EXHIBIT G

Dane
18 Edgewood

Submitted to South Windsor Planning and Zoning Public Hearing on 10/26/2021

Questions / Comments towards Traffic Impact Study (October 2021 version) and other matters for Proposed Warehouse Development

25 Talbot Lane South Windsor, Connecticut

Dane Mattran, Edgewood Drive Resident

1. The Traffic Impact Study failed to address impact of non- tractor trailer vehicles turning right to exit the site going East onto Governor's Highway, towards Ellington Road and Beldon Road. At the end of Talbot Lane, there is a sign that says tractor trailers must turn left, but it makes no mention of the cars, vans or straight trucks abiding by this ordinance. The applicant has proposed 333 parking spaces on the site, which will generate considerable non-tractor trailer vehicle traffic.

   Straight trucks consist of a body and cab that are one unit. A straight truck can be up to 26 feet in length and weigh 32,000 to 36,000 lbs.

   It is reasonable to state that delivery non-tractor trailer delivery vehicles, straight trucks and employee vehicles from the site will reach the intersection of Ellington Road and Beldon Road. Previously, it has been noted that this intersection is poorly designed. I personally witnessed car accident this past summer of 2021 in which a white Tesla was t-boned trying to enter Ellington Road from this intersection, directly in front of the Mill on the River restaurant.

2. Section 5.5 of the applicant's Traffic Impact Study provides and overview of the Intersection Sight Distance. The report alleges that there will be no impact to safety for vehicles entering and exiting the driveway on Governor's Highway. However, referencing previous Planning and Zoning Special Meeting Minutes on August 28, 2018 regarding a proposal to operate a daycare at the Temple Beth Hillel facility on Baker Lane, Sgt. Duschene from Police Services indicated the site line at Baker Line and Governor's Highway was inadequate. The intersection of Baker Lane and Governor's highway is immediately East of the proposed warehouse driveway. The statement made by Police Services is a contradiction to the applicant's line of site findings in section 5.5 Traffic Impact Study, with regards to westbound traffic on Governor's Highway.

3. I personally viewed traffic light timing at the intersection of John Fitch Boulevard and Governor's Highway. For traffic entering John Fitch Boulevard from Governor's Highway, the total traffic light time is 18 seconds. 2 to 3 consecutive tractor trailer trucks can complete the turn onto John Fitch Boulevard, without any additional cars. This does not take into consideration the delay due to westbound traffic on Governor's Highway crossing John Fitch Boulevard. Any trucks turning left would be delayed until the vehicles finished crossing John Fitch Boulevard. The light at this intersection will be completely overwhelmed, especially during peak traffic hours. The applicant proposed adjusting the timing of the traffic lights if necessary. Has any impact study been performed to evaluate the impact to traffic on John Fitch Boulevard if the light timing were changed? It is not acceptable to propose changing the timing of the lights without additional evaluation.

TOWN OF SOUTH WINDSOR

PLANNING & ZONING COMMISSION

MEMBERS PRESENT: Bart Pacekonis, Kevin Foley, Stephanie Dexter, Kevin Greer, Bill Flagg, Steve Wagner

ALTERNATES PRESENT: Mike LeBlanc

STAFF PRESENT: Michele Lipe, Director of Planning; Lauren Zarambo, Recording Secretary

PUBLIC HEARING / COUNCIL CHAMBERS

CALL TO ORDER: Chairman Pacekonis called the Public Hearing to order at 7:30 p.m.

Acting Secretary Commissioner Dexter read the legal notice into the record as it was published in the Journal Inquirer on August 16, 2018 and August 23, 2018.

Chairman Pacekonis appointed Alternate Commissioner LeBlanc to be seated for Commissioner Bonzani.

1. **Appl. 18-43P, Indian Valley Family YMCA, Ellington CT** – request for a Special Exception to Article 3.1.A to operate a before and after school program for a maximum of 120 children at the Temple Beth Hillel facility, on property located at 20 Baker Lane, A -20 zone

Ms. Tina Gladden, regional child care director for the Indian Valley Family YMCA, presented the request stating they were contacted to help out the community because of the long wait list for the 4th R program by Temple Beth Hillel which already has great classroom facilities in place. The wait list of 120 children can be accommodated but their program will be limited to a total of 50 children with the morning enrollment capped at 20 children.

Hours for a.m. care will be 7:00 - 8:30 a.m. and then be reopened for after school care at 3:30 – 6:00 p.m. When there is no school the 'vacation club days' will run unless the temple is not available because of holidays at which time care will be provided at their Vernon facility. Two buses are anticipated. Locations of the bus stops are still to be determined by the bus company. Outdoor play areas will be in the back on grass and blacktop that will be coned off and limited to 40 children at a time but may be as low as 20 children. Drop-off of children in the morning is between 7:00 – 8:00 a.m. and the afternoon program closes at 6 p.m. with parents arriving from 3:30 – 6 p.m. to pick up children so traffic will not be all at once.

Director of Planning Michele Lipe gave staff comments:

1. Request for request for a Special Exception to Article 3.1.A to operate a before and after school program for a maximum of 120 children at the Temple Beth Hillel facility, on property located at 20 Baker Lane, A-20 zone. After speaking with the applicant about the proposed number of students requested without a traffic study completed, she agree to scale the request back to a maximum of 50 students.
2. There are no exterior site improvements proposed with this application other than the requirement for a sidewalk to be added from the exit door to the parking lot.
3. This use, is permitted by special exception. Special exception review criteria for this use include:
   - The proposal is consistent with the goals and objectives of the Plan of Conservation and Development.
   - The application has met the requirements of the zoning regulations.
   - The land is physically suited to the proposed use.
   - Minimal, if any, adverse environmental impacts are created.
   - No traffic or other hazards will be created.

- The impacts on the capacity of the present and proposed utilities, street, drainage systems, sidewalks, and other elements of the infrastructure will be minimal.
- There will be minimal or no adverse effects on existing uses in the area.
- Surrounding property values will be conserved.
- The character of the neighborhood will be maintained or minimally disrupted.
- The general welfare of the community will be served.
- There is a balance between neighborhood acceptance and community needs.
- Historic factors are adequately protected; or due consideration to preservation of historic factors has been demonstrated.
- The overall physical appearance of the proposed development is compatible with surrounding development and the Commission's goals for the neighborhood/corridor.
- The architectural design is aesthetically pleasing and blends well into the surrounding area.

The Commission may impose additional conditions in accordance with these regulations in order to ensure that all applicable criteria enumerated above and/or within a particular use category are satisfied.

4. The program will open at 7:00 a.m. and close at approximately 8:30 a.m. An estimate of 20 children would be accommodated in the morning, and traffic is anticipated to take place over the hour and half, and not all at once. The program will re-open at approximately 3:30 p.m. on Monday, Tuesday, Thursday and Friday and at 1:30 p.m. on half-day Wednesdays. Families are expected to arrive for pick up between 4:30-6:00 p.m. When there is no school during the school year (other than major holidays and major Jewish holidays), the YMCA will provide care from 7 a.m.- 6 p.m. There will be no bus activity on these days, only parent drop off and pick up.
5. Students would be dropped off in the morning by parents and one bus would bring them to the school. Students would be brought to the center in the afternoon by one or two buses and be dropped off curb side and walked into the building.
6. Where will the children be discharged from the buses that come to the site?
7. The site currently has 83 parking spaces currently on site. Fifty-four (54) spaces would be available at any given time as 29 spaces in a portion of the southern parking area are shown to be designated for outside play. Can the applicant explain how many students would be outside at any given time and what activities are likely to occur? Would the parking be cordoned off by a barrier? I would note (as evidenced by the aerial in front of you) that area is screened by a landscaped buffer as well as existing wooded area on the abutting property.
8. Sgt. Chris Duschene from Police Services has indicated that the site line at Baker Lane and Governor Highway need to be improved. He also stated if the proposal is for more than 50 children, a traffic study would be necessary to evaluate any impacts.
9. The applicant has had discussions with both the Fire Marshal and Building Official regarding the proposed changes to the facility and permits will be taken out as necessary. The Fire Marshal has inspected the site and is requiring an additional walkway from the building to the parking area.
10. The site is served by public water and public sewers.
11. Any new signage would require a sign permit.

If this application is approved, the Planning Department has no additional modifications to request.

Chairman Pacekonis asked for public comment in favor of the application.

Mr. Tim Wentzell of 630 Governors Highway spoke in a favor of the application as a reasonable use and requested a crosswalk and signage as an approval condition where there are sidewalks on both sides of Baker Lane.

Ms. Karen Lydecker of 107 Lefoll Boulevard spoke in favor of the Y using the facilities at Temple Beth Hillel and reviewed 9 of 14 special exception criteria which are met by the application: 3) Land is suited to the use since the building is already there with existing classrooms vetted for the use. 4) No environmental impacts since nothing has been changed. 5) No additional traffic or hazards since enrollment is capped at 50 with staggered drop-offs and pick-ups. 6) Impact on utilities will be minimal. 7) Minimal to no adverse effects on neighborhood since the building is there already. 8) Surrounding property values will be conserved since property values are high and nothing is being changed with approximately 35 children enrolled which is significantly less than when the temple is used. 9) Character of the neighborhood will not change since there is a public facility already there for use. 10) General welfare of the community will be served addressing the wait list for the before and after care program. 11) Balance between community acceptance and need is served helping fill the need for before and after school care to support young families to live and grow in South Windsor.

Mayor Saud Anwar of 93 Rockledge Drive spoke in support of the application thanking the commission and stating South Windsor is experiencing growth with young families arriving where both parents work and need before and after school care.

Town Councilor Jan Synder of 191 Bourbon Street thanked and congratulated all involved and stated there has been great effort to increase the 4th R program to meet the before and after school care needs of residents. This partnership between the Y and temple will be beneficial for both groups and the town.

Deputy Mayor Andrew Paterna of 301 Strawberry Lane stated South Windsor is one of the few Connecticut towns with an increase in school age population and as a member of the Town committee created by the Mayor to look into solutions for day care need he supports the application as a reasonable solution applauding the temple for stepping forward and thanking the Y in partnering with the project.

Mr. Dan Edwards of 131 Hilton Drive spoke in favor of the application as a reasonable and great use of the space stating the more children that are in the neighborhood making it a more vibrant community the better and will promote driving slower through the neighborhood.

Ms. Divya Subramanian of 86 Swan Nest (Lakewood) spoke in favor of the application as someone in need of after school care and that the location of the program being close to the school it will serve makes it an ideal solution.

Mr. Brian Powers of 164 Carriage Drive as a father of 3 spoke in favor stated daycare options are very limited and his 1st grader has been on the wait list for a 2nd year. He stated this is a great example of the Town Council and community coming together to create a solution.

Mr. Anthony Leone of 57 Beelzebub Road stated he serves on the committee from Town Council to find a solution to the problem which he knows firsthand having stood in line at 4 a.m. to register for the program. The committee has explored many solutions and the Town has come together to find a long term solution. The facility is existing and the Y's program is established. There may be a little added traffic but otherwise is a good solution for the community.

Mr. John Holowczak of 39 Cody Circle spoke in favor of a modest use of the facility for 50 children but 120 is too many. He voiced concern that original occupancy calculations were based upon the number of seats in

the synagogue and now this request will move the use from a house of worship to a mixed use. He asked for a condition of approval that an independent firm create a true occupancy number for the safety of children involved.

Mr. Jeff Bemis, a direct abutter at 126 Cody Circle, stated the application will change the character of the neighborhood and is opposed to it but is in favor of a smaller version that could be approved temporarily while Pleasant Valley gets built or other daycares are created. Indian Valley YMCA is big business and the application indicates 9 classrooms with 2 assembly areas compared to the 4th R at Pleasant Valley which uses the cafeteria. The Y will be filling the space and the number of students will be increased over time. Mr. Bemis asked for the Town to find a location properly zoned for the use. Existing traffic conditions were described as issues already and businesses growing in the area will be effecting traffic.

Mr. Kumar Ellappan of 3 St Marc Circle #L spoke in favor of the application as a parent who stood in line at 4 a.m. and did not get on the list and asked the commission to approve the application.

The Chairman asked for public comment with concerns or against the application.

Ms. Doreen Blondin of 7 Cody Circle stated she and other neighbors were unaware of the plans being presented and that Rabbi Glickman met with the Town, YMCA and his congregation about the program but there was no neighborhood outreach. The 4th R program is an important program to address parent's needs but does not belong in the residential neighborhood. There are 86 parking spaces with 30 to be taken away for play and parking is now problem on holidays. Ms. Blondin recalled a stipulation that there would not be a daycare or school at the temple and asked if the record could be researched.

Mr. Peter Andrews of 80 Cody Circle stated he waited 2 years to get into the 4th R program which he supports but not in his neighborhood. He spoke in opposition not knowing where this application will lead for their neighborhood. One criteria for a special exception approval is a balance of neighborhood acceptance which is not being met. The neighborhood is not in acceptance.

Mr. Nise Kuriakose of 7 Baker Lane across from the temple spoke in opposition stating the application will change the neighborhood. Baker Lane is very narrow and will not accommodate 2 buses at the same time. Emergency vehicles will be challenged and it will be risky for neighborhood kids who are used to using both the sidewalk and the street. The number of cars for 120 students will be huge. The speed limit is 25 but cars now go 35 to 40 mph plus and this will increase the risks. He requested to either increase the size of the road or look for alternate locations.

Mr. Rich Delhaie of 95 Cody Circle asked his neighbors opposing the application to stand and stated they are not asking for a special exception to the rules but to uphold the regulations for the residential zone and submitted his daughter's certificate of legal blindness and picture of a Blind Child Area sign located on the applicant's property to the commission (Exhibit A). He compared the amount of traffic that will be generated in their neighborhood during rush hour to that of a McDonald's drive-in which will be 40' from their home and will cause issues for his disabled and blind daughter who is enrolled in South Windsor medically fragile school program where teachers come to their home and her world is their neighborhood. Mr. Delhaie cited special criteria not met and stated 50 children enrolled are too much and will change the character of the neighborhood.

Mr. Jim Clyburn of 35 Cody Circle, spoke in opposition to the application stating parents are responsible for finding care for their children and should not expect the Town be responsible for their lives. There are plenty of other commercial facilities that could house the program. Safety and traffic on Governors Highway create too much of a hazard now and has an affect property values. He encouraged leaders to plan better not hold their neighborhood responsible for the program.

Mr. Wei Zhang of 125 Cody Circle, showed his house on an aerial map very close to the Temple and stated the traffic, pollution and noise on Baker Lane will be impacting their yard. He is respectful of the 4th R program but is in opposition to the location where their cul de sac will be used to turn around putting neighborhood children playing at risk.

Mr. Gerald Jeyaraj of 105 Cody Circle spoke in opposition stating the parking lot is in his back yard and since moving to the neighborhood the cul de sac and temple have always been quiet but with this program going on every day it will affect the character of their neighborhood and what goes on in his backyard literally.

Ms. Mary Hockenberry of 16 Foxglove Lane asked if the road width is already regulated for buses, what precautions will be taken for the blind child, whether a stop sign or other signage can be added to slow traffic and if a police officer will be available during drop-offs.

Ms. Susan Ruchin of 75 Risley Road in Vernon spoke with concerns as a member of the temple about the traffic pattern and what it will do to the neighborhood.

Acting Secretary Commissioner Dexter read a letter into the record written with concern and in opposition from Mr. Andrew Viola of 21 Baker Lane (Exhibit B).

Rabbi Jeff Glickman of 114 Cody Circle stated a well-advertised after school care forum to which everyone was invited was held to discuss options and only one family expressing concern showed up for the event. The Rabbi stated it is a fine proposal and recommended its adoption.

Past president of Temple Beth Hillel Gary Ruchin of Vernon stated he was present for the original approval for the building which was built on a smaller footprint than was originally proposed. The number of parking spaces were determined by the Town and there has always been school with classrooms in the building. The Fire Marshal has control over capacity. He stated he has questions for the Y about some of the details but clarified there are ways to egress in an emergency from Cody Circle which is not a cul de sac.

A concerned neighbor stated the school in the temple is a Hebrew school and not a public day care program. The neighborhood has concerns this will expand into something much bigger once approved. If there are cars parked on both sides of the street on Baker Lane and Cody Circle a fire truck cannot get through.

Board of Education Chairman Craig Zimmerman stated he is part of the subcommittee which came up with the proposal as one of the solutions for the 4th R and voiced concern the neighbors had not heard about the proposal with all the press in the papers, Town Council and the public meeting held by Rabbi Glickman. School starts tomorrow and families are looking for the program to go through. There will not be 50 cars coming at the same time morning or evening and if the program grew beyond the cap of 50 it will have to come back to the commission for approval. He voiced concern for the blind child asked for protections to be put in place.

Town Councilor Matt Reilly of 12 Heatherwood Drive voiced support for the project stating the Y in combination with the temple is a private sector solution which can help meet the need for day care. The concern for traffic and that the program could expand is legitimate but by limiting the number to 50 children the program is reasonable to proceed

Mr. Dan Edwards of 131 Hilton Drive with 2 children in the program voiced support for the program with a cap of 50 and noted exiting onto Cody Circle from the temple should be limited.

Mr. Jeff Bemis noted the sign limiting traffic onto Cody Circle has been respected by the temple and the balance between neighborhood acceptance and community versus political needs were noted.

Mr. Rich Delhaie of 95 Cody Circle commented the number of children playing outside at a time daily should also be limited in tandem with number of children in the program and asked where the demand for afterschool care is coming from since there are 4 different schools. He noted emergency vehicles have come to their house 15 times over the past years so their concern for access is real.

Ms. Karen Lydecker of 107 Lefoll Boulevard stated she is on the committee for before and after care and as of July the wait list at Eli Terry was 2 and is now zero, 41 children are on the wait list at Orchard Hill, 18 at Philip R Smith and 46 at Pleasant Valley school. She noted wait lists for local private daycare facilities and the severe lack of options for parents. The bi partisan committee has been working extremely hard to help residents since April and noted the balance of neighborhood acceptance and community need is not represented clearly by those who are here to speak.

Mr. Bob Dickinson, 19 Birch Road, asked if the approval could be granted for a two-year period rather than by special exception in order to work out the concerns being brought forward.

Mr. Grum Ngatu of 236 Kent Lane spoke in support of the application as good for the Town and families.

Mr. John Blondin of 7 Cody Circle asked if any other religious facilities were asked to use their property.

Mr. Anthony Leone of 57 Beelzebub Road speaking in support and as part of the committee stated Avery Street Church is also being explored for the program but are not able to be up and running right now. With school starting tomorrow the temple is the best solution for now. Wait list numbers are part of the committee minutes and are online and have been reported by Town Council. He sympathized with the neighbors but with the building with classrooms at the temple already in place it is the best solution at this time and encouraged the commission to approve the application.

Ms. Selam Haile of 236 Kent Lane voiced a need for the program and also sympathized with the neighbor's concerns.

A concerned gentleman stated the duration of the time taken for this decision is not enough to consider the neighborhood's concerns.

Ms. Lauren Powers of 164 Carriage Drive spoke in support of the application as a mother of 3 using Kindercare and a nanny but in need of a better solution and stated parents will be the most cautious drivers when picking up children in the neighborhood.

A gentleman from St. Marks Circle spoke in favor of the application stating traffic will increase only slightly because parents will not be picking up the children at the same time. Planning has taken place over 4 months and there has been open forums and no opposition was given. There will only be one or two additional buses.

The Chairman asked for comments from commissioners.

Commissioner Greer asked if buses will exit through Cody Circle. Ms. Gladdens stated they have not yet heard from the bus company about their route and described existing stops the bus will most likely make. The commissioner stated he would not be in favor of having a police presence during drop offs as the Town would incur the cost and asked if there will be any cost to the Town to run the program. Ms. Gladdens stated she did not think there would be and discussed enrollment numbers.

Vice Chairman Foley asked Mr. Zimmerman about other options for solutions for the program. Mr. Zimmerman stated a comparable solution will be run with the Y at Avery Street Church which still needs to get approvals. The Vice Chair asked if there was any direct outreach to the neighbors. Rabbi Glickman stated he did not have contact with all neighbors but did have contact with some and there was more publicity about the information meeting than anything else that has taken place in his 24 years with the synagogue. The Vice

Chair asked if daycare use is approved for the synagogue. Director Lipe stated it is not but when the synagogue was first approved in 1999 nighttime use of classrooms was approved and in 2010 approval was granted for about 35 children for daycare but never the facility was never started up. Ms. Gladdens described their goal to have care set up at Temple Beth Hillel and once licensing is in place open the Avery Street Church program.

Commissioner Dexter asked when they will open and would they be willing to limit the amount of children playing outside at one time. Ms. Gladdens stated their plan is to open October 1 and are willing to limit the number of kids playing out of doors based on their 1 to 10 ratio and are agreeable to the limit as an approval condition.

