

NEEDHAM PLANNING BOARD
Thursday July 7, 2022
7:00 p.m.

Virtual Meeting using Zoom
Meeting ID: **826-5899-3198**
(Instructions for accessing below)

To view and participate in this virtual meeting on your phone, download the “Zoom Cloud Meetings” app in any app store or at www.zoom.us. At the above date and time, click on “Join a Meeting” and enter the following Meeting ID: **826-5899-3198**

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Direct Link to meeting: <https://us02web.zoom.us/j/82658993198>

1. Minutes.
2. Report from Planning Director and Board members.
3. Public Hearing:

7:15 p.m. Major Project Site Plan Special Permit No. 2022-02: 557 Highland, LLC, an affiliate of The Bulfinch Companies, Inc., 116 Huntington Avenue, Suite 600, Boston, MA, Petitioner. (Property located at 557 Highland Avenue, Needham, Massachusetts). Regarding proposal to redevelop the Property with approximately 496,694 square feet of office, laboratory and research and development uses (see legal notice and application for more details). *Please note: this hearing has been continued from the June 7, 2022 meeting of the Planning Board.*

4. Review of Brewery Zoning for 2022 Special Town Meeting.
5. Correspondence.

(Items for which a specific time has not been assigned may be taken out of order.)

NEEDHAM PLANNING BOARD MINUTES

May 3, 2022

The Needham Planning Board Virtual Meeting using Zoom was remotely called to order by Paul Alpert, Chairman, on Tuesday, May 3, 2022, at 7:15 p.m. with Messrs. Block and Crocker and Mmes. McKnight and Espada, as well as Planning Director, Ms. Newman and Assistant Planner, Ms. Clee.

Mr. Alpert took a roll call attendance of the Board members and staff. He noted this is an open meeting that is being held remotely because of Governor Baker's executive order on March 12, 2020 due to the COVID Virus. All attendees are present by video conference. He reviewed the rules of conduct for zoom meetings. He noted this meeting does include one public hearing and there will be public comment allowed. If any votes are taken at the meeting the vote will be conducted by roll call. All supporting materials, including the agenda, are posted on the town's website.

Public Hearing:

7:20 p.m. – Amendment to Major Project Site Plan Special Permit No. 91-7: Henry Hospitality, Inc. d/b/a The James, 18 Cliftdale Street, Roslindale, MA, Petitioner (Property located at 1027 Great Plain Avenue, Needham, MA). Regarding request to permit up to 69 outdoor seats by the James Pub on 5 on-site parking spaces.

Upon a motion made by Mr. Crocker, and seconded by Mr. Block, it was by a roll call vote of the five members present unanimously:

VOTED: to waive the reading of the public hearing notice.

Stuart Henry, owner of the James Pub, thanked the Board for access to the patio during the pandemic. Mary Kiley, General Manager of the James, was at the meeting with him. He will keep the same footprint and build another platform from the building to access more handicap accessible tables. Mr. Block noted the application says 3 parking spaces. Mr. Henry noted they are currently on 3 parking spaces. There are 2 more by the entrance. Mr. Alpert asked Mr. Henry to work with the Planning Staff to correct the application. He noted the applicant is asking for year-round outdoor dining. He looked at the second license and memorandum of understanding dated 3/11/22. Reading this gives the ability to have year-round and is subject to the agreement. The Board cannot grant year-round but he has no objection. The Board can allow as long as it conforms under the second license and memorandum of understanding. It looks like that is Select Board approval.

Mr. Alpert noted the following correspondence for the record: multiple communications from the Building Commissioner; an email from Fire Chief Dennis Condon noting the Fire is ok with this; an email from Assistant Health Director Tara Gurge with the usual requirements to continue to maintain the exterior in a clean and safe condition and a letter from Town Engineer Thomas Ryder with no objections. The emails from Building Commissioner David Roche questioned the number of seats and bathroom accommodations. Mr. Henry made arrangements to use a third bathroom at the Architrave store. The Building Commissioner then responded that the ability to use the third bathroom is fine and he is satisfied. Mr. Block had a question about the arrangement. The store hours are different, and he asked how the arrangement would work. Mr. Henry stated he rents space in the basement of that building and has 24-hour access to the back door and bathroom right there. Mr. Block is pleased with the bathroom arrangement and congratulated Mr. Henry on the success of his business.

Ms. McKnight noted the entry/exit on the left side and asked if that is the railway walkway. Mr. Henry noted that is on the other side. Mr. Block noted the entry to the restaurant is on the railway right of way. This plan is only outdoor seating. Ms. McKnight stated she agreed with Mr. Alpert's comments. The applicant needs the Select Board's approval for the 5 spaces. Currently the handicap parking space is being used. It is problematic to eliminate a handicap space. She asked where a handicapped person would park. Mr. Henry stated they could park right outside the entry to the restaurant. There are 2 spaces right there. There is no placard yet but he will get one. Mr. Alpert asked if the applicant is ok with a condition the applicant replace the handicap space. Mr. Henry is ok with that. Ms. McKnight asked if a handicap person would be able to enter the restaurant via the outside eating area. Mr. Henry stated yes, the door is 42 inches wide.

Ms. Espada stated she appreciates the site plan. It is helpful to see all accessibility provisions. She asked why there is a 6-inch platform for most of the seating. Mr. Henry noted they were waterlogged most of the first year and people were sitting

in puddles. Ms. Espada noted some seats are on the ramp. The ramp needs handrails. Mr. Crocker stated he has done a fantastic job. Mr. Block noted there are 2 parking plans. One has the proposed dumpster location. He noted there is a yellow section around 4 spaces and it shows bollards. The plan does not show the structure of where the restaurant is. He assumes it is behind that. Ms. Newman noted those parking spaces are the ones the Town has approved for use for the dumpster and now they want outdoor seating. The spaces in yellow are privately owned. Mr. Alpert stated the spaces are privately owned but need Town approval due to the agreement with the Town. It sounds like the Town can grant the request but pull it back anytime if they need the spaces.

Ms. McKnight noted the license agreement is dated in 2022. This is extending the 2015 license. She asked if there was any discussion with the Select Board when the license was approved regarding outdoor seating. Mr. Alpert stated it was covered in the agreement allowing outdoor dining. It contemplates outdoor dining. Ms. Newman noted the original agreement did not contemplate outdoor dining. It ran for 5 years and when it was renewed it added language for seasonal outdoor dining. Year-round seating would not be in violation of the agreement subject to Select Board approval.

Mr. Crocker asked about snow removal and what is happening with that. Mr. Henry noted all the restaurants, Needham Center Fine Wine and Citizens Bank all take care of the snow removal. They are responsible for that part of the lot as it is private. Citizens has people that do snow removal and take it away. The rest of the snow is pushed against the patio wall.

