

NOTICE OF PUBLIC HEARING

The City of Stoughton Plan Commission will hold a **Hybrid Public Hearing** on **Monday, October 9, 2023 at 6:00 o'clock p.m.**, or as soon after as the matter may be heard, to consider proposed ordinance amendments to Section 78-206 (4)(g) of the Stoughton Code of Ordinances, relating to in-vehicle sales and service uses. The following sections are proposed to be added:

78-206(4)(g)1

“h) Any use that includes vehicular fuel stations shall be located a minimum of 500 feet from: any public or private school, group day care center (section 79-206(4)(m)), hospital, institutional residential development (section 78-206(3)(f)) or other residential land use (section 78-206(1)), park, playground, playcourt, playfield, natural or wildlife area, or other institutional land use (section 78-206(3)). In all cases, the distance between two lots shall be measured from the property lines at the nearest points.

i) For any use that includes vehicular fuel stations, the property line at the nearest point shall be located a minimum of 500 feet from the boundary of any wetland, the ordinary high water mark (section 78-015) of any surface water, or the perimeter of any groundwater protection area.

j) Any use other than vehicular fuel stations shall be located a minimum of 100 feet from any public or private school, group day care center (section 79-206(4)(m)), residential land use (section 78-206(1)), or institutional land use (section 78-206(3)). The distance between two lots shall be measured from the property lines at the nearest points.”

See additional information at: <http://stoughtoncitydocs.com/planning-commission/>

In-Person: Council Chambers (2nd floor of the Public Safety Building)

321 S. Fourth Street, Stoughton, WI

Virtual: You can join the meeting using a computer, tablet or smartphone via Zoom <https://us06web.zoom.us/j/84070124106?pwd=ZWZFM0g5OWIPRDhhUW0vMmNNSk1WQT09>

Phone in: +1 312 626 6799

Meeting ID: 840 7012 4106

Passcode: 039043

If you wish to call in and speak at the meeting, please register at: <http://speak.cityofstoughton.com> by 5:45 on or before the day of the meeting. Any written comments will be forwarded on to the “Organizer” and Commissioners.

For questions regarding this notice please contact Michael Stacey, Zoning Administrator at 608-646-0421.

Published September 14 and September 21, 2023 Hub

**City of Stoughton Application for Amendment of Zoning Regulations
(Requirements per Section 78-902)**

Applicant Name: _____

Applicant Address: _____

Applicant Phone and Email: _____

This form is designed to be used by the Applicant as a guide to submitting a complete application to amend the Zoning Ordinance text *and* by the City to process said application. Parts II and III are to be used by the Applicant to submit a complete application; Parts I - IV are to be used by the City when processing said application.

I. Record of Administrative Procedures for City Use

Application form filed with Zoning Administrator

Date: _____

II Application Submittal Packet Requirements for City and Applicant Use

Prior to submitting the complete application as certified by the Zoning Administrator, the Applicant shall submit a draft application for staff review, followed by one revised final application packet based upon staff review and comments. The application shall include the following:

- (a) **A copy of the provisions of the current Zoning Ordinance which are to be amended.**
- (b) **A copy of the text which is proposed to replace the current text.**
- (c) **Written justification for the proposed text amendment**
 - Indicating reasons why the Applicant believes the proposed text amendment is in harmony with the recommendations of the City of Stoughton Comprehensive Plan, particularly as evidenced by compliance with the standards set out in Section 78-902(4)(c)1.-5.

III Justification of the Proposed Zoning Ordinance Amendment for Applicant and City Use

1. How does the proposed Official Zoning Ordinance amendment further the purposes of the Zoning Ordinance as outlined in Section 78-005?

2. How does the proposed text amendment further the purposes of the general Article and specific Section in which the amendment is proposed to be located?

3. Which of the following has arisen that are not properly addressed in the current zoning text (Check One)?

- The provisions of the Zoning Ordinance should be brought into conformity with the Comprehensive Plan. (If a factor related to the proposed amendment, note pertinent portions of the Comprehensive Plan.)
- A change has occurred in the land market, or other factors have arisen which require a new form of development, a new type of land use, or a new procedure to meet said change(s).
- New methods of development or providing infrastructure make it necessary to alter the Zoning Ordinance to meet these new factors.
- Changing governmental finances require amending the Zoning Ordinance to meet the needs of the government in terms of providing and affording public services.
- Explain if necessary:

4. If the proposed text amendment is concerned with the provisions of Articles II and/or III: how does the proposed amendment maintain the desired overall consistency of land uses, land use intensities, and land use impacts within the pertinent zoning districts?

IV. Final Application Packet Information for City Use

Receipt of final application packet by Zoning Administrator	Date: _____
Notified Neighboring Property Owners (within 300 feet)	Date: _____
Notified Neighboring Township Clerks (within 1,000 feet)	Date: _____
Class 2 legal notice sent to official newspaper by City Clerk	Date: _____
Class 2 legal notice published on _____ and _____	Date: _____

Sec. 78-902. - Amendment of zoning regulations.

- (1) *Purpose.* The purpose of this section is to provide regulations which govern the procedure and requirements for the review and approval, or denial, of proposed amendments to provisions of this chapter. (Refer to the requirements of Wisconsin Statutes 62.23(7)(d)).
- (2) *Initiation of request for amendment of this chapter.* Proceedings for amendment of this Ordinance may be initiated by any one of the following three methods:
 - (a) An application by any member of the general public;
 - (b) A recommendation of the plan commission; or
 - (c) By action of the common council.
- (3) *Application requirements.* All applications for proposed amendments to this chapter, regardless of the party of their initiation per subsection 78-902(2) above shall be approved as complete by the zoning administrator prior to the formal initiation of this procedure. The submittal of an application to the zoning administrator to initiate this procedure shall not occur until the zoning administrator has certified acceptance of the complete application to the zoning administrator. No placement of the application on any agenda, as an item to be acted upon, shall occur unless said certification has occurred. The item may be placed on any agenda as a discussion-only item, with the permission of the zoning administrator, without an application. Prior to the submittal of the Official Notice regarding the application to the newspaper by the zoning administrator, the applicant shall provide the zoning administrator with 15 copies of the complete application as certified by the zoning administrator. Said complete application shall be comprised of all of the following:
 - (a) A copy of the portion of the current provisions of this chapter which are proposed to be amended, with said provisions clearly indicated in a manner which is clearly reproducible with a photocopier;
 - (b) A copy of the text which is proposed to replace the current text; and
 - (c) As an optional requirement, the applicant may provide written justification for the proposed text amendment, consisting of the reasons why the applicant believes the proposed text amendment is in harmony with the recommendation of the comprehensive plan, particularly as evidenced by compliance with the standards set out in subsection 78-902(4)(c)1 - 4, below.
- (4) *Review by the zoning administrator.* The proposed text amendment shall be reviewed by the zoning administrator as follows:
 - (a) The zoning administrator shall determine whether the application is complete and fulfills the requirements of this chapter. If the zoning administrator determines that the application is not complete or does not fulfill the requirements of this chapter, he shall return the application to the applicant. If the zoning administrator determines that the application is complete, he shall so notify applicant.
 - (b) Upon notifying the applicant that his application is complete the zoning administrator shall review the application and evaluate and comment on the written justification for the proposed text amendment provided in the application per subsection 78-902(3)(a) through (c), above.
 - (c) The zoning administrator may also evaluate the application to determine whether the proposed text amendment is in harmony with the recommendations of the comprehensive plan, particularly as evidenced by compliance with the standards of subsection 78-902(4)(c)1 - 4, below:
 1. The proposed text amendment furthers the purposes of this chapter as outlined in section 78-005.
 2. The proposed text amendment furthers the purposes of the general article 0 n which the amendment is proposed to be located.
 3. The proposed text amendment furthers the purposes of the specific section in which the amendment is proposed to be located.
 4. The following factors have arisen that are not properly addressed in the current zoning text:

- a. The provisions of this chapter should be brought into conformity with the comprehensive plan. (If a factor related to the proposed amendment, note pertinent portions of the Comprehensive Plan.);
 - b. A change has occurred in the land market, or other factors have arisen which require a new form of development, a new type of land use, or a new procedure to meet said change(s);
 - c. New methods of development or providing infrastructure make it necessary to alter this chapter to meet these new factors;
 - d. Changing governmental finances require amending this chapter in order to meet the needs of the government in terms of providing and affording public services.
5. If the proposed text amendment is concerned with the provisions of article II and/or III: The proposed amendment maintains the desired overall consistency of land uses, land use intensities, and land use impacts within the pertinent zoning districts.
- (d) The zoning administrator shall forward the review per subsection 78-902(4)(b), and if it has been prepared, the report per subsection 78-902(4)(c), to the plan commission for the commission's review and use in making its recommendation to the common council. If the zoning administrator determines that the proposal may be in conflict with the provisions of the comprehensive plan, the zoning administrator shall note this determination in the report.
- (5) *Review and recommendation by the plan commission.* The common council shall not make an amendment to this chapter without allowing an opportunity for a recommendation from the plan commission per the provisions of this subsection.
- (a) The zoning administrator shall schedule a reasonable time and place for a public hearing to consider the application within 45 days after the acceptance and determination of the complete application as determined by the zoning administrator. The applicant may appear in person, by agent, and/or by attorney. Notice of the proposed amendment and the public hearing shall conform to the requirements of Section 62.23(7)(d) of the Wisconsin Statutes. Said notice shall contain a description of the proposed text change. In addition, at least ten days before said public hearing, the city clerk shall mail an identical notice to the applicant, and to the clerk of any municipality whose boundaries are within 1,000 feet of any portion of the jurisdiction of this chapter. Failure to mail said notice, provided it is unintentional, shall not invalidate proceedings under this section.
 - (b) Within 60 days after the public hearing (or within an extension of said period requested in writing by the applicant and granted by the plan commission), the zoning administrator may make a written report to the common council and/or may state in the minutes, its findings regarding subsection 78-902(4), above, and its recommendations regarding the application as a whole. Said report and/or minutes may include a formal finding of facts developed and approved by the plan commission concerning the requirements of subsection 78-902(4)(c)1 - 4, above.
 - (c) If the zoning administrator fails to make a report within 60 days after the filing of said complete application (and in the absence of an applicant-approved extension (per subsection 78-902(5)(b), above), then the common council may hold a public hearing within 30 days after the expiration of said 60-day period. Failure to receive said written report and/or minutes from the plan commission per subsection 78-902(5)(b), above, shall not invalidate the proceedings or actions of the common council. If such a public hearing is necessary, the common council shall provide notice per the requirements of 78-902(5)(a), above.

State Law reference— Section 62.23(7)(d).

- (d) If the plan commission recommends approval of an application, it shall state in the minutes or in a subsequently issued written decision, its conclusion and any finding of facts supporting its conclusion as to the following: that the potential public benefits of the proposed amendment outweigh any and all potential adverse impacts of the proposed amendment, as identified in subsection 78-902(4)(c)1 - 4, above, after taking into consideration the proposal by the applicant.
- (6) *Review and action by the common council.* The common council shall consider the plan commission's recommendation regarding the proposed text amendment. The common council may request further

information and/or additional reports from the plan commission, zoning administrator, and/or the applicant. The common council may take final action (by ordinance) on the application at the time of its initial meeting, or may continue the proceedings, at the common council's, or the applicant's request. The common council may approve the amendment as originally proposed, may approve the proposed amendment with modifications (per the recommendations of the zoning administrator, the plan commission, authorized outside experts, or its own members), or may deny approval of the proposed amendment. If the common council wishes to make significant changes in the proposed text amendment, as recommended by the plan commission, then the procedure set forth in Section 62.23(7)(d) of the Wisconsin Statutes shall be followed prior to common council action. Any action to amend the provisions of proposed amendment requires a majority vote of the common council. The common council's approval of the requested amendment shall be considered the approval of a unique request, and shall not be construed as precedent for any other proposed amendment.