Commissioner Wagner asked about the requested use in Table 3.1.1A which Director Lipe stated is a non-profit educational use. He also asked if a crosswalk can be created across Baker Lane, and the 'No Right Turn' sign moved off private property and onto the Town right of way so it can be enforced, and to install a 4-way stop at Baker Lane and Governors Highway. The Director recommended getting police input before any approval conditions are put in place regarding on street road signage as the Traffic Authority has jurisdiction of over road signage. A two year temporary and conditional permit was discussed but not recommended since it was proposed as a permanent solution.

Commissioner Wagner asked whether Wapping School could be used. Mr. Zimmerman explained it will not since it is being used by the Parks and Recreation Department and is not in district with Pleasant Valley School. Mr. Tim Wentzell of 630 Governors Highway recalled a stop sign which was later removed and suggested a painted crosswalk to help with traffic calming on Governors Highway.

Commissioner Flagg discussed the program run by the Y with Ms. Gladdens and suggested a traffic study be done and agreed with having the right hand turn sign on Town property.

Commissioner LeBlanc shared concerns about traffic and spoke highly about the 4th R program which his children went through remembering the time it took to pick them up from the program which did have an impact on traffic. The original number of 120 will be too many but voiced agreement with a limited number and approval conditions in place.

The Chairman thanked the public for speaking and asked if Baker Lane is sized for buses. Director Lipe stated Baker Lane and Cody Circle are standard Town subdivision roads at 26' wide and the width of the temple's entrance driveway is 24' flaring out at the road. The Chairman stated he would be more comfortable with an approval if their driveway could safely accommodate buses and the number of students was limited to up to 50.

The Chairman asked for the original approval conditions from 1999 and suggested parking be reviewed by the traffic commission for what will be allowed on Baker Lane. The Chairman suggested traffic calming measures on Governors Highway be proposed as part of the special exception and a limit of 30 children outside at a time for play. Painted walkways for handicap accessibility were requested. Parking requirements were explained and discussed.

Mr. Ruchin commented though the Y is seeking approval the synagogue membership of Beth Hillel still needs to vote on this and approve the use for the temple.

Commissioner Greer asked if school vacation days would result in full day care. Ms. Gladdens replied it would be full days 7:00 a.m. to 6:00 p.m. and described their process and decision to limit enrollment to 50. Commissioner Greer stated it will be difficult to make a decision without information on how buses will drop off and pick up students.

Vice Chairman Foley asked about snow conditions and location of the playground area. Ms. Gladdens noted snow removal on Baker Lane will be the responsibility of the synagogue and any change in the location of the playground area would have to be discussed with them.

Discussion ensued about the one or two buses that will be used to bring children from other school districts.

Mr. Peter Andrews of 80 Cody Circle asked why the Commission would not wait on voting until concerns and questions are answered. The Chairman stated if commissioners have adequate information the public hearing can be closed and will be able to move forward.

Commissioner LeBlanc voiced concern about how the traffic generated will flow from Baker Lane onto Governors Highway and if there is an existing traffic study. Director Lipe stated the traffic study goes back to the original application. Sgt. Duschene from Police Services requested a traffic analysis for 120 children but with the number reduced to 50 he was comfortable without one unless the number is increased.

Commissioner Wagner noted the regular bus stop for children from Pleasant Valley school is not at the synagogue and asked that the BOE work with the bus company so that there is a stop at the temple and not on Governors Highway.

Commissioner Wagner made a motion to close the public hearing at 10:30 p.m.
Commissioner LeBlanc seconded the motion.
The motion carried and the vote was unanimous.

SPECIAL MEETING / COUNCIL CHAMBERS

CALL TO ORDER:

PUBLIC PARTICIPATION:

NEW BUSINESS: Discussion/Decision/Action regarding the following:

Commissioner Greer made a motion to extend the meeting past 10:00 p.m.
Commissioner Wagner seconded the motion.
The motion carried and the vote was unanimous.

1. **Appl. 18-43P, Indian Valley Family YMCA, Ellington CT** – request for a Special Exception to Article 3.1.A to operate a before and after school program for a maximum of 120 children at the Temple Beth Hillel facility, on property located at 20 Baker Lane, A -20 zone

Commissioner Dexter made a motion to approve with the following conditions:

1. The program will have a maximum of 20 children for the morning and maximum of 50 children in the afternoon. In the event the applicant would like to increase the number of attendees, a traffic study will be required at the time of the application.

2. The program will open at 7:00 a.m. and close at approximately 8:30 a.m. The program will re-open at approximately 3:30 p.m. on Monday, Tuesday, Thursday and Friday and at 1:30 p.m. on half-day Wednesdays. Pickups will occur between 4:30 p.m. - 6:00 p.m. When there is no school during the school year (other than major holidays and major Jewish holidays), the YMCA will provide care from 7 a.m. - 6 p.m. There will be no bus activity on these days, only parent drop off and pick up.
3. The sight line at the intersection of Governor's Highway and Baker Lane must be improved to be compliant with sight distance based on the speed of traffic.
4. The Building Official must be contacted to determine what building permits may be required for this use.
5. The Fire Marshal's comments about additional walkways to the parking areas from exit doors must be incorporated into the final plans.
6. The parking lot that will be utilized for outside play should be blocked off with cones, or some other barrier, during its use.
7. All free standing signs and/or building signs require the issuance of a sign permit before they are erected.
8. No more than thirty (30) children are permitted outside at one time.
9. Crosswalks are to be added to the intersection of Baker Lane and Governor's Highway and Baker Lane and Cody Circle.

Commissioner Wagner seconded the motion and added conditions that an agreement with parents participating in the program require entry and exit from Governor's Highway and not via Cody Circle and that the right turn only sign is moved onto Town property so that it can be enforced by the Police.

Commissioner Dexter accepted the two conditions as a friendly amendment.

Vice Chairman Foley added a condition that if the use does not receive approval by the membership of Temple Beth Hillel that any further use of the property will return back to the Commission for approval.

Commissioner Dexter accepted the condition as a friendly amendment and Director Lipe read the added conditions:

10. An agreement with parents participating in the program will be made to enter and exit the property only from Governor's Highway.
11. The right turn sign is to be moved onto Town property so that Police can enforce it.
12. If the membership of Temple Beth Hillel does not approve the use any other use on the property will require additional approval from the Planning & Zoning Commission.

Motion passed 6 in favor and 1 against. Commissioners LeBlanc, Flagg, Wagner, Dexter, Foley and Pacekonis voting for and Commissioner Greer voting against.

ADJOURNMENT:

The Special Meeting adjourned at 10:44 p.m.

Respectfully Submitted,
Lauren L. Zarambo
Recording Secretary

Submitted to South Windsor Planning and Zoning Public Hearing on 10/26/2021

Questions / Comments towards Traffic Impact Study (October 2021 version) and other matters

for

Proposed Warehouse Development

25 Talbot Lane

South Windsor, Connecticut

Wei Zhang, a 500 Feet Abutter

1. The Traffic Impact Study failed to address impact from **school bus traffic during school days.**

It says "Video turning-movement and vehicle-classification were conducted in June 2021 at three intersections and used as a basis for this evaluation." However, it does not explain on which day (or days) this study was conducted. So, it is unclear this was done during school days or the summer break.

As residents living in Town, we all know being school day or non-school day makes a big difference on local traffic, especially during peak hours.

2. School bus traffic on the intersection of Governor's Highway and John Fitch Boulevard (Route 5) is even slower because of the existence of **a rail track on Governor's Highway.** The Traffic Impact Study does not address this unique traffic pattern in this area. It does not mention that rail track at all, which has become busier than before because of the recent operation for the Home Depot warehouse on Ellington Rd.

Connecticut Department of Motor Vehicles Regulation "Minimum Requirements for Inspection, Maintenance and Repair of School Buses and Student Transportation Vehicles"

"Sec. 14-275c-7. Crossing railway tracks Before crossing any railway tracks at grade, the driver of every school bus shall stop the bus, open the door, look and listen, close the door; and when safe to do so, may then proceed with caution across the tracks. Gears shall not be shifted while passing over any such crossing."

3. The area near the proposed development has the heaviest school bus traffic in town due the proximity to two large **Dattco School Bus yards** on Nutmeg Rd North, and Ident Rd. These two school bus yards serve not only South Windsor but also other school districts. Thus, the buses can go many different directions on Route 5 and Governor's Highway. This Traffic Impact Study does not mention any interaction between the proposed warehouse traffic and the school bus volume generated by these two school bus yards

4. If there is any chance that school bus traffic is mentioned in the next version of Traffic Impact Study, please note less than normal school bus traffic due to the **hybrid learning** at South Windsor Public Schools due to COVID in the 2020-2021 school year. Even now, the school bus traffic is less than what it should be due to **a state-wide shortage of bus drivers**. All these should be factored in the Traffic Impact Study to correct into a post-COVID normal school bus traffic volume.

5. **A new daycare center (Precisely Pandas)** has been approved by Planning and Zoning Commission (Application: 21-17P) to operate on property located at 1033 John Fitch Boulevard (the former Bank of America branch, next to the intersection of John Fitch Boulevard & Governor's Highway). Traffic and safety impacts generated by the proposed warehouse project to the new daycare center need to be analyzed. However, under section 5.2 on page 5, this Traffic Impact Study says "We contacted the Town of South Windsor Planning Department and confirmed that there are no planned or approved developments in our study area."

6. On page 5 of the Traffic Impact Study, below section 5.2, it says "A review of the ConnDOT data indicates that traffic volumes in **Windsor** have fluctuated over the last several years, with a growth of 0.46%." Why does traffic in South Windsor have anything to do with Windsor?

7. **Seasonal high truck traffic volume due to holidays was not mentioned**. This study projects "The anticipated number of peak-hour trips generated by the proposed facility is based on rates established in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition. Land Use Code 156: High-Cube Parcel Hub Warehouse was selected based on a conservative trip generation estimate and the intended building use." However, without knowing the intended real tenant of this warehouse, whether the truck traffic volume has a seasonal pattern is unknown. If the developer does not offer any details of the intended tenant, then a more conservative approach should be used to consider the high holiday traffic flow pattern from facilities like an Amazon distribution center. A facility like that may even hire more people during holiday seasons.

8. The latest version of the Traffic Impact Study adjusted the traffic volumes to pre-COVID conditions as requested by the Office of the State Traffic Administration (OSTA). However, when comparing its Table 2 (CAPACITY ANALYSIS SUMMARY – WEEKDAY A.M. PEAK-HOUR) and Table 3 (CAPACITY ANALYSIS SUMMARY – WEEKDAY P.M. PEAK-HOUR) with the same tables from the earlier version (July 2021) of Traffic Impact Study without pre-COVID adjustment, **some values of delay in seconds decreased after COVID adjustment** (for example, John Fitch Blvd./ Us-5 & Governor's Hwy, EB-LTR). This is not intuitive as pre-COVID adjustment should make the delays longer than COVID time.

9. **The accident count within the area roadway network is completely wrong** in this Traffic Impact Study. On page 11, Table 5, ACCIDENT DATA SUMMARY (2018 - 2020), it only listed 1 accident on John Fitch Boulevard & Governor's Highway, and 0 for the other two intersections. Anyone living in this area would know this is totally impossible. In fact, the online UConn Crash Data Repository shows there were 9 crashes at this intersection between 2018 and 2020. And there were many others on Governor's Highway and other intersections. This Traffic Impact Study cannot even get this simple fact right after 4 revisions.

UConn Crash Data Repository can be accessed here to validate the accuracy of this Traffic Impact Study

https://www.ctcrash.uconn.edu/dashboards/dashboard.html

The Existing Air Pollution Issue from Diesel Engines in This Area

10. Last, possible additional air pollution generated by the trucks serving this warehouse will add to the existing emissions from other large vehicles operating in this area and the air pollution even worse. One example is the **Dattco School Bus Company, which was sued** by Conservation Law Foundation, Inc., for violated the Clean Air Act in Connecticut. The bus company was accused of spreading "toxic exhaust into areas near homes, schools, churches, and parks." This lawsuit includes the Nutmeg Road School Bus Yard in South Windsor, which is only a few thousand feet away from this warehouse project. Excessive idling was observed at Nutmeg Road School Bus Yard according to the plaintiff's data.

On October 14, 2021, just less than two weeks ago, Dattco reached a settlement with the plaintiff. The settlement requires DATTCO to commit $1.8 million to the transition to a zero-emissions fleet, including purchasing vehicles, charging stations, and other infrastructure upgrades. The company must also install automatic engine shut-off technology on its entire coach fleet and on all its large diesel school buses. Finally, DATTCO must increase its monitoring of vehicle idling and make that data available in semi-annual reports.

We do not need to bring in more truck emissions from the proposed project in this small area or otherwise they have to make similar commitments as those from Dattco.

https://www.clf.org/newsroom/clf-settles-clean-air-act-lawsuit-for-almost-2-million/

https://www.fox61.com/article/news/local/connecticut-school-bus-company-sued-for-allegedly-violating-clean-air-act/520-a4bcdf79-b741-42bb-b214-f3661207a522


EXHIBIT G
Old Dominion Freight Line
KF Plant
New England Silica
Elite Tire
Forest Village Open Space
Precision Motor Coach
Guy's Electric Services
Total Induction Tuning Solutions
Patco
Patco Bus Yard
ECS Performance
MB Tractor
Stoughton Brook
East Windsor Welding & Fab
Now Furnishings
HPC Foodservice
Glasco Heating & Air Conditioning
Steeltech Building Products
Distinctive Tree Care
Mike and Tony Auto Sales
Camp Bow Wow
Omni Mechanical Services
Keystone Paper & Box Company
All American Waste
Max Finkelstein
Nightmare Acres
Empower Adventure Park at Nomads
DayCare
Electron Technologies Corporation
Electro-Methods, Inc
G & S Scrap Metal
Revolutions Bowling and Lounge
Commercial Tire & Recapping
M & G Corporation
Able
Windsor Winair Co
Macy's
American Metallizing & Machine, Inc
Nomads Adventure Quest
O&W Heat Treat
Applied Industrial Technologies
Commercial Storefront Services Inc
Barker Steel
Kukin Auto sound
Carla's Pasta
Maine Oxy
Aa Industries
Gina's Total Fitness
Temple Beth Hillel
South Windsor Pizza & Restaurant
NAPA Auto Parts - Genuine Parts Company
Frito-Lay
JFB Auto Repair & Tire
Pleasant Valley Estates Open Space
Powerscreen New England
K & W Custom Auto
Cametoid Technologies
R D Weis & Co
Capture 3D, Inc
Mobil
McDonald's
Capewell Aerial Systems
Royalhouse Chapel International Victory
John Fitch Blvd
Strong Rd
Governors Hwy
Nutmeg Rd N
Nutmeg Rd S
Colony Rd
S Satellite Rd
Edgewood Dr
Elizabeth St
Stoughtons Brook

EXHIBIT G

TABLE 2
CAPACITY ANALYSIS SUMMARY – WEEKDAY A.M. PEAK-HOUR

INTERSECTION	CONTROL TYPE	LANE USE	STORAGE LENGTH (ft)	EXISTING CONDITIONS					BACKGROUND CONDITIONS					BUILD CONDITIONS					SIGNAL TIMING OPTIMIZATION CONDITIONS				
				LOS	DELAY (sec)	V/C RATIO	QUEUES (ft) 50th%	QUEUES (ft) 95th%	LOS	DELAY (sec)	V/C RATIO	QUEUES (ft) 50th%	QUEUES (ft) 95th%	LOS	DELAY (sec)	V/C RATIO	QUEUES (ft) 50th%	QUEUES (ft) 95th%	LOS	DELAY (sec)	V/C RATIO	QUEUES (ft) 50th%	QUEUES (ft) 95th%
John Fitch Blvd./ Us-5 & Governor's Hwy.	ACTUATED-COORDINATED	**Overall**		**C**	**33.3**	**0.92**			**C**	**34**	**0.93**			**D**	**37.7**	**0.99**			**C**	**33.2**	**0.91**		
		EB-LTR	>1000'	B	18.4	0.1	10'	33'	B	18.1	0.1	10'	33'	B	17.7	0.08	10'	33'	B	15.6	0.08	9'	31'
		WB-LTR	>1000'	D	49.4	0.82	149'	#236'	D	49.6	0.82	150'	#242'	E	74.3	0.99	225'	#418'	D	54.7	0.91	209'	#377'
		NB-L	260'	A	7.7	0.1	8'	21'	A	7.8	0.1	8'	21'	A	8.4	0.12	9'	21'	B	10.5	0.14	10'	24'
		NB-TT	>1000'	C	22.7	0.52	161'	214'	C	22.8	0.53	163'	217'	C	22.8	0.53	163'	217'	C	22	0.51	159'	213'
		NB-R	280'	A	4.5	0.14	0'	30'	A	4.6	0.14	0'	30'	A	3.9	0.24	0'	38'	A	3.8	0.23	0'	38'
		SB-L	260'	D	35	0.2	32'	72'	D	35.1	0.2	33'	73'	D	40.9	0.43	57'	109'	D	52.5	0.56	61'	#140'
		SB-TTR	>1000'	D	38.9	0.92	352'	#495'	D	40.2	0.93	357'	#503'	D	40.2	0.93	357'	#503'	D	36.2	0.91	350'	#490'
Pocunk Cir. / Governors Hwy. & Ellington Road	ACTUATED-UNCOORDINATED	**Overall**		**A**	**8.9**	**0.48**			**A**	**9**	**0.48**			**A**	**9.8**	**0.5**							
		EB-LTR	>1000'	A	7.2	0.25	40'	112'	A	7.2	0.25	41'	113'	A	7.9	0.29	45'	124'					
		WB-LT	>1000'	A	9.4	0.48	95'	250'	A	9.4	0.48	96'	254'	A	10	0.5	100'	254'					
		WB-R	240'	A	1.8	0.21	0'	28'	A	1.8	0.21	0'	29'	A	1.8	0.23	0'	29'					
		SEB-LTR	>1000'	C	28.4	0.4	29'	84'	C	28.6	0.4	30'	85'	C	28.1	0.49	33'	#113'					
		NWB-LTR	>1000'	C	26.5	0.01	1'	7'	C	26.5	0.01	1'	7'	C	26	0.01	1'	7'					
Talbot Ln. & Governor's Hwy.	UNSIGNALIZED	EB	-	A	0	0		0'	A	0	0		0'	A	0	0		0'					
		WB	-	A	7.6	0.038		3'	A	7.6	0.038		3'	A	7.9	0.043		3'					
		NB	-	B	11.4	0.088		8'	B	11.5	0.089		8'	B	14.6	0.161		15'					
Site Driveway & Governor's Hwy.	UNSIGNALIZED	EB	-											A	0	0		0'					
		WB	-											A	7.7	0.024		3'					
		NB	-											B	12.6	0.218		20'					