Upon a motion made by Mr. Crocker, and seconded by Ms. McKnight, it was by a roll call vote of the five members present unanimously:

VOTED: to close the hearing.

Ms. Newman will prepare an affirmative decision with prior comments and the discussion from tonight for the next meeting.

Appointment:

7:50 p.m. – Minor Project Review: Town of Needham, 500 Dedham Avenue, Needham, MA, Petitioner (Property located at 1330 Highland Avenue, Needham, MA).

Ms. Newman noted this is a minor project review. It does not hit the trigger for a major project review. The Planning Board provides comments to the Design Review Board (DRB). They do not issue a decision but recommendations. Hank Haff, Director of Building Design and Construction for the town, noted this is a complete gut renovation for continued use of the office for the school administration. The building was built in 1898 as a high school and is 124 years old. Construction was 24 years old before the first draft of the Zoning By-Laws. In 1947 the building was converted to administration and in 1986 it was placed on the Registry of Historic Places. The Historical Society is supportive of the renovation. There will be CPC funding approved and the hope is Town Meeting will approve it. The renovation is almost entirely enclosed within the building. Several waivers are being requested. This was discussed with the DRB on 4/25/22 and the architect is reviewing those. He noted the DRB is generally supportive of the project.

Town Counsel Christopher Heep reviewed the waivers. In Section 5.1.1.2, amount of parking, the requirement is 89 parking spaces, and they are proposing 62 spaces. The current building would require 85 spaces under the By-Law but there are only 65 spaces on site. This is a net reduction of 3 spaces. The site has performed well over the years. In Section 5.1.1.3 (j), setback to parking, there is 10 feet required and there is only 4 feet in some places at the rear of the site along Oakland Avenue. In Section 5.1.1.3 (k), landscaping, the By-Law requires 10% and 25% interior. There is 13.4% landscaping but only 8.4% internal. In Section 5.1.1.3 (m), parking location within 300 feet of the site, he noted there may be instances where parking may need to be off-site. He acknowledges this. He noted there are 3 existing non-conformities. The side yard setback for the portico is 11.3 feet from the side yard lot line. That portico is not changing but 15 feet is the setback requirement. The maximum height is 3 stories and 40 feet but the existing is 4 levels and 60 feet.

Mr. Alpert asked what the building to the west is. Mr. Haff noted, technically, it is south and adjacent to St. Joseph's. Ms. McKnight noted immediately there is the former convent that is used as a school. Then next to that is the church itself. Mr. Heep stated none of the existing non-conformities are being extended in any substantial way. Ms. McKnight stated, with the waiver with regards to parking, she is supportive of granting a waiver to reduce to 62 spaces. She does not understand the need for any special conditions if the waiver is granted. She is opposed to parking at Stephen Palmer and does not see

the need for a waiver of over 300 feet from the site. Mr. Haff stated the applicant applied for more relief than needed. The list was worked up with the Building Commissioner so he would not like to drop the request.

Mr. Alpert noted the waiver to allow for additional parking more than 300 feet from the building. He asked, if granted, would the applicant need to come back if that changes. Mr. Heep does not think there is any question of their contracting with any business owners. This is for municipal lots within 300 feet of the building. Mr. Haff analyzed the number of spaces within 300 feet of the building. This is the experience for decades with the existing user. Town Meeting requested the applicant not constrain the Stephen Palmer site, which is more than 300 feet from the site. Ms. Newman agrees with Ms. McKnight it does not need a waiver. The relief under Section (m) is not required. Mr. Heep stated if the Planning Board wants to include it with a recommendation to the Zoning Board of Appeals (ZBA) the relief is not needed he is ok with that.

Mr. Crocker stated he does not understand why they are looking for a waiver when it is not needed. There is parking on site and other parking nearby. Mr. Block stated, when it was a larger project, there was a discussion regarding using Stephen Palmer as a site, but the project has since been reduced. He asked if the ZBA should add a requirement no employees or visitors shall park on Oakland or Pickering north of May Street as that is resident parking only. For big meetings, were they thinking of parking on Pickering and north of May Street? Mr. Haff stated all spaces were counted as available parking. He noted people park in the school lot for church and funerals. It has functioned like this for years. The teachers can park in 2- or 3-hour spots. It is all public parking around there. Mr. Block was not aware it was public parking.

Mr. Alpert clarified people can park on public streets. Mr. Block commented he was concerned with 100 cars pulling out. Mr. Crocker noted the Town has a responsibility when they have a large gathering to encourage car-pooling. Ms. McKnight agrees with Ms. Newman. A condition that allows for parking further than 300 feet is appropriate only when the site is owned or leased by the applicant, and it is determined the applicant needs the parking. Any condition about 300 feet is not necessary. Ms. Espada agrees. She does not see the need.

Joel Bargmann, of Bargmann Hendrie & Archetype, Inc., reviewed the project. The old entry is being changed by infilling it to prevent confusion with the new entrance. The DRB suggested a planter and recess the window a bit. It is not practical to put the old clock in but it has been preserved off site. There is a roof top enclosure to hold the mechanics. The major change is they are down 3 parking spaces. The entire asphalt in front of the school is being removed and only 3 handicap spaces will remain at the left portico. It was suggested they use some bushes to hide the spaces from Highland Avenue. There is a small addition for trash and a loading dock. All the floors are at a split level, so you need a loading dock.

Mr. Bargmann stated the existing entry is being maintained due to an easement access for the residential abutters. The DRB suggested panelizing the roof top enclosure or putting a cornice to provide more detail and make the enclosure smaller. They will put a planter to infill the old entry. It is difficult to see the elevator overrun and mechanical systems from Highland Avenue. He noted the elevator has to be where it is at the entry. The back of the building has 6 windows that are filled with brick. The project will open them up and create some office space that can be used. He stated they plan to show the comments from the Planning Board to the ZBA.

Mr. Block stated this was an excellent presentation. He asked if someone were to go by wheelchair, are there stairs to go from the driveway into the front door. Mr. Bargmann stated there is one step there. Ms. Espada had no comments or questions. Mr. Crocker asked, with the heating system being different, would the chimneys even be used. Mr. Bargmann stated the chimneys could not be used. The 2 chimneys in the middle will be kept as they are structurally required for air exchange. The chimneys in the back are being removed and they are gaining 8 offices in the building.

Ms. McKnight clarified the property is burdened by an easement to the condominium property and was informed that is correct. There is also a utility easement. Ms. McKnight noted she always thought of the structure referred to as a clock as a water tank. Mr. Haff noted Anne Gulati, Assistant Superintendent for Business and Finance, requested the high school students have input into what goes into the circle if the clock is not put back. The students designed the town logo. Ms. McKnight noted the comments from the DRB regarding trees and plantings. She asked if the applicant is responding to comments from the DRB. Mr. Bargmann noted the comment regarding tree removal is necessary. The addition cannot be put on without removing the tree and there is no other place to put the loading dock. He noted some historic photos show bushes. There is one remaining bush that will bring back some of the historical character.

