing the proposed development could encroach on neighborhood streets, bike lanes and parking areas at the park or other nearby properties. Without a designated loading zone, trucks serving the site would compete with site traffic for parking and maneuvering space, and could hinder traffic on neighborhood streets. The cumulative effect of traffic, noise and light generated by operations of the proposed development is likely to negatively impact the neighborhood environment.

The design of the proposed development places parking between the building and the right of way, which does not comply with Parking requirements in Neighborhood Commercial Districts (LMC 16.36.070).

After reading the Market Assessment and the Narrative for the Project# 20-310: Meridian Market & Gas, I have the following comments:

Comments on Market Assessment:

1. The Market Assessment says that feeding lunch to these 4500 workers is an opportunity for this site. And to be successful it must attract drive-by sales
    - Chapter 16.36.010 *Neighborhood Commercial District Intent* states: "pedestrian accessibility shall be a major criterion in the location of neighborhood commercial facilities"
    - How is feeding lunch to the 4500 workers who will have to drive over to this location going to meet this criterion?
        - This seems like it will create a less pedestrian friendly area with all of the vehicle traffic
        - Most of this traffic will come and go on Campus Glen Dr NE which is where the Salish Middle Schoolers walk to and from school

2. The Market Assessment mentions Bainbridge Island and Tacoma for examples of other locations
    - We live in LACEY
        - Who said we wanted to be like those areas?
        - Those are totally different types of cities
        - Most of us have located in Lacey to get away from what they have up North

3. The Market Assessment states: "the opportunity for development of this site: to provide a true convenience store that sells both good-quality groceries and freshly prepared food"
    - How can they guarantee that the store will sell these types of food

4. The Market Assessment states: "long-term decline in the sale of fuel and tobacco"
    - We should consider the long-term goals of OUR neighborhood, OUR city, OUR environment and OUR future
    - When fuel stations close there are tanks and pollutants that are always left behind for someone else to clean up
    - There is a recently closed fuel station at Martin and Marvin

5. The Market Assessment states: "Gas is what will get people coming to this location"
    - But doesn't this contradict what they just said about the decline of fuel sales?
    - How will the thousands of warehouse workers know about the new fuel station with "good food"?
        - Sounds like they will need to post advertising and signage around the neighborhoods and main roads. Doesn't sound like gas is what will bring them in, but tacky clutter

6. The Market Assessment mentions "commuters stopping to buy coffee and egg McMuffin"
    - We already have a locally owned coffee and eatery only .3 miles away from this location, with a drive-through option. So that need is already fulfilled.
    - I thought they wanted to sell "real food". Why do they mention a McDonald's food item that wouldn't even be sold there?

7. The Market Assessment states: "the entire area north of I-5 is a food desert"
    - There are already 6 eatery businesses with take-out and dine-in options

- The coffee and eatery business located .3 miles from this location serves beverages and food and has a drive-through, inside and outside seating
- There are 5 restaurants in the Britton Plaza that have sit-down and take-out food options, 2 miles from this location

Comments on Narrative:

1. Northwest Investors say that they have lived in Thurston County for the last 38 years. But on the General Land Use Application the address for this owner/applicant lists a house located in Federal Way which is in King County.

2. The Narrative says they "see the need for a Farmers Market style store located on the corner of Willamette Drive and London Loop
    - Just shows they don't know the neighborhood
    - Willamette Drive and London Loop don't meet. Campus Glen Drive NE and Willamette Dr NE is the actual location of this site

3. Northwest Investors say that it is frustrating to cross over the I-5 bridge to get to the 5 grocery stores in the Hawks Prairie area
    - As a local citizen who has lived and owned a home in NE Lacey since 2006, I find that the 3 miles to drive to these grocery stores is actually easy, especially with the new overpass that the WSDOT built recently
    - Marvin Rd NE isn't the only way to I-5; Carpenter Rd NE and Meridian Rd NE are also main roads to gas stations, eateries and grocery stores

4. Tacoma is the Northwest Investors example of what they want for our neighborhood
    - This is LACEY in THURSTON COUNTY
    - We do not want to live in Tacoma or Pierce County or even King County
    - Please don't turn our beloved area into something else

5. They want to offer locally sourced goods from farmers, bakeries and meat shops and listed some local brands that will "ultimately be included"
    - How can they guarantee that those local goods would be sold at this fuel station convenience store
    - How can they compare a Metropolitan Market to a fuel station convenience store

In conclusion, this sounds like a bait and switch. Sell us on the fancy food market idea, but it is actually just another a gas station with a fast-food convenience store.