- (7) *Effect of denial.* No application which has been denied (either wholly or in part) shall be resubmitted for a period of 12 months from the date of said order of denial, except on grounds of new evidence or proof of change of factors found valid by the zoning administrator.
- (8) *Fee.* A fee may be required for this procedure. Refer to section 78-919.

The provisions of the current Zoning Ordinance which are to be amended are provided below in black text. The text which is proposed to be added is provided below in red text.

Article II. Section 78-206 (4)(g)

Description: In-vehicle sales and service land uses include all land uses which perform sales and/or services to persons in vehicles, or to vehicles which may or may not be occupied at the time of such activity (except vehicle repair and maintenance services, see subsection [78-206\(4\)\(q\)](#)). Such land uses often have traffic volumes which exhibit their highest levels concurrent with peak traffic flows on adjacent roads. Examples of such land uses include drive-in, drive-up, and drive-through facilities, vehicular fuel stations, all forms of car washes. If performed in conjunction with a principal land use (for example, a convenience store, restaurant or bank), in-vehicle sales and service land uses shall be considered an accessory use (see subsection [78-206\(8\)\(g\)](#)).

1) Regulations:

- a) Clearly marked pedestrian crosswalks shall be provided for each walk-in customer access to the facility adjacent to the drive-through lane(s).
- b) The drive-through facility shall be designed so as to not impede or impair vehicular and pedestrian traffic movement, or exacerbate the potential for pedestrian/vehicular conflicts.
- c) In no instance shall a drive-through facility be permitted to operate which endangers the public safety, even if such land use has been permitted under the provisions of this section.
- d) The setback of any overhead canopy or similar structure shall be a minimum of ten feet from all street rights-of-way lines, a minimum of 20 feet from all residentially-zoned property lines, and shall be a minimum of five feet from all other property lines. The total height of any overhead canopy or similar structure shall not exceed 20 feet per the measurement of roof height.
- e) All vehicular areas of the facility shall provide a surface paved with concrete or bituminous material which is designed to meet the requirements of a minimum four ton axle load.
- f) Facility shall provide a bufferyard with a minimum opacity of .60 along all property borders abutting residentially zoned property (section [78-610](#)).
- g) Interior curbs shall be used to separate driving areas from exterior fixtures such as fuel pumps, vacuums, menu boards, canopy supports and landscaped islands. Said curbs shall be a minimum of six inches high and be of a non-mountable design. No curb protecting an exterior fixture shall be located closer than 25 feet to all property lines.
- h) Any use that includes vehicular fuel stations shall be located a minimum of 500 feet from: any public or private school, group day care center (section [79-206\(4\)\(m\)](#)), hospital, institutional residential development (section [78-206\(3\)\(f\)](#)) or other residential land use (section [78-206\(1\)](#)), park, playground, playcourt, playfield, natural or wildlife area, or other institutional land use (section [78-206\(3\)](#)). In all cases, the distance between two lots shall be measured from the property lines at the nearest points.
- i) For any use that includes vehicular fuel stations, the property line at the nearest point shall be located a minimum of 500 feet from the boundary of any wetland, the ordinary high water mark (section [78-015](#)) of any surface water, or the perimeter of any groundwater protection area.
- j) Any use other than vehicular fuel stations shall be located a minimum of 100 feet from any public or private school, group day care center (section [79-206\(4\)\(m\)](#)), residential land use (section [78-206\(1\)](#)), or institutional land use (section [78-206\(3\)](#)). The distance between two lots shall be measured from the property lines at the nearest points.

III Justification of the Proposed Zoning Ordinance Amendment for Applicant and City Use

1. How does the proposed Official Zoning Ordinance amendment further the purposes of the Zoning Ordinance as outlined in Section [78-005](#)?

Section 78-005 specifies that the zoning ordinance has been adopted “for the purpose of protecting the public health, safety, morals, comfort, convenience and general welfare by implementing certain goals and objectives of the comprehensive plan.” Specifically, the Section notes that it is designed to, among other things, “control and lessen congestion in the streets; to secure safety from fire, panic and other dangers; to promote health and the general welfare; to promote adequate light and air; to encourage the protection of groundwater resources; to prevent the overcrowding of land; to avoid undue concentration of population; to preserve, protect and promote property values.”

The proposed amendment directly addresses the need to protect public health and safety, control and lessen congestion in the streets, promote health and the general welfare, and encourage the protection of groundwater resources. Specifically, the amendment uses scientific evidence to help determine a safe distance between “in-vehicle sales and service land uses” and schools, daycares, hospitals and other care facilities, as well as residential land uses, institutional residential developments, parks, playgrounds, playcourts, playfields, natural and wildlife areas, [wetlands](#), the Yahara River and other [surface water](#), and [groundwater protection areas](#).

In-vehicle sales and service land uses, as currently defined by the zoning ordinance, “include all land uses which perform sales and/or services to persons in vehicles, or to vehicles which may or may not be occupied at the time of such activity. . . . Such land uses often have traffic volumes which exhibit their highest levels concurrent with peak traffic flows on adjacent roads. Examples of such land uses include drive-in, drive-up, and drive-through facilities, vehicular fuel stations, all forms of car washes.” Byproducts of in-vehicle sales and service land uses, along with the potential for high traffic volumes cited in the definition above, are air pollution, noise and light pollution, and significant and well-documented risks to the environment and public health and wellbeing. These include, but are not limited to, the negative health effects of benzene, toluene, ethylbenzene, xylene, and airborne fine particulate matter.

There is widespread agreement in the scientific community about the harmful effects of BTEX (benzene, toluene, ethylbenzene, and xylene) and airborne fine particulate matter, a byproduct from the burning of gasoline and diesel. There is extensive [scientific evidence](#) showing an elevated health risk for those spending extended periods of time near facilities or areas that emit BTEX and airborne fine particulate matter. Benzene, for example, is a harmful carcinogen that is known to have toxic effects on humans’ blood and bone marrow. Airborne fine particulate matter is also a well-known contributor to adverse health effects. Children, who breathe more rapidly than adults and whose systems are still developing, the elderly, and immunocompromised people are especially vulnerable.

With regards to addressing potential congestion in the streets, it is important to note that young children are also especially at risk in accidents involving slow-moving vehicles (in, for instance, driveways and parking lots) since they are mobile well before they can comprehend risks to personal safety or anticipate potential dangers. As vehicles have gotten larger, frontal blind zones have correspondingly grown and accidents involving small children have become more fatal. While passenger vehicles have become safer for drivers and passengers, driving deaths and severe injuries are still a public health crisis, with pedestrians at particular risk. Wisconsin specifically experienced a whopping 28% increase in pedestrian fatalities between 2021 and 2022.

Finally, in addition to the above primary concerns about public health from pollution directly caused by in-vehicle sales and service land uses and by the increase in traffic, there is [ample research](#) demonstrating harmful effects on the environment, property value of homes, the increased risk of fires and explosions, and concerns over general quality of life for the community.

2. How does the proposed text amendment further the purposes of the general Article and specific Section in which the amendment is proposed to be located?

The purpose of Article II, in which the proposed text amendment would be located, is “to indicate which land uses may locate in each zoning district and under what requirements; and which land uses may not locate therein.” The proposed amendment clarifies in-vehicle sales and service land uses, reflecting current scientific research about the negative impacts such facilities have on nearby, vulnerable populations and local environs.

The incorporation of this proposed regulation into subsection 78-206(4)(g) reflects that in-vehicle sales and service uses produce undesirable effects on abutting and nearby properties, as documented in the attached [Adverse Impact Assessment for In-Vehicle Sales and Service Land Uses in Proximity to Sensitive Land Uses](#) prepared by the Stoughton Healthy Children and Neighborhoods Alliance. Specifically, the findings demonstrate the potential for such uses to increase adverse health outcomes for vulnerable populations from airborne pollutants (produced by idling vehicles and/or the presence and transfer of unburned fuel), pedestrian and vehicular accidents, and risks of environmental contamination. The findings demonstrate the potential for such uses to negatively impact public health and safety, the appeal of nearby locations for new development, and the long-term ability to sell and redevelop properties blighted by such facilities. It is explicitly not the intent of this regulation to unreasonably limit avenues of dispensing motor vehicle fuel or operating car washes or other drive-in, drive-up, and drive-through facilities, but rather to balance the need to promote commercial opportunities with the need to maintain air quality for vulnerable populations in close proximity; protect land and water quality; and to protect the character and integrity of Stoughton’s community, as outlined in the city’s comprehensive plan.

3. Which of the following factors has arisen that are not properly addressed in the current zoning text?

The provisions of subsection 78-206(4)(g) should be brought into conformity with the Comprehensive Plan. The Comprehensive Plan “seeks to minimize [potential land use] conflicts through thoughtful planning and implementation.” In fact, the ordinance, as it is currently written, conflicts with no fewer than ten stated goals, objectives, and policies in the Comprehensive Plan. These include, but are not limited to, the following:

- Goal: Protect natural resource features in Stoughton’s Planning Area.
Objectives:
 - a. Preserve streams, drainageways, floodplains, wetlands, wildlife habitat, steep slopes, woodland areas, and other natural features.
 - b. Protect surface water and ground water quality.
 - d. Prevent future problems associated with developing land too close to natural areas, drainageways, and floodplains.
- Natural Resource Policies:
 - 3. Use the City’s zoning, subdivision, and official mapping powers to protect waterways, shorelines, wetlands, and floodplain areas within the current City limits and extraterritorial area.
- Goal: Enhance and maintain the City’s unique neighborhoods.
Objectives:
 - c. Discourage high traffic volumes and speeds in residential neighborhoods.
 - f. Prohibit incompatible land uses (e.g. high traffic generators, noisy or unaesthetic uses) from locating within or next to residential neighborhoods.

- Goal: Preserve and establish visually attractive development.
 - Objectives:
 - a. Preserve and re-establish attractive gateways and entryways into the community.
- Land Use Planning Policies
 - a. The City shall strive for compatibility of adjacent land uses by requiring site plan review for all multi-family residential, commercial, office, industrial, recreational, and institutional land uses.
 - d. Major activity areas such as building entrances, service and loading areas, parking lots, and trash receptacle storage areas shall be oriented away from less intensive land uses to the greatest degree possible.

The Comprehensive Plan lays out explicitly the ways in which Land Use Planning Policies, such as the ones cited above, should be used on a day-to-day basis to implement the Comprehensive Plan and accomplish the stated goals and objectives. This includes amending the Zoning Ordinance: “The policies listed in this Plan should provide guidance to the City as it revises development-oriented ordinances such as the Zoning Ordinance, Subdivision Ordinance, and Official Map” (50).