Ms. McKnight noted rubbish removal and the arborvitae tree screen. Mr. Bargmann noted there is a tree screen and hedge that screens the dumpster for St. Josephs. Mr. Crocker noted the Planning Board would require some type of additional trees between the back and St. Josephs to the south of the building. He asked why nothing is being planted there. Mr. Bargmann will take a look at that. Mr. Haff stated St. Josephs side has a row of pine trees that goes all the way across the face of the building and one large oak tree by the play yard. He will speak with St. Josephs. If they want the applicant to add a second row of trees, they will do that although it may be redundant.

Oscar Mertz, architect, asked if the community would have access to the building at times with shared room and common spaces. Mr. Haff stated the community comes in throughout the day for a variety of services. The top floor will be a larger conference room that could be utilized by the public especially in the evening. It is not really as big as Powers Hall. They are still in discussions if School Committee will have their meetings there or continue to have them at Broadmeadow School. Ms. McKnight commented she is happy to hear. She asked if that room will be added to the list of available spaces. Mr. Haff noted it most likely would be added for off hours and weekends. It would need monitoring of the room and a nominal fee. Mr. Alpert reviewed the comments for the ZBA. The parking waiver is not necessary for more than 300 feet and landscaping on the south side of the building. McKnight would like to comment she would support the grant of a parking waiver to allow construction with 62 spaces. All agreed. Mr. Alpert asked if there would be a bicycle rack. Mr. Haff stated it conforms to the zoning by-law. They have not observed a lot coming by bicycle, but he noted the bike rack could accommodate 8 bicycles.

Upon a motion made by Mr. Block, and seconded by Mr. Crocker, it was by a roll call vote of the five members present unanimously:

VOTED: to recommend approval of a parking waiver of 62 spaces and recommend they not grant a waiver for off-site parking more than 300 feet from the site as it is unnecessary.

Upon a motion made by Mr. Block, and seconded by Mr. Crocker, it was by a roll call vote of the five members present unanimously:

VOTED: to accept the rear setback on the east side of the building from 10 feet to 4 feet and the amount of landscaping within the interior of the area.

Decision: Amendment to Major Project Site Plan Review No. 1018-05: Town of Needham, 1471 Highland Avenue, Needham, MA, Petitioner (Property located at 28 Glen Gary Road, Needham, MA.) Regarding request to remove Condition 3.2 of the existing decision, which would then allow the temporary move of the Needham Public Schools (“NPS”) administrative staff.

Mr. Alpert noted the decision has Ms. Espada as being present and she was not. The vote would be 4 members. Condition 3.2 regarding preventing using the parking lot for municipal use has been removed.

Upon a motion made by Ms. McKnight, and seconded by Mr. Crocker, it was by a roll call vote of four of the five members present (Ms. Espada abstained):

VOTED: to grant the requested amendment to a Major Site Plan Review Special Permit issued by the Needham Planning Board on July 17, 2018, amended June 29, 2021, under Section 7.4 of the Needham Zoning By-Law and Special Permit 2019-05, Section 421, subject to the following plan modifications, conditions and limitations in the decision that is before the Board.

A motion was made to approve the amendment to the decision dated 5/1/22. Mr. Alpert noted the finding in Section 1.5 says “Needham Public Schools (NPS) would of course need to use existing parking spaces.” He does not feel “of course” is appropriate and should be struck. Ms. Newman agreed.

Upon a motion made by Ms. McKnight, and seconded by Mr. Crocker, it was by a roll call vote of four of the five members present (Ms. Espada abstained):

VOTED: to approve the amendment to the decision dated 5/1/22 with the one change discussed.

Decision: Amendment to Major Project Site Plan Review No. 2008-08: The Learning Tree Preschool, Inc., 225 Highland Avenue, Needham, MA, Petitioner (Property located at 225 Highland Avenue, Needham, MA). Regarding request to expand its current operation at this location to include the abutting former UBreakIFix tenant space.

Mr. Alpert noted on the 1st page, 4th paragraph, it does not list those present. That information needs to be added. On the top of page 3, last sentence in Section 1.3, says “in essence.” That is not appropriate and should be removed. All agreed. Mr. Alpert noted in Section 3.1, there is a space that should be removed between 2020 and the comma. Ms. Newman stated she would remove Ms. Espada from the signature line.

Upon a motion made by Mr. Block, and seconded by Mr. Crocker, it was by a roll call vote of four of the five members present (Ms. Espada abstained):

VOTED: to grant (1) the requested Major Project Site Plan Special Permit Amendment under Section 7.4 of the Needham Zoning By-Law and Section 4.2 of the Major Project Special Permit No. 2008-08; dated November 12, 2008, amended August 11, 2009, January 4, 2011, August 9, 2011, June 12, 2012 and July 21, 2020; and (2) the requested Special Permit under Section 5.1.1.5 of the By-Law to further waive strict adherence with the requirements of Section 5.1.2 (Required Parking), subject to and with the benefit of the following Plan modifications, conditions, limitations and finding of facts as set forth in the decision.

Mr. Alpert noted there is another space in the “Therefore” section. There is an extra space after July 21, 2020. It will be removed.

Upon a motion made by Mr. Block, and seconded by Mr. Crocker, it was by a roll call vote of four of the five members present (Ms. Espada abstained):

VOTED: to approve the decision with the changes discussed.

Revise temporary outdoor seating/outdoor display policy to extend applicability date to April 1, 2023 or another later date deemed appropriate by the Board.

Mr. Alpert noted the date should be changed to 4/1/2023 as the outside date. Ms. Newman stated the Governor has approved outside seating through 4/1/2023. The town needs to modify the policy for an additional year to be consistent with the Governor. This is a very recent change.

Upon a motion made by Mr. Block, and seconded by Mr. Crocker, it was by a roll call vote of the five members present unanimously:

VOTED: to adopt a change of date as presented to the Board.

Vote new Select Board appointment to the Housing Plan Working Group.

Ms. McKnight has spoken with Heidi Frail who has agreed to be the advisor.

Upon a motion made by Ms. McKnight, and seconded by Ms. Espada, it was by a roll call vote of the five members present unanimously:

VOTED: to appoint Heidi Frail as a member of the Housing Plan Working Group Committee as the Select Board member.

Minutes

Ms. McKnight noted in the minutes of 12/21/21, 1688 Central Avenue, the paragraph at the bottom, it says “Mr. Jacobs stated it may not be in the proviso.” Mr. Alpert stated it should be “may not be in the M.G.L. Ch. 40, Section 3.” All agreed. Ms. McKnight noted on the next page, it says “the barn is exclusively for day care use and not necessarily for storage.” She thinks “only” should be added after “storage.” In the paragraph at the bottom of the page, Mr. Alpert stated the Board needs to come up with “regulations.” It should be “conditions.” Mr. Alpert thought it may be “reasonable regulations.” It was decided to leave it alone. On the next page regarding setbacks, it says “the setbacks are there because that is where the builders decided years ago to build the houses.” Ms. McKnight feels it should say “the setbacks in Section 4.” Mr. Block agreed.