TABLE 3
CAPACITY ANALYSIS SUMMARY – WEEKDAY P.M. PEAK-HOUR

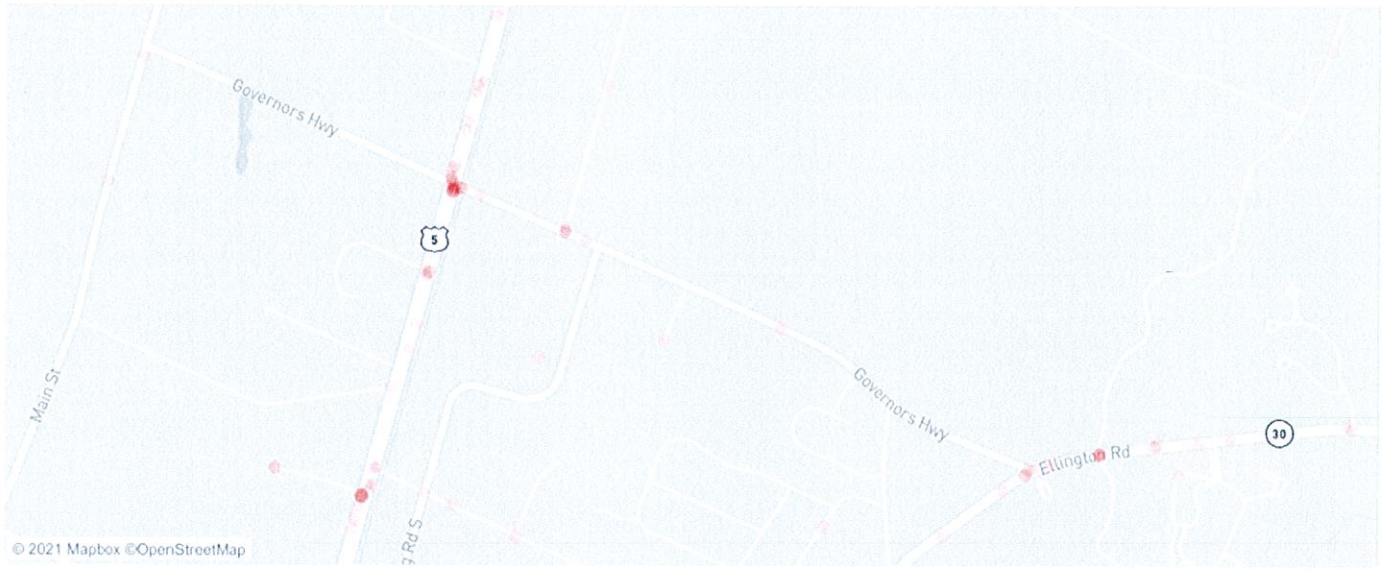
INTERSECTION	CONTROL TYPE	LANE USE	STORAGE LENGTH (ft)	EXISTING CONDITIONS					BACKGROUND CONDITIONS					BUILD CONDITIONS					SIGNAL TIMING OPTIMIZATION CONDITIONS				
				LOS	DELAY (sec)	V/C RATIO	QUEUES (ft) 50th%	QUEUES (ft) 95th%	LOS	DELAY (sec)	V/C RATIO	QUEUES (ft) 50th%	QUEUES (ft) 95th%	LOS	DELAY (sec)	V/C RATIO	QUEUES (ft) 50th%	QUEUES (ft) 95th%	LOS	DELAY (sec)	V/C RATIO	QUEUES (ft) 50th%	QUEUES (ft) 95th%
John Fitch Blvd./ Us-5 & Governor's Hwy.	ACTUATED-COORDINATED	**Overall**		**C**	**29.7**	**0.86**			**C**	**30**	**0.86**			**C**	**31.3**	**0.95**			**C**	**28.8**	**0.89**		
		EB-LTR	>1000'	C	30.9	0.52	81'	143'	C	31	0.53	83'	146'	C	28.4	0.47	81'	146'	C	25.6	0.45	76'	135'
		WB-LTR	>1000'	E	57.4	0.86	121'	#231'	E	58.6	0.86	122'	#235'	E	70.5	0.95	164'	#327'	E	56.9	0.89	154'	#293'
		NB-L	260'	A	7.4	0.03	2'	9'	A	7.5	0.03	2'	9'	A	7.6	0.03	2'	9'	A	9.7	0.04	3'	10'
		NB-TT	>1000'	C	26.5	0.7	238'	310'	C	26.7	0.71	242'	314'	C	26.7	0.71	242'	314'	C	28.0	0.73	246'	321'
		NB-R	280'	A	4.5	0.14	0'	30'	A	4.5	0.14	0'	30'	A	3.8	0.26	0'	40'	A	4.0	0.26	0'	41'
		SB-L	260'	D	35.5	0.22	37'	79'	D	35.7	0.23	38'	81'	D	41.7	0.47	67'	123'	D	44.4	0.48	69'	#144'
		SB-TTR	>1000'	C	28.1	0.76	262'	340'	C	28.4	0.77	266'	346'	C	28.4	0.77	266'	346'	C	24.4	0.71	250'	324'
Pocunk Cir. / Governors Hwy. & Elington Road	ACTUATED-UNCOORDINATED	**Overall**		**B**	**19.5**	**0.86**			**B**	**19.8**	**0.87**			**B**	**14.8**	**0.76**							
		EB-LTR	>1000'	B	15.7	0.74	139'	339'	B	15.9	0.75	141'	344'	B	16.5	0.76	152'	376'					
		WB-LT	>1000'	A	8.9	0.36	52'	131'	A	8.9	0.37	53'	132'	A	8.5	0.35	53'	132'					
		WB-R	240'	A	2.1	0.18	0'	23'	A	2	0.18	0'	24'	A	2	0.19	0'	25'					
		SEB-LTR	>1000'	D	54.3	0.86	74'	#271'	E	55.9	0.87	75'	#275'	C	26.2	0.73	40'	#183'					
		NWB-LTR	>1000'	A	0	0.01	0'	0'	A	0	0.01	0'	0'	A	0	0.01	0'	0'					
Talbot Ln. & Governor's Hwy.	UNSIGNALIZED	EB	-	A	0	0		0'	A	0	0		0'	A	0	0		0'					
		WB	-	A	7.8	0.008		0'	A	7.8	0.008		0'	A	8.2	0.009		0'					
		NB	-	B	11.7	0.208		20'	B	11.8	0.213		20'	C	14.4	0.284		30'					
Site Driveway & Governor's Hwy.	UNSIGNALIZED	EB	-											A	0	0		0'					
		WB	-											A	8.4	0.039		3'					
		NB	-											B	14.4	0.173		15'					

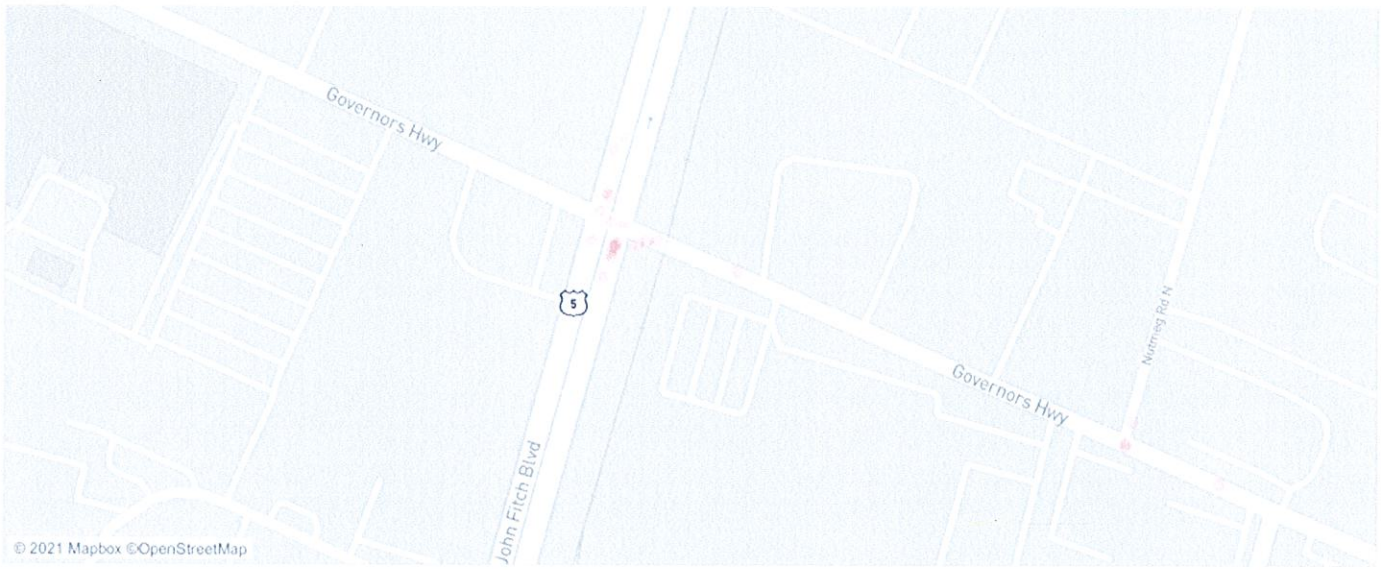
Crash Accidents in Nearby Roads (2018-2020)

EXHIBIT G

Data Source: online UConn Crash Data Repository

https://www.ctcrash.uconn.edu/dashboards/dashboard.html





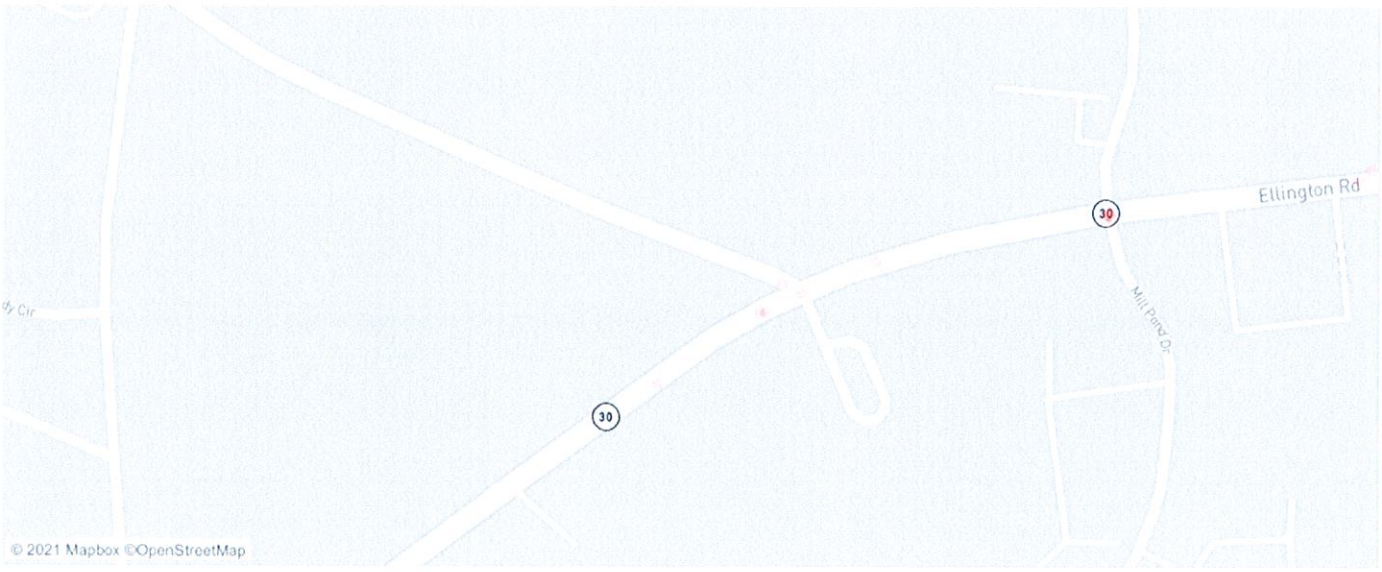


EXHIBIT G

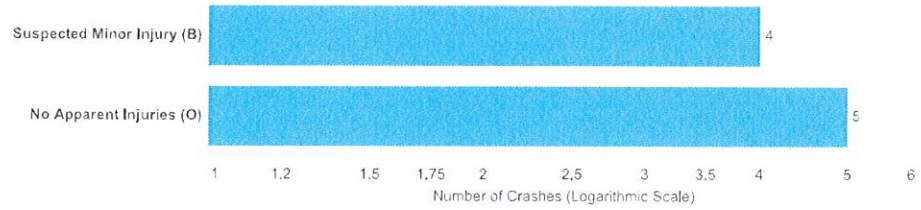
Collision Analysis Safety Tables

Crash Severity | Top 10 Routes | Time and Date of Crashes | Crash Conditions | Roadway Features 1 | Roadway Features 2 | Contributing Factors

Queries Selected: Town: *South Windsor*, Date (Year:*2018, 2019, 2020* or *1/1/2018* to *12/31/2020*), Severity: *All*, Route Class: *All*, Road Number: 5, Local Road Name: GOVERNOR'S HWY & Governors Hwy, Mile Markers: *-1* to *117.36*

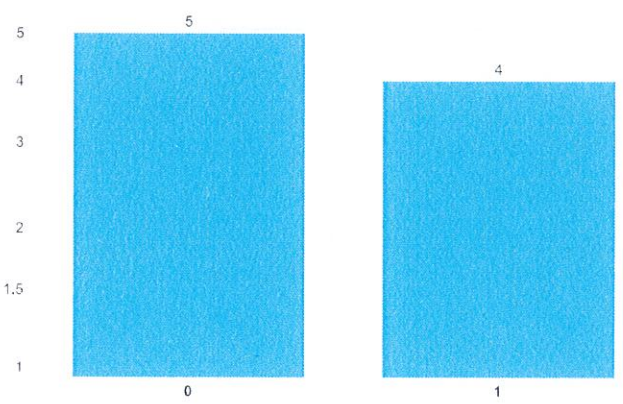
These figures display **crash-level data only** and provide the totals for crashes involving an injury of that type.

Injury Status of Crashes



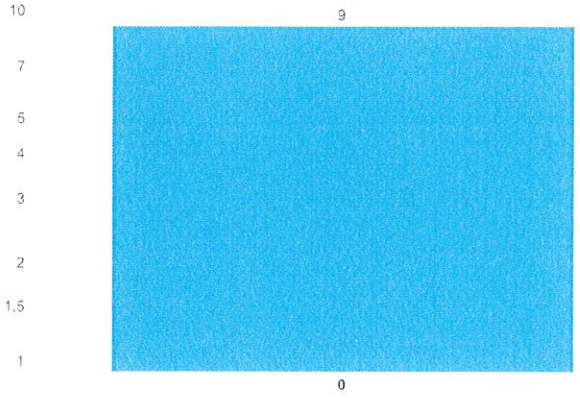
Crash Severity	Crashes	% of All Crashes
Suspected Minor Injury (B)	4.000	44.44%
No Apparent Injuries (O)	5.000	55.56%
Grand Total	9.000	100.00%

Injuries per Crash



Injuries per Crash	Crashes	% of All Crashes
0	5.000	55.56%
1	4.000	44.44%
Grand Total	9.000	100.00%

Fatalities per Crash



Fatalities per Crash	Crashes	% of All Crashes
0	9.000	100.00%
Grand Total	9.000	100.00%

EXHIBIT G

Collision Analysis Safety Tables

Crash Severity | **Top 10 Routes** | Time and Date of Crashes | Crash Conditions | Roadway Features 1 | Roadway Features 2 | Contributing Facto...

Queries Selected: Town: *South Windsor*, Date (Year:*2018, 2019, 2020* or *1/1/2018* to *12/31/2020*), Severity: *All*, Route Class: *All*, Road Number: 5, Local Road Name: GOVERNOR'S HWY & Governors Hwy, Mile Markers: *-1* to *117.36*

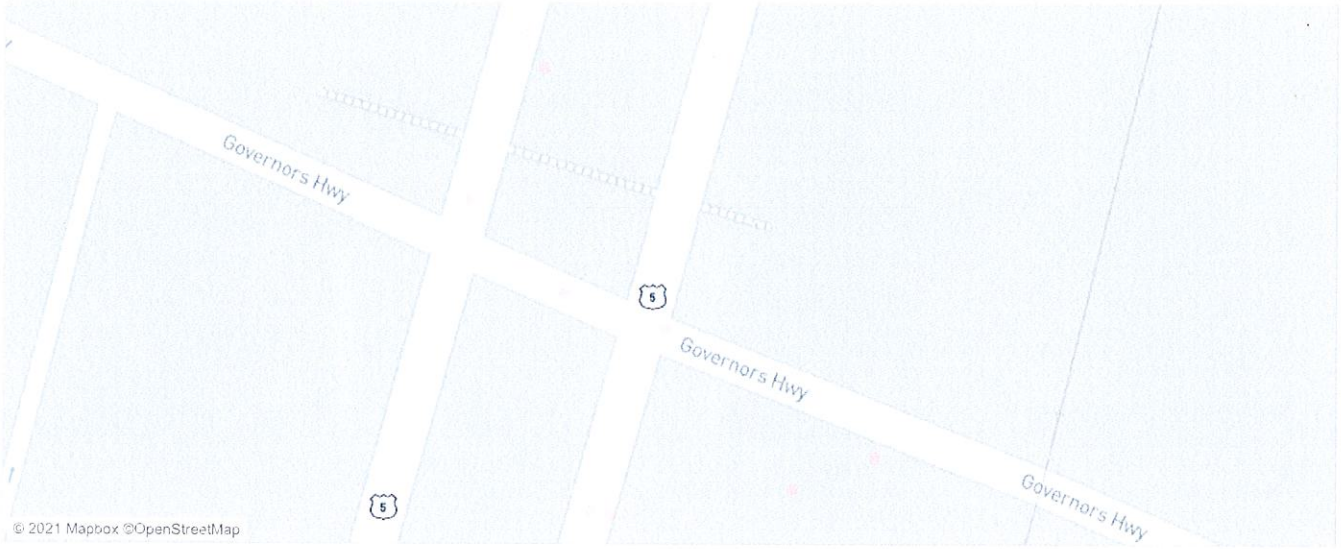
This page incorporates dynamic filtering on the tables and mile marker bar graph. By selecting a record, the other figures will be filtered by that selection. **Any selections made on this page will not be reflected anywhere else in the report.**

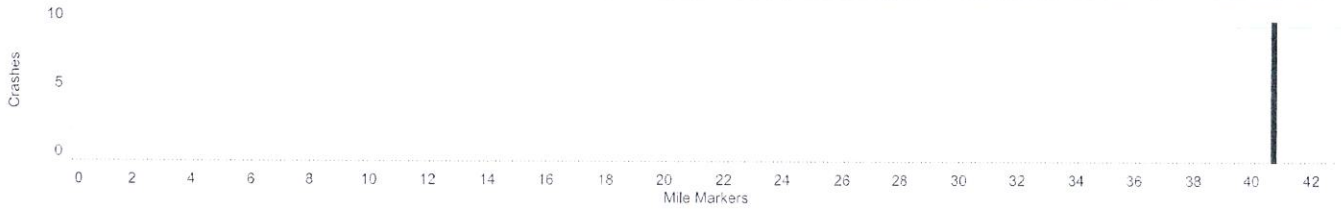
Please Note: The location and route number are both drawn directly from the crash reports and have not been checked for entirely errors. These may not directly correspond and are not guaranteed to be accurate.

Top 10 Routes for Crashes

5	9

Crash Locations (limited to the 10,000 most recent crashes)





These data are exempt from discovery or admission under 23 U.S.C 409. Data Extracted 10/01/2021

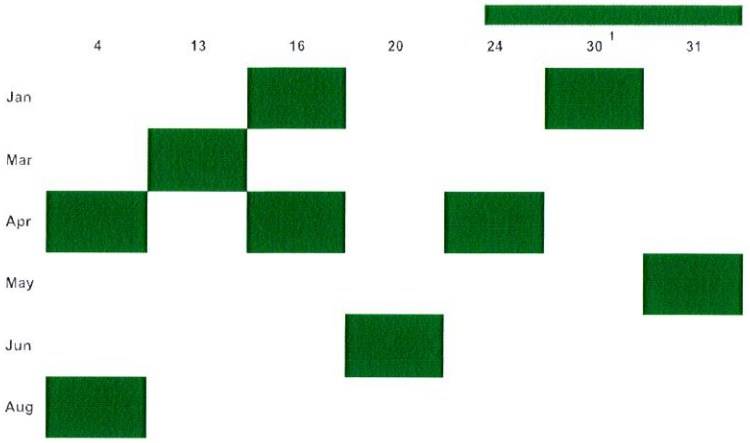
Collision Analysis Safety Tables

Crash Severity | Top 10 Routes | **Time and Date of Crashes** | Crash Conditions | Roadway Features 1 | Roadway Features 2 | Contributing Factors

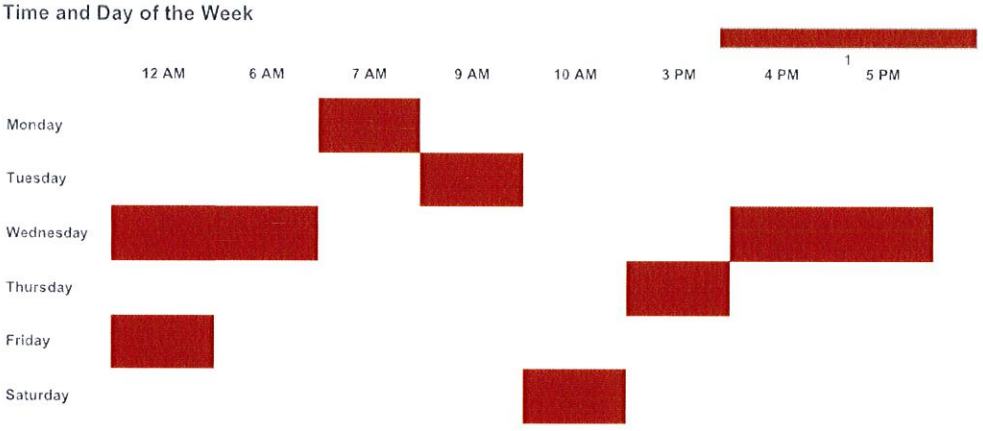
Queries Selected: Town: *South Windsor*, Date (Year:*2018, 2019, 2020* or *1/1/2018* to *12/31/2020*), Severity: *All*, Route Class: *All*, Road Number: 5, Local Road Name: GOVERNOR'S HWY & Governors Hwy, Mile Markers: *-1* to *117.36*

Month and Date of Crashes

	2018		2019		2020	
	Crashes	% of All Crashes	Crashes	% of All Crashes	Crashes	% of All Crashes
Jan			1.000	33.3%	1.000	100.0%
Mar			1.000	33.3%		
Apr	3.000	60.0%				
May			1.000	33.3%		
Jun	1.000	20.0%				
Aug	1.000	20.0%				
Total	5.000	100.0%	3.000	100.0%	1.000	100.0%



Time and Day of the Week



	Saturday	Friday	Thursday	Wednesday	Tuesday	Monday	Grand Total
Crashes	1.000	1.000	1.000	4.000	1.000	1.000	9.000
% of Total Crashes	11.11%	11.11%	11.11%	44.44%	11.11%	11.11%	100.00%

Hour of Crash Time	Crashes	% of All Crashes
12 AM	2.000	22.22%
6 AM	1.000	11.11%
7 AM	1.000	11.11%
9 AM	1.000	11.11%
10 AM	1.000	11.11%
3 PM	1.000	11.11%
4 PM	1.000	11.11%
5 PM	1.000	11.11%
Grand Total	9.000	100.00%

EXHIBIT G

October 14, 2021 (BOSTON, MA) – Conservation Law Foundation (CLF) and DATTCO, Inc. have reached a settlement (https://www.clf.org/wp-content/uploads/2021/10/35-1-Consent-Decree-4852-7661-4649-v.1.pdf) in a lawsuit regarding Clean Air Act violations in Connecticut. CLF sued the company after its school buses were observed frequently violating federal and state laws regulating prolonged vehicle idling, which spreads toxic diesel exhaust into neighborhoods. The company will be required to put an end to this unlawful idling and begin transitioning to zero emission buses.