As noted above, the Comprehensive Plan “seeks to minimize land use conflicts “through thoughtful planning and implementation” as the city works to achieve its goals and objectives (43). The Plan goes on to note that “basic upgrades to the City’s Zoning Ordinance will readily forward these objectives” (148).

The proposed amendment is a thoughtfully planned regulation for land uses, including future high-impact land uses that, when implemented, will help the city achieve the following Overall Planning Goals (see Chapter 1, Section F on page 16 of the plan): “provide safe, affordable housing and attractive neighborhoods”; “protect the natural resources in the Stoughton planning area”; “preserve and enhance Stoughton’s ‘small city’ character and heritage”, and “promote an efficient and sustainable development pattern.”

4. If the proposed text amendment is concerned with the provisions of Articles II and/or III: how does the proposed amendment maintain the desired overall consistency of land uses, land use intensities, and land use impacts within the pertinent zoning districts?

The proposed text amendment does not conflict with any existing regulation of in-vehicle sales or service land uses (Article II, Section 4(g)). It augments and clarifies two existing regulations:

- (b) The drive-through facility shall be designed so as not to impede or impair vehicular and pedestrian traffic movement, or exacerbate the potential for pedestrian/vehicular conflicts.
- (c) In no instance shall a drive-through facility be permitted to operate which endangers public safety, even if such land use has been permitted under the provisions of this section.

The overall consistency of land uses, land use intensities, and land use impacts will not be affected by the adoption of the proposed text amendment.

August 31, 2023

ADVERSE IMPACT ASSESSMENT
for In-Vehicle Sales and Service Land Uses in
Proximity to Sensitive Land Uses

Prepared by members of the
Stoughton Healthy Children and Neighborhoods Alliance

Amber R. Cederström, Ph.D.
B. Marcus Cederström, Ph.D.
Adrienne A. Nienow, Science Writer



Access the digital version of this document (for active, clickable links to cited references) by visiting <https://tinyurl.com/protect-stoughton> or by using the camera on your smart phone to **scan the QR code to the left.**

CONTENTS

Summary [3]

Proposed Amendment [3]

Adverse Impacts of In-Vehicle Sales and Service Land Uses [4]

Air Quality and Health Effects. . . . [4]

Traffic Operations and Pedestrian Safety Impacts. . . . [12]

Other Public Health, Environment, and Property Concerns. . . . [14]

Conclusions [18]

SUMMARY

The *Stoughton Healthy Children and Neighborhoods Alliance (SHCNA)* has assessed the effects of in-vehicle sales and service developments on nearby people, properties, and natural resources and recommends an amendment to the current zoning ordinance. SHCNA has identified substantial evidence showing that the following negative effects are likely, which are listed from most severe to least:

1. Jeopardize the health and safety of people in proximity to in-vehicle sales and service land uses due to harmful, long-term exposure to benzene and other toxins common in airborne particulate matter associated with such developments. Risks are elevated for vulnerable populations, such as children, immunocompromised people, and the elderly. When in-vehicle sales and service uses involve gasoline, a highly volatile substance with easily vaporized toxic compounds, the **cumulative** effect of **long-term** exposure **in close proximity** is especially harmful to babies and children, whose respiration rates are much higher than adults and whose developing brains and growing bodies metabolize the toxic compounds differently. This is an important health and safety issue that requires putting significant distance between children and other vulnerable community members, hence our proposed amendment (regulation h) to Article II, Section 78-206 (4)(g)(1) of the City of Stoughton zoning ordinances, which ensures a safe and scientifically-backed distance between in-vehicle sales and service land uses and the citizens of Stoughton.
2. Exacerbate the potential for pedestrian/vehicular conflicts during a time when pedestrian fatalities throughout the state of Wisconsin continue to increase. According to current transportation safety guidelines, proximity between high vehicle traffic producers (all in vehicle sales and service uses) and pedestrian traffic producers (schools, daycares, residential neighborhoods, etc.), greatly increases the risk of vehicular-pedestrian conflict. Separating vehicles and pedestrians with the proposed amendment (regulation j) to Article II, Section 78-206 (4)(g)(1) of the City of Stoughton zoning ordinances, however, greatly mitigates this risk.
3. Cause possible or probable harm to Stoughton's environment, wetlands, surface and groundwater resources, nearby properties, nearby property values, public health, as well as risk major accidents from leaks, spills, explosions, and fires to nearby people, properties, and natural resources, hence the proposed amendment to Article II, Section 78-206 (4)(g)(1) of the City of Stoughton zoning ordinances, which ensures a scientifically informed distance between the underground gasoline storage and fueling stations of in-vehicle sales and service land uses and the vulnerable people and natural resources of Stoughton.

PROPOSED AMENDMENT

As a result of the above and other negative effects described in more detail below, with provided evidence and scientific research, SHCNA proposes new provisions be added to **Article II, Section 78-206 (4)(g)(1)** of the City of Stoughton zoning ordinances:

- h) Any use that includes vehicular fuel stations shall be located a minimum of 500 feet from: any public or private school, group day care center (section 79-206(4)(m)), hospital, institutional residential development (section 78-206(3)(f)) or other residential land use (section 78-206(1)), park, playground, playcourt, playfield, natural or wildlife area, or other institutional land use (section 78-206(3)). In all cases, the distance between two lots shall be measured

from the property lines at the nearest points.

- i) For any use that includes vehicular fuel stations, the property line at the nearest point shall be located a minimum of 500 feet from the boundary of any wetland, the ordinary high water mark (section 78-015) of any surface water, or the perimeter of any groundwater protection area.
- j) Any use other than vehicular fuel stations shall be located a minimum of 100 feet from any public or private school, group day care center (section 79-206(4)(m)), residential land use (section 78-206(1)), or institutional land use (section 78-206(3)). The distance between two lots shall be measured from the property lines at the nearest points.

ADVERSE IMPACTS OF IN-VEHICLE SALES AND SERVICE LAND USES

There is widespread agreement in the scientific community about the harmful effects of in-vehicle sales or service land uses. While gas stations are the most egregious offenders, all in-vehicle sales or service land uses carry heightened risk for nearby populations. These include (but are not limited to): severe and potentially fatal health outcomes as a result of exposure to toxic, airborne pollutants; injury or death from vehicular-pedestrian accidents; risk of major accidents involving fire, explosions, or chemical leaks; harm to the natural environment; and depreciation of home values and general city appeal. This document details some of these risks in support of the proposed additions to **Article II, Section 78-206 (4)(g)(1)** as included above.

Air Quality and Health Effects

With increased traffic comes increased health risks due to air pollution. All vehicles emit pollutants, or airborne particulate matter, that are hazardous to human health. These pollutants come from vehicle emissions, as well as from tires and brakes. Increased traffic at in-vehicle sales and service venues is therefore a potential health risk for all nearby populations. While the risk is elevated for those already vulnerable due to age or preexisting health conditions, the World Health Organization (WHO) points out that “There is no evidence of a safe level of exposure or a threshold below which no adverse health effects occur.”¹

New research suggests that brakes and tires are causing particulate pollution that is detrimental to the health and wellbeing of people. These particulate pollutants, known as PM_{2.5} because they measure 2.5 microns or less, are some of the most toxic air pollutants to humans. Because of their size, they can easily travel through the bloodstream and are known to be carcinogenic and to cause heart disease. As vehicles become heavier, not only does the risk to pedestrians increase in pedestrian-vehicle interactions, but the amount of particulate pollution increases due to the wear and tear on tires and brakes.² These particulate pollutants are also harmful to the environment.³ As more cars are on the road in and around areas with more pedestrians and residents, these risks become even more acute. While it is not possible to eliminate all risk from

1 World Health Organization. Regional Office for Europe. Review of evidence on health aspects of air pollution: REVIHAAP project: technical report. Regional Office for Europe, 2013. <https://apps.who.int/iris/handle/10665/341712>

2 Wang X, Gronstal S, Lopez B, Jung H, Chen LA, Wu G, Ho SSH, Chow JC, Watson JG, Yao Q, Yoon S. Evidence of non-tailpipe emission contributions to PM_{2.5} and PM₁₀ near southern California highways. *Environ Pollut*. 2023 Jan 15;317:120691. doi: 10.1016/j.envpol.2022.120691. Epub 2022 Nov 23. PMID: 36435278. <https://pubmed.ncbi.nlm.nih.gov/36435278/>

3 E.g., One study associates tire pollutants with increased salmon death in local populations. See: Tian, Zhenyu et al. “A ubiquitous tire rubber-derived chemical induces acute mortality in coho salmon.” *Science* 371, 185–189 (2021). <https://pubmed.ncbi.nlm.nih.gov/33273063/>

vehicles, including particulate pollutants, it is possible to mitigate those risks through common-sense and scientifically backed changes. The proposed zoning amendment does just that.

No less dangerous and far better known, vehicles also emit dangerous and toxic emissions through normal operations. Running and idling vehicles burning fuel at drive-through facilities create two phases of emissions: the “particulate phase” and the “gas phase.” The gas phase contains air pollutants such as benzene, formaldehyde, polycyclic aromatic hydrocarbons (PAHs), and other chemicals. The particulate phase consists of PM_{2.5}, including toxic substances, which easily reach “the smallest compartments of the lung (alveoli) where they gain direct access to the bloodstream”.⁴ PM_{2.5} is a well-known contributor to adverse health effects in humans and is especially dangerous for children and the elderly. Diesel emissions are made up of even finer particles than PM_{2.5}, including particles of Black Carbon. This has been causally linked to lung cancer, heart failure, stroke, adverse birth effects, and neurodevelopmental and cognitive impairment.⁵

The ill effects on children of these types of pollutants are well-documented and include increased risks of asthma, delayed lung development, autism, obesity, delayed cognitive development, poor cognitive performance, behavioral problems, and leukemia. A recent study from researchers at the CDC and the EPA found that children, up until the age of 14, are especially vulnerable to traffic emissions. Children in close proximity to high-volume roadways are disproportionately affected. The study found that a host of pollutants, particularly benzene, toluene, ethylbenzene, and xylene (BTEX, discussed in more detail below), as well as diesel exhaust particles and gasses, are known to negatively impact public health.⁶

Due to childrens’ rapidly developing immune systems as well as the fact that they breathe at a higher rate, the children exposed to these traffic-caused pollutants are at greater risk of asthma, delayed lung development, and leukemia. Traffic pollutants have even been linked to autism, obesity, and delayed cognitive development in children. In addition, neurotoxic air pollution, including fine particulate matter and carcinogenic chemicals like BTEX, negatively affects cognitive abilities in children, with effects being measured in reading and math abilities.⁷ A study examining both pre- and postnatal exposure to air pollution found that children between the ages of two and four who were exposed to elevated small-particle air pollution demonstrated “poorer child behavioral functioning and cognitive performance.”⁸ In yet another study, researchers identified high traffic streets and gas stations as two of the risk factors leading to cognitive deficits in children who were exposed to air pollutants.⁹ Finally, studies have also shown that airborne fine particulate matter causes excess annual deaths directly related to lower respiratory infections among children under

4 Oregon Physicians For Social Responsibility. “Airborne Particulate Matter and Public Health Factsheet.” https://www.oregonpsr.org/environmental_health_factsheets

5 Oregon Physicians For Social Responsibility. “Diesel, Small Particle Emissions & Public Health Factsheet.” https://www.oregonpsr.org/environmental_health_factsheets