Ms. McKnight noted there were 2 sentences by Mr. Jacobs that are unclear. One was “Mr. Jacobs stated the Board could find the setback needs to be more than 64 feet, but he does not know how to make that clear. Mr. Block stated that would be making a condition based on a subsequent condition. It is not clear.” Mr. Alpert thinks the discussion was about traffic and a condition of whether to have a police detail and if it continues was about traffic study. Mr. Block stated the second sentence from Mr. Block should be struck and Mr. Jacobs sentence should remain. Ms. McKnight noted in the 1st paragraph of the breweries discussion, Mr. Alpert stated Mr. Jacobs said at the Select Board meeting “He was not sure we need to have zoning. Under the current By-Laws there can be breweries.” She is not sure that is needed. She brought the 2 sentences together and suggests adding “if deemed similar to already allowed uses.” Mr. Alpert stated that is not what Mr. Jacobs said. Mr. Block felt it was a reasonable addition. Mr. Alpert noted he was ok with adding it.

Upon a motion made by Ms. McKnight, and seconded by Mr. Block, it was by a roll call vote of four of the five members present (Mr. Crocker abstained):

VOTED: to accept the minutes of 12/21/21 with the changes shown in red line and further changes discussed tonight.

Upon a motion made by Ms. McKnight, and seconded by Ms. Espada, it was by a roll call vote of four of the five members present (Mr. Crocker abstained):

VOTED: to accept the minutes of 1/4/22 with the changes shown in red line.

Ms. McKnight noted in the minutes of 2/15/22, page 2, “Mr. Jacobs asked if the construction dumpsters will be in a couple of months.” Mr. Alpert stated it should be “will be installed in a couple of months.” Ms. McKnight noted Mr. Moskowitz conceded the dumpsters were there about 5 years. She is not clear on how many years. It should be 15 years. Ms. McKnight noted the last paragraph of the Emery Grover discussion regarding setbacks. A non-apartment building side yard setback is 15 feet under Section 4.3. It should be Section 4.73.

Upon a motion made by Ms. McKnight, and seconded by Ms. Espada, it was by a roll call vote of four of the five members present (Mr. Crocker abstained):

VOTED: to accept the minutes of 2/15/22 with the changes shown in red line and with the additional changes discussed tonight.

Ms. McKnight noted on the minutes of 2/25/22, 2nd paragraph, Mr. Alpert noted there was a minor modification on the agenda and there would be public comment. The Board did not get to that item. Mr. Alpert stated it was on the agenda and should be left as is. Ms. McKnight noted the 1st paragraph of 1688 Central Avenue, “at the last meeting the Board discussed the restriction of further subdividing the lot. They have since learned an easement would enable a subdivision of the lot.” She suggested adding “roadway” before easement. Mr. Block stated it should be “roadway easement.” He remembers the substantive conversation. Mr. Crocker asked if there could be a driveway easement. Mr. Alpert asked when does a driveway become a roadway. A driveway cannot have frontage. It would need a roadway. Ms. McKnight suggested adding “a roadway laid out and approved” or separating the paragraphs and leave out the sentence.

Ms. McKnight noted on page 4, 3rd paragraph, Mr. Jacobs stated “members have already said no to enough and cannot say yes to the letter.” Ms. McKnight asked if this is the letter from the attorney. Mr. Block stated it makes sense in the context. Ms. McKnight suggested removing the sentence. Mr. Alpert noted Mr. Huber’s letter said the applicant would agree to an 80-foot setback if the Planning Board agreed to other things. This was already discussed, and the Board said no. He suggested putting “Evans Huber’s settlement letter.” This was agreed.

Upon a motion made by Ms. McKnight, and seconded by Mr. Block it was by a roll call vote of three of the five members present (Mr. Crocker and Ms. Espada abstained):

VOTED: to accept the minutes of 2/25/22 with the red line changes shown in the draft and with the changes discussed tonight.

Ms. McKnight noted the minutes of 3/1/22, 5th page, 1st full paragraph, it should be “segment” not “department.” Mr. Block agreed.

Upon a motion made by Ms. McKnight, and seconded by Mr. Block, it was by a roll call vote of four of the five members present (Mr. Crocker abstained):

VOTED: to accept the minutes of 3/1/22 with the red line changes shown in the draft and the one change discussed tonight.

Report from Planning Director and Board members.

Ms. Newman noted a copy of the Town's response to the Environmental Notification Form (ENF) for 557 Highland Avenue, comments from the DPW and Rebecca Brown of GPI. Mr. Alpert noted Town Manager Kate Fitzpatrick stated the parcel being used as a dealership but that is long gone and the buildings have been razed. Ms. Newman stated she wrote the letter for the Town Manager so she takes ownership of that. GPI is doing a review now on the site plan and she will get a revised letter. The intended roadway widening at Highland and Gould is extending onto the Muzi property and is showing as an easement. It should be shown in the layout. It could impact FAR. She noted the hearing is set for 6/7/22 and will be the 1st hybrid meeting at Powers Hall. She stated the Board has Power's Hall for July and August as it is a larger space. Mr. Block asked when the leadership changes for the Planning Board and was informed after Town Meeting.

Ms. McKnight stated a housing survey was sent out last week with the responses due 5/19/22. The responses will be evaluated at a subsequent meeting of the Housing Plan Working Group. She requested if any members are active in any group they send out the link to the survey. Mr. Block asked what the plan is, where is the subcommittee at, what are they studying and what kind of recommendation will there be. Ms. McKnight noted they would likely have a draft housing plan and public meeting in October. The 2020 census data is finally set. Housing and Planning Consultant Karen Sunnarborg made a good start on the housing plan. Now the housing group has come up with ideas and put a lot in the survey. They will take into account all the responses.

Ms. McKnight noted the MBTA Communities Initiative Act. There are 11,500 housing units in town. If it is a commuter rail community it would be 15% and not the 20%, which is unreasonable. Ms. Newman stated the Town wants to come up with a plan in response to the new law. Mr. Alpert stated he is in full accord with the objective of the intentions of this bill. He would love to see Needham do what it can to have transit housing in somewhat the form the statute is requiring. The penalty is not so onerous for not adopting. He agrees with all the sentiments, but it should be done by special permit. The Town should adopt the sentiment of it and go forward and have the kind of housing envisioned but by special permit.