"Companies must be held responsible when they violate environmental laws and threaten public health," said Heather Govern, Vice President and Director of CLF's Clean Air and Water program. "This settlement will reduce children's exposure to toxic exhaust and ensure cleaner air in Connecticut. It's time we end unlawful idling and transition away from polluting gas-powered buses."

The settlement requires DATTCO to commit $1.8 million to the transition to a zero-emissions fleet, including purchasing vehicles, charging stations, and other infrastructure upgrades. The company must also install automatic engine shut-off technology on its entire coach fleet and on

all its large diesel school buses. Finally, DATTCO must increase its monitoring of vehicle idling and make that data available in semi-annual reports.

EXHIBIT G

CLF sued the company after DATTCO buses were observed idling in excess of the state's three-minute limit (also enforceable under federal law) in lots throughout Connecticut, including in New Haven, Bridgeport, Durham, Cheshire, South Windsor, and New Canaan. DATTCO serves school districts across Connecticut and provides private coach bus services.

Vehicle idling releases harmful exhaust that can cause lung damage and aggravate conditions like asthma and bronchitis. Exposure to the pollutants in vehicle exhaust has also been linked to cardiovascular disease, cancer, brain damage, and premature death.

CLF experts are available for further comment.

###

Media Contact:

Jake O'Neill
joneill@clf.org
(617) 850-1709

Focus Areas

Clean Air & Water (https://www.clf.org/blog/focus-areas/clean-water/)

EXHIBIT G

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF CONNECTICUT

Conservation Law Foundation, Inc.,	
Plaintiff,	Case No. 20-234
v.	
DATTCO, Inc.,	
Defendant.	Clean Air Act, 42 U.S.C. §§ 7401, *et seq* JURY TRIAL DEMANDED

COMPLAINT

1. Conservation Law Foundation brings this citizen suit to enforce the Clean Air Act against DATTCO, Inc. ("DATTCO" or "the Defendant"), a transportation company. DATTCO's fleet of vehicles, primarily school buses, pollutes neighborhoods throughout Connecticut with exhaust while these vehicles idle for extended periods of time, in violation of federal law.

2. DATTCO collects $180 million in revenue annually, including millions of taxpayer dollars under contracts with Connecticut public school districts. DATTCO vehicle lots provide school buses to serve these contracts.

3. DATTCO vehicles unlawfully pollute communities the company is meant—and paid—to serve. During a few hours' observation on a sample of seven days in October and November 2019 and February 2020, CLF investigators observed 132 violations of federal air-pollution laws by DATTCO vehicles at the company's lots in New Canaan, Bridgeport, South Windsor, New Britain, Cheshire, Durham, Plainville, and New Haven, Connecticut.

EXHIBIT G

The Nutmeg Road Lot in South Windsor

175. DATTCO owns, operates, and/or manages vehicles on a lot located at 660 Nutmeg Road North, South Windsor, Connecticut ("the Nutmeg Road Lot").

176. Upon information and belief, DATTCO uses vehicles it owns, operates, and/or manages on the Nutmeg Road Lot to serve its contracts with the Windsor and South Windsor Public Schools.

177. Members of the local community worship and engage in religious activity within a one-mile radius of the Nutmeg Road Lot, including at the Temple Beth Hillel.

178. DATTCO caused and/or allowed vehicles to idle in excess of the regulatory maximum at the Nutmeg Road Lot.

179. On a sample of six days in October and November 2019, a CLF investigator observed the following instances of unlawful idling by DATTCO vehicles at the Nutmeg Road Lot:

	Date	Idling Start	Idling End	Duration
180.	10/11/2019	6:05AM	6:12AM	7 min
181.	10/11/2019	6:34AM	6:40AM	6 min
182.	10/11/2019	6:50AM	6:58AM	8 min
183.	10/11/2019	7:01AM	7:05AM	4 min
184.	10/11/2019	7:14AM	7:18AM	4 min
185.	10/23/2019	5:53AM	5:58AM	5 min
186.	10/23/2019	6:11AM	6:16AM	5 min
187.	10/23/2019	6:52AM	6:58AM	6 min
188.	10/23/2019	7:09AM	7:17AM	8 min
189.	10/30/2019	5:27AM	5:35AM	8 min
190.	10/30/2019	5:57AM	6:04AM	7 min
191.	10/30/2019	6:05AM	6:31AM	26 min
192.	10/30/2019	6:05AM	6:09AM	4 min
193.	10/30/2019	6:05AM	6:23AM	18 min
194.	10/30/2019	6:27AM	6:35AM	8 min
195.	10/30/2019	7:10AM	7:15AM	5 min

EXHIBIT G

196.	11/19/2019	5:22AM	5:27AM	5 min
197.	11/19/2019	5:34AM	5:38AM	4 min
198.	11/19/2019	5:41AM	6:15AM	34 min
199.	11/19/2019	5:59AM	6:03AM	4 min
200.	11/19/2019	6:06AM	6:11AM	5 min
201.	11/19/2019	6:35AM	6:40AM	5 min
202.	11/19/2019	7:04AM	7:09AM	5 min
203.	11/20/2019	1:11PM	1:21PM	10 min
204.	11/20/2019	1:24PM	1:39PM	15 min
205.	11/20/2019	1:59PM	2:04PM	5 min
206.	11/20/2019	2:23PM	2:39PM	16 min
207.	11/25/2019	1:17PM	1:44PM	27 min
208.	11/25/2019	2:44PM	2:49PM	5 min

209. No regulatory exceptions apply to these instances of vehicle idling.

210. During these instances of idling, the idling vehicles released exhaust containing fine and ultrafine particulate matter, nitrogen oxides, sulfur dioxide, benzene, formaldehyde, and other air contaminants into the atmosphere above and around the Nutmeg Road Lot.

211. These pollutants endanger the people—including children—in the area, and otherwise damage the environment.

The South Street Lot in New Britain

212. DATTCO owns, operates, and/or manages vehicles on a lot located at 583 South Street, New Britain, Connecticut ("the South Street Lot").

213. Over eight and a half thousand people live within a one-square-mile radius of the South Street Lot.

214. Children attend school within a one-mile radius of the South Street Lot, including at the Smith Elementary School.

215. Members of the local community worship and engage in religious activity within a one-mile radius of the South Street Lot, including at the Greater Harvest Church Ministries and Tabernacle Baptist Church.

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EXHIBIT H

BRIAN R. SMITH

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
bsmith@rc.com
Direct (860) 275-8224

October 26, 2021

Chairman Bart Pacekonis & Commission Members
South Windsor Planning & Zoning Commission
Town Hall
1540 Sullivan Avenue
South Windsor, CT 06074

Re: Application 21-36P, 25 Talbot Lane Site
Plan Request by UW Vintage Lane II, LLC

Dear Chairman Pacekonis and Commission Members:

This letter is written on behalf of our clients, NFP Real Estate, LLC, owner of 50 Talbot Lane and the operating entity CP Foods, LLC d/b/a Carla's Pasta (hereinafter collectively referred to as "Carla's Pasta"). As the adjoining neighbor west and southwest of the proposed development, Carla's Pasta has two concerns:

First, that the proposal to construct a 359,640 square foot distribution facility that will generate a considerable amount of stormwater runoff from the roof and other impervious surfaces and could potentially cause or exacerbate drainage issues on the Carla's Pasta property.

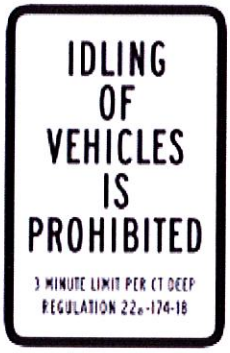
Second, Carla's Pasta is also concerned that placement of all the loading docks on the westerly side of the proposed building could generate excessive amounts of air pollutant from trucks idling. Carla's Pasta has HVAC units that will take in these fumes and circulate within its food manufacturing facility. While we recognize that the Commission does not have jurisdiction over air pollution caused by truck exhaust it does have jurisdiction over the location of the loading docks and signage. To the extent feasible we ask that the loading docks be located so as not to cause Carla's Pasta to be unduly exposed to the truck exhaust that may be generated by the proposed use of 25 Talbot Lane.

We also ask that the Commission request that the applicant place signs on its property advising its truck drivers not to violate state and federal anti-idling mandates.

The State of Connecticut DEEP has a model design for such a sign and it is shown below.

Robinson+Cole

- CT DEEP has this sample sign (also sold at the DEEP store).



We suggest that these signs be located at each loading dock and wherever trucks may idle on-site.

We understand that a retention basin is planned that should accommodate the anticipated runoff, but Carla's Pasta respectfully requests that the Commission and the Town Engineer carefully scrutinize the stormwater management system. Please ensure that plans for its maintenance are robust and adequate to prevent any adverse impacts to the Carla's Pasta facility and its parking lots and do not inappropriately disturb the Newbury Brook or on-site wetlands. If you determine that what has been proposed is inadequate we request that the Commission revise the scope of the project so that it will comply with your requirements.

In our review of the "Stormwater Management Report 25 Talbot Lane, 5 & 25 Talbot Lane and 475 & 551 Governor's Highway South Windsor, Connecticut", prepared by Design Professionals, Inc. dated July 2, 2021 and revised October 15, 2021, we note on page 4 therein that the Applicant's proposed water quality basin "shall be evaluated at least every 5 years for the build-up of organic matter." In addition to the private requirements that we have by virtue of drainage easements, we request that these evaluations of the proposed water quality basin be done every 3 years instead of every 5 years due to the increasing number and intensity of storm events.

Robinson+Cole

Thank you for your consideration of Carla's Pasta's concerns and requests.

Sincerely,

Brian R. Smith

Brian R. Smith

cc: Michele M. Lipe, AICP, Director of Planning, Town of South Windsor
Benjamin Wheeler, P.E., Design Professionals, Inc. for the Applicant
Brian Durst, CEO and Managing Member, NFP Real Estate, LLC and Carla's Pasta

95 Bilton

EXHIBIT I

TRAFFIC NOISE LEVELS AT THE SOURCE DEPEND ON THREE MAIN FACTORS

Highway noise generation is dependent on three main factors, including:

1. Traffic Volume
2. Traffic Speed
3. Number of trucks in the traffic

Each of these varies at any given moment.

HOW TRAFFIC VOLUMES AFFECT NOISE

Doubling the traffic volume (e.g. from 1,000 to 2,000 vehicles per hour) will increase the sound level by 3 dB(A).

How Traffic Volumes Affect Noise

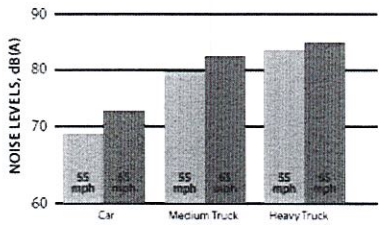
2000 Vehicles Per Hour is 3 dB(A) louder than

1000 Vehicles Per Hour

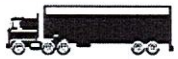
Source: FHWA Highway Traffic Noise Fact Sheet, http://www.fhwa.dot.gov/environment/noise

How Speed Affects Traffic Noise

As speed increases, noise levels increase as illustrated below:



How Trucks Affect Traffic Noise



One truck at 55 miles per hour sounds as loud as

28 cars at 55 miles per hour

FREQUENTLY ASKED QUESTIONS

1. At what level will hearing damage occur?
   Generally, 120 dB(A) is recognized as the threshold of pain and considered a dangerous noise level. Noise levels less than 120 dB(A) can damage hearing if the listener is exposed to the noise for an extended time period. Noise levels less than 90 dB(A) are generally not recognized as being able to cause hearing damage.

   Typically, traffic noise levels in areas of frequent human use do not approach these noise levels. A 90 dB(A) traffic noise level would occur if a person stood 10 to 20 feet from a roadway carrying approximately 1,000 trucks per hour. It is unlikely that residents would be exposed to this level of noise, and therefore it is unlikely residents experience hearing damage due to traffic noise.

2. What is Leq?
   Leq is the equivalent steady-state sound level that in a stated period of time contains the same acoustic energy as a time-varying sound level during the same period.

3. How loud is 67 dB(A)?
   A sound level of 67 dB(A) is associated with normal speech at 3 ft. Some common sound levels are shown in the chart within this pamphlet.

Illinois Department of Transportation

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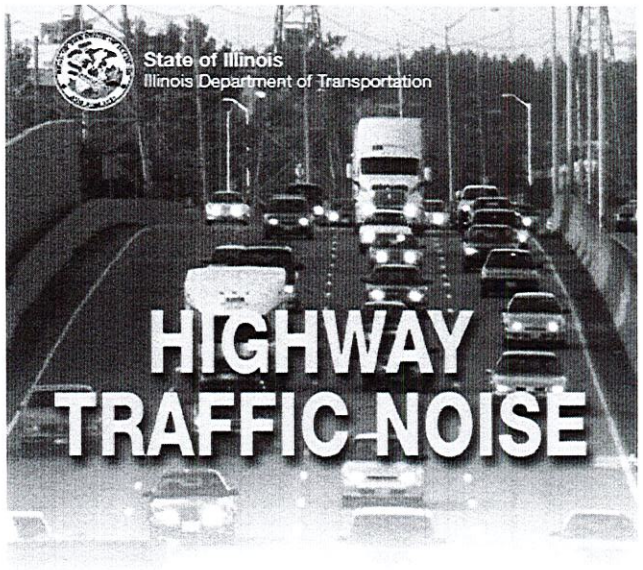


NOISE FUNDAMENTALS

- What is noise?
- Measuring noise
- Perception of noise changes
- Noise reduction with distance
- Mobile noise sources

IDOT's MISSION STATEMENT

The mission of IDOT is to provide safe, cost-effective transportation for Illinois in ways that enhance quality of life, promote economic prosperity, and demonstrate respect for our environment. We will accomplish our mission while making the following principles the hallmark of all our work: Safety, Integrity, Diversity, Responsiveness, Quality, and Innovation.

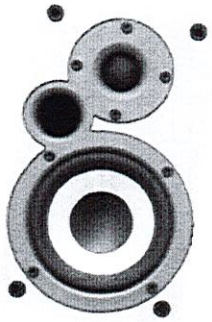
The following has been prepared to assist the public in understanding the fundamentals of traffic noise, crucial to providing meaningful input into the planning process.

EXHIBIT 1

WHAT IS NOISE?

SOUND – A vibratory disturbance capable of being detected by the ear.

NOISE – Unwanted sound that may interfere with normal activities.



NOISE IS AN UNINVITED GUEST.

MEASURING NOISE

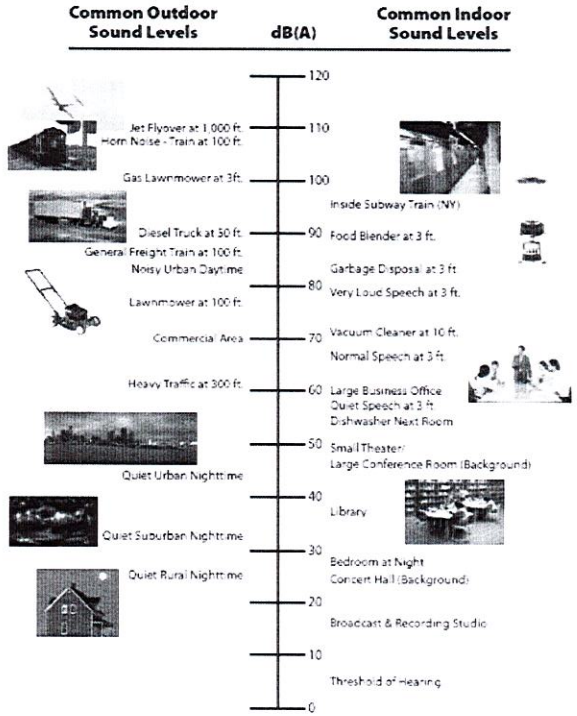
- Noise is measured in decibels (dB).
- Decibels are established on a logarithmic scale.
- A 10 dB increase represents a doubling in noise to the human ear. For example, 60 dB is perceived to be twice as loud as 50 dB.

A-WEIGHTED NOISE MEASUREMENTS

- The unit of measure is dB(A).
- Humans do not hear all noise frequencies equally.
- The A-weighted scale indicates sound is filtered similar to the human ear, which reduces the strength of very low and very high frequencies. Without A-weighting, a noise monitor would respond to noise events people cannot hear, such as a dog whistle.

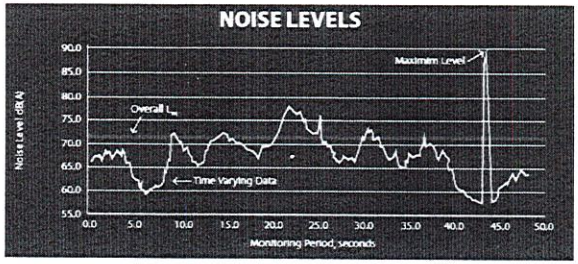
The chart below shows common outdoor and indoor sound levels with associated dB(A).

COMMON SOUND LEVELS



EQUIVALENT SOUND LEVEL (Leq)

The Leq is used to describe changes in noise over a time period as an overall noise level. The graph below represents the time-varying noise data for a 50-second monitoring period. For this period, the approximate Leq is 72 dB(A).



PERCEPTION OF NOISE CHANGES

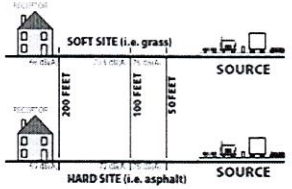
- Changes less than 3 dB(A) are not typically perceived by a human listener with average hearing.
- Changes from 3 to 5 dB(A) will be perceived by humans with sensitive ears.
- Changes greater than 5 dB(A) are readily perceived by humans with average hearing.

NOISE REDUCTION WITH DISTANCE

Highway noise is generated by a line of vehicles closely spaced. This gives a listener the perception of a line noise source rather than a single, identifiable point of noise. As distance increases from the highway, noise is reduced. Generally, every time the distance doubles, the noise level will decline 3 dB(A) when it travels over hard surfaces. Over soft surfaces, the noise level will decline 4.5 dB(A) for every doubling of distance.

For example, assume traffic produces a noise level of 75 dB(A) measured 50 feet from the highway:

Soft Site If grass is the predominant cover, then at 200 ft, the noise level will be 9 dB(A) lower, or 66 dB(A).



Hard Site If asphalt is the predominant cover, the resulting noise level at 200 ft will be 6 dB(A) lower, or 69 dB(A).

NOISE FROM MOBILE SOURCES

	Primary Sources:
Low Speeds	• Engine • Gear Box and Transmission • Exhaust
High Speeds	• Tire/Road Noise • Aerodynamics of vehicle

EXHIBIT I

Transit Talk: The ETC Bulletin
Latest Edition Dec 2020

Edmonton Trolley Information

Diesel Buses:
Environment & Health Impacts

Clean Diesel: Myths

Diesel Particulate Filters

Buses, Trucks and Noise Pollution

New Bus Technologies:
CNG, Hybrid, Fuel Cells

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Noise Pollution

"Calling noise a nuisance is like calling smog an inconvenience. Noise must be considered a hazard to the health of people everywhere."

William H. Stewart, former U.S. Surgeon General

Because noise is invisible, its impact on the surrounding environment is often more difficult to recognize than is the case with chemical pollutants found in the air or water. However, the effects of noise on our lives are very real. Noise is not a "non-quantifiable" emission and its effects can no longer be regarded as "indeterminate". It is a misconception that people can adjust to noise by ignoring it or "getting used to it". The ear never closes and even responds to sound during sleep!

What does noise do to our health?