6 Boothe, Vickie L. and Richard W. Baldauf. 2020. “Traffic emission impacts on child health and well-being.” In *Transport and Children’s Wellbeing*. Eds. E. Owen D. Waygood, Margareta Friman, Lars E. Olsson, and Raktim Mitra. <https://www.sciencedirect.com/science/article/abs/pii/B9780128146941000075>

7 Wodtke, Geoffrey T., Kerry Ard, Clair Bullock, Kailey White, and Betsy Priem. “Concentrated poverty, ambient air pollution, and child cognitive development.” *Science Advances*, 8.48: 2022. <https://www.science.org/doi/10.1126/sciadv.add0285>

8 Yu Ni, Christine T. Loftus, Adam A. Szpiro, Michael T. Young, Marnie F. Hazlehurst, Laura E. Murphy, Frances A. Tylavsky, W. Alex Mason, Kaja Z. LeWinn, Sheela Sathyanarayana, Emily S. Barrett, Nicole R. Bush, Catherine J. Karr. Associations of Pre- and Postnatal Air Pollution Exposures with Child Behavioral Problems and Cognitive Performance: A U.S. Multi-Cohort Study. *Environmental Health Perspectives*, 2022; 130 (6) DOI: [10.1289/EHP10248](https://doi.org/10.1289/EHP10248)

9 Calderón-Garcidueñas, Lilian and Ricardo Torres-Jardón. “Air Pollution, Socioeconomic Status, and Children’s Cognition in Megacities: The Mexico City Scenario.” *Front Psychol.* 2012; 3: 217. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3408108/>

the age of 4.¹⁰ Researchers therefore recommend that city planners de-emphasize cars so as to reduce the risk of child exposure.¹¹ Increasing the allowable distance between running vehicles on in-vehicle sales and service lots and residential areas, daycares, schools, and other high-use pedestrian areas, as the proposed amendment to Stoughton’s zoning ordinance does, is one way to reduce these health risks.

A similar wealth of evidence points to heightened health risks for elderly populations. The title of a 2009 article is blunt as to one of the several adverse health outcomes: “Long-term exposure to traffic-related particulate matter impairs cognitive function in the elderly.”¹² Another study concludes that “exposure to quasi-ultrafine particles and combustion-related pollutants (predominantly from traffic) increase the risk of myocardial ischemia” in elderly patients with coronary artery disease.¹³ Even beyond such at-risk populations, the health risks are well known and well documented, with long-term exposure to PM_{2.5} causing damage to respiratory and cardiovascular systems as well as diabetes, cancer, and neurological disorders.¹⁴

The risks of air pollution are directly related to proximity and length of exposure to the source of emissions, namely, vehicles and the services they rely on. All in-vehicle sales and service venues would increase traffic and therefore increase health risks, but fueling stations are the most harmful. According to the Environmental Protection Agency’s (EPA) 2020 National Emissions Inventory (the most recent data available), out of 59 sectors measured, only 12 industries produce more hazardous air pollutants (HAPs) than gas stations.¹⁵ There is extensive scientific evidence showing an elevated health risk for those spending extended periods of time near a gas station, particularly, again, for the young and elderly. One of the main reasons for the elevated health risk of gas stations is the cumulative release of unburned fuel from underground storage tanks, during vehicle fueling, and during transfer from tanker trucks to storage tanks.¹⁶ Unburned fuel contains a toxic and carcinogenic chemical mixture (BTEX) that, when chronically released, is a significant public health concern. The proposed amendment reflects scientifically informed caution in requiring the greatest distance between fueling stations and other land uses.

10 Vohra, Karn; Alina Vodonos; Joel Schwartz; Eloise A. Marais; Melissa P. Sulprizio; and Loretta J. Mickley. “Global mortality from outdoor fine particle pollution generated by fossil fuel combustion: Results from GEOS-Chem.” <https://pubmed.ncbi.nlm.nih.gov/33577774/>

11 Boothe, Vickie L. and Richard W. Baldauf. 2020. “Traffic emission impacts on child health and well-being.” In *Transport and Children’s Wellbeing*. Eds. E. Owen D. Waygood, Margareta Friman, Lars E. Olsson, and Raktim Mitra. <https://www.sciencedirect.com/science/article/abs/pii/B9780128146941000075>

12 Ranft, Ulrich, Tamara Schikowski, Dorothee Sugiri, Jean Krutmann, and Ursula Krämer. “Long-term exposure to traffic-related particulate matter impairs cognitive function in the elderly.” *Environmental research* 2009; 109 (8): 1004-1011. DOI: [10.1016/j.envres.2009.08.003](https://doi.org/10.1016/j.envres.2009.08.003)

13 Delfino, Ralph J., Daniel L. Gillen, Thomas Tjoa, Norbert Staimer, Andrea Polidori, Mohammad Arhami, Constantinos Sioutas, and John Longhurst. “Electrocardiographic ST-Segment Depression and Exposure to Traffic-Related Aerosols in Elderly Subjects with Coronary Artery Disease.” *Environmental Health Perspectives* 2011; 119 (2): 196-202. doi: [10.1289/ehp.1002372](https://doi.org/10.1289/ehp.1002372).

14 Li W, Lin G, Xiao Z, Zhang Y, Li B, Zhou Y, Ma Y, Chai E. A review of respirable fine particulate matter (PM_{2.5})-induced brain damage. *Front Mol Neurosci*. 2022 Sep 7;15:967174. doi: [10.3389/fnmol.2022.967174](https://doi.org/10.3389/fnmol.2022.967174). PMID: 36157076; PMCID: PMC9491465; World Health Organization. Regional Office for Europe. Review of evidence on health aspects of air pollution: REVI-HAAP project: technical report. Regional Office for Europe, 2013. <https://apps.who.int/iris/handle/10665/341712>

15 Environmental Protection Agency. “2020 National Emissions Inventory Technical Support Document: Overview.” https://www.epa.gov/system/files/documents/2023-01/NEI2020_TSD_Section2_Overview_0.pdf It is important to note, as the report does, that the pandemic played a significant role in the decrease of emissions related to car travel and that in past years, gas stations have been responsible for even more HAPs. The EPA, which identifies gas stations as sites of air emissions that emit hazardous air pollutants, therefore includes them in its regular National Emissions Inventory, in which it tracks the release of hazardous gasses such as benzene, toluene, ethyl benzene, and xylene (BTEX).

16 Hilpert M, Mora BA, Ni J, Rule AM, Nachman KE. “Hydrocarbon Release During Fuel Storage and Transfer at Gas Stations: Environmental and Health Effects.” *Curr Environ Health Rep*. 2015 Dec;2(4):412-22. doi: [10.1007/s40572-015-0074-8](https://doi.org/10.1007/s40572-015-0074-8). PMID: 26435043. [PubMed]

Health Impacts of BTEX Emissions

BTEX, the primary chemicals present in gasoline, are acknowledged by the Wisconsin Department of Health Services to cause adverse health effects. An evaluation on the toxicology of the joint toxic action of the chemicals in the BTEX mixture by the Agency for Toxic Substances and Disease Registry (ATSDR) determined that each chemical in the mixture “can produce neurological impairment”.¹⁷ In fact, the evaluation points out that even at the lowest exposure levels, neurotoxicity is expected, and that when exposure to a mix of BTEX chemicals occurs, higher venous blood concentrations of each chemical may result compared to individual chemical exposures.

Benzene is the easily vaporized gasoline constituent most harmful to human health and a known pollutant from vehicle emissions as well as gas stations and other in-vehicle sales and service venues, due to the increase in traffic in and around these developments as well as the probable number of idling vehicles. The research available describing the adverse health effects of benzene is substantial. There is no debate or disagreement in the scientific community: benzene is a harmful carcinogen that is known to have toxic effects on humans’ blood and bone marrow. These include leukemia, lymphoma, aplastic anemia, and pancytopenia. Benzene has additional adverse health effects on the nervous, immune, hematological, hepatic, renal, cardiovascular, and respiratory systems.¹⁸ In addition, benzene can lead to increased susceptibility to infections, and low birth weight. According to the Centers for Disease Control and Prevention (CDC), the major effect of benzene from long-term exposure (meaning a year or more) is on the blood, causing harmful effects to the bone marrow, altering the blood’s antibody levels, causing white blood cell loss, and causing excessive bleeding.¹⁹ People who live and work at or nearby in-vehicle sales and services venues suffer long-term exposure to benzene; among gas station attendants, studies “have found decreased red blood cell counts, hemoglobin, and hematocrit levels.”²⁰

According to the World Health Organization (WHO) Guidelines for Indoor Air Quality, **there is no safe level for benzene**.²¹ That is the case for all humans, but some vulnerable populations, including children and the elderly, are at particular risk. In 2018, a paper published in *Global Pediatric Health*²² reviewed 77 studies of the effects of benzene exposure (primarily from proximity to gasoline service stations) on children, and concluded that exposure to benzene is “a potentially major cause” of leukemia and other hematologic cancers, including non-Hodgkin lymphoma and multiple myeloma.²³ The evidence also indicates exposure is associated with abnormalities in respiratory, pulmonary, and other major bodily functions. Children, the study notes, are uniquely

17 Agency for Toxic Substances and Disease Registry (ATSDR). 2004. Interaction profile for benzene, toluene, ethylbenzene, and xylenes (BTEX). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. <https://atsdr.cdc.gov/interactionprofiles/ip-btex/ip05.pdf>

18 D’Andrea, Mark A. and G. Kesava Reddy. “Adverse Health Effects of Benzene Exposure Among Children Following a Flaring Incident at the British Petroleum Refinery in Texas City.” *Clinical pediatrics* vol. 55,3 (2016): 219-27. doi:[10.1177/0009922815594358](https://doi.org/10.1177/0009922815594358)

19 Centers for Disease Control and Prevention. “Facts About Benzene.” <https://emergency.cdc.gov/agent/benzene/basics/facts.asp>

20 Abou-EIwafa, Hala Samir et al. “Some Biochemical and Hematological Parameters among Petrol Station Attendants: A Comparative Study.” *BioMed research international* vol. 2015 (2015): 418724. doi:[10.1155/2015/418724](https://doi.org/10.1155/2015/418724)

21 Harrison R, Delgado Saborit JM, Dor F, et al. Benzene. In: WHO Guidelines for Indoor Air Quality: Selected Pollutants. Geneva: World Health Organization; 2010. 1. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK138708/>

22 D’Andrea MA, Reddy GK. Health Risks Associated With Benzene Exposure in Children: A Systematic Review. *Global Pediatric Health*. 2018 Aug 17;5:2333794X18789275. doi: 10.1177/2333794X18789275. PMID: 30148190; PMCID: PMC6100118. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6100118/>

23 Hsieh PY, Shearston JA, Hilpert M. Benzene emissions from gas station clusters: a new framework for estimating lifetime cancer risk. *J Environ Health Sci Eng*. 2021 Jan 7;19(1):273-283. doi: [10.1007/s40201-020-00601-w](https://doi.org/10.1007/s40201-020-00601-w). PMID: 34150235; PMCID: PMC8172828.