Ms. Espada stated they had a community housing workshop with community members. There were 69% who wanted to participate in the MBTA Communities Initiative and 50% supported the Needham Housing Authority to renovate and expand the housing units. The Board should revise zoning to allow for different types of housing in different areas of town. This needs to be revised pre-zoning but should be by special permit. Mr. Crocker agrees they need to look at it but not by right. Mr. Alpert agrees with Ms. Espada they do need to change Zoning By-Laws to move on housing. Ms. McKnight encouraged all to read the report done by the Town staff. There is a blueprint for compliance.

Mr. Alpert stated they could look at structure in terms of site plan review. Site plan review is like 40A and cannot be denied. Ms. Espada noted the subgroups work will be done the end of May. They can start getting together before the summer so they can start again in October and move forward. Mr. Alpert stated it has to be family friendly, but they seem to be encouraging studio apartments.

Mr. Alpert noted the following correspondence for the record: an email to support and vote positively on a Town Meeting Warrant Article but at last night's Town Meeting. Ms. McKnight noted The Town of Needham Sewer System Impact Program Regulations are included in the packet. She intends to make a comment at Town Meeting regarding an article regarding Public Works capital projects on storm water improvements. She wants to comment the reason they need to spend money on it is because subdivisions and multi-family housing are being built without proper storm water management. It almost seems to imply the Planning Board has not been watching this issue when approving projects. The Town adopted new storm water regulations in 2018. Maybe in decades past the town was not addressing the need but they are certainly doing so now. She does not want to let it hang out there that it is the Planning Board's fault.

Upon a motion made by Mr. Block, and seconded by Mr. Crocker, it was by a roll call vote of the five members present unanimously:

VOTED: to adjourn the meeting at 10:15 p.m.

Respectfully submitted,
Donna J. Kalinowski, Notetaker

Adam Block, Vice-Chairman and Clerk

DRAFT

NEEDHAM PLANNING BOARD MINUTES

May 17, 2022

The Needham Planning Board Virtual Meeting using Zoom was remotely called to order by Paul Alpert, Chairman, on Tuesday, May 17, 2022, at 7:15 p.m. with Messrs. Block and Crocker and Mmes. McKnight and Espada, as well as Planning Director, Ms. Newman.

Mr. Alpert took a roll call attendance of the Board members and staff. He noted this is an open meeting that is being held remotely because of Governor Baker's executive order on March 12, 2020 due to the COVID Virus. All attendees are present by video conference. He reviewed the rules of conduct for zoom meetings. He noted this meeting does include one public hearing and there will be public comment allowed. If any votes are taken at the meeting the vote will be conducted by roll call. All supporting materials, including the agenda, are posted on the town's website.

Reorganization

Upon a motion made by Ms. McKnight, and seconded by Ms. Espada, it was by a roll call vote of the five members present unanimously:

VOTED: to nominate Adam Block as Chairman.

Upon a motion made by Mr. Alpert, and seconded by Mr. Crocker, it was by a roll call vote of the five members present unanimously:

VOTED: to nominate Jeanne McKnight as Vice-Chairman.

Mr. Block continue the meeting as Chairman.

Public Hearing:

7:20 p.m. – Amendment to Major Project Site Plan Special Permit No. 97-12: Four Forty-Four Group, Inc., 444 Hillside Avenue, Petitioner (Property located at 442 and 444 Hillside Avenue, Needham, MA).

Upon a motion made by Mr. Alpert, and seconded by Ms. McKnight, it was by a roll call vote of the five members present unanimously:

VOTED: to waive the reading of the public hearing notice.

George Giunta Jr., representative for 444 Group, Inc., noted the property is owned by Jim O'Brien and Paul Gardiner, owners and operators of Center Automotive. There are 2 properties next door with 444 Hillside Avenue currently occupied by Center Automotive. The building at 442 Hillside Avenue is a large warehouse building for the Gentle Giant Moving Company. Gentle Giant left in 2013 and then it was a gymnastics academy. Gentle Giant would like to move back in and would like to acquire ownership of the building. The transfer was started but they ran into a snag. When the lot was created in 1999 it was built to the 80-foot width rule which was different than today. They could get 80 feet across the back of the building but now it specifies the specific way to measure lot width. At that, they are just under 2 feet shy of 80 feet.

Mr. Giunta Jr. noted this parcel is an L shape and wraps around Center Automotive. Center Automotive wants to keep the parking they use. The plan was to carve out the parking and add it to the Center Automotive lot. With the lot width issue no lot lines can be altered. The applicants looked at the abutting property but do not have the 2 feet needed. They came up with the solution to combine the 2 lots and form a commercial condominium so Gentle Giant can purchase the lot they want and Center Automotive can keep their lot and parking. This is an application to do something that should be allowed. Only the parking in front of Center Automotive is changing. The gymnastics academy went to the Zoning Board of Appeals (ZBA) with a parking plan which is laid out. Gentle Giant does not need or want all those parking spaces.

Mr. Giunta Jr. noted the Board should have a plan that shows the new parking. It is being used the same as the original permit 99-13. The site plan decision says no changes to the property. There is one unified ownership but technically 2 separate owners. Combining the 2 properties will have 2 principal buildings on a lot and 2 principal uses on a lot. It is ok

for the Center Automotive lot where the primary use is mechanics and the accessory use is sales. The Gentle Giant use is allowed by right. The Center Automotive use is allowed by special permit. The total parking demand for both buildings is 44 spaces and there will be 87 spaces on site. Adam Dash, representative for Gentle Giant Moving Company, stated the building is just going back to what it used to be.

Mr. Alpert stated he is curious if there is a need for the transfer of the parking lot in back. Would the 80 feet be grandfathered and be ok or is there a problem because of 2 lots under current ownership? A long-term lease could be done for the parking lot. Mr. Giunta Jr. stated he explored all options. Because the lot at 442 Hillside Avenue will be changed all By-Law requirements need to be complied with. Ms. Espada asked Ms. Newman if there is anything that could occur in the future when this becomes a condo. She asked if the Board is putting themselves at risk by making this one lot. Ms. Newman stated the Board has the flexibility to allow more than one use on a lot and share the parking. She noted this originally went through as a minor modification, so no operational conditions were imposed. Now would be the time to make changes if the Board has any concerns.

Mr. Alpert asked if Ms. Newman has any concerns the Board should be aware of like a use by Gentle Giant that should be conditioned. Ms. Newman stated it was permitted as an industrial use/warehouse use. She understands the hours of operation and when trucks will be coming and going. The Board has imposed those types of conditions on similar projects. Gentle Giant originally went in as of right and needed only a minor project, so these types of conditions were not imposed when it went in. Mr. Block clarified it used to be by right in that location and was informed it was. He asked the hours of operation. John Pachoca, owner, noted the hours will be 7:00 a.m. to after 5:00 p.m. They try to get everyone back by 5:00 p.m. if not a little after. Mr. Block asked if 7:00 a.m. to 6:00 p.m. was manageable. Mr. Pachoca noted it may be different at times from a traffic standpoint. Mr. Block commented the closing hour is undetermined. He asked the administrative hours and was informed the hours would be 8:00 a.m. to 5:00 p.m.