- Exposure to noise has been demonstrateed to cause a rise in blood pressure (hypertension). There is a correlation between noise exposure and adverse cardiovascular effects.
- Noise has been linked to gastrointestinal changes and an increase in the use of antacids, hypnotics, sedatives.
- Noise has been shown to affect mental health. Intermittent noise, even at low levels, has been shown to make people tense and angry. Noise exposure has been linked to increased aggression and even violence and suicide.
- Intermittent and impulsive noise is reesponsible for sleep disturbances. Chronic sleep disturbance is associated with additional adverse health effects. Persons whose sleep is continually disturbed by noise are more likely to perceive themselves as being in poorer health.

How do vehicular noise levels compare?

Noise is measured in decibels. The decibel scale is a logarithmic scale. The intensity or "power" of a sound doubles roughly every 10 decibels. The noise level on a typical city street with automobile traffic averages 60-65 db; larger vehicles like heavy trucks and diesel buses cause noise peaks ranging up to about 90 db. The following chart gives the values on the decibel scale associated with various types of vehicles; the measurements were made with the vehicles travelling in urban conditions between 45 and 60 km/h.

Type of Vehicle	Noise in decibels
Gasoline passenger car	62-67
Electric trolley bus	60-70
LRT car	72-75
Medium-sized truck	73-78
Urban diesel bus	80-85
Heavy Truck	80-85

EXHIBIT I

(Adapted from: Transport Action, Transport Canada 2000, October 2001; additional data from BC Transit, 1999 and Calgary Transit)

Typically, city traffic engineers and planners measure the noise generated by vehicular traffic in a give corridor as an average over a specific time period. However, this type of measurement is actually misleading in determining the effects of traffic noise on the community. Noise experts agree that intermittent and impulsive noise is far more disturbing than continuous noise. Diesel buses and trucks passing at intervals may exert little influence on average noise levels over a time period, but the effects on community health produced by the peaks that they create in the noise level are significant.

- **One diesel bus or heavy truck produces the noise equivalent of over 32 automobiles.**
- **The noise levels generated by a diesel bus pulling away from a stop may exceed 90 db, the threshold level for hearing loss.**
- **The sound "power" of the noise from a diesel bus or heavy truck is on the order of some 300 times greater than that of ambient street noise or that produce by an electric trolleybus.**

How does this relate to my community?

Edmonton civic records show that the noise levels from both diesel buses and heavy trucks are a concern to residents. To some extent, the problem of noise from heavy trucks has been addressed through the establishment of fixed truck routes and the installation of noise attenuation measures (berms) along freeways and heavy traffic corridors. However, the noise from diesel transit buses has never been satisfactorily addressed. These vehicles are permitted to operate freely in ever increasing numbers in otherwise quiet residential neighborhoods as well as in high density areas.

Electric public transportation modes such as the trolleybus and light rail do not create the noise problems associated with diesel buses. The increased use of electric modes is clearly conducive to building healthier communities in Edmonton.

Sources
Transport Canada 2000, Noise Centre (League for the Hard of Hearing), BC Transit, Calgary Transit, City of Edmonton departmental correspondence.

EXHIBIT I

(Open Access refers to publications that are available online at no cost. Check the publisher's Web site for specific terms of use.)VEHICLE NOISE SOURCES AND NOISE-SUPPRESSION POTENTIAL

A study was made of the noise sources of a heavy-duty diesel tractor trailer. By making measurements at 50 ft (15 m) to the side of the vehicle, it was found that: (1) truck engine noise produced by the rapid pressure rise in the combustion chambers of such engines is radiated by the vibrations of the engine block and attached fixtures, with a sound level of 78 dBA being attributed to the engine and mechanical combustion noise sources; (2) exhaust noise is engine noise is engine noise radiated from the exhaust pipe outlet and vibration noise of the pipes and mufflers, and a level of 85 dBA represents typical exhaust noise; (3) engine air intake or induction noise at a relatively low level of 75 dBA is created by the pulsating column of air moving into the engine and, in many cases, includes noise of mechanically driven or exhaust turbine-driven supercharges; (4) the engine cooling fan moves large quantities of air through the radiator with a very restricted downstream flow condition and generates high noise levels (82 dBA); and (5) truck tires generate a noise level of 75 dBA at a speed of 35 mph (56 km/h) or less and 95 dBA at highway speeds. Adding all sources gives a total truck noise level of 88 dBA at speeds less than 35 mph (56 km/h) and 96 dBA at highway speeds. These data would apply to a relatively modern truck design that is in compliance with voluntary industry standards and noise regulations of various states and localities. Measurements were also made on passenger car noise and motorcycle noise; these results are presented and discussed. In addition, discussions are made of noise certification levels, sound propagation, atmospheric attenuation, traffic noise, and highway noise barriers. Tables are presented on the following: Percentage of people annoyed by the sources of residential noise; population and use of mobile noise sources in the U.S.; miles traveled by motor trucks; California motor vehicle noise certification levels at 50 ft (15 m); effect of noise-abatement measures on highway noise; and relation of quieting truck and using roadside barriers to reduce truck noise.

Record URL:

http://onlinepubs.trb.org/Onlinepubs/sr/sr152/sr152-003.pdf (http://onlinepubs.trb.org/Onlinepubs/sr/sr152/sr152-003.pdf)

Availability:

Find a library where document is available. Order URL: http://worldcat.org/issn/0360859X (http://worldcat.org/issn/0360859X)

Supplemental Notes:

Corporate Authors:
Transportation Research Board (TRB)
Washington, DC

Authors:
Close, W H
Wesler, J E

Conference:
Workshop on Motor Vehicle Noise Control (/Results?q=&serial="Workshop%20on%20Motor%20Vehicle%20Noise%20Control")
Location: Washington District of Columbia, United States
Date: 1974-12-10 to 1974-12-11

Publication Date: 1975

Media Info

Media Type: Digital/other
Features: Figures; References; Tables;
Pagination: pp 14-33
Monograph Title: Motor vehicle noise control
Serial:
Transportation Research Board Special Report (/Results?q=&serial="Transportation%20Research%20Board%20Special%20Report")
Issue Number: 152
Publisher: Transportation Research Board
ISSN: 0360-859X

Publication flags:
Open Access (libre) (Open Access refers to publications that are available online at no cost. Check the publisher's Web site for specific terms of use.)

Subject/Index Terms

TRT Terms: Emission control systems (/Results?q=&datein=all&index="Emission%20control%20systems"); Engines (/Results?q=&datein=all&index="Engines"); Exhaust gases (/Results?q=&datein=all&index="Exhaust%20gases"); Heavy vehicles (/Results?q=&datein=all&index="Heavy%20vehicles"); Measurement (/Results?q=&datein=all&index="Measurement"); Motor vehicles (/Results?q=&datein=all&index="Motor%20vehicles"); Motorcycles (/Results?q=&datein=all&index="Motorcycles"); Noise (/Results?q=&datein=all&index="Noise"); Noise barriers (/Results?q=&datein=all&index="Noise%20barriers"); Noise control (/Results?q=&datein=all&index="Noise%20control"); Sound level (/Results?q=&datein=all&index="Sound%20level"); Speed (/Results?q=&datein=all&index="Speed"); Tires (/Results?q=&datein=all&index="Tires"); Traffic noise (/Results?q=&datein=all&index="Traffic%20noise"); Trucks (/Results?q=&datein=all&index="Trucks"); Vehicle components (/Results?q=&datein=all&index="Vehicle%20components")

EXHIBIT I

SURVEY OF MOTOR VEHCILE NOISE

TRANSPORTATION NOISE, AND MOTOR-VEHICLE NOSIE IN PARTICULAR, ACCOUNT FOR THE STEADY OR SLOWLY VARYING AMBIENT NOISE LEVEL, PARTICULARLY IN URBAN AREAS. BEING SO NUMEROUS, MOTOR VEHICLES CAN BE TREATED STATISTICALLY, AND THIS ESTABLISHES CONSISTENT NOISE EMISSION CHARACTERISTICS. VEHICLES ARE CATEGORIZED AS: PASSENGER CARS (INCLUDING LIGHT DELIVERY TRUCKS UP TO 6,000 LB GROSS VEHICLE WEIGHT (GVW), LIGHT, MEDIUM AND HEAVY TRUCKS WITH GVW RANGES OF 6000-15000, 15000-30000, AND OVER 30000 LB, RESPECTIVELY, TRACTOR TRAILERS, BUSES, CEMENT-MIXER TRUCKS, AND MOTORCYCLES. SPEED RANGES ARE 20-29, 30-39, 40-49, 50-59, AND 60-69 MPH. THE SOUND LEVEL OF THE AVERAGE VEHICLE OF A GIVEN CATEGORY INCREASES CONSISTENTLY WITH SPEED AND WEIGHT. THE AVERAGE VEHICLE IS DEFINED AS THE HYPOTHETICAL VEHICLE HAVING A SOUND LEVEL (A, B, OR C WEIGHTING) AND BAND-PRESSURE LEVELS EQUAL TO THE WEIGHTED-MEAN DECIBELS IN THE STATISTICAL DISTRIBUTIONS. THE RATE OF INCREASE WITH SPEED IS SUCH THAT IN GOING FROM 30-39 MPH TO 60-69 MPH, THE SOUND LEVEL (A WEIGHTING) INCREASES 8.5 DB FOR PASSENGER CARS, 9 DB FOR TRUCKS AND BUSES, 7DB FOR TRACTOR TRAILERS, AND 12 DB FOR MOTORCYCLES. FOR AN ESTIMATED DOUBLING OF WEIGHT, SOUND LEVELS INCREASE 3.5 DB. FOR MOTORCYCLES, MAXIMUM NOISE OCCURS FOR FULL THROTTLE SETTING, INDEPENDENT OF ROAD SPEED, GEAR, OR ENGINE LOADING. THE OCTAVE-BAND SPECTRUM OF THE AVERAGE VEHICLE HAS A SHAPE WHICH IS CHARACTERISTIC OF EACH CATEGORY AND SHOWS PROGRESSIVE CHANGE IN LEVEL AND SHAPE WITH INCREASING SPEED. THE OCTAVE-BAND SPECTRA OF FOUR MOTORCYCLES, AS EXAMPLES, INDICATE DEPENDENCE OF LEVEL AND SHAPE ON SUCH PARAMETERS AS TYPE AND SIZE OF ENGINE, MUFFLER CONFIGURATION, AND THROTTLE SETTING. THE SOUND LEVEL FOR ACCELERATION IS EAUIVALENT TO ABOUT 40-49 MPH CRUISING SPEED FOR TRACTOR TRAILERS AND HEAVY TRUCKS, AND 30-39 MPH FOR CEMENT-MIXERS, BUT THE OCTAVE BAND SPECTRA FOR THE TWO MODES OF OPERATION EXHIBIT CONSISTENT DIFFERENCES. SOULD LEVELS RECORDED CONTINUOUSLY FOR 24-1 PERIODS AT FIVE LOCATIONS, AND ANALYZED FOR PERCENTILE DISTRIBUTIONS IN EACH 1-H INTERVAL, HAVE A DIURNAL CYCLE THAT FOLLOWS A CONSISTENT PATTERN IN RESPONSE TO MOTOR-VEHICLE TRAFFIC. (A)

Availability:

Find a library where document is available. Order URL: http://worldcat.org/issn/00014966 (http://worldcat.org/issn/00014966)

Authors:

Lson, N

Publication Date: 1972-11

Media Info

 EXHIBIT I

Features: Figures; References;
Pagination: 15 p.
Serial:

Journal of the Acoustical Society of America (/Results?q=&serial="Journal%20of%20the%20Acoustical%20Society%20of%20America")
Volume: 52 N
Publisher: Acoustical Society of America
ISSN: 0001-4966
Serial URL: http://asadl.org/jasa/ (http://asadl.org/jasa/)

Subject/Index Terms

TRT Terms: Acoustic measuring instruments (/Results?q=&datein=all&index="Acoustic%20measuring%20instruments"); Acoustics (/Results?q=&datein=all&index="Acoustics"); Noise (/Results?q=&datein=all&index="Noise"); Traffic noise (/Results?q=&datein=all&index="Traffic%20noise"); Vehicles (/Results?q=&datein=all&index="Vehicles"); Weight (/Results?q=&datein=all&index="Weight")
Old TRIS Terms: Acoustic measurement (/Results?q=&datein=all&index="Acoustic%20measurement")
Subject Areas: Environment; Highways; Safety and Human Factors; Vehicles and Equipment;

Filing Info

Accession Number: 00224627
Record Type: Publication
Source Agency: Nat Safety Council Safety Res Info Serv
Files: TRIS
Created Date: (/edit/115729)Jul 31 1974 12:00AM

EXHIBIT I

Noise Sources and Their Effects

Noise Source	Decibel Level	comment
Jet take-off (at 25 meters)	150	Eardrum rupture
Aircraft carrier deck	140	
Military jet aircraft take-off from aircraft carrier with afterburner at 50 ft (130 dB).	130	
Thunderclap, chain saw. Oxygen torch (121 dB).	120	Painful. 32 times as loud as 70 dB.
Steel mill, auto horn at 1 meter. Turbo-fan aircraft at takeoff power at 200 ft (118 dB). Riveting machine (110 dB); live rock music (108 - 114 dB).	110	Average human pain threshold. 16 times as loud as 70 dB.
Jet take-off (at 305 meters), use of outboard motor, power lawn mower, motorcycle, farm tractor, jackhammer, garbage truck. Boeing 707 or DC-8 aircraft at one nautical mile (6080 ft) before landing (106 dB); jet flyover at 1000 feet (103 dB); Bell J-2A helicopter at 100 ft (100 dB).	100	8 times as loud as 70 dB. Serious damage possible in 8 hr exposure
Boeing 737 or DC-9 aircraft at one nautical mile (6080 ft) before landing (97 dB); power mower (96 dB); motorcycle at 25 ft (90 dB). Newspaper press (97 dB).	90	4 times as loud as 70 dB. Likely damage 8 hr exp
Garbage disposal, dishwasher, average factory, freight train (at 15 meters). Car wash at 20 ft (89 dB); propeller plane flyover at 1000 ft (88 dB); diesel truck 40 mph at 50 ft (84 dB); diesel train at 45 mph at 100 ft (83 dB). Food blender (88 dB); milling machine (85 dB); garbage disposal (80 dB).	80	2 times as loud as 70 dB. Possible damage in 8 h exposure.
Passenger car at 65 mph at 25 ft (77 dB); freeway at 50 ft from pavement edge 10 a.m. (76 dB). Living room music (76 dB); radio or TV-audio, vacuum cleaner (70 dB).	70	Arbitrary base of comparison. Upper 70s are

EXHIBIT I

		annoyingly loud to some people.
Conversation in restaurant, office, background music, Air conditioning unit at 100 ft	60	Half as loud as 70 dB. Fairly quiet
Quiet suburb, conversation at home. Large electrical transformers at 100 ft	50	One-fourth as loud as 70 dB.
Library, bird calls (44 dB); lowest limit of urban ambient sound	40	One-eighth as loud as 70 dB.
Quiet rural area	30	One-sixteenth as loud as 70 dB. Very Quiet
Whisper, rustling leaves	20	
Breathing	10	Barely audible

[modified from **http://www.wenet.net/~hpb/dblevels.html**] on 2/2000. SOURCES: Temple University Department of Civil/Environmental Engineering (www.temple.edu/departments/CETP/environ10.html), and *Federal Agency Review of Selected Airport Noise Analysis Issues*, Federal Interagency Committee on Noise (August 1992). Source of the information is attributed to *Outdoor Noise and the Metropolitan Environment*, M.C. Branch et al., Department of City Planning, City of Los Angeles, 1970.

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Vehicle Noise Levels and Compression Release Engine Braking

INTRODUCTION

This document is intended to provide the reader with information about commercial vehicle noise and its relationship with compression release engine brakes. This relationship is a subject of community concern and often results in the posting of "No Engine Brake" signs along roads and highways. Data is presented illustrating the relationship between vehicle noise and the condition of the vehicle's exhaust system. This data identifies improperly muffled vehicles as the principal cause of the vehicle noise that concerns communities. This document examines existing regulations that govern vehicle noise levels and presents suggestions for effectively addressing noise concerns at the community level. References are provided for further reading on the subjects of engine braking and vehicle noise.

COMPRESSION RELEASE ENGINE BRAKES

Compression release engine brakes (referred to hereafter as engine brakes) are the most popular type of supplemental vehicle retarder used in North America. Their function is to turn a power producing diesel engine into a power absorbing air compressor. It does this by quickly opening the exhaust valve near top dead center of the compression stroke. This causes a sudden release of compressed air from an engine cylinder into the exhaust system. This is what causes the characteristic staccato sound of an engine brake in operation. The engine brake is activated only when the driver's foot is off of the accelerator pedal and no fuel is being injected into the cylinder.

It is well known that the stopping power available from a vehicle's service (or wheel) brakes decreases significantly as the brake lining temperature increases. One of the uses of engine brakes on commercial vehicles is to help control vehicle speed on long downgrades. Minimizing the use of the vehicle's service brakes virtually eliminates the likelihood of overheating the brakes and thus helps to avoid dangerous brake fade. Reduced usage of the service brakes on engine brake equipped vehicles also leads to lower maintenance costs through reduced brake lining wear. Vehicles equipped with engine brakes are more efficient and productive to operate. Enhanced driver control and a reduced risk of brake fade also means safer interaction between all of the vehicles operating on public roadways. The overall result of engine brake usage is of significant value to the trucking industry and to the general public as well.

The need for equipping commercial vehicles with engine brakes is greater today than ever before. Vehicle weight and speed limits have been increasing. At the same time the vehicle's natural retarding power has decreased due to reductions in aerodynamic drag and rolling resistance. These improvements are beneficial in terms of vehicle fuel consumption and operating cost. However, they require that more work be done by the service brakes to maintain speeds on long down grades or slow the vehicle. The increased load being placed on vehicle service brakes led to the issuance of an industry practice recommending the use of supplemental retarders [7]. In addition to supplementing the vehicle's service brakes, engine brakes are also being integrated into other vehicle functions such as cruise control, automatically shifted manual transmissions, and the newly introduced collision avoidance systems. These factors are why the majority of heavy-duty vehicles produced in North America today are equipped with engine brakes when delivered from the vehicle manufacturer.

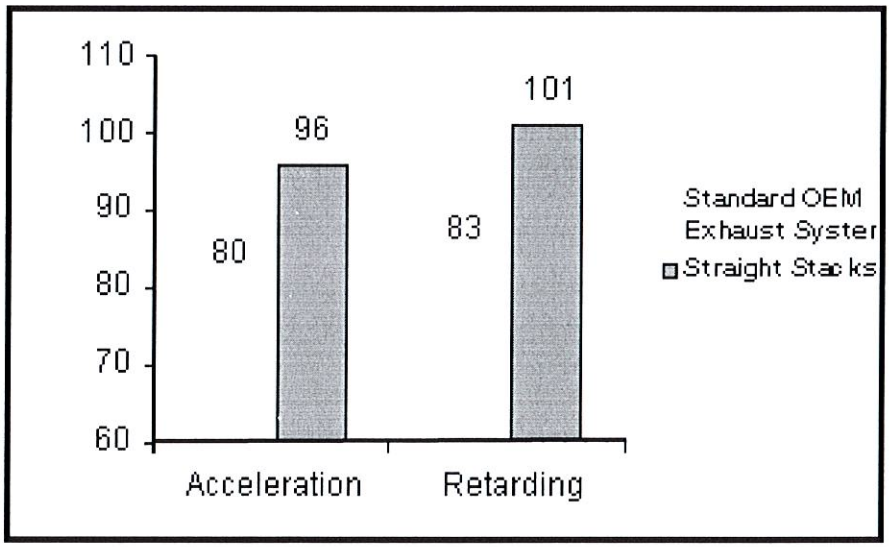
ABOUT NOISE

Residents near steep downgrades, highway exits and curves in some communities in North America have expressed concerns about commercial vehicle noise. These concerns frequently identify engine brakes, due to their characteristic sound, as the cause of the objectionable noise. Signs prohibiting engine brake usage have been posted in some communities. The trucking industry is sensitive to these concerns and has studied the issue with regard to both new and in use trucks.

Truck, engine and equipment manufacturer studies have consistently found that improperly muffled vehicles are the root cause of this noise issue. Vehicle operating sound levels have been shown repeatedly to be much higher for vehicles with improper, defective or deteriorated mufflers. The problem is most pronounced on vehicles equipped with "straight stack" exhaust systems (i.e., no muffler). Studies have found that the sound level from "straight stacks" is 16 to 22 dB(A) higher than from original equipment mufflers [1]. Studies have also shown that the operation of an engine brake produces sound levels that are similar to those produced during acceleration on properly muffled vehicles [2].