vulnerable, due to their levels of mobility, elevated oxygen consumption, and production of hormones, as well as the fact that “the toxicodynamic processes that determine exposure, absorption, metabolism, excretion, and tissue vulnerability are all age related.” A study published by the Journal of Environmental Health Science and Engineering puts the matter sharply: “While the general population experiences low exposure to benzene at gas stations when dispensing gasoline, at-risk populations include those who are occupationally exposed, people that live near gas stations, and children in schools near stations.”²⁴

Widely known to be high traffic producers, all in-vehicle sales and service developments—either due to the presence of gasoline or emissions from running and idling vehicles—are major sources of outdoor benzene concentration, which affects the indoor concentrations of benzene in nearby buildings. Benzene is heavier than air and accumulates in low-lying areas, towards the ground (again putting small children at particular risk) and, counter-intuitively, indoors. According to the WHO guidelines, benzene in indoor air can originate from outdoor air, and indoor concentrations of benzene are affected by outdoor levels “as a consequence of the entry and accumulation of benzene from outdoor sources.” Indoor concentrations of benzene are typically higher than those in the surrounding outdoor air, and have been consistently shown to be even higher in the colder seasons.²⁵

Fueling stations are, again, the most hazardous of in-vehicle sales and service venues. “Spills, leaky pipes, leaky dispenser hoses,” and “leaks in underground storage tanks” pose acute risk, increasing the emission of—and exposure to—benzene and other toxic chemicals.²⁶ In 2008, the Wisconsin Department of Health determined that, due to just a 20-gallon leak from an underground tank, the children at a daycare in Jackson, Wisconsin, were briefly exposed to an unacceptably high amount of benzene, whose ill effects were avoided primarily thanks to rapid response.²⁷ For reference, 20 gallons will not even fill a 2022 Ford F-150, the best-selling vehicle in America and a common vehicle on Wisconsin roads. Studies suggest that even at small gas stations, over 40 gallons of gasoline are spilled annually just through the pumping of gas.²⁸ Nor do leaks only occur during pumping; storage tanks can also leak during refills or over time, and according to a University of Wisconsin Extension report on petroleum storage tanks, “one drop every 10 seconds could release 60 gallons per year.”²⁹ Data from the Wisconsin Remediation and Redevelopment Database indicates over 820 leaks from underground storage tanks with associated environmental damage have been reported in the last 10 years in Wisconsin alone, of which more than 200 remain open (meaning cleanup is still needed or still underway); more than 9,600 spills are reported for the same time frame.³⁰

24 Hsieh PY, Shearston JA, Hilpert M. Benzene emissions from gas station clusters: a new framework for estimating lifetime cancer risk. *J Environ Health Sci Eng*. 2021 Jan 7;19(1):273-283. doi: [10.1007/s40201-020-00601-w](https://doi.org/10.1007/s40201-020-00601-w). PMID: 34150235; PMCID: PMC8172828.

25 Harrison R, Delgado Saborit JM, Dor F, et al. Benzene. In: WHO Guidelines for Indoor Air Quality: Selected Pollutants. Geneva: World Health Organization; 2010. 1. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK138708/>

26 Hsieh PY, Shearston JA, Hilpert M. Benzene emissions from gas station clusters: a new framework for estimating lifetime cancer risk. *J Environ Health Sci Eng*. 2021 Jan 7;19(1):273-283. doi: [10.1007/s40201-020-00601-w](https://doi.org/10.1007/s40201-020-00601-w). PMID: 34150235; PMCID: PMC8172828.

27 U.S. Department of Health and Human Services. Kiddie Kampus Daycare Center – Gasoline Vapor Intrusion: Village of Jackson, Washington County, Wisconsin. September 22, 2008. Health Consultation Report. Available [here](https://www.atsdr.cdc.gov/HAC/pha/KiddieKampusDaycareCenter/KiddieKampusDaycareCenter%20HC%20092208.pdf). <https://www.atsdr.cdc.gov/HAC/pha/KiddieKampusDaycareCenter/KiddieKampusDaycareCenter%20HC%20092208.pdf>

28 Hilpert, Markus and Patrick N. Breyse. “Infiltration and evaporation of small hydrocarbon spills at gas stations.” *Journal of Contaminant Hydrology* 170, 2014: 39–52.: <https://doi.org/10.1016/j.jconhyd.2014.08.004>

29 Webendorfer, Bruce, Nancy Young, Tim Clay, and Sharon Schwab. 2000. “Farm and Residential Petroleum Storage Tanks.” UW Extension. <https://townofnekimi.com/wp-content/uploads/2017/03/storage.pdf>

30 Wisconsin DNR. Wisconsin Remediation and Redevelopment Database. <https://dnr.wisconsin.gov/topic/Brownfields/WRRD.html>

Importantly, hazardous pollutants, including benzene, are emitted even during normal vehicle operations, not just when there are accidents. At fueling stations, most significantly, fuel vapors are released into the atmosphere from the storage tanks supplying the fuel to the gas pumps, during vehicle fueling, and during transfer from tanker trucks to storage tanks (see **Figure 1**), as well as from small gasoline spills and leaky hoses, nozzles, pipes, and more. A recent study examining short-term exposure to benzene at and around gas stations due to fuel vapors released into the atmosphere from storage tanks through vent pipes recorded vent emission factors more than 10 times higher than estimates used to derive setback distances for gas stations.³¹ The authors recommended setback distances be amended to address time-related variability and pollution controls in vent emissions.

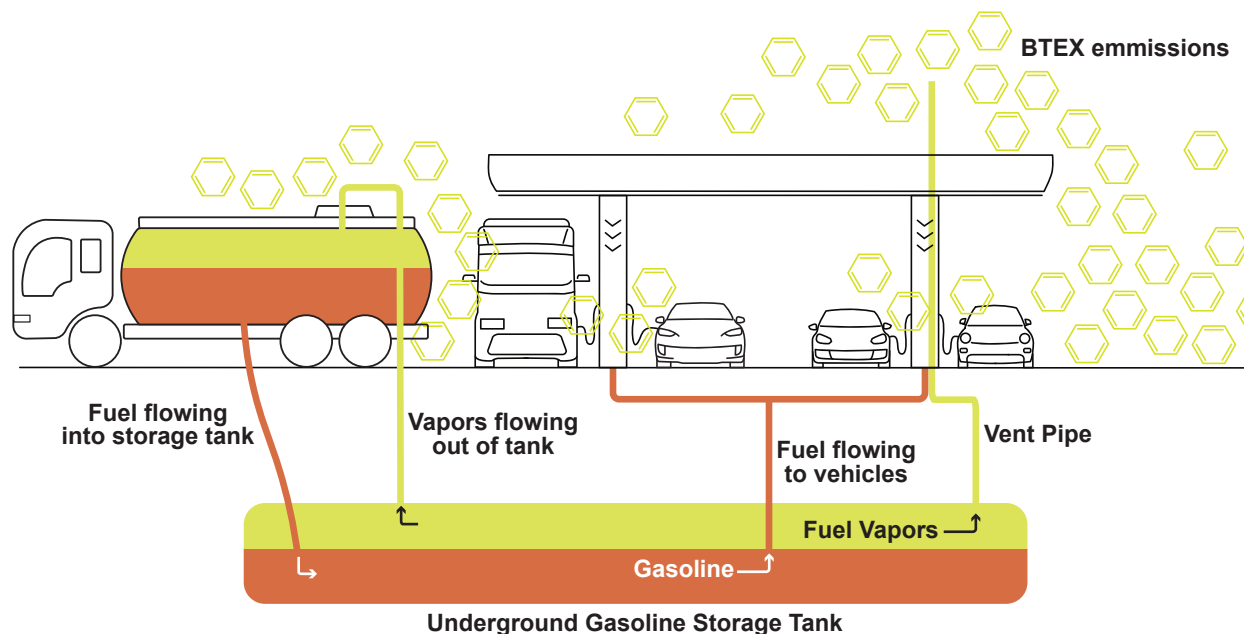


Figure 1. Benzene, toluene, ethylbenzene, and xylene (BTEX) are released into the air in fuel vapors from underground gasoline storage tanks, during vehicle fueling, and during fuel storage transfer, and any time there are spills or leaks of unburned fuel. The BTEX compounds, which evaporate very quickly and are heavier than air, are shown sinking to the ground and into low-lying areas where they can accumulate.

The Environmental Protection Agency recommends that large gas stations within 1,000 feet of schools be evaluated, citing risks of indoor and outdoor air pollution in addition to soil contamination, groundwater contamination, and traffic.³² It is important to note that while gas stations are some of the most dangerous in-vehicle sales and service venues, all in-vehicle sales and service venues carry heightened risk to humans and the environment due to the increase in airborne particulate matter.

Other toxic pollutants, beyond benzene, include toluene, xylene, and ethylbenzene. **Toluene** is increasingly replacing benzene as a solvent in fuel additives because it is considered less toxic, but the American Chemical Society (ACS) notes that its carcinogenicity is undetermined.³³

31 Hilpert, Markus, Ana Maria Rule, Bernat Adria-Mora, Tedmund Tiberi. "Vent pipe emissions from storage tanks at gas stations: Implications for setback distances." *Science of The Total Environment*, 650.2 2019: 2239-2250, ISSN 0048-9697, <https://doi.org/10.1016/j.scitotenv.2018.09.303>. View full study [here](#)

32 United States Environmental Protection Agency, *School Siting Guidelines*, 2011, p. 59. https://www.epa.gov/sites/default/files/2015-06/documents/school_siting_guidelines-2.pdf

33 American Chemical Society. *Toluene*. March 18, 2019.

Regardless of its carcinogenicity, it is documented to be a neurotoxin, “readily absorbed from the lungs,”³⁴ and known to cause neurodevelopmental disorders and cognitive impairment, particularly when inhaled during pregnancy. As one 2006 study notes, however, “The human brain continues to develop postnatally, and the period of heightened vulnerability therefore extends over many months, through infancy and into early childhood.”³⁵ A more recent study offers more specificity: “Toluene leads to apoptotic neurodegeneration in the cerebellum and hippocampus. Besides, it causes cerebellar and pyramidal dysfunctions, peripheral neuropathy, optic atrophy, neurologic hearing loss, and temporary and/or permanent damage including cognitive functions.” The study also associates toluene to atrophy and peripheral nerve damage, and notes the rapidity of its absorption: it takes only 10 seconds from inhalation for toluene to enter the arterial blood stream.³⁶ Like benzene, toluene is also highly flammable as a liquid and, in gaseous form, collects toward the ground as it is heavier than air.

Xylene—another flammable liquid and heavy vapor—is thought to be less dangerous than other toxic pollutants, but in the case of accidents can cause respiratory distress, impaired cognitive function, damage to major organs, and even death. It is also less studied, and most of the information about its effects on health deal with adult workers in industrial settings.³⁷ As the CDC points out, however, “Children exposed to the same levels of xylene vapor as adults may receive a larger dose because they have greater lung surface area:body weight ratios and increased minute volumes:weight ratios. In addition, they may be exposed to higher levels than adults in the same location because of their short stature and the higher levels of xylene vapor found nearer to the ground.”³⁸

Ethylbenzene, just like benzene, is a common toxic pollutant found in vehicle emissions. According to the CDC, ethylbenzene can irritate the eyes and throat at high levels of exposure and may be a carcinogen. The CDC also notes that even low levels of ethylbenzene are likely harmful: “Irreversible damage to the inner ear and hearing has been observed in animals exposed to relatively low concentrations of ethylbenzene for several days to weeks.” Inhaling low concentrations for slightly longer periods of time—several months to years—has caused kidney damage in animals.³⁹

Hazardous pollutants are emitted by vehicles while driving, idling, and of course during refueling. Fueling stations present the greatest risks, but all in-vehicle sales and service venues increase traffic and therefore increase the associated health risks. To protect its citizenry, the city of Stoughton should ensure a safe, scientifically informed distance between in-vehicle sales and service venues, including but not limited to fuel stations, and sites that are vulnerable in themselves or regularly host human populations, including schools, group day care centers, hospitals, residential areas, parks, playgrounds, playcourts, playfields, and natural or wildlife areas.