Ms. McKnight commented on the notice of this hearing. Across the street are 2 family homes in the Residence B District and she brings her car to Center Automotive. She has complemented them on their landscaping at their building. There is none at this building. She asked if landscaping is required in parking lots and how is it 422 has no landscaping whatsoever. Ms. Newman noted it is required as a condition. She does not know what the Zoning Board of Appeals (ZBA) did. Mr. Giunta Jr. noted there is a little bubble of landscaping in front, which is really just grass, with a little along the property line. Landscaping was part of the minor project review. The front part was all asphalt. That piece did go before the Planning Board as part of the minor project review. Ms. Newman stated someone must have granted parking waivers. If not the Planning Board it must have been the ZBA. Mr. Giunta Jr. noted there were a couple of other small areas of landscaping.

Ms. McKnight stated the proposed site plan and existing condition plans do not show landscaping. Mr. Giunta Jr. stated the existing condition plan does not call out the landscaping on site. Ms. McKnight stated she wants to go back to what was approved and make that a condition. She thinks it is important when an industrial use is across from residential, and she wants it shown on a site plan. She sees parking for trucks up front. She asked if trucks would also be traveling down the right of way and have some rights to the rear of the property. Mr. Giunta Jr. stated the plan is to have access to spaces 9 through 18 in the rear. Ms. McKnight asked if the applicant considered big trucks out back instead and small trucks and cars in front. Mr. Giunta Jr. noted there is a steep ramp. The building was built so the storage area is at grade in front. There is a small mezzanine office area in back. The building was designed for trucks to come in front.

Ms. McKnight asked if there is a loading dock. Mr. Giunta Jr. stated spaces 6, 7 and 8 were a loading bay at that location. The bays were turned into windows and will revert back to a loading dock per the minor project review. He noted a handicap ramp was put in and is shaded as with the parking. Ms. McKnight asked where the handicap parking spot is. Mr. Giunta Jr. stated there is not a designated handicap space. Gentle Giant is not open to the public. He noted there is a ramp in back also but a handicap space would need to be added. Ms. McKnight wants to see the space on a plan and wants to see plantings done as originally approve. She asked if someone goes up the right of way and then goes into a basement area. Mr. Giunta Jr. noted customers park in front. Vehicles are taken around the back for repair. The ramp pulls into the service bays on the upper floor. There are 8 bays where the work is actually done.

Ms. McKnight asked if there is a driveway to the right of way. The driveway is on Hillside Avenue and goes to Easy Street to the back of the building. Ms. McKnight asked if parking in back is intended to be used for parking for 444 Hillside Avenue and was informed it was. She asked if there was notice of this hearing to abutters and was informed yes. She stated

she did not get notice and assumes it is appropriate for her to participate. Mr. Crocker commented the landscaping needs to be put back in place. He noted there are different size trucks and he wants a better understanding if this is short term or long term storage, the volume of trucks coming and going and signage. He noted some of the trucks are pretty big with signage on the sides. What signage will be on the building? He noted Center Automotives' hours are 7:00 a.m. to 6:00 p.m. He does not want to see this used with trucks coming and going until 8:00 p.m. Mr. Block commented he has work done at Center Automotive and parks in back. He noted large trucks would not be able to get in the back.

Attorney Adam Dash, attorney for the applicant, noted Gentle Giant was in this location for 9 years and it worked for all those years. It has been tested and it worked. Mr. Pachoca noted some customers would store items a couple of days to several months. The usual storage is one month to 3 months. When a customer calls to have their stuff, it is loaded and taken to them. The majority is residential and comes from the area. He does not remember what the requirement for signage is, but he would like a sign. Mr. Crocker asked if it would be a sign up to the maximum allowed and was informed it would be. Mr. Pachoca stated the hours of operation will be 7:00 a.m. to 7:00 p.m. assuming the trucks come back in the afternoon. Some will be earlier and some later. Mr. Dash stated Gentle Giant is located next to residential in another town and they are very courteous to them. Mr. Crocker would be satisfied with having something where trucks cannot idle. Mr. Pachoca noted there is a state law that trucks cannot idle more than 5 minutes. There is no need to have them idle. He is ok with a condition that the trucks cannot idle.

Mr. Alpert is comfortable with the hours of 7:00 a.m. to 7:00 p.m. He has been a customer of Center Automotive and they used to be open until 7:00 p.m. If Mr. Pachoca is comfortable with a 7:00 p.m. closing time he is also. The Board should have the signage consistent with the Needham Sign By-Law. Ms. Newman noted the Design Review Board (DRB) sets that and it is enforced by the Building Commissioner. Mr. Giunta Jr. showed a photo from when Gentle Giant was there before to show the previous sign. Mr. Block noted the ground rules for public comment and opened the meeting for comments.

Amy Gore, of 433 Hillside Avenue, stated she has lived here for 23 years and was there when Gentle Giant was here before. Some weekends they were loading trucks at 6:00 a.m. and were very loud. Sometimes the trucks came back at 10:00 p.m. She understands but is concerned about weekends. Before Gentle Giant left there was an accident where one truck came loose and went down Dale Street and hit a tree just missing some kids. She wants to make sure that does not happen again. Mr. Block stated the Board will look for conditions on landscaping and hours of operation and will deliberate at a future time. Ms. McKnight noted the Board has not discussed weekends and holidays. She asked if there were any thoughts. Mr. Pachoca stated they do work on Saturday with limited crews. Typically, they rarely work on Sunday unless it is a charity event.

Mr. Block asked what Mr. Pachoca could do to ensure no trucks roll down Dale Street. Mr. Pachoca will take precautions. There are chock blocks on all vehicles. He is willing to work with whatever makes the most sense. Mr. Alpert stated Needham has a noise by-law that has a 7:00 a.m. start. The applicant needs to be aware that starting at 6:00 a.m. is in violation of the By-Law. Mr. Crocker would like a condition regarding idling of trucks. Mr. Block noted landscaping, idling, hours of operation and chock blocks when trucks are unmanned. Ms. Newman will write a decision that conditions approval based on an updated landscape plan consistent with landscaping approved under the minor site plan review and that incorporates the conditions discussed tonight.

Upon a motion made by Mr. Alpert, and seconded by Mr. Crocker, it was by a roll call vote of the five members present unanimously:

VOTED: to close the hearing.

Decision: Amendment to Major Project Site Plan Special Permit No. 91-7: Henry Hospitality, Inc. d/b/a The James, 18 Cliftondale Street, Roslindale, MA, Petitioner (Property located at 1027 Great Plain Avenue, Needham, MA). Regarding request to permit up to 69 outdoor seats by the James Pub on 5 on-site parking spaces.