I would like to make sure that it is on record that there were 3-4 gatherings held by neighbors and local citizens in protest of the gas station project. These protests were held on the sidewalks on the corner of Willamette Dr NE and Campus Glen Dr NE. Not all who are against this project were able to attend these. These gatherings were reported about on the TV news and the local online news websites.

We the citizens of NE Lacey don't want this type of business across from a city park, city trail, and in the middle of our quiet neighborhood. **Please listen to us.**

Exhibit 40B - 37

From: Kathalyn Tung-Goodblatt
To: Samra Seymour
Subject: 20-310: MERIDIAN MARKET AND GAS
Date: Sunday, April 03, 2022 1:35:18 PM

Hi Ms. Seymour,

I will not be able to attend the April 4th hearing for this project, but would like to submit my comment.

I am an Environmental Planner in the private sector and prepare environmental impact documentation (namely California Environmental Quality Act and National Environmental Policy Act [CEQA/NEPA]) for an array of development projects for the public and private sectors. I am also a former resident of Lanyard Drive and my children still go to the Children's Courtyard daycare center to the southwest of the project site. We drive past this project site every weekday and frequently visit this park to play at the playground and walk our dogs.

I reviewed the documents provided at: http://www.ci.lacey.wa.us/city-government/city-departments/community-and-economic-development/planning-zoning/current-planning/projects_under_review- including the SEPA Environmental Checklist and it is a little disappointing to see that no Air Quality, Greenhouse Gas Emissions, or Health Risk Assessments were conducted for this project. (Additionally, many of the responses for the SEPA were cut off and no attachment was provided.) For a contentious project that is abutting single-family residences (SFR) to the north and a park directly to the south (i.e., with many sensitive receptors within a very close distance), the City should do their due diligence to provide a more complete analysis of potential environmental impacts (not just traffic counts/trip generation, aesthetics considerations, and contaminated soils) to assure these residents/sensitive receptors who would be directly affected by the gas station that the City is conscientious of the potential health risks concerns.

Additionally, although the staff report indicated comments were received from the Olympic Regional Clean Air Agency (ORCAA) to submit a California Air Resource Board certified Storage I Enhanced Vapor Recovery system, it is not listed in the Environmental Conditions set forth on the Mitigated Determination of Nonsignificance (Exhibit 24). There is significant concern for the off-gassing vapors associated with gas stations as noted in this Columbia University Mailman School of Public Health study supported by the National Institutes of Health (NIH) published in 2018: https://www.sciencedaily.com/releases/2018/10/181004110021.htm. The study concluded that vapors (i.e., benzene a carcinogen) from gas station vent pipes were 10 times higher than estimates used in setback regulations used to determine how close to schools, playgrounds, and parks these gas stations should be located. It was noted that "people could be exposed to the chemical [benzene] at locations beyond the setback distance of 300 feet." The SFRs to the north abutting the site would be approximately 160 feet from the proposed fuel stations based on the Conceptual Site Plan in Exhibit 6. Meridian Park to the south is approximately 80 feet from the project site

(considering the maximum 10-foot setback + 24 feet for where the proposed fuel stations would be placed on site) and approximately 250-275 feet from the playground. The study notes that "officials should reconsider their regulations based on these data with particular attention from regular operations or improper procedures related to fuel deliveries and the use of pollution prevention technology. " This is a valid concern that the City should consider as potential cancerous exposures to the existing and future sensitive receptors could create public health, environmental justice, and ultimately legal issues further down the road.

As noted in the permit documents, the property is zoned for Neighborhood Commercial, but requires the conditional use permit (CUP) in order to allow the construction of the gas station. Although the trip generation rates estimated for a gas station are lower than if a "typical" neighborhood commercial use was developed, the average weekday daily traffic would result only in an 18% reduction in number of trips (552 trips per day) which is not a significant difference and should not be a determining factor for selecting the gas station as a viable option. The gas station creates a number of additional environmental concerns including air quality and hazards (e.g., air emissions including cancer-causing toxins, accidental spill risks) and the potential for heavy duty vehicles to utilize the road (although heavy trucks are not permitted on Campus Glen Drive NE, some have passed through).

Based on your Findings of Facts listed in your March 18, 2022 report, "#5: No other probable significant adverse impacts were identified through the review of the environmental checklist and application materials that would not be addressed and/or governed by the provision of the Lacey Municipal Code" does not seem to be appropriate as the City did not conduct or disclose its reasoning for not including an air quality, GHG emissions, and health risk assessment especially when it is evident the gas station will be constructed directly adjacent to and surrounded by sensitive receptors. Please consider taking some additional time to evaluate and review these potential health risk concerns that may be associated with the construction of the gas station.