Figure 1 shows total vehicle sound level data for a typical heavy-duty diesel powered vehicle. Sound levels are measured in 'A' weighted decibels or dB(A). This is a logarithmic scale weighted to the sensitivity of human hearing. Each doubling of a sound source will increase the sound level by 3 dB(A). An 18 dB(A) increase corresponds to a 64 fold increase in the sound source. Additional information on other vehicle/engine combinations is presented in Society of Automotive Engineers (SAE) papers [1] and [2].

Figure1. Typical Heavy-Duty Vehicle Results



Improper, defective or deteriorated mufflers will increase vehicle sound levels over those of properly maintained exhaust systems. The magnitude of the increase though is not as large as that for "straight stacks". A question that can be asked is how prevalent are improperly muffled exhaust systems on commercial vehicles? One survey observed a moderate traffic volume consisting of about 300 trucks per hour traveling on a stretch of Indiana highway. It found 5.3 percent of the trucks did not have a functioning muffler; in fact, 2.4 percent of the vehicles inspected were operating with "straight stacks" installed [1].

From this data one can conclude that residents living near that stretch of highway were on average exposed to 16 vehicles per hour with improperly muffled exhaust systems. These vehicles would be operating beyond acceptable noise levels during acceleration as well as retarding. Overall, this information supports the position that the root cause of objectionable vehicle noise is improperly muffled vehicles.

ABOUT THE LAW

All new vehicles must comply with EPA noise regulations. The maximum permitted noise level was set to 83 dB(A) in 1979 and later reduced to 80 dB(A) in 1988. The overall design and manufacture of heavy-duty trucks, including their exhaust systems, results in all new vehicles meeting the applicable regulations when they leave their manufacturer's factory.

The EPA regulations prohibit "The removal or rendering inoperative by any person, other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use". The EPA regulations also prohibit the use of a vehicle that has had the noise control system rendered inoperative. This is stated clearly on a label required on all vehicles sold in the U.S. and is fully explained in the operator's manual for every new truck [3]. The improperly muffled vehicles, especially those with straight stacks, are not operating in compliance with current federal regulations.

Most states have adopted motor vehicle regulations that address the configuration and condition of vehicles operated on their roads and highways. These regulations typically require that a vehicle be equipped with a proper exhaust system and a muffler. "Straight stacks" are not in compliance with either the federal or the state regulations.

WHAT CAN BE DONE

The current federal and state regulations addressing exhaust system configuration and maintenance are not always aggressively enforced. This has led communities to adopt ordinances of their own and post signs prohibiting engine brake usage. Prohibiting engine brake use attempts to solve the problem without addressing the real cause. Any action taken should address the small percentage of vehicles with improperly muffled exhaust systems that are at the root of the problem.

The most direct solution is to visually inspect vehicles for the presence of a muffler. This type of inspection is relatively simple to implement once some basic definitions of what constitutes a muffler are established. The inspection could be done as part of current roadside inspections with minimal additional training and effort. This action would address the root cause of the community problem and would eliminate the most severe noise offenders. This type of inspection would be the simplest way to start addressing the noise problem.

The drawback to a simple inspection is that it may not catch all offenders. Improper, defective or deteriorated mufflers that appear intact from the outside may be missed. Detecting these cases requires a roadside noise test. The EPA sets forth procedures in its regulations based on the SAE J366 Recommended Practice [4]. The International Standards Organization (ISO) also has procedures for driveby testing, described in ISO 362 [5]. A stationary test could be used to detect vehicles that are noise offenders [6]. However, active noise tests for inspection purposes are complicated by various vehicle and muffler configurations, and require calibrated noise-testing equipment and trained operators. Therefore visual inspection for the presence of mufflers is the simplest and most immediate way to address commercial vehicle noise.

If a community determines that a sign is still required, wording similar to the following examples is suggested. Signs under Oregon State Vehicle Code Section 811.492 read: Unmuffled Engine Brake Use Prohibited Except In Emergencies. Signs under Minnesota Traffic Regulations Section 169.69 read: Vehicle Noise Laws Enforced. Both address the root cause of the problem, do not adversely effect properly maintained vehicles and acknowledge the positive impact of engine brakes on operating safety.

CONCLUSIONS

Enforcement of current muffler regulations is the most direct way to address the noise issue. It will have benefits to the trucking industry as well as to the public. Installing the mufflers required by federal and most state motor vehicle regulations on vehicles that are operated without a muffler will reduce noise levels by 16 to 22 dB(A). This does not necessitate anything more than proper maintenance using original equipment mufflers or replacement systems that are equivalent to those provided by the vehicle manufacturer. Signs prohibiting engine brake usage should be eliminated. This is especially true since most heavy-duty vehicles are properly muffled and do not cause offensive noise when operating their engine brakes.

The benefits to the public are two-fold. First, proper mufflers effectively control objectionable noise during all modes of vehicle operation, not just retarding. This means that objectionable noise is controlled in congested city streets, stop and go traffic, climbing hills, as well as in retarding situations. The second public benefit comes indirectly in the goods we all use that are moved by truck. The improved effectiveness of trucks in terms of operating economy, reduced trip times and improved operating safety will be reflected in the cost of the goods they transport. Truckers will be free to utilize their engine brakes and realize the economic and operating benefits they were purchased to provide. The result will be more efficient transportation, safer vehicles and safer highways.

The benefits to properly muffling trucks and allowing engine brake usage to the trucking industry are also compelling. Drivers will benefit by being exposed to less on-the-job noise. Vehicle operating safety and productivity will be improved. Controlling the noise level of vehicles by installing proper mufflers will also serve to improve the overall image of the trucking industry.

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EXHIBIT I

Noise Increases with Vehicle Speed

When Congress allowed states to raise speed limits, and many states did raise speed limits from 55 mph to 65 mph and higher, highways in these states got noisier. The table below lists the change in the noise made by auotmobiles, medium trucks, and heavy trucks as they increase in speed from 30 mph to 70 mph. Raising the speed of an automobile 10 mph (from 55 to 65 mph) increases the noise made by that vehicle 3 dB, from 72 dB to 75 dB. Similarly, noise made by trucks increases from 86 to 88 dB with the same 10 mph increase in speed. In these examples, gas mileage also decreases by 15%.

The result is a substantial increase in noise for those living and working near highways. Soundwalls are capable of reducing noise levels by 10 dB, so increased speed limits have also significantly reduced the effectiveness of highway noise barriers.

Reducing speed limits on roadways and increasing enforcement of speed limits is often the most effective and cost efficient means of reducing noise. For example, reducing vehicle speeds from 40 to 30 mph is as effective as removing one half the vehicles from the roadway.

Speed (mph)	Noise at 50 ft (dB)		
	Auto	Medium Truck	Heavy Truck
30	62	73	80
31	62	74	80
32	63	74	81
33	63	75	81
34	64	75	81
35	64	76	82
36	65	76	82
37	65	77	82
38	66	77	82
39	66	77	83
40	67	78	83
41	67	78	83
42	67	78	84
43	68	79	84
44	68	79	84
45	68	79	84
46	69	80	85
47	69	80	85
48	70	80	85
49	70	81	85
50	70	81	85
51	71	81	86
52	71	82	86
53	71	82	86
54	72	82	86

 EXHIBIT I

55	72	82	86
56	72	83	87
57	72	83	87
58	73	83	87
59	73	83	87
60	73	84	87
61	74	84	88
62	74	84	88
63	74	84	88
64	74	85	88
65	75	85	88
66	75	85	88
67	75	85	89
68	75	86	89
69	76	86	89
70	76	86	89
Source: Cowan, Environmental Acoustics, 150			

Top

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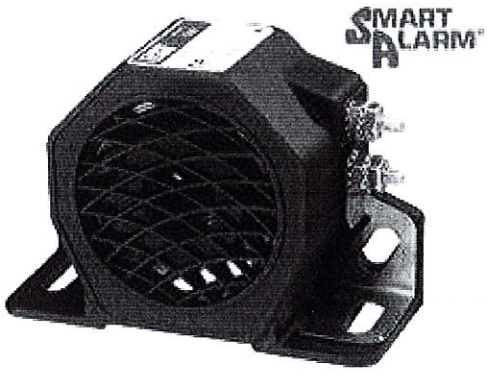

Ecco Warning Lights

82-102 db Smart Alarm

Smart Alarm - 82-102 db

$56.84

Original Price: ~~$76.73~~ 26% off

Item #: SA950

ECCO (800) 761-1700 (/)

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Quantity: **1**

Add to Cart

All Purchases are 100% Risk-Free. View Return Policy Details (https://www.eccowarninglights.com/ReturnPo

Specifications

Series	Series
Volume	82-102 db
Voltage	12-24VDC
Amps	0.4
Operating Range	-40F to 185F -40C to 85C
Approval	UL
Approval	R10
Warranty	2 year

General

Brand	Ecco Warning Lights (/brand/ecco-warning-lights)
Item #	SA950
Dimensions (L/W/H)	4x2x3
Weight	0.8 lbs
MSRP	$76.73
Category	Construction (/products/ecco-warning-lights/industries/construction) Bus and Coach (/products/ecco-warning-lights/industries/bus-and-coach) Tow Truck (/products/ecco-warning-lights/industries/tow-truck) Utilities (/products/ecco-warning-lights/industries/utilities) Snow Removal (/products/ecco-warning-lights/industries/snow-removal)

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Description

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The Smart Alarm? from ECCO was the worlds first self-adjusting back-up alarm, constantly measuring ambient noise and adjusting their sound level, creating a volume that is safe without being annoying or contributing to noise pollution. Smart Alarms? eliminate the need for constant manual adjustment and help prevent intentional alarm disconnection. Compact size and universal mounting bracket maximizes location options, self grounding with stud terminal connections, sealed in epoxy for protection against dust, moisture, and vibration.

Additional Information

SMART ALARM: 82 thru 102 dB, 12-24VDC

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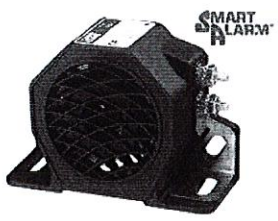

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Ecco Warning Lights

Environmental Research
Volume 197, June 2021, 111064

A community noise survey in Southwest Detroit and the value of supplemental metrics for truck noise

Stuart Batterman [a], Sydni C. Warner [a], Tian Xia [a], Simone Sagovac [b], Benjamin Roberts [c], Bridget Vial [d], Chris Godwin [a]

https://doi.org/10.1016/j.envres.2021.111064

Highlights

- A community noise survey was conducted in Detroit, Michigan at 21 residential sites.
- Community members and youth assisted in making noise and traffic measurements.
- Noise near truck routes, arterials and freeway ramps exceeded guideline levels.
- Conventional noise metrics were supplemented with metrics for short-term noise exposure.
- Traffic noise was widespread and noise abatement strategies should be considered.

EXHIBIT I

Abstract

Noise exposure can affect sleep, health and cognitive performance, and it disproportionately affects communities of color. This study has the objective of evaluating both conventional and supplemental noise metrics in a community noise survey examining Southwest Detroit, Michigan, a densely populated and industrialized area with extensive truck traffic on residential streets. Sound pressure level (SPL) monitors were deployed at 21 residential sites within 900 m of a major interstate highway. With assistance from youth volunteers, continuous SPL measurements were obtained for 1.5–7 days at each site, and short-term vehicle counts on local roads were recorded. We calculated conventional noise metrics, including the day-evening-night average sound level L_{DEN} and the 90th percentile 1-hr maximum $L_{10}(h)$, and evaluated the effect of distance from highways, traffic volume, time-of-day, and other factors. Supplemental metrics potentially appropriate for intermittent traffic noise were calculated, including fraction of time over specific SPL thresholds using a new metric called F_{DEN}, which is the fraction of time over 60, 65 and 70 dB during night, evening and daytime periods, respectively, and a peak noise metric called $L_{2P}(h)$, which utilizes the 98th percentile SPL within time blocks to increase robustness. The conventional metrics indicated five sites that exceeded 70 dB, and the highest noise levels were found within ~50 m of truck routes, arterials and freeway ramps. The estimated impact of truck traffic ranged up to 17 dB for hourly averages and to 33 dB for 1-s peaks. The conventional metrics did not always capture short-term noise exposures, which may be especially important to annoyance and sleep issues. In addition to showing widespread exposure to traffic noise in the study community that warrants consideration of noise abatement strategies, the study demonstrates the benefits of supplemental noise metrics and community engagement in noise assessment.

Previous Next

Keywords

Noise exposure; Environmental health; Road traffic noise; Noise events; Community noise surveillance

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FEEDBACK

The National Academics of Sciences, Engineering & Medicine

SURVEY OF MOTOR VEHCILE NOISE

TRANSPORTATION NOISE, AND MOTOR-VEHICLE NOSIE IN PARTICULAR, ACCOUNT FOR THE STEADY OR SLOWLY VARYING AMBIENT NOISE LEVEL, PARTICULARLY IN URBAN AREAS. BEING SO NUMEROUS, MOTOR VEHICLES CAN BE TREATED STATISTICALLY, AND THIS ESTABLISHES CONSISTENT NOISE EMISSION CHARACTERISTICS. VEHICLES ARE CATEGORIZED AS: PASSENGER CARS (INCLUDING LIGHT DELIVERY TRUCKS UP TO 6,000 LB GROSS VEHICLE WEIGHT (GVW), LIGHT, MEDIUM AND HEAVY TRUCKS WITH GVW RANGES OF 6000-15000, 15000-30000, AND OVER 30000 LB, RESPECTIVELY, TRACTOR TRAILERS, BUSES, CEMENT-MIXER TRUCKS, AND MOTORCYCLES. SPEED RANGES ARE 20-29, 30-39, 40-49, 50-59, AND 60-69 MPH. THE SOUND LEVEL OF THE AVERAGE VEHICLE OF A GIVEN CATEGORY INCREASES CONSISTENTLY WITH SPEED AND WEIGHT. THE AVERAGE VEHICLE IS DEFINED AS THE HYPOTHETICAL VEHICLE HAVING A SOUND LEVEL (A, B, OR C WEIGHTING) AND BAND-PRESSURE LEVELS EQUAL TO THE WEIGHTED-MEAN DECIBELS IN THE STATISTICAL DISTRIBUTIONS. THE RATE OF INCREASE WITH SPEED IS SUCH THAT IN GOING FROM 30-39 MPH TO 60-69 MPH, THE SOUND LEVEL (A WEIGHTING) INCREASES 8.5 DB FOR PASSENGER CARS, 9 DB FOR TRUCKS AND BUSES, 7DB FOR TRACTOR TRAILERS, AND 12 DB FOR MOTORCYCLES. FOR AN ESTIMATED DOUBLING OF WEIGHT, SOUND LEVELS INCREASE 3.5 DB. FOR MOTORCYCLES, MAXIMUM NOISE OCCURS FOR FULL THROTTLE SETTING, INDEPENDENT OF ROAD SPEED, GEAR, OR ENGINE LOADING. THE OCTAVE-BAND SPECTRUM OF THE AVERAGE VEHICLE HAS A SHAPE WHICH IS CHARACTERISTIC OF EACH CATEGORY AND SHOWS PROGRESSIVE CHANGE IN LEVEL AND SHAPE WITH INCREASING SPEED. THE OCTAVE-BAND SPECTRA OF FOUR MOTORCYCLES, AS EXAMPLES, INDICATE DEPENDENCE OF LEVEL AND SHAPE ON SUCH PARAMETERS AS TYPE AND SIZE OF ENGINE, MUFFLER CONFIGURATION, AND THROTTLE SETTING. THE SOUND LEVEL FOR ACCELERATION IS EAUIVALENT TO ABOUT 40-49 MPH CRUISING SPEED FOR TRACTOR TRAILERS AND HEAVY TRUCKS, AND 30-39 MPH FOR CEMENT-MIXERS, BUT THE OCTAVE BAND SPECTRA FOR THE TWO MODES OF OPERATION EXHIBIT CONSISTENT DIFFERENCES. SOULD LEVELS RECORDED CONTINUOUSLY FOR 24-1 PERIODS AT FIVE LOCATIONS, AND ANALYZED FOR PERCENTILE DISTRIBUTIONS IN EACH 1-H INTERVAL, HAVE A DIURNAL CYCLE THAT FOLLOWS A CONSISTENT PATTERN IN RESPONSE TO MOTOR-VEHICLE TRAFFIC. (A)

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Los Angeles Times

EXHIBIT J

CALIFORNIA

Massive fire at Redlands warehouse burns Amazon trailers, briefly closes 10 Freeway

1/6

A firefighter inside a warehouse that was leveled by a three-alarm fire June 5 near the 10 Freeway in Redlands. (Irfan Khan / Los Angeles Times)

BY HANNAH FRY | STAFF WRITER

JUNE 5, 2020 UPDATED 10:39 AM PT

A three-alarm fire tore through a warehouse in Redlands early Friday, triggering a large response from firefighters and briefly closing a stretch of the 10 Freeway.

 EXHIBIT J

The blaze was reported at the warehouse in the 2200 block of West Lugonia Avenue about 5:30 a.m. About 100 employees were inside but evacuated before firefighters arrived, said Carl Baker, a spokesman for the city and its fire department. Fire officials have not reported any injuries.

Video from the scene showed massive flames engulfing the building and plumes of black smoke billowing into the air. One wall of the warehouse collapsed inward, Baker said.

Firefighters poured streams of water on flames that appeared to engulf almost all of the sprawling structure and began to burn truck trailers, some with Amazon logos, parked at loading docks.

Initial reports indicated the distribution center was an Amazon facility, but Baker said it was occupied by a company that contracts with the online retail giant.

Kuehne and Nagel, the company that operates the site, helps Amazon ship extra-large items to customers, according to Amazon.

By about 9:15 a.m., there were still active flames at the building, and firefighters remained in a defensive position, battling the blaze from outside, Baker said.

"But it's certainly a lot more controlled than it was earlier this morning," he said.

Officials remained concerned about the building's structural integrity, and firefighters were keeping a safe distance in case any more walls collapsed.

"I would estimate it's going to be a total loss," Baker said of the building.

It was not immediately clear what caused the fire.

"We are glad everyone is safe, and thankful for the efforts of the local firefighters and first responders," Lisa Levandowski, a spokeswoman for Amazon, said in a statement. "This site was operated by a third party and we will support them throughout this process."

No nearby Amazon sites were affected by the fire, and the company expects the blaze to have minimal impact on customers. Orders will be fulfilled from other locations, the company said.

The blaze prompted officials to close the 10 Freeway in both directions for more than an hour. The freeway reopened shortly after 7 a.m.

CALIFORNIA

Hannah Fry

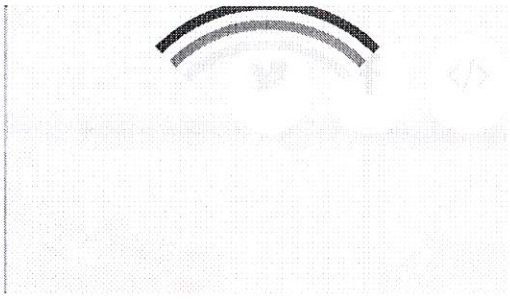
LEX18 Menu

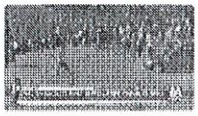
LEX 18 TV

EXHIBIT J

Fumes spur evacuation of Amazon facility in Lexington, 6 treated

Health concerns called non-life-threatening; 500 people evacuated





Posted at 9:28 AM, Aug 02, 2019 and last updated 1:24 PM, Aug 02, 2019

EXHIBIT J

LEX18

Lexington's northwest side.

Lexington police told LEX 18 that the incident was reported before 9 a.m. at the online shopping and shipping giant's facility at 1850 Mercer Road.

Claire Kopsky · Aug 2, 2019
@ClaireMKopsky
Replying to @ClaireMKopsky

Lexington Firefighters tell me there are 6 employees with non-life threatening injuries after a package that was returned to the facility started emitting a vapor that caused burning to their eyes. @LEX18News

Claire Kopsky
@ClaireMKopsky

Lexington Fire hazmat crews are gearing up to "re-con" and go inside to gather information; possibly run tests to find out what is inside that package. @LEX18News

EXHIBIT J

LEX18

Lexington fire officials confirmed that a full hazmat response was being executed.

Officials said six people were treated for minor problems related to the spill, including burning eyes and trouble breathing. They said the injuries were not life-threatening. One of the injured ended up being transported to an area hospital for additional treatment.

Fire officials said 500 people were evacuated from the building. Four city buses were enroute to take the workers from the area.

It was not immediately clear what caused the fumes. Amazon officials said the fumes came from a returned package.

"Today at our Lexington fulfillment center a returned package emitted strong fumes in a contained area of the facility," officials said in a statement. "The safety of our employees is our top priority, and as such, all employees at the site were promptly evacuated and relocated to a safe place. Employees experiencing symptoms received immediate treatment onsite."