34 Agency for Toxic Substances and Disease Registry. 2014. Medical Management Guidelines for Toluene. <https://wwwn.cdc.gov/TSP/MMG/MMGDetails.aspx?mmgid=157&toxid=29>

35 Grandjean, P. and Landrigan, P.J. “Developmental neurotoxicity of industrial chemicals.” *The Lancet* 368 (9553, 16–22): 2167–78. doi: [10.1016/S0140-6736\(06\)69665-7](https://doi.org/10.1016/S0140-6736(06)69665-7).

36 Demir, Mehmet, Mustafa Cicek, Nadire Eser, Atila Yoldas, and Turgay Sisman. 2017. “Effects of Acute Toluene Toxicity on Different Regions of Rabbit Brain.” *Anal Cell Pathol (Amst)*. doi: [10.1155/2017/2805370](https://doi.org/10.1155/2017/2805370).

37 Agency for Toxic Substances and Disease Registry. “Toxicological Profile for Xylene.” <https://www.atsdr.cdc.gov/toxprofiles/tp71.pdf>

38 Agency for Toxic Substances and Disease Registry. “Medical Management Guidelines for Xylene.” <https://www.atsdr.cdc.gov/MHMI/mmg71.pdf>

39 Agency for Toxic Substance and Disease Registry. “ToxFAQs™ for Ethylbenzene.” Centers for Disease Control, 2015. <https://wwwn.cdc.gov/TSP/ToxFAQs/ToxFAQsDetails.aspx?faqid=382&toxid=66>

Inadequacy of vapor mitigation strategies

As mentioned, gas stations provoke especial risk, since their business purpose is refueling vehicles. Although state and federal regulations exist to reduce pollutant emissions with vapor recovery systems for vehicle refueling events as well as for underground storage tank loading equipment, a separate study found that even with these systems in place, gasoline vapors (BTEX) are emitted throughout the process of refueling.⁴⁰ Vapor recovery during refueling is dependent on the onboard refueling vapor recovery (ORVR) systems in vehicles because recovery at the gas pumps themselves, via Stage II vapor recovery systems, is not required in Wisconsin. ORVR technology is determined to be widespread among newer vehicles. However, the ages of vehicles fueling at the proposed gas station cannot be guaranteed, and we can assume many will be older vehicles without such systems. Moreover, while the study unsurprisingly found that older vehicles had “more evaporative emissions than newer ones,” even new vehicles posed a threat: “the majority of newer vehicles had substantial fuel vapor emissions, particularly at the end of refueling.” Any vapor recovery systems added to the pumps themselves will not address emissions emanating from the vehicles themselves.

No accidents, preventable or not, need occur to release toxic pollutants; as a study of health effects on gas station employees notes, “The volatile nature of petrol products makes them readily available in the atmosphere any time it is dispensed, especially at petrol filling stations and depots.” The study goes on to recommend that gas station employees wear PPE at work, obviously a nonviable solution for most people living or working near fuel stations.⁴¹ Spills and leaks obviously exacerbate the risk, yet even absent accidents, the chronic and cumulative release of unburned fuel from multiple sources, and the resulting accumulation of benzene in

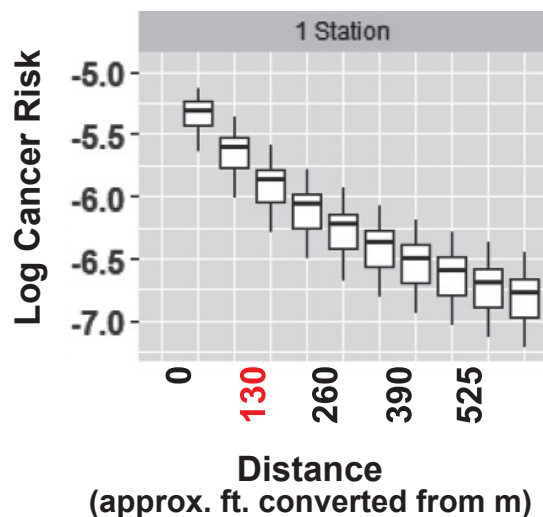


Figure 2. The chart shows lifetime cancer risk using box plots to indicate the variation of cancer risk as a function of distance from a single gas station.

the atmosphere, exacerbates the risk of negative health effects and endangers public safety.

Adverse impact increases with proximity

Proximity exacerbates the health risk. A recent analysis estimating the cancer risk of a single gas station as a function of sales volume determined that “benzene levels depend substantially on distance from [the] gas station” and “cancer risk due to toxic evaporative emissions from a gas station is a function of distance from the gas station” (see **Figure 2**, adapted from Hsieh et al. 2021).⁴² Montgomery county in Maryland, citing tanker trucks at large gas stations in particular as “a nuisance to nearby residents and an environmental threat,” stipulated in 2015 that any gas station dispensing 3.6 million gallons of gasoline per year or more be sited at least 500 feet “from the lot line

40 Shearston JA, Hilpert M. Gasoline Vapor Emissions During Vehicle Refueling Events in a Vehicle Fleet Saturated With Onboard Refueling Vapor Recovery Systems: Need for an Exposure Assessment. *Front Public Health*. 2020 Feb 7;8:18. doi: 10.3389/fpubh.2020.00018. PMID: 32117853; PMCID: PMC7020915; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7020915/>

41 Abou-EIWafa HS, Albady AA, El-Gilany AH, Bazeed FB. Some Biochemical and Hematological Parameters among Petrol Station Attendants: A Comparative Study. *Biomed Res Int*. 2015;2015:418724. doi: [10.1155/2015/418724](https://doi.org/10.1155/2015/418724). Epub 2015 Nov 8. PMID: 26634207; PMCID: PMC4655017.

42 Hsieh PY, Shearston JA, Hilpert M. Benzene emissions from gas station clusters: a new framework for estimating lifetime cancer risk. *J Environ Health Sci Eng*. 2021 Jan 7;19(1):273-283. doi: 10.1007/s40201-020-00601-w. PMID: 34150235; PMCID: PMC8172828. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8172828/>

of any land with a dwelling unit; public or private school; park; playground; day care center...; or any wetland, stream, river, flood plain, or environmentally sensitive area.”⁴³ Similar regulations are cropping up in other states, including Wisconsin’s neighbor Illinois. Stoughton’s adoption of the proposed ordinance amendment would be in line with the preponderance of evidence and this growing regulatory trend.

Traffic Operations and Pedestrian Safety Impacts

With new in-vehicle sales and service developments, an increase in traffic in the immediate area is almost guaranteed (and is in fact required for such developments to be successful). Besides the immediate health hazards provoked by increased traffic and associated pollutants, in-vehicle sales and service developments significantly increase the risk of vehicle-pedestrian conflict. Often referred to as traffic accidents, these dangerous interactions can lead to serious injury and death and are, in many cases, completely avoidable. Traffic calming measures should be considered in all project designs. However, there is no guarantee that every site can be designed to prevent increased impairments or conflict potential for pedestrians or vehicles. In instances where there is no feasible design to solve public safety issues created by high traffic land uses, ensuring distance between vehicles and pedestrians becomes the most viable option. It is important to recognize that as citizens and city representatives we can take action to mitigate the risk of pedestrian fatalities and injuries by ensuring a safe distance between pedestrians and vehicles, as the zoning amendment proposes to do.

Traffic increases generated by in-vehicle sales and services are a public safety concern near high-pedestrian use areas, especially those frequented by children—including schools, day care centers, residential neighborhoods, parks, playgrounds, and outdoor recreation fields, courts, etc. Young children are particularly vulnerable due to their lack of visibility and unpredictability. As a fact sheet prepared by Kids and Car Safety notes, young children are especially at risk in accidents involving slow-moving vehicles (in, for instance, drive-throughs, driveways, and parking lots) since children become independently mobile well before they can comprehend risks to personal safety or anticipate potential dangers. In 2020, over 600 children under the age of 9 were killed in traffic accidents according to the Fatality Analysis Reporting System and the Crash Report Sampling System. Of those children, nearly 20% were pedestrians. At least 60 children are hurt and two are killed every week in accidents involving slow-moving vehicles. In frontover accidents—slow-moving accidents in which a driver cannot see a person in front of them—over 90% of victims are under the age of 6. In 2020, 39% of children killed as pedestrians in traffic crashes were killed between 6:00am and 9:00am and 3:00pm and 6:00pm. These are the busiest drop-off and pick-up times at daycares and schools and coincide with the busiest estimated usage times at gas stations and other in-vehicle sales and service facilities.

It is important to remember that while passenger vehicles have become safer for the drivers and passengers, driving deaths and severe injuries are still a public health crisis and pedestrians are especially at risk. In fact, the National Safety Council (NSC)⁴⁴ released data in 2021 showing a 24% increase in roadway deaths in 2020, the “highest estimated year-over-year” increase in the rate of death since 1924. According to the NSC’s CEO Lorraine M. Martin, “These data expose our lack of an effective roadway safety culture.” The Governors Highway Safety Administration (GHSA) report on Pedestrian Traffic Fatalities by State offers the most recent assessment of pedestrian

43 Montgomery zoning text amendments: filling station - use standards ZTA-15-07. Montgomery County Council. 2015. Pg. 2; 4. https://www.montgomerycountymd.gov/COUNCIL/Resources/Files/zta/2015/20151201_18-07.pdf. Cited also in Hsieh et al. 2021.

44 National Safety Council. “Motor Vehicle Deaths in 2020 Estimated to be Highest in 13 Years, Despite Dramatic Drops in Miles Driven.” March 4, 2021. <https://www.nsc.org/newsroom/motor-vehicle-deaths-2020-estimated-to-be-highest>

safety, stating that “Both state and national data confirm that the pedestrian safety crisis on U.S. roads is worsening.” Wisconsin saw an increase of 50% in pedestrian fatalities between 2021 and 2022, the third highest increase in the nation. There are three main factors, according to the report, that have resulted in the increase in pedestrian deaths: dangerous driving, increased number of larger and heavier vehicles, and inadequate pedestrian-friendly infrastructure. Dangerous driving and excess speed is especially dangerous for older pedestrians. Deaths due to excess speed in

the 75+ age groups have increased every year for the last three years.

The report notes that “larger vehicles are inherently more dangerous to pedestrians” and that vehicles classified as light trucks make up nearly 80% of total light vehicle sales. In fact, “the number of deaths involving SUVs increased 120%, while deaths involving passenger cars grew 26%”.⁴⁵ The frontal blind zone (**Figure 3**) for a large car like a Cadillac Escalade can extend more than 10 feet and larger vehicles are deadlier than smaller: according to a 2022 article published in the Journal of Safety Research, children are 8 times as likely to die when struck by an SUV compared to a passenger car, and hospital charges are highest in pedestrian accidents involving pickup trucks.