Thank you for your time,
Kathalyn Tung-Goodblatt, AICP

Exhibit 40B - 38

From: Vern Turner
To: Samra Seymour
Subject: Re: Project# 20-310: Meridian Market & Gas - NOTICE OF HEARING
Date: Tuesday, March 29, 2022 2:41:30 PM

Samra Seymour:

Thanks for the info. I found it interesting that the Lacey City Council changed the zoning for this lot from Low Density Residential to Neighborhood Commercial 2003. What was the impetus for the change? Was a feasibility study done? It would seem that we need (on this side of 5) some decent grocery stores (e.g. Trader Joe's) and good restaurants (not just fast food, but not in the middle of Campus Glen). We are already experiencing unbridled growth in the surrounding area with an overabundance of Distribution Centers, some of which remain empty. The volume of traffic and type of traffic (e.g. Tractor Trailers) is increasing, and it appears that the roads in area are under-engineered to handle this transition. Additionally, this type of traffic will produce additional. safety hazards to the residents of the area, especially the children in and around Campus Glen. Why increase the traffic hazard by adding a gas station, when it is not clear why the proposal is needed in the community?

Regards,
Vern Turner

Sent from the all new AOL app for iOS

On Tuesday, March 29, 2022, 10:55 AM, Samra Seymour <Sseymour@ci.lacey.wa.us> wrote:

> Good morning all,
>
> Here is a link to the City's website where you are able to download the entire exhibit package. The exhibits are all now labeled and bookmarked within the pdfs. You'll need to scroll down until you see this project. (I think it's the fourth project.) The exhibits are broken up into five separate pdfs due to size.
>
> There is also a flyer that provides some additional information on the process, as well as a link to the informational webinar from last spring.
>
> Thank you,

Samra Seymour AICP | Senior Planner

(she/her)
City of Lacey
360.491.5642 department

360.413.3541 direct

From: Samra Seymour
Sent: Friday, March 25, 2022 4:50 PM
To: Samra Seymour <Sseymour@ci.lacey.wa.us>
Subject: Project# 20-310: Meridian Market & Gas - NOTICE OF HEARING

Good afternoon all,

Attached to this email is the official notice of public hearing, scheduled for April 4, 2022 @1pm. It includes a link for registering for the hearing. I will be following up shortly, with a link to the hearing materials, including staff report.

Thank you,

Samra Seymour AICP | Senior Planner
(she/her)

City of Lacey
420 College St SE
Lacey, WA 98503

www.ci.lacey.wa.us www.locationlocationlacey.com

360.491.5642 department

360.413.3541 direct

Exhibit 40B - 39

From: Danny K
To: Samra Seymour
Cc: Rick Walk
Subject: Public Record Questions about 20-310: MERIDIAN MARKET AND GAS
Date: Saturday, March 26, 2022 3:54:10 PM

Public Record Questions about 20-310: MERIDIAN MARKET AND GAS

1. To get an example of their business model, can Northwest Investors LLC and/or Navi Grewal present to the city and residents the other gas stations and markets that they own?

2. What can the city do to ensure that Northwest Investors LLC operate their store as they wrote in the Meridian Market narrative?

   If the market is built and Northwest Investors LLC does not follow what they presented in their Meridian Market narrative (it becomes another '7-11' type of store vs 'a miniature grocery store' carrying many local goods as they state,), what can the city of Lacey do to ensure that the LLC continues to operate as promised in their market narrative?

Exhibit 40B - 40

From: carol.vanbaalen
To: Samra Seymour
Subject: Gas station / mini mart at Campus Glen and Willamette
Date: Sunday, April 03, 2022 3:48:59 PM

You don't often get email from carol.vanbaalen@gmail.com. Learn why this is important

Caution: This is an external email. Please take care when clicking links or opening attachments. When in doubt, contact the IS Department

I am writing to express my concern about the proposed gas station / mini mart at the corner of Campus Glen and Willamette, Project #20-310. I am a resident of the Jubilee community, so live close enough to be impacted by this project, in a negative way. It would certainly bring more traffic, noise, and pollution to our quiet residential community. But I am more concerned about the inappropriateness of this project to its next door neighbors-- Meridian Community Park across the street, and Salish Middle School just down the street. A gas station and mini mart do not belong in this residential neighborhood, next to a school and a park! Lacey can and must do a better job in protecting its neighborhoods and planning its future development.

Please do not move ahead with Project 20-310.

Sincerely,
Carol Van Baalen
4225 Bainbridge Ct NE
Lacey, WA

Sent from my Galaxy

Exhibit 40B - 41

From: paul von thun
To: Samra Seymour
Subject: Project #20-310
Date: Sunday, April 10, 2022 10:11:41 PM

[You don't often get email from vonthunpaul@gmail.com. Learn why this is important at http://aka.ms/LearnAboutSenderIdentification.]