Lexington fire officials said the hazmat team reported that the return package was marked as having a leak. It was a commercial box with a powdered

Noise from inside this proposed sheet metal Butler Building see page 2

EXHIBIT J

June 14, 2021 FOCUS: LOGISTICS & DISTRIBUTION

Hartford's distribution real estate market is red hot; get a peek inside a modern logistics warehouse

HBJ PHOTO | STEVE LASCHEVER

Scott High is the operations manager at Veritiv Corp.'s 458,000-square-foot Bacon Road distribution center in Enfield.

By Sean Teehan

Major distribution centers have been popping up along Connecticut's I-91 corridor in recent years, but to the average passerby, the buildings appear to be nothing more than giant, mundane storage facilities.

But inside these modern warehouses, workers and machines weave a complex web of inventory control, delivery routes and incoming and outgoing orders.

At Veritiv Corp.'s 458,000-square-foot Bacon Road distribution center in Enfield, forklifts beep as they whip around the floor, bringing pallets of products to storage shelves that reach toward the top of the building. Warehouse workers scan items into inventory and others pick products off shelves for delivery, while employees in the back of the facility map out delivery routes, and where to place products based on how fast they sell.

The cacophony of scanner beeps, forklift horns and machinery whirring play over a background of classic rock radio 24 hours a day. Veritiv uses the massive facility to sell its printing, packaging and other products to businesses, and it represents just a small slice of the 76 million square feet of industrial space in the Greater Hartford market.

Mark Duclos Co-founder & president
Hartford's Sentry Commercial

Demand for such facilities is booming as the pre-existing trend of customers expecting faster delivery has collided with a pandemic-era surge in e-commerce, experts say. Amazon has grabbed many of the headlines for its growing distribution footprint in central Connecticut and beyond, but demand for such space is coming from retailers and distributors of all stripes, making industrial properties the hottest segment of the state's commercial real estate market.

"I've been doing this for 35 years, and this is as hot a market as I've ever experienced," said Mark Duclos, president of Sentry Commercial in Hartford, which specializes in brokerage and consulting of industrial, office and investment real estate. "The whole logistics, e-commerce market was there before the pandemic, but the pandemic accelerated this — it put it on steroids."

The distribution market has been hot in all facets, including lease and sales activity as well as new construction.

During the final three months of 2020 alone, for example, Amazon signed new leases for 403,000 square feet in Cromwell and 184,875 square feet in Wallingford, according to commercial real estate investment firm CBRE. The e-commerce giant, which leases millions of square feet in Connecticut, also recently announced it was opening a 104,000-square-foot logistics facility in Glastonbury in a former Nabisco warehouse.

And construction continues on its new $200 million, 3.6 million-square-foot facility in Windsor on Kennedy Road.

EXHIBIT J

Warehouse workers at Veritiv Corp.'s Enfield distribution center transport and stack inventory.

Plenty of other companies are in on the action as well, including Massachusetts-based dairy supplier Agri-Mark, which is opening a 500,000-square-foot distribution facility in Enfield.

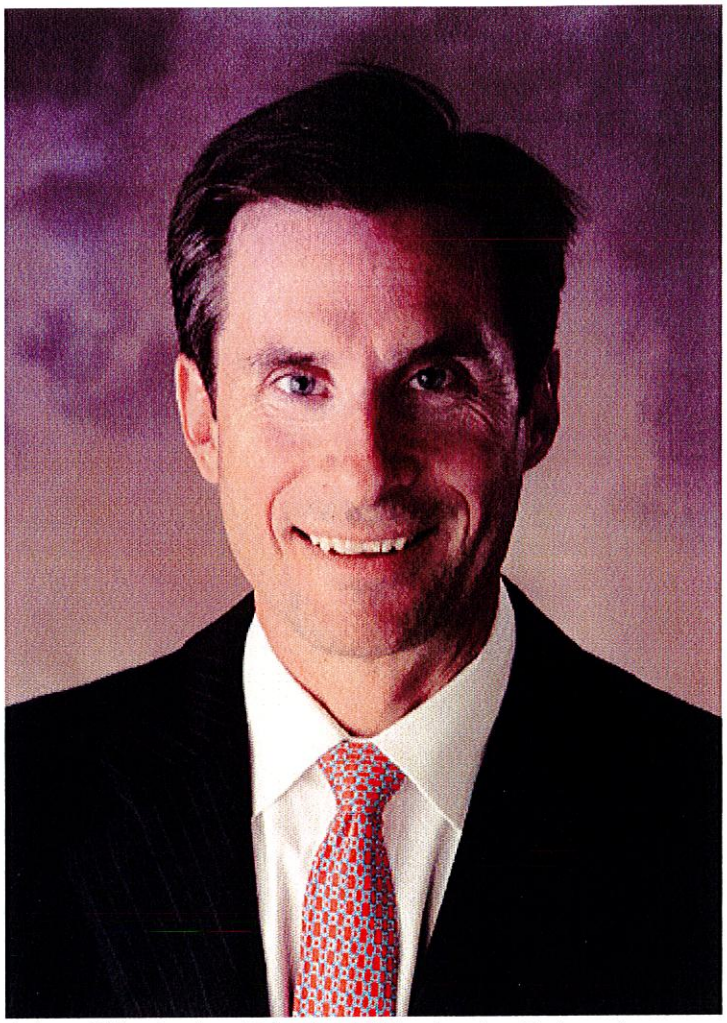
Distribution properties have also seen some of the biggest Greater Hartford commercial real estate sales of 2021. For example, New York-based real estate investment firm Metropolitan Realty Associates in February purchased a massive FedEx distribution center in South Windsor for $50 million.

And all eyes are on a 300-acre plot of land adjacent to Rentschler Field and Pratt & Whitney's East Hartford headquarters that has been listed for sale as a potential logistics hub.

Meantime, rents for industrial space in the Northeast rose significantly in the first quarter of 2021, with tenants paying 60 cents per-square-foot higher than the previous quarter, CBRE reported.

The upward trend in distribution and logistics space isn't brand new, but has become more visible, said Adam Winstanley, co-principal of Massachusetts-based Winstanley Enterprises, which owns 8 million square feet of distribution and logistics space in Connecticut, including the Enfield Veritiv facility.

EXHIBIT J



Adam Winstanley, Principal, Winstanley Enterprises

"It's been going on since 2015, but it's only getting on peoples' radar screens in the last 24 months with the pandemic and the growth in e-commerce," Winstanley said.

Additionally, Amazon offering two-day or less deliveries has increased online shoppers' expectations, Winstanley said. For the last four decades companies delivering to customers in the Northeast primarily worked out of distribution centers in Pennsylvania and parts of New Jersey, Winstanley said. To meet customers' increasing desires for quick delivery, these businesses are leasing space in Connecticut and Massachusetts to reduce travel time.

Duclos pointed out that more people are also ordering groceries online, and companies are responding to that with projects like the 12-story, 250,000-square-foot Stop & Shop frozen foods warehouse under construction in Plainville.

Stop & Shop's parent company, Ahold Delhaize, also signed a 975,000-square-foot lease last year at a sprawling Manchester warehouse — known as the Winstanley Logistics Hub at 1339 Tolland Turnpike — as part of a $480-million investment to broaden its supply chain into a fully-integrated, self-distribution model.

High bays

As customers' expectations for quick delivery have risen, companies renting distribution space have new needs, Duclos said. For example, buildings charging the highest rents need more and taller delivery bays and enough space outside to facilitate multiple trucks arriving and leaving at the same time.

Prospective tenants are looking for ceiling heights between 32 and 40 feet, higher than in the past, he said.

"That's what we're generally seeing; [demand for] higher bays, deeper buildings, and much more loading capacity," Duclos said.

Ceilings at the forthcoming Agri-Mark facility, which Winstanley Enterprises is building, will be 33 feet high, Winstanley said. It will also have a loading dock area with no columns, LED lighting and electric vehicle chargers, Winstanley said.

But even though the market is hot now, Winstanley said he predicts demand will peter out over the next three years.

"Companies ... are building out their [distribution] networks, and once those networks are built out, the opportunities are going to start to sunset," Winstanley said. "They're just not going to have a need for more space."

For the time being, though, demand for distribution property is in full swing, as is work within the occupied buildings.

Warehouse to doorstep

To get a package from a warehouse to a customer's front door or office, requires many steps and a well-organized logistics operation often intertwined with technology, and sometimes even robots and artificial intelligence.

When an inventory order arrives at the Enfield Veritiv facility, warehouse employee Bill Scagliarini scans a barcode to see what's supposed to be included. After he verifies all the toilet paper, cardboard boxes, cleaning chemicals and whatever else Veritiv ordered is there, Scagliarini uses his scanner gun to enter everything into the inventory database, and create a "license plate" barcode.

Later on, John Cultrera drives up on a forklift and scans the license plate, which tells him what products are on the pallets, and where they should be stored. Fast-selling products go in the front, slower items toward the back.

During the night shift other workers prepare orders that get shipped to Veritiv's customers by placing outgoing products by specific loading bays. Barcodes in the staging areas identify where products should be placed and where pickers can find them.

"We're running 24 hours a day," said Veritiv Operations Manager Scott High.

EXHIBIT J

FEASIBILITY OF WAREHOUSE DRONE ADOPTION AND IMPLEMENTATION

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Please see pages 10 + 13 page 1 this page

Companik, Edward, Michael J. Gravier, and M. Theodore Farris II (2018), "Feasibility of Warehouse Drone Adoption and Implementation," *Journal of Transportation Management* 28(2), 33-50.

ABSTRACT

While aerial delivery drones capture headlines, the pace of adoption of drones in warehouses has shown the greatest acceleration. Warehousing constitutes 30% of the cost of logistics in the US. The rise of e-commerce, greater customer service demands of retail stores, and a shortage of skilled labor have intensified competition for efficient warehouse operations. This takes place during an era of shortening technology life cycles. This paper integrates several theoretical perspectives on technology diffusion and adoption to propose a framework to inform supply chain decision-makers on when to invest in new robotics technology.

INTRODUCTION

Unmanned drones have been described as "on the verge of blowing a big hole in the supply-chain" (Bamburry, 2015) - an assertion supported by a predicted global market of $22.15 billion by 2022 representing a compounded annual growth rate (CAGR) of 20.7% from 2015 to 2022 (Stratistics, 2016). The military and consumer markets drove much early growth, and recent commercial usage has ballooned from 102,600 units in 2016 to a projected 805,000 units in 2021, representing a five-year CAGR of 51% (Meola, 2017).

Defined as "robot vehicles" that are remotely or unmanned piloted, tethered, or autonomous (Rys, 2016), aerial unmanned drones captured headlines after Amazon made the first unmanned aerial vehicle delivery to a customer in England on December 7, 2016 (Bort, 2017). Regulatory challenges have slowed unmanned aerial drone use in open skies for delivery by companies including Amazon and Domino's Pizza. At the same time the pace of adoption in warehouse drones has accelerated, conducting infrastructure monitoring and inventory management using bar codes, QR codes, and RFID in combination with industrial Internet of Things technologies, and wheeled unmanned drones working both autonomously and in tandem with humans to pick-and-pull (Appelbaum and Nehmer, 2017). Preliminary results suggest paradigm-shifting improvements for inventory management, with Wal-Mart reporting that unmanned warehouse drones cut the warehouse inventory count process from 30 days using manual processes to one day (Bose, 2017), and Amazon's 2012 acquisition of robotics powerhouse Kiva for $775 million is cited as the cornerstone to its ability to provide even more efficient and effective next-day and two-day shipping (Kim, 2016; Nichols, 2016).

The process of adoption of technology has resulted in a media cycle of exaggerating the promise of a new technology in the short-run while underestimating its importance over the long run—dubbed the "hype cycle" by Gartner and more generally known as Amara's law (*PC Magazine*, n.d.)—renders suspect most of the prognostications in mainstream media. Given the importance of warehousing in global supply chains (Frazelle, 2002a) and that warehousing constitutes 30% of the cost of logistics in the US (AT Kearney, 2016), the time is right for a reasoned inquiry regarding the factors that supply chain decision-makers should use to decide when to invest in the new robotics technology.

This paper compares models of technology diffusion in order to develop a hybrid model that combines the insights of several empirically supported perspectives. Warehouse operations are reviewed for the purpose of applying this knowledge to the domain of warehouse drone robots. Next, the thoughts of several supply chain professionals are presented based upon exploratory conversations, followed by a brief conclusion regarding the applicability of technology diffusion models and the hype versus reality of warehouse drone robots in the near future.

Drone Technology

The term "drone" may include a number of different characteristics. In general, "drone technology" involves using unmanned robotic vehicles. There is a tendency to immediately conclude drone technology only involves the multi-rotor or quadcopter aerial devices touted by firms such as Amazon (unmanned aerial vehicles or UAV); however, drone technology may also involve (Drone, n.d.):

- unmanned aerial vehicles (UAV) including multirotor or quadcopter which is a type of unmanned aerial vehicle
- unmanned combat aerial vehicle (UCAV)
- unmanned spacecraft both remote controlled ("unmanned space mission") and autonomous ("robotic spacecraft" or "space probes")
- Unmanned ground vehicles (UGV) such as autonomous self-driving automobiles
- Unmanned surface vehicle (USV) for operation on the surface of water
- Autonomous underwater vehicles (AUV) or unmanned undersea vehicles (UUV) for operation underwater

For this paper, we investigated wheeled unmanned ground vehicles (UGV) utilized for warehouse operations and specify them as "warehouse drones". These include driverless trucks, aerial delivery drones, wheeled, warehouse drones, and warehouse robots.

Technology Diffusion Models

There are several models of technology diffusion, for example, "product life cycle management (PLC)" dominates in marketing, the technology acceptance model (TAM) developed in information technology research, and the spiral life cycle (SLC) model developed to manage risks in software development. Since unmanned warehouse drones represent a unique combination of mainstream product, information technology systems, and software, each model is compared, with insights distilled into a new "spiral cost implementation model."

Product Life Cycle Model

The product life cycle management model was originally developed by Everett Rogers (1962), a communications professor who defined diffusion as the process by which an innovation is communicated over time among the members of a social system through certain channels, with system saturation modeled using a logistic curve (Figure 1). Theodore Levitt (1965) brought the PLC into the mainstream for general business use by matching each stage of diffusion with marketing and product management advice. Subsequently, Frank Bass (1969) published the most widely used forecasting model that describes the PLC mathematically based upon the coefficients of innovation and imitation.

Insert Figure 1 About Here

Based upon the rapid growth in market demand of 20-50% (Stratistics, 2016; Meola, 2017), unmanned warehouse drone demand demonstrates the inflection point that transitions from the "introduction" to the "growth" stage of the PLC. The PLC provides some basis for distinguishing customer segments based on their adoption process—they either adopt based on written communications such as technical reports, or they await word of mouth regarding the product or technology's promise. Disadvantages of the PLC are its simplification and aggregation of the complex processes of innovation, diffusion, and adoption—the PLC looks strictly at the aggregate adoption behavior for a new product or technology, and does not incorporate considerations such as technical capabilities, costs, or risks. The next model, the Technology Acceptance Model, incorporates some of these factors.

Technology Acceptance Model

The Technology Acceptance Model (TAM) was originally developed by Fred Davis (1989) as an extension of the theory of reasoned action (Fishbein and Ajzen, 1975; Ajzen and Fishbein, 1980). TAM's advantage to managers considering adopting warehouse drone technology is that it is the most empirically applied and validated model of users' acceptance and usage of technology (Venkatesh and Davis, 2000; Marangunić and Granić, 2015), incorporating the external variables of perceived usefulness and ease of use to explain the adoption process. These variables provide insights into the drivers for humans to adopt a new technology or product, with greater levels of perceived usefulness and ease of use predicting a greater probability of technology acceptance.

TAM offers the advantage of using easily measurable characteristics to predict the likelihood of adoption at the level of the individual user. The model's measurement instruments have been

widely validated (e.g., Adams, et al., 1992) and extended to include additional social and cognitive factors (Venkatesh and Davis, 2000). TAM's disadvantages include failure to consider cost and structural factors that obligate or prevent technology adoption (Lunceford, 2009), and the potential lack of meaning for an individual technology user trying to assess "perceived usefulness" due to its broad and dynamic nature. These disadvantages both diminish the applicability of TAM in the warehouse environment which is cost-sensitive, demonstrate fixed structural factors (at least in the short run), and the issue of deciphering usefulness of a new technology that may require several iterations to optimize. Both of these disadvantages may be addressed using the spiral life cycle model proposed next.

Insert Figure 2 Here

Spiral Life Cycle Model

Supply chain managers considering drone adoption often consider the risk and cost involved. Barry Boehm (1986, 1988) originally developed the spiral life cycle model for defense software development in order to shift project decisions from a coding or document-driven process to a risk-driven approach. In the words of Boehm (2000), the spiral model is a "process model generator" because its output prescribes the appropriate process for managing a project based upon a four-step iterative process that incorporates risk assessment and cost (see Figure 3).

Insert Figure 3 About Here

The spiral life cycle model starts in the middle of the diagram with the four basic activities performed during every cycle: determining objectives (planning), followed by identifying and resolving risks (risk analysis), development and testing (engineering), and planning the next iteration (evaluation). At the very beginning of the model, the concept of operations, the concept of requirement, and the operations plan are developed. Cost accumulates as iterations or

prototypes are produced, and the spiral model advises how to minimize the level of risk by scaling the level of effort and degree of details. The spiral life cycle model incorporates other extant process models such as incremental, waterfall, and prototyping as special cases depending on the risk patterns of certain projects (Boehm, 2000).

The spiral life cycle model offers advantages for minimizing risk, especially for large projects, and for managing and controlling documentation and approval processes; these features make the model conducive to development of new product lines rather than implementation of a new supply chain operational technology. The model may be costly to implement and not very suitable for small projects, such as implementing drones in a single warehouse. Additionally, while the spiral life cycle determines a project process and incorporates cost, it depends heavily upon identifying risks, which may vary widely depending upon the project. A framework that specifically incorporates supply chain and unmanned warehouse drone risk factors would prove advantageous for managers and researchers assessing incorporation of unmanned warehouse drone, robots, and related digital economy advances.

Spiral Cost Implementation Model (SCIM)

The spiral cost implementation model (SCIM) represents a hybrid framework that combines the previous models in order to encompass their salient positive aspects while compensating for reduced parsimony by reducing the negative aspects. The framework modifies the spiral life cycle model by focusing on costs at every stage and repeating the evaluation stages. The model assumes adoption of an existing technology available on the market, which is an important difference from the spiral life cycle model that focuses on innovating a new product or

technology, and renders the model particularly appropriate for the warehouse drone adoption decision.

Insert Figure 4 About Here

The SCIM framework incorporates a constant review phase in response to the intensely dynamic technology and regulatory environments. A cost review at every stage of the model reflects the rapid changes and the shift of purpose from developing new product lines to on-going supply chain operations. As a visual enhancement, the spiral grows larger or smaller based on the cost in each phase. SCIM incorporates the TAM's perceived usefulness into the planning and evaluation stages. The model loses in its application to creating a new technology, but gains from greater depth of analysis when adopting a new offering available on the open market—a circumstance currently confronted by warehouse managers considering drone adoption.

THE WAREHOUSING ENVIRONMENT

Warehousing represents close to 30% of US supply chain costs (AT Kearney, 2016), with 55% or more resulting from order picking costs which would respond readily to automation (van den Berg and Zijm, 1999; De Koster, et al., 2007). [Warehouse] drone implementation should address current inefficiencies in warehousing most amenable to automation including inventory accuracy, inventory locating, space utilization, redundant processes, and picking optimization (Garcia, 2013; van den Berg and Zijm, 1999). The key drivers for modern warehouse management is the reduction of inventory due to heightened financial risks, shorter response times, and increased productivity (van den Berg and Zijm, 1999).

Warehousing increasingly relies upon "smart" technologies that incorporate information tracking technologies such as bar coding, electronic data interchange (EDI), and radio frequency identification (RFID) into data processing systems designed to aid decision-making (Autry, et al., 2005)—unmanned warehouse drones represent the logical extension that integrates the virtual information processes with the physical warehouse processes.

The rate of growth of industrial robots provides evidence of this integration. Overall world supply of industrial robots hit an annual record increase for the fourth year in a row in 2016, and increased 84% from 2011 to 2016 compared to the 2005 to 2008 timeframe (IFR World Robotics, 2017). The world population of industrial robots is projected to increase from 1.8 million in 2016 to over 3 million by 2020. Industry reports predict warehouse robotics compound annual growth rate varies from 7.6% through 2024 (Goldstein Research, 2017) up to 11.5% through 2021 (Mordor Intelligence, 2017) and 11.6% through 2023 (Dasyam, 2017). Warehouse robotics has gone from novelty to mainstream for larger companies seeking competitive advantage in an era of labor shortages and highly demanding customers (Futch, 2017).