Traffic-calming infrastructure such as narrower roadways, pedestrian islands, and sidewalks all play a role in reducing the risk of pedestrian deaths. However, ***the best way to ensure safer, healthier communities with fewer pedestrian deaths is to further reduce the opportunities for vehicle-pedestrian interaction.*** Local provisions are needed to bolster bicycle and pedestrian safety laws that proactively plan where and how close in-vehicle sales and service land uses can be situated in relation to heavily-used pedestrian areas. The proposed amendment does precisely that.

The combination of increasing pedestrian fatalities and the drastically increased traffic volumes of in-vehicle sales and service land uses adds magnitude to the potential traffic and pedestrian safety issues presented above. The GHSA report notes that, according to the National Roadway Safety Strategy (NRSS) adopted by the United States Department of Transportation in 2021, we all have a shared

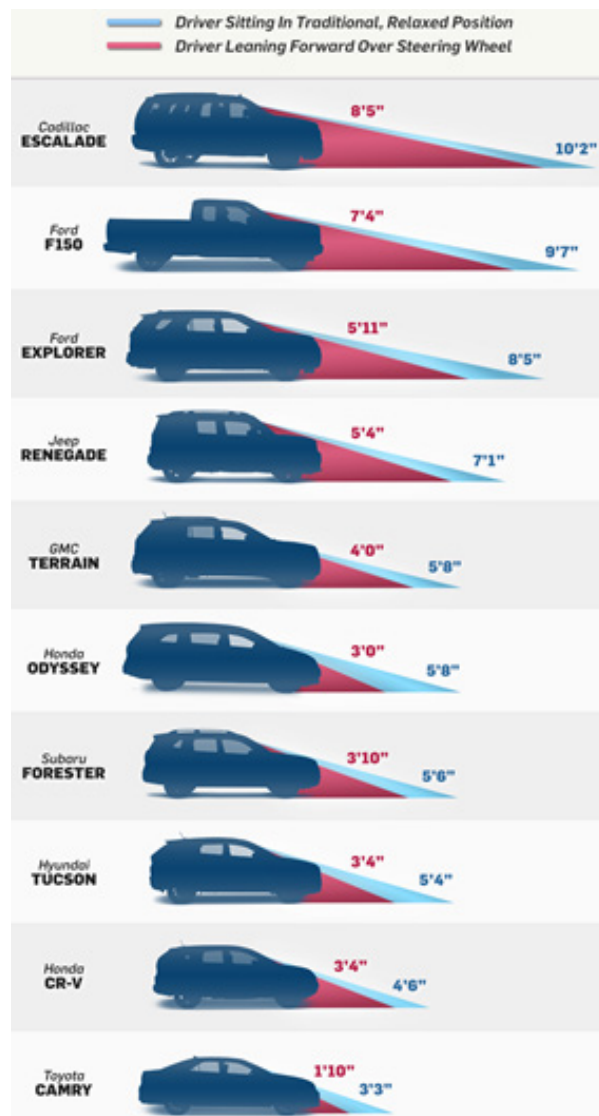


Figure 3. Blind zones vary depending on the car, driver’s height, seat position, and the size of the object in front of the car. These results use an average female driver (5’4”) and a 29” traffic cone, similar to the height of an average one-year-old child. The Ford F-150, one of the most common cars on the road, has a blind spot of nearly 10 feet for a driver sitting in a traditional position.

45 Governors Highway Safety Association. “Pedestrian Traffic Fatalities by State: January - December 2022 Preliminary Data. June 2023. <https://www.ghsa.org/sites/default/files/2023-06/GHSA%20-%20Pedestrian%20Traffic%20Fatalities%20by%20State%2C%202022%20Preliminary%20Data%20%28January-December%29.pdf>

responsibility to keep all road users safe: a key component of this is “to build an environment that **separates** people traveling at different speeds (i.e., vehicles and pedestrians) as much as possible, thus preventing the potential conflict that can lead to crashes.” A lack of clear guidelines in Stoughton’s zoning ordinance creates unnecessary risks and unnecessary environments that will encourage high volumes of vehicles near high-pedestrian areas, placing citizens, particularly children and the elderly, at needless risk.

Other Public Health, Environment, and Property Concerns

In addition to the above primary concerns about public health from air pollution directly caused by in-vehicle sales and service developments and the high traffic they generate, there is ample research demonstrating harmful effects on the environment, property value of homes near high traffic areas and gas stations particularly, increased risk of fires and explosions (again at gas stations particularly), and concerns over general quality of life for the community, making a change to the zoning ordinance necessary.

Environmental Risks to Groundwater, Surface Water, Wetlands, and Soils

Underground storage tanks (UST), like the ones in use at gas stations, pose a serious risk to public safety and the environment through what federal regulations refer to as a release. Releases include any sort of “spilling, leaking, emitting, discharging, escaping, leaching or disposing from an UST into groundwater, surface water or subsurface soils.”⁴⁶ UW-Extension reports that USTs can start leaking after only 12 years, putting aside accidental spills, and “present the greatest threat to health and the environment.” It goes on to note: “Unfortunately, it takes only a few quarts of gasoline to severely contaminate a family’s drinking water or a nearby stream or lake.”⁴⁷ With homes, schools, childcare facilities, hospitals, natural areas, vulnerable wetlands and other water resources, and other at-risk facilities or areas in the near vicinity, any UST release could be devastating to the people, the environment, and the city of Stoughton.

According to the EPA, as of September 2022, over half a million UST releases have been confirmed, with over 60,000 yet to be cleaned up. Cleaning up underground storage tank releases can, in some cases, take several years and cost millions of dollars,⁴⁸ a cost typically suffered by taxpayers. In fact, the EPA asserts that old and abandoned gas stations make up half of the country’s 450,000 brownfield sites. In their words, these petroleum brownfields “blight the surrounding neighborhoods and threaten human health and the environment.”⁴⁹ The EPA also states that “gasoline, leaking from service stations, is one of the most common sources of [groundwater] pollution” and, because groundwater is the source of drinking water for nearly half of the U.S. population, this “is a serious problem” that has resulted in many municipal and private wells being shut down.⁵⁰ This is not surprising considering that just ten gallons of gasoline can contaminate 12 million gallons of groundwater.⁵¹ In our city, Stoughton Utilities takes great care to ensure safe, clean, and reliable drinking water along its entire distribution system from the four sources of groundwater to the taps in our buildings. Each groundwater source has a designated

46 40 CFR Section 280.12: <https://www.ecfr.gov/current/title-40/chapter-I/subchapter-I/part-280/subpart-A/section-280.12>

47 Webendorfer, Bruce, Nancy Young, Tim Clay, and Sharon Schwab. 2000. “Farm and Residential Petroleum Storage Tanks.” UW Extension. <https://townofnekimi.com/wp-content/uploads/2017/03/storage.pdf>

48 Environmental Protection Agency. “Releases from Underground Storage Tanks.” [Link](#)

49 Environmental Protection Agency. “Petroleum Brownfields.” <https://www.epa.gov/ust/petroleum-brownfields>

50 Environmental Protection Agency. “Frequent Questions About Underground Storage Tanks.” <https://www.epa.gov/ust/frequent-questions-about-underground-storage-tanks>

51 Meegoda JN, Hu L. A review of centrifugal testing of gasoline contamination and remediation. Int J Environ Res Public Health. 2011 Aug;8(8):3496-513. doi: 10.3390/ijerph8083496. Epub 2011 Aug 24. PMID: 21909320; PMCID: PMC3166756. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3166756/>

groundwater protection area, as shown on the city's Overlay District Zoning Map.⁵² The City of Stoughton must share the responsibility with Stoughton Utilities in protecting this critical resource, and codify the need to establish sufficient distance between gas stations and groundwater protection areas.

Though new tank materials and coatings are available to help prevent UST and pipeline leaks caused by corrosion, and new technology helps prevent UST spills caused by overfilling as well as detect problems sooner, these merely mitigate cracks, leaks, spills, and other failures. They do not eliminate them completely. In fact, from March 31, 2022, to March 31, 2023, the cumulative number of confirmed UST releases in Wisconsin alone went from 19,911⁵³ to 20,002,⁵⁴ an increase of 91 EPA-confirmed releases in a 1-year period.

It is important to note that even spills or leaks from gasoline stations that do not occur in the USTs are harmful to public health and the environment. Research has shown that the leaks at gas stations are cumulative and, even if they occur on paved areas, can reach the ground. Larger leaks and even droplets of gasoline seep through concrete, a porous material, and can eventually reach the groundwater.⁵⁵ The gasoline can then *move horizontally* and contaminate lakes, streams, and other bodies of water.⁵⁶

The EPA explains that the hazardous and toxic chemicals contained in gasoline “threaten human safety and health as well as the environment” because the “fumes and vapors can travel beneath the ground and collect in areas such as basements, utility vaults, and parking garages where they can pose a serious threat of explosion, fire, and asphyxiation or other adverse health effects.”⁵⁷ The U.S. Department of Health and Human Services also asserts that the exposure pathways extend beyond soil, groundwater, and surface water, stating that “contamination of groundwater can result in volatilization into indoor air when the groundwater is used as household water” and “contamination of subsurface soil can result in migration of [the hazardous BTEX] chemicals into basements as soil gas.”⁵⁸ One study notes that long-term exposures to drinking water contaminated with these chemicals above their EPA Maximum Contaminant Levels are hazardous. Similar to their effects when inhaled, imbibed benzene increases the risk of cancer; toluene and ethylbenzene damage the liver, kidneys, and central nervous system; and xylene affects the liver, kidneys, and nervous system, though not as severely.⁵⁹

On April 6, 2022, in Lily Lake, IL, 8,000 gallons of gasoline were released, contaminating nearby soil, surface water, groundwater, and wetlands. As noted in an April 2022 lawsuit filed by the Illinois Attorney General against the gas station, “[gasoline] spilled, leaked, or discharged onto or into the ground” can “migrate on the surface or subsurface toward waterways, wetlands, buildings, businesses, and residences.” In this case, high volumes of gasoline mixed with rainwater ran

52 The City of Stoughton Overlay Districts Zoning Map. https://www.stoughtonplanning.com/s/Overlay_Zoning_Map.PDF

53 Environmental Protection Agency. Semiannual Report of UST Performance Measures Mid Fiscal Year 2022 (October 1, 2021 - March 31, 2022). <https://www.epa.gov/system/files/documents/2022-05/ca-28-12.pdf>

54 Environmental Protection Agency. Semiannual Report of UST Performance Measures Mid Fiscal Year 2023 (October 1, 2022 - March 31, 2023). <https://www.epa.gov/system/files/documents/2023-05/FY%202023%20MY%20Report%20-%20mb.pdf>

55 Hilpert, Markus and Patrick N. Breyse. “Infiltration and evaporation of small hydrocarbon spills at gas stations.” *Journal of Contaminant Hydrology* 170, 2014: 39–52.: <https://doi.org/10.1016/j.jconhyd.2014.08.004>

56 Webendorfer, Bruce, Nancy Young, Tim Clay, and Sharon Schwab. 2000. “Farm and Residential Petroleum Storage Tanks.” UW Extension. <https://townofnekimi.com/wp-content/uploads/2017/03/storage.pdf>

57 Environmental Protection Agency. “Frequent Questions About Underground Storage Tanks.” <https://www.epa.gov/ust/frequent-questions-about-underground-storage-tanks>

58 Agency for Toxic Substances and Disease Registry (ATSDR). 2004. Interaction profile for benzene, toluene, ethylbenzene, and xylenes (BTEX). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. <https://atsdr.cdc.gov/interactionprofiles/ip-btex/ip05.pdf>

59 Meegoda JN, Hu L. A review of centrifugal testing of gasoline contamination and remediation. *Int J Environ Res Public Health*. 2011 Aug;8(8):3496-513. doi: 10.3390/ijerph8083496. Epub 2011 Aug 24. PMID: 21909320; PMCID: PMC3166756. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3166756/>

into the drainage ditch and nearby wetlands where it continued to spread. The suit aims to recover emergency response, containment, clean-up, and other costs.⁶⁰ It is important to note that conventional wetland clean-up approaches, such as excavation, trenching, and burning, are considered “aggressive and expensive, and may harm the wetland ecosystem.”⁶¹

While wetlands can be harmed directly by gasoline contamination, the greatest risk to public and environmental health and safety is in a wetland area’s ability to allow the gasoline to migrate. Wetlands tend to act as a border between dryer land and free-flowing water. Within the City of Stoughton’s municipal boundary, many wetlands act as a buffer to the free-flowing water of the Yahara River. A gasoline leak or spill contaminating our wetlands could easily turn into a costly river cleanup project, as well. Similarly, a leak or spill into the river could just as easily lead to wetland contamination. And, as noted in the lawsuit cited above, wetland contamination could also spread to nearby buildings, businesses, and residences.