Caution: This is an external email. Please take care when clicking links or opening attachments. When in doubt, contact the IS Department

Dear Samra,
Please forward this to the Hearings Examiner:
A very popular family friendly Lacey city park is located just across the street from the proposed gas station, and the area is dangerous to drive with poor sight lines, and high speeds along with heavy school and commuter traffic. To my knowledge there no other gas stations next to a big Lacey park.
I was on the H.O.A. board for Campus Meadows for three years and no one that I have talked to likes the idea of a gas station at this location. Meridian Campus even sent a survey to residents asking about what type of neighborhood business they would like to see; no one wanted to see a gas station.
PLEASE SAY NO TO THE TRAFFIC, THE NOISE, AND THE LITTER THAT A GAS STATION WOULD BRING TO OUR NEIGHBORHOODS AND OUR POPULAR LACEY PARK!

Thank you,
Paul Von Thun

Sent from my iPhone

Exhibit 40B - 42

From: Marianne Webster
To: Samra Seymour
Subject: Feedback on Project# 20-310
Date: Sunday, April 03, 2022 1:18:35 PM

To: Samra Seymour, AICP, Senior Planner

Hello,

I'm writing to express my strong view that Project# 20-310, the Gas Station Mini-mart development, should not proceed for many reasons. First, this type of business is extremely inappropriate for this community that includes a park across the street and a high density of children. This is a major safety issue. We're also concerned that the development will increase loitering and crime and lower the property values.

Second, the environmental and quality of life impact will be significant. The added traffic, noise, lights and pollution will all negatively affect both the local residents and the wildlife that we all enjoy.

There are already many other options local residents can use, including gas station/mini-marts on both Marvin and Martin as well as Costco.

In summary, a new gas station mini-mart is not needed and is not appropriate in this residential neighborhood.

Thank you for your attention to the voices of this community.

Marianne Webster & Marshall Johnson
8245 Vashon Drive NE
Lacey, WA 98516

Exhibit 40B - 43

From: Andra
To: Samra Seymour
Subject: gas station by the park
Date: Tuesday, March 29, 2022 9:28:46 AM

You don't often get email from gwalchmai@scattercreek.com. Learn why this is important

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Please listen to the people who live there. I sure wouldn't want a big gas station and convenience store next to Wonderwood Park! There's got to be a better place for that sort of commercial venture.

Andra Weddington
2809 Brentwood Dr. SE
Lacey

Exhibit 40B - 44

From: janetjwilde@gmail.com
To: Samra Seymour
Subject: oppose gas station, Willamette and Campus Glen Dr
Date: Monday, April 04, 2022 9:35:41 AM

You don't often get email from janetjwilde@gmail.com. Learn why this is important

Caution: This is an external email. Please take care when clicking links or opening attachments. When in doubt, contact the IS Department

Hello,

I oppose the plan for the gas station and market to be built at the corner of Willamette Drive and Campus Glen Drive in NE Lacey. I live in Jubilee and travel through that intersection often. There are many pedestrians and bicycle riders in the area. The park is very well used. There are students going to and from Salish Middle School. It is a beautiful and quiet residential neighborhood. A gas station would increase traffic and noise and is not necessary. There are eight gas stations within a few miles of my home. (two on Marvin road north of Martin Way, four in the area of Marvin and Martin, two at Martin and Meridian)

Thank you for your consideration,

Janet Wilde
8439 Orcas Place NE
Lacey

Exhibit 40B - 45

From: amywilvert@gmail.com
To: Samra Seymour
Subject: Attention Hearing Examiner re: Willamette Gas Station
Date: Monday, April 11, 2022 7:52:50 AM

[You don't often get email from amywilvert@gmail.com. Learn why this is important at http://aka.ms/LearnAboutSenderIdentification.]

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100% we do not need a gas station on Willamette. I moved here only 4 years ago, 4 years, and now there is a paucity of trees and an excess of warehouses!!!
I am so disappointed!!!
I agree there must be a grocery placed, although not sure the corner across from the park would be a great place to do so. I definitely would not like a “convenience store”. I would prefer something like a Trader Joe’s or Met Market - probably around the Britton/Willamette area. Please stop the destruction of the area!!
There have been multiple mailbox break ins, multiple package thefts - we do not need a gas station/convenience store to bring the traffic of non-neighborhood individuals.

Also, there is 1 crosswalk across Willamette near that park. I live closer to the school, and to cross Willamette on the other side of that park - where the children typically cross - is literally like playing frogger each time to get to the other side. Please put up another crosswalk to make it safer!!!

Thank you for your time
Amy Wilvert
Campus Prairie

Sent from my iPhone