Practical considerations mean that warehousing offers a particularly compelling application for unmanned warehouse drones compared to oft-hyped direct-to-customer delivery drones. The co-founder of Kiva—the warehouse drone company acquired by Amazon in 2012—identified three major challenges that will delay use of unmanned warehouse drones for direct-to-customer delivery that will take several technology iterations to overcome: vehicle design, localization and navigation, and vehicle coordination (D'Andrea, 2014). Once the technological challenges are overcome, issues such as public reactions, privacy concerns, and government regulation will

offer further challenges. Warehouses provide protected and controlled environments that obviate these concerns, and the future of direct-to-customer delivery drones may be extensions of warehouse drones. The SCIM model implies that as market offerings of drone technology continue to evolve, they should diminish the risk of direct-to-customer deliveries while simultaneously reducing the cost per delivery until such a point that the cost and risk become acceptable.

Unmanned warehouse drones may greatly improve warehouse operations. As previously noted, warehouse drones may be aerial or wheeled. For difficult to reach places unmanned aerial warehouse drones facilitate inventory management using bar codes, QR codes, and RFID in combination with industrial focused Internet of Things technologies, and wheeled unmanned warehouse drones work both autonomously and in tandem with humans to pick-and-pull, with Wal-Mart reporting that the switch from manual to warehouse drone-based processes cut warehouse inventory time from 30 days to one day (Bose, 2017). Warehouse operators have relatively low profit margins (3-6%), which impedes their ability to invest in technological capital, a fact which accentuates competitive advantage for those who do (AT Kearney, 2016).

Unmanned aerial warehouse drones perform tasks other than moving product. The cost of inventory auditing with aerial warehouse drones is approximately half the annual cost of a live employee and eliminates most of the need for humans to climb warehouse racks and perform other dangerous work (Appelbaum and Nehmer, 2017; PwC, 2016). Amazon has already reduced "click to ship" time from 60-75 minutes with a human to 15 minutes with warehouse drones; additionally, Amazon's drone enabled warehouses carry 50% more inventory per square

foot and have 20% lower operating costs, a savings of $22 million per warehouse for 13 warehouses so far (Bhattacharya, 2016). Other companies report costs as low as 10 cents per order for automated picking versus 80 cents for the typical order pick (Banker, 2017). Incorporating low-light, infrared, and other capabilities these unmanned warehouse drones may often observe more with high resolution video or still cameras, useful for temperature controlled items, monitoring vermin, seeing items in dark corners, and identifying signs of leaking roofs or faulty wiring. Unmanned aerial warehouse drones may also provide auditability details such as geo-locational, RFID, and other sensor data. Unmanned aerial warehouse drones may reinforce the auditability of other inputs, such as verifying that RFID tags are attached to the correct product; overlapping of technologies may provide hitherto unachievable inventory accuracy on an hour-by-hour basis.

Warehouse drones hold the promise of taking inventory and facility management to greater heights of efficiency and effectiveness. As one example, in collaboration with two important research sponsors, MIT believes that warehouse drone technology could have saved $3 billion in lost revenue for Walmart, and prevented the US Army from losing track of $5.8 billion in assets (Hardesty, 2017). Determining where warehouse drones may best contribute requires first enumerating the types, activities, and functionalities of warehouses.

Types, Activities, and Functionalities of Warehouses

Warehouses fall into three categories (van den Berg and Zijm, 1999). A *distribution warehouse* collects and sometimes assembles products from different suppliers for subsequent customer delivery. A *production warehouse* localizes in a production facility and stores raw materials,

semi-finished products, and finished products in a production facility. A *contract warehouse* discharges the warehousing operation on behalf of one or more customers.

All types of warehouses conduct four primary functional activities (Coyle, et al., 2017):

- Accumulation: receipt of goods from a variety of locations
- Sortation: assembling like products for storage or transfer to customers
- Allocation: matching available inventory to customer orders (break-bulk)
- Assortment: product mixing capability

Picking constitutes in excess of 60% of warehousing costs and represents the greatest opportunity for unmanned warehouse drones to generate efficiencies (van den Berg and Zijm, 1999; De Koster, et al., 2007).

Locus Robotics is an example of how a modern unmanned warehouse drone can work side-by-side with humans, doing most of the 12-16 miles per day that warehouse workers walk but still requiring humans to pick and place products on the robot's tray (Garfield, 2016). Locus Robotics forecasts up to 800% productivity improvements since the robots move faster than humans, can work 24 hours straight, and take no breaks; freeing humans to provide a personal touch to the shipments that are craved by consumers of e-commerce parcel goods, such as personalized notes or fancy wrapping paper.

Optimizing Warehouse Flows for Unmanned Drones

Warehouse layouts generally fall into two styles (Figure 5), the U-flow and the through-flow (Frazelle, 2002b). The U-flow design locates fast moving products on the inner side of a U-

shaped flow so that product moves less distance at all stages of warehouse operations. This improves use of dock resources since inbound and outbound occur on the same or proximate docks, improves efficient lift truck utilization since fast-moving product is located close to the docks, and improves security since entry and exit occupy the same side of the building.

Insert Figure 5 About Here

Through-flow warehouses move all product in a straight line from one side of the building to the opposite, locating fast-moving items along the center aisle of the warehouse and slower items along the walls of the warehouse (Frazelle, 2002b). This layout requires all product to move the length of the building and is less flexible. It provides advantages for avoiding confusion regarding product flowing in and out, and when different material handling equipment is used for in-flows vs. out-flows. Factory warehouses often use the flow-through layout.

The interest in warehouse drones by companies like Wal-Mart and Amazon focuses on leveraging drone strengths primarily to maintain inventory accuracy and to shorten response times for picking in response to consumer orders—an environment conducive to U-flow warehouse layouts. In addition to greater speed of picking, warehouse drones reduce losses to shrinkage—especially relevant for high value finished goods—and the U-flow layout results in shorter trips to recharging stations, a critical consideration with current battery technology (D'Andrea, 2014). Other factors that suggest that consumer finished goods warehouse drones will initially establish themselves in U-flow warehouses are based on the assumption that U-flow warehouses are more likely to be the design of choice for finished consumer goods, the potential to standardize packaging for consumer goods, improved product identification (barcodes,

RFID), and the greater value (and profitability) of finished goods to pay for the early investments in technology.

Through-flow warehouses are often attached to production facilities, and the product more often changes shape and form, which presents a challenge for warehouse drone technology for the near future. Cross-dock facilities represent the application of the through-flow layout to finished goods—the bulk nature of the entering goods diminishes the productivity advantage for warehouse drones vs. human labor. Other challenges to the current state of warehouse drone technology include the ability to move increased product weight and travel further, factors which increase time spent at charging stations. Warehouse drone technology exists with the potential to facilitate through-flow work such as the Automated Ground Vehicles described in the next section, yet it does not demonstrate the rapid growth of smaller, lighter warehouse drones, and additionally appears in U-flow warehouses.

Best Approach for Warehousing with Unmanned Warehouse Drones

Warehousing is a labor-intensive industry, and has become even more so with the strong growth of e-commerce which requires picking more "eaches", or single units of product, in response to consumer order size. This trend has driven part of the 53% increase of warehouse employment from 622,000 in January 2017 to 950,000 in July 2017[1], and has increased wages for warehouse workers 6% in the past year (Smith, 2017) E-commerce warehouses tend to locate near population centers, and offer a better value proposition than retail, an even more labor-intensive

[1] US Bureau of Labor Statistics, https://www.bls.gov/iag/tgs/iag493.htm#workforce

industry (Gebeloff and Russell, 2017), even when e-commerce related warehouse jobs command a 26% premium over traditional retail jobs (Mandel, 2017).

Warehouses have also increasingly adopted automation, with one consultant citing an increase from eight in ten clients having some level of warehouse automation (Smith, 2017). The primary automation designed to expedite high volumes of small, multi-line orders (Banker, 2017) are automated guided vehicles (AGV's)that perform goods-to-person (also known as goods-to-picker). In this role, AGV's include robot auxiliaries that take over material transport from human pickers. Large AGV's can move bulk and palletized goods—such as forklifts that work either autonomously or in conjunction with a human—but most act as shuttles between human pickers and packing lines; the latter type of warehouse drone shows particular promise since it does not require modifications to warehouse layouts, comes with essentially turnkey installation, and all types of AGV's save human repetitive labor and movement (Appelbaum and Nehmer, 2017), thus increasing performance and safety simultaneously. As previously noted, AGV's improve efficiencies primarily at retrieving from storage and as an expeditor for human labor, and increasingly share data amongst themselves and with other IT systems such as warehouse management systems, with pick costs going from 80 cents to 10 cents per pick after automation (Banker, 2017) and order pick times going from 60-75 minutes to 15 minutes (Bhattacharya, 2016).

Goods-to-picker, also known as goods-to-person, automate warehouses by bringing goods to humans to pick. Kiva is the goods-to-picker warehouse drone used by Amazon that resembles an automated warehouse drone vacuum (e.g., a Roomba) that goes beneath a set of shelves, lifts it,

and brings it to the human picker. Industry leaders indicate expect to adopt commercially viable unmanned warehouse drones in about a year (Baskin, 2017).

The current generation of unmanned warehouse drones performs material transport, acting as a shuttle between humans who pick and pack the goods. The greatest impact of implementing warehouse robotics remains the ability to perform the human tasks of identifying product on the shelf, picking product in non-standardized packaging, and understanding the human context of the goods in order to properly package it for presentation to a human customer. Amazon launched a $250,000 competition, now in its third year to develop a robot that can perform the human portion of order picking reliably; commercial application could occur as soon as next year (Baskin, 2017), albeit the competition focuses on stationary robots and does not require unmanned warehouse drones.

Primary uses for unmanned warehouse drones include inventory audit, infrastructure and security surveillance. Warehousing competitive advantage relies strongly upon data integration in real time, a capability that unmanned warehouse drone use reinforces (Gresham, 2017; Waller and Fawcett, 2013), yet picking represents the greatest need for labor savings. Commercially available unmanned warehouse drones may lift up to 10 kilograms (22 lbs.). (Dronelli, 2017), perfect for e-commerce, and the incentive for labor savings which should drive robotic picking technology to unmanned warehouse drones. Unmanned warehouse drones promise productivity improvements, do not require breaks, improve accuracy, maximize use of 3D space utilization, and alleviate injury, repetitive task, and other worker quality of life issues related to what the warehousing industry calls the 3D's category: dirty, dangerous, and difficult (Fiveash, 2016).

Exploratory research suggest that executives may be unaware of the impact of unmanned warehouse drone technology even over the next few years as discussed in the next section.

Motives for Intransigence

Despite the advantages of warehouse drones and robotics, certain issues create intransigence when it comes to adopting the new technology. Positive leadership support represents the single most important factor for bringing a knowledge or data-related initiative successfully to fruition (Patil and Kant, 2014). While 75% of executives assert the importance of digital transformation across the supply chain, 48% still use non-digital (phone, fax, email) communications; only 15% can access the majority of needed data from trading partners, and 23% have the ability to analyze the data to make better supply chain decisions (Dougados and Felgendreher, 2016). When the same group of 337 executives from across multiple industries were asked to forecast five years into the future, 68% expected that data from across the majority of trading partners in the supply chain will be available to be analyzed and 54% expect to have access to the majority of needed data from their trading partners—indicating that technology is expected to advance rapidly throughout supply chains.

While supply chain executives exhibit knowledge and optimism about information supply chains, the literature suggests that they have relatively little knowledge or optimism about the physical supply chain. The traditional view of the supply chain looks at the information, financials, and product moving in essentially a straight line; but increasingly, supply chains may be divided into support supply chains—those nodes through which the physical product does not flow but which support the physical movement—and the physical supply chain, which

encompasses the traditional view of the product accompanied by its information and financials (Carter, et al., 2015).

EXECUTIVE'S STATE OF AWARENESS ON DRONE TECHNOLOGY

In order to confirm the state of awareness of unmanned warehouse drone technology, we present the results of conversations with three executives from three industries about their knowledge of current unmanned warehouse drone use and their thoughts regarding the future of unmanned warehouse drone use. While the executives appear optimistic about the support supply chain that falls largely outside of their direct control, the conversations suggest that executives are much less informed and optimistic about the future technology that impacts the physical supply chain more directly under their control. Given the importance of supply chain velocity and order accuracy—physical and informational—to supply chain integration and competitive advantage (Handfield and Linton, 2017; Hofman, 2004), as well as the quick resolution and mitigation of supply chain disruptions (Craighead, et al., 2007), more work should address the information gap among decision-makers regarding digital technologies such as unmanned warehouse drones and 3D printing that will have an impact on the physical supply chains of the future. The results from our conversations suggest that supply chain decision-makers appreciate the potential of information technology yet remain staunchly traditional in their views of the physical aspects of supply chain technology. Questions and responses appear in the appendix.

Regional Wholesale Club

The vice president of transportation for a regional wholesale club with operations in 15 states is responsible for improving operational efficiencies by automating transportation tasks and optimizing the planning of shipments. The transportation function efficiency depends upon accurate inventory information and tracking movement of goods at distribution centers throughout the shipping process. This executive expressed an appreciation for the ability of unmanned warehouse drones to conduct inventory audits, monitor for security breaches, and trailer pool validation in the distribution center environment.

With regard to the company's greatest warehouse operational bottlenecks, he cited four areas. First, the "put to club" case or tier breakdown consumes much more time than the full pallet cross-dock process. Second, peak volume times see congestion in the building and yard. Third, certain specialized processes require holding inventory at the distribution center rather than sending immediately to the store, which slows velocity. One example is holding candy during the warm months to be processed one day per week in temperature-controlled trailers. Fourth, sorting through non-merchandise returns such as empty pallets, dunnage, plastic, and water jugs is slow and cumbersome.

The wholesale club enjoys several advantages. One is strong internal inventory controls resulting in inventory shrinkage that is well below the industry average. Another is vendor-owned inventory for most cold goods until they reach the stores. The company has achieved very low inventory in storage at only $50 million out of $1 billion of goods moving through its supply chain (5% of total value of goods moved). Company financials reveal the benefits of this

performance: inventory turns were 10.6 and receivables turnover was 81.1, more than double and quadruple, respectively, for the retail industry overall (CSI Market, 2017). Such a lean supply chain could be improved even further through unmanned warehouse drones in conjunction with RFID tracking in order to monitor the cargo yard in real time. This could improve visibility and real-time decision-making greatly over the current system of periodically walking the yard and make the company's lean supply chain more resilient against disruptions. Improved cost accountability could be an additional benefit since allocating costs of current activities such as the yard walks proves complex; a drone would provide detailed records of its observations, associated inventories and assets, and time spent.

National 3PL

A national account manager at a national 3PL made the connection between unmanned warehouse drones and tracking trailers, yet prefers GPS tracking as a solution. The 3PL is primarily a transportation company focused on trucking that also provides warehousing, logistics, and intermodal services. The company assets include nearly 5,000 trailers and 2,000 power units with low dwell times, which explains the manager's preference for GPS tracking. The company owns multiple facilities near the ports of Baltimore and Norfolk and leases public warehouse space. With many mobile assets and few fixed facilities, this 3PL could benefit less from unmanned warehouse drones, although unmanned warehouse drones could provide trailer tracking and security of the existing facilities and yards where the company drops its trailers.

National Supplier of Electronic Hardware Components

The third conversation was with the warehouse manager at a leading national supplier of electronic hardware components. Much of their product fits in either a large box size of 8.5 x 8 x 3.5 inches (21.5 x 20.3 x 8.9 cm) or a small box size of 6.5 x 4 x 3.5 inches (16.5 x10.2 x 8.9 cm). Average pick time by humans is 1 minute 5 seconds, due to small product size, multiple SKU's, and a bar coding system that suffers occasional signal interruptions common to Wi-Fi technology and the slowdowns common to trying to scan barcodes in general,. The package size and light weight of the company's products seem ideal for future unmanned warehouse drones, especially in combination with an upgrade from barcode technology to a more reliable and sophisticated technology such as RFID. The manager demonstrated insightful understanding of unmanned warehouse drone technology with the observation that they would provide a greater pay-off if the warehouse's ceilings were higher.

Interviews Summary

Overall, these conversations suggest that supply chain managers may not understand the potential for operational improvements offered by the current generation of unmanned warehouse drones. A limited understanding of the current benefits and potential of unmanned warehouse drones underscores an even more limited understanding of the future of unmanned warehouse drone technology.

IMPLICATIONS AND FUTURE DIRECTIONS

Warehouse drones represent a fundamental shift in supply chain management in several ways. Operationally, warehouse drones improve warehouse functionality by better utilizing available space, reducing production downtime, reducing labor turnover and downtime, improving health

and safety, increasing warehouse flexibility, and increasing productivity output. These benefits argue in favor of adoption of warehouse drone technology especially as costs continue to diminish as the industry matures.

Substantial research has assessed technology adoption and the rate of technological diffusion, and this research suggests combining extant models to provide more comprehensive guidance for decision-makers to assess cost and timing of technology adoption in order to determine investments in warehouse drone technology. Limited research assesses the specific impacts of robots on economic and productivity outcomes (Muro and Andes, 2015), especially in the supply chain context, making further research in this area vital.

This paper offers several important questions that should be addressed in future research:

1) Future research should confirm early findings that robots have contributed to productivity gains on the scale of the steam engine's effect on late 19th century productivity, the archetypical general purpose technology (Graetz and Michaels, 2015).

2) Assuming these findings regarding general robotics productivity gains find confirmation in subsequent research, they suggest that work needs to be done to explore the perceptions of executives regarding the advantages and disadvantages specific to the context of warehouse drones.

3) Relatedly, future research should measure the financial impact and cost trade-offs of drone technology in the warehouse setting. Financially, drones shift from human labor that constitutes variable costs to fixed investments in capital. Higher fixed costs create an impetus to maximize productivity so as to spread the cost of capital over more units—making warehouse drones apt for the high volume, high-throughput e-commerce distribution center environment.

4) With talent shortages predicted of at least 6 openings to each available laborer (Ruamsook and Craighead, 2014), many distribution center and warehouse managers confronting the supply chain talent shortage may see the opportunity for relief by replacing human workers with drone automation. In this scenario, automation may have two effects, firstly alleviating the challenge of filling technically qualified positions, and secondly freeing up resources so that companies can better afford to train workers for the

work that automation cannot perform. Assuming that countries where more automation prevails actually generate more jobs or at least lose less jobs (Graetz and Michaels, 2015), automation seems unlikely to solve the talent shortage, yet may become the price of entry into an industry competing for efficiencies and workers. More research needs to address the important role of warehouse drones in particular and automation in general in relation to the issue of employment and human resource management.

5) Future research should be conducted and oriented toward understanding the circumstances under which drones and automation could replace or complement human labor. This requires more complete enumeration of the functional roles and physical capabilities of drones. The current state of drone applications focuses on surveillance, inventory management, and picking, with picking reliant on humans to pick up-and-place the inventory while the warehouse drones and robots perform shuttle duties. As noted previously, experts project that in the near future robots will be able to pick most forms of products and seem likely to be able to master the challenging task of identifying and retrieving a single item from a jumbled box (Baskin, 2017). Warehouse automation technology can currently handle approximately 75% of products. Some warehouse tasks continue to pose additional challenges, especially assembly tasks, delicate small items such as produce, and packaging in plastic or partially obscured products, such as garment-on-hangar (Ackerman, 2016). A comprehensive typology of applications would facilitate the advancement of both drone technology and managerial decision-making regarding adopting new automation technology.

6) Strategic managerial and organizational factors related to the rate of adoption of warehouse drone technology, and the timeline for implementing new technologies in supply chain settings should be defined. An indicator of the potential for improvements appears in the Capgemini (2016) report which found that almost half of managers (48%) communicate with supply chain partners primarily through "traditional" technologies like phone, fax and emails rather than internet or cloud-based technologies—the same survey-based work revealed that two-thirds of the same executives expected adoption of major new technologies to integrate their supply chains in the next five years. Managers will need clearer guidance for this new technology and others to follow. Adoption and application of warehouse drones present many additional opportunities for future research.

CONCLUSION

Current unmanned warehouse drone technology offers the potential for significant efficiency gains both for inventory handling and inventory transparency. Unmanned warehouse drones offer strong potential with inventory audits and real-time supply chain visibility. Warehouse drone technology supports supply chain competitive advantage vis-à-vis supply chain integration

and shortened cycle times to support improved customer service levels and supply chain responsiveness. Based upon recent developments in the Amazon warehouse robot competition, the application of unmanned warehouse drones to reduce the greatest warehouse cost—picking—appears to be on the verge of rapid adoption. The Amazon warehouse competition may have generated innovation of robot pickers to commercial application in four years, and it seems reasonable to expect a similar timespan for the technology to incorporate unmanned warehouse drones. As early adopters companies that invest in unmanned warehouse drones will garner operational benefits sooner and be better positioned for the next generation of unmanned warehouse drones.

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