Mr. Block noted the following correspondence for the record: an email from Fire Chief Dennis Condon, dated 5/9/22, with no objection to the proposal to join the lots; an email from Assistant Public Health Director Tara Gurge, dated 5/10/22, with no comments and an email from Town Engineer Thomas Ryder, dated 5/11/22, with no comments or objections. Ms.

McKnight noted 2 typos in the decision. Page 3, Section 1.5, 4th line from the bottom, “stores” should be “store’s.” On page 4, Section 1.6, 3rd line from the top, it should be “proposes.”

Upon a motion made by Mr. Alpert, and seconded by Ms. McKnight, it was by a roll call vote of the five members present unanimously:

VOTED: to accept the relief to grant (1) an amendment to a Major Site Plan Review Special Permit No. 91-7, issued by the Needham Planning Board dated February 4, 1992, amended March 23, 1993, November 15, 1994 and September 8, 2015, transferred on September 24, 1996, May 8, 2001, October 20, 2009, October 10, 2017, under Section 7.4 of the Needham Zoning By-Law and Special Permit 91-7, Section 4.2 and (2) a Special Permit under Section 5.1.1.6 of the By-Law to waive strict adherence with the requirements of Section 5.1.2 (Required Parking), subject to and with the benefit of the following Plan modifications, conditions and limitations as set forth in the draft decision.

Upon a motion made by Mr. Alpert, and seconded by Ms. McKnight, it was by a roll call vote of the five members present unanimously:

VOTED: to adopt the decision as drafted with the 2 typographical changes pointed out this evening.

Approval Not Required Plan & Minor Modification request for Residential Compound and Heather Lane Extension Subdivision Decision, Koby Kempel, Petitioner (Property located at 94 Heather Lane).

Koby Kempel, Manager, stated the family that bought the property next to his needs approximately 6,000 feet for more setback from the abutting property, so he has agreed to move the property line. Mr. Block asked if this was new construction and was informed it was. Ms. McKnight recalled a conservation restriction on the land. She asked if people who owned lots in the Heather Lane subdivision have rights to the conservation restricted area. Mr. Kempel does not know. The neighbor’s lot is only one acre buildable and one acre conservation. Mr. Alpert noted there is a conservation restriction. The land was not transferred to the Conservation Commission. The Board discussed having the conservation area be open to the public. The landowner was against it and we agreed. He does not know if the owners have limits to the conservation land. Mr. Kempel stated there is a 100 foot no touch zone and 200 feet if he wants to do anything in that area.

Ms. Espada stated there is a note in the area that say the existing pool is to be razed. Mr. Kempel stated he went before the Conservation Commission 2 weeks ago to get approval to remove the pool and plant the area. A motion was made to approve the ANR plan. Ms. McKnight asked if there is an application needed that is separate from endorsement of ANR. Ms. Newman stated there needs to be an approval of a deminimus change. The motion was withdrawn.

A motion was made to approve the division of lots as shown on the plan as presented to the Board tonight to create Parcel A under the condition of the subdivision decision for the Heather Lane Extension Residential Compound, Condition 3, that there shall be no further development of the lot as shown thereon without prior written approval of the Planning Board. Mr. Alpert seconded the motion and made a further motion to treat this as a minor modification. The previous motion was withdrawn.

Upon a motion made by Mr. Alpert, and seconded by Mr. Crocker, it was by a roll call vote of the five members present unanimously:

VOTED: to treat this as a minor modification.

Upon a motion made by Ms. McKnight, and seconded by Mr. Alpert, it was by a roll call vote of the five members present unanimously:

VOTED: to approve as a minor modification to the subdivision decision for the Heather Lane Extension Residential Compound to allow a further division of the lots as shown in the subdivision to create Parcel A as shown on the Plan of Land Needham Massachusetts, dated 4/29/22, prepared for 94 Heather Lane LLC by GLM Engineering Consulting, Inc.

Upon a motion made by Mr. Alpert, and seconded by Ms. McKnight, it was by a roll call vote of the five members present unanimously:

VOTED: to accept the ANR plan.

Board of Appeals – May 19, 2022

68 Garden Street -- Andrew P. Feldman, applicant

Upon a motion made by Ms. McKnight, and seconded by Mr. Alpert, it was by a roll call vote of the five members present unanimously:

VOTED: “No comment.”

1330 Highland Avenue (Emery Grover Building) -- The Town of Needham Permanent Public Building Committee, applicant.

Ms. Newman noted this has already been dealt with. She can send a note in the letter to the ZBA this has already been reviewed and commented on separately as a minor project review.

670 Highland Avenue, 284 Webster Street and 28 Greendale Avenue – Temple Beth Shalom and Davenport Holding Properties, Inc., applicants.

Mr. Alpert recused himself from this matter as he is General Counsel to Temple Beth Shalom.

Mr. Block noted the Temple has acquired another property to combine on one lot. The house is to be demolished for a parking lot. Ms. McKnight asked if all cars would be going in through the present entrance, circle around and go out the same way or is there another entrance further up Greendale Avenue. Ms. Newman thought access was provided through the 2 existing driveway accesses. Mr. Block noted presently there is an egress out to Davenport Road. The Board needs to find out how the egress will work. Ms. Espada noted the current curb cut to the house is eliminated.

Mr. Block stated the site plan is not clear. He is not sure it makes sense for the main traffic channel to run through the parking lot. The other issue is the building being razed for a parking lot. The afternoon peak hour pick up is not efficient. He has a concern with children running 250 feet to get to the main building through the active parking lot. The Board should comment the ZBA should closely study and mitigate for pedestrian safety. He feels if the Temple would move the administrative offices to the building at Greendale and Davenport and leave the kids in the main building that would alleviate the issue. Ms. Newman will call that out as a concern and ask the developer to come up with a solution.

Mr. Block asked what the main travel route is at the site entrance and egress. Ms. McKnight stated this is a Dover Amendment use. The parking lot landscaping requirement would apply but no landscaping is shown. It should be made clear where the landscaping is and be in compliance with our By-Laws. All agreed. Mr. Crocker stated the neighbors had raised that as a request that there be landscaping between Webster Street and the parking lot. Ms. Newman will send the comments to the ZBA.

Mr. Alpert returned to the meeting.

Minutes

Ms. McKnight noted in the minutes of 3/15/22, the Needham Gateway property, it says this was discussed at great length at a previous hearing. She feels “at a previous hearing on a separate application” should be added. Mr. Block noted “relating to the same property.” All agreed. Ms. McKnight noted “he has submitted a formal application” not “resubmitted.” On page 2, Mr. Block stated he “would be willing to waive 2 spots.” Mr. Block stated that is correct. Ms. McKnight noted on page 4, 4th line, “it is the name that matters.” She is not sure about that and feels it should be deleted. Mr. Block remembers members from the public raising the comment that corporately it is a clinic but in Massachusetts it is not a clinic. Ms. McKnight asked if clinic was in the name. Mr. Block noted it refers to clinics in the “About them” section on their website. Ms. McKnight does not see a reference to clinic and would delete the sentence. She requested the spelling be checked for Dr. Mondavia’s name. It is spelled incorrectly in one place.