Gas stations can, as evidenced, create circumstances of substantial danger to the environment as well as public health, safety, and welfare. This is especially concerning for high-volume gas stations, which can store more than 60,000 gallons in underground storage tanks and, as noted earlier, it only takes ten gallons of gasoline (.0167% of 60,000 stored gallons) to contaminate 12 million gallons of water. The need for the proposed amendment to help ensure adequate distance between gas stations and wetlands, surface water, and groundwater protection areas is well justified. In fact, because Stoughton is situated on the Yahara River and the risk to groundwater, surface water, and wetlands is so great, the amendment recommends 500 feet from the boundary of any wetland, the ordinary high water mark of any surface water, or the perimeter of any groundwater protection area.

Human Health and Environmental Risks Due to Noise Pollution

Of course, it is not just UST releases and other leaks that pose a risk to the environment when it comes to in-vehicle sales and service developments. The loud noise produced by increased traffic, cars starting, and especially combination trucks during normal operation is another significant health concern, especially for children: “Newborns exposed to sound above 45 decibels may experience increase in blood pressure, heart rate, respiratory rate; decreased oxygen saturation; and increased caloric consumption. Noise exposure in older children may result in learning disabilities, attention difficulties, insulin resistance, hypertension, stress ulcers and cardiovascular diseases.”⁶² Combination trucks—the kind that refuel gas station storage tanks and deliver food and other materials—produce in the neighborhood of 100 decibels. Not only do loud noises disrupt sleep—crucial for healthy development—but loud noise can also increase the risk of ischemic heart disease, hearing loss, and cognitive impairment. Infants, of course, have the most sensitive and easily damaged auditory systems, but all young children could be adversely affected, especially during outdoor play. The elderly and even adults are also at risk. The WHO documents “increasing evidence for other health impacts such as adverse birth outcomes and mental health problems” and points to traffic noise in particular as a common culprit, estimating “one million healthy life years were lost from traffic-related noise” in Western Europe alone in

60 State Energy & Environmental Impact Center, NYU School of Law. Illinois AG Filed Suit against Gas Station after Gas Spill Contaminated Wetland. April 27, 2022.

<https://stateimpactcenter.org/ag-work/ag-actions/illinois-ag-files-suit-against-gas-station-after-gas-spill-contaminated-wetland>

61 Moore, B.J., Hardisty, P.E., Thompson, R.G., and B. Esselinckx. “Fate of Hydrocarbon Contaminants In Natural Wetlands.” J Can Pet Technol 38 (1999): No Pagination Specified. [Link](#)

62 Thakur, Neha, Prerna Batra, and Piyush Gupta, 2016. “Noise as a Health Hazard for Children: Time to Make a Noise about It.” Indian Pediatrics 53: 111–114. [Link](#)

2011.⁶³ Among other suggestions, the World Health Organization recommends reducing traffic flow, restricting truck traffic, and creating additional green space to mitigate the harmful effects of noise pollution. An amendment to the zoning ordinance would help accomplish this, making Stoughton a healthier and more welcoming place.

Research has shown that noise pollution also causes undesirable impacts on the environment, exacerbating “the problems posed by habitat fragmentation and wildlife responses to human presence”⁶⁴ and playing a role in declining bird populations throughout the country.⁶⁵ The CDC notes that traffic noise measured from inside a car can reach 85 decibels.⁶⁶ For birds, hypertension, hearing loss, and other undesirable impacts, including effects on their reproduction, can begin as low as 20 decibels, clearly putting them at risk.⁶⁷

Risk to Property Values

One study on residential property values shows that “housing prices increase significantly with every additional kilometer from the nearest gasoline station, and the closer to the gasoline station that the house is, the more negative the impact on the housing price. The closest 100-meter band showed almost a 16% reduction in housing price, and the furthest affected band (301–600 meters) was down by almost 9%.”⁶⁸ Several studies have shown that property values decrease in environments with decibel levels over a range of 60–85 decibels.^{69,70,71} Other studies show that increases in traffic reduce property values.⁷² In fact, mitigation of traffic noise can raise property prices by 10–12%.⁷³ Just as with traffic-related pedestrian deaths, the best way to avoid depressed property values and the potential costs of noise pollution mitigation is to limit the amount of traffic and other noise-pollution creating developments near residential areas. The proposed amendment would help protect the most undesirable impacts of traffic-generating in-vehicle sales and service uses on nearby properties.

Health and Property Risks Due to Fire and Explosion Hazards

Fueling stations again pose a particular risk, not just in terms of harmful pollutants released by vehicles refueling and storage tanks, but also in terms of fire and explosions. The National Fire Protection Association (NFPA) reported in 2020 that during a five-year period from 2014 through

63 Environmental noise. In: Compendium of WHO and other UN guidance on health and environment, 2022 update. Geneva: World Health Organization, 2022 (WHO/HEP/ECH/EHD/22.01). License: CC BY-NC-SA 3.0 IGO. [Link](#)

64 Barber, Jesse R et al. “The costs of chronic noise exposure for terrestrial organisms.” *Trends in ecology & evolution* vol. 25,3 (2010): 180-9. doi:[10.1016/j.tree.2009.08.002](https://doi.org/10.1016/j.tree.2009.08.002)

65 Senzaki, M., Barber, J.R., Phillips, J.N. et al. “Sensory pollutants alter bird phenology and fitness across a continent.” *Nature* 587: 605–609 (2020). <https://doi.org/10.1038/s41586-020-2903-7>

66 Centers for Disease Control and Prevention. “What Noises Cause Hearing Loss?” https://www.cdc.gov/nceh/hearing_loss/what_noises_cause_hearing_loss.html

67 Barber, Jesse R et al. “The costs of chronic noise exposure for terrestrial organisms.” *Trends in ecology & evolution* vol. 25,3 (2010): 180-9. doi:[10.1016/j.tree.2009.08.002](https://doi.org/10.1016/j.tree.2009.08.002)

68 Zhao, Qinna, Mengling Liu, and Qi Chen. 2017. “The Impacts of Gasoline Stations on Residential Property Values: A Case Study in Xuancheng, China.” *Journal of Sustainable Real Estate* 9.1: 66–85. <https://doi.org/10.1080/10835547.2017.12091901>

69 Kaufman, Hilary F. et al. 1998. “No Plane, Big Gain? Airport Noise and Residential Property Values in the Reno-Sparks Area.” *Choices: The Magazine of Food, Farm, and Resource Issues*, 13, issue 3, number 132086. <https://ageconsearch.umn.edu/record/132086>

70 Walker, Jay K. 2016. “Silence Is Golden: Railroad Noise Pollution and Property Values.” *Review of Regional Studies* 46 (1): 75–89. <https://doi.org/10.52324/001c.8044>.

71 Bell, Randall. 2001. “[The impact of Airport Noise on Residential Real Estate](#),” *The Appraisal Journal*, 69(3), 312-321.

72 Guijarro, Francisco. “Assessing the Impact of Road Traffic Externalities on Residential Price Values: A Case Study in Madrid, Spain.” *International journal of environmental research and public health* vol. 16,24 5149. 17 Dec. 2019, doi: [10.3390/ijerph16245149](https://doi.org/10.3390/ijerph16245149)

73 Lindgren, Samuel. “A sound investment? Traffic noise mitigation and property values,” *Journal of Environmental Economics and Policy*, 10:4, 428-445, DOI: [10.1080/21606544.2021.1911861](https://doi.org/10.1080/21606544.2021.1911861)

2018, local fire departments responded to an estimated 20,750 fires in or on service or gas station properties, for an average of 4,150 fires per year. Annually, “these fires caused an average of three civilian deaths, 43 civilian fire injuries, and \$30.0 million in direct property damage.”⁷⁴ While up to 19% of the fires may have involved fuel dispensing pumps, a whopping 56% were vehicle fires, including fires started by unclassified static discharge, at the fuel tank or fuel line, on the exterior surface of the vehicle, or with the ignition of flammable or combustible liquids, gasses, piping, or filters. These types of incidents also run the risk of exposing any populations nearby to massive amounts of benzene and other toxic pollutants.⁷⁵

Conclusions

In-vehicle sales and service land uses increase traffic, which has direct impacts on the air quality, liveability, and safety of the immediate environs. Toxic airborne pollutants produced by vehicular traffic are a known threat to human health, particularly of vulnerable populations like children and the elderly, and recent studies suggest brakes and tires are unregulated but significant sources of additional harmful pollutants. Fatalities and injuries involving vehicular-pedestrian conflict are increasing throughout the country, including in the state of Wisconsin, thanks largely to the increasing size of vehicles. The environmental impacts of increased traffic are similarly well known. Gas stations are the most hazardous of in-vehicle sales and service uses, but all such venues increase traffic by design, and thus all deserve careful attention, foresight, and regulation.

Increasing the required distance between in-vehicle sales and service land uses and other land uses will greatly mitigate the risks and ill-effects caused by increased traffic. As Stoughton grows, it is incumbent upon city leaders to look to the future and develop the city in a sustainable, attractive, and safe manner. Adopting the proposed additions to Article II, Section 78-206 (4) (g)(1) of Stoughton’s zoning ordinance will ensure the continued thoughtful and supportable development of the city.

74 Ahrens, Marty. Service or Gas Station Fires. National Fire Protection Association. December 2020. <https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Building-and-life-safety/osservicestations.pdf>

75 D’Andrea, Mark A. and G. Kesava Reddy. “Adverse Health Effects of Benzene Exposure Among Children Following a Flaring Incident at the British Petroleum Refinery in Texas City.” *Clinical pediatrics* vol. 55,3 (2016): 219-27. doi:[10.1177/0009922815594358](https://doi.org/10.1177/0009922815594358)