Ms. McKnight noted Mr. Block asked if the doctor is compensated and was informed based on scheduling “they may float.” Mr. Block stated the doctor was talking about himself. Ms. McKnight asked if it should be “he” may float. Mr. Block stated it was fine to leave it as “they.”

Upon a motion made by Ms. McKnight, and seconded by Ms. Espada, it was by a roll call vote of four of the five members present (Mr. Crocker abstained):

VOTED: to accept the minutes of 3/15/22 as redlined with further changes noted on page 1 and correspondence on page 4.

Report from Planning Director and Board members.

Ms. Newman stated there will be a meeting for the Housing Plan Working Group next Thursday, 5/26/22. There was a meeting this week to work on the agenda. There will be a report on the results from the community survey that was done. She noted the 2020 census data is available and Housing and Planning Consultant Karen Sunnarborg has updated the Need Study to include that information. They are also looking at goals from the 2007 plan and how those can be modified to reflect current conditions. Ms. McKnight stated a direction will be set at the May meeting and an actual draft of the Plan will occur. They will take June, July and August to finalize a draft plan for a public meeting in October. Ms. Newman stated they have talked about having the Housing Authority go over the plan to see if it complements their plans. The plan will be worked on over the summer.

Ms. Espada noted after that meeting there will be a key update for the Planning Board. Mr. Alpert asked if something would be ready to present to Town Meeting next May. He questions where the momentum is -- from the Committee or from outside. Does the committee have consensus already or the changes they want? Ms. McKnight stated the Select Board is in favor of this and the Board of Health also. She heard the ZBAs question of whether a special permit was needed for Accessory Dwelling Units (ADUs). She does not feel ADUs should be, as a general matter, moved from special permit to as of right until there is a more comprehensive housing plan. She stated they are not talking dimensionals but general concept. A more generous use of ADUs is not a high priority. Ms. Espada stated that is just one piece of the puzzle. Mr. Block stated he wants the Housing Group to set out what the whole puzzle is. Ms. Espada stated they are still in the exploratory phase but that is what they are trying to do. Mr. Crocker noted it is important to look at the aging in place factor for seniors. He does not agree with opening up ADUs by right but he does agree the Board needs to look at the whole picture, how to address this and what can be done now. How everything is going to fit as part of the puzzle is important. This needs to be a thoughtful project. He stated the Housing Working Group is doing a great job.

Ms. Newman reminded the members that at the 6/7/22 meeting they will be going to their first hybrid meeting. She had a conversation with Tree Warden Ed Olsen regarding the Town Common project. The costs came in significantly higher than Beta, so a number of things will be done within house. They are making a couple of adjustments to the plan to save money. The trees installed were to be a 3½ inch caliper, but they will be going with a 2-inch caliper. They will also move from an exposed aggregate concrete system for the walkways to a paver system. It was recommended they take the change to the DRB. When the DRB signs off on it she will approve it as an insignificant change.

Ms. Espada stated they need to know what the substrate will be. There needs to be really good substrates underneath pavers and bricks. Cost should not be cut in this area. Concrete is less than pavers if you do it right. Ms. Newman will loop Ms. Espada in with Mr. Olsen. Mr. Alpert asked if this is something that can be handled at the DRB level. Ms. Espada stated yes, but she wants to make sure it is done properly. Mr. Crocker stated the DRB does not look into things at that depth. Ms. Newman would like to bring Ms. Espada in with Mr. Olsen and handle it that way. Mr. Alpert stated he would be more comfortable with Ms. Espada as part of the discussions on construction details.

Correspondence

Mr. Block noted a letter, dated 5/9/22, from Planning Director Lee Newman to ZBA Chairman Jon Schneider but they have already met. There was a letter from the Toll Brothers to each of the Planning Board members looking to engage with the Town to take advantage of the MBTA communities. He appreciates them reaching out. Predominantly this is a matter of private property. If the Planning Board decides to discuss it, they will reach out when the time is right. He thinks this is widely premature. Ms. Newman let them know the town was developing a housing plan and strategy to implement

development guidelines and will share it with them. Ms. McKnight would let them know when the community workshop and public comment will be.

Upon a motion made by Mr. Alpert, and seconded by Mr. Crocker, it was by a roll call vote of the five members present unanimously:

VOTED: to adjourn the meeting at 10:48 p.m.

Respectfully submitted,
Donna J. Kalinowski, Notetaker

Jeanne S. McKnight, Vice-Chairman and Clerk

DRAFT

The following information regarding

557 Highland Avenue

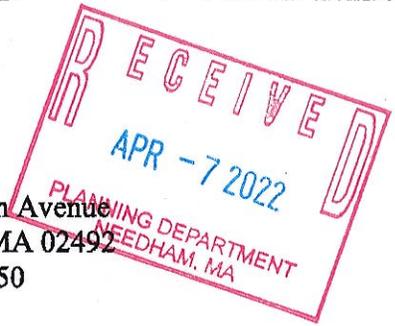
was also included in the packet for
June 7, 2022

2022 APR -7 PM 3:41

TOWN OF NEEDHAM
MASSACHUSETTS



500 Dedham Avenue
Needham, MA 02492
781-455-7550



PLANNING BOARD

APPLICATION FOR SITE PLAN REVIEW

Project Determination: (circle one) Major Project Minor Project

This application must be completed, signed, and submitted with the filing fee by the applicant or his representative in accordance with the Planning Board's Rules as adopted under its jurisdiction as a Special Permit Granting Authority. Section 7.4 of the By-Laws.

Location of Property 557 Highland Avenue
Name of Applicant 557 Highland, LLC
Applicant's Address c/o The Bulfinch Companies, 116 Huntington Avenue,
Phone Number Suite 600, Boston, MA 02116

Applicant is: Owner x Tenant _____
Agent/Attorney _____ Purchaser _____

Property Owner's Name 557 Highland, LLC
Property Owner's Address c/o The Bulfinch Companies, 116 Huntington Avenue,
Telephone Number Suite 600, Boston, MA 02116

Characteristics of Property: Lot Area _____ Present Use Vacant, former car dealership
LOT AREA: 9.273 ACRES Map # ___ Parcel # ___ Zoning District Highway Commercial 1
PARCEL ID 1990760000300000

Description of Project for Site Plan Review under Section 7.4 of the Zoning By-Law:

Please see ~~attached~~ ^{the} filing and zoning letter filed herewith

557 Highland, LLC, by: Robert Schlager

Signature of Applicant (or representative) [Signature]
Address if not applicant _____
Telephone # 781.707.4122
Owner's permission if other than applicant N/A

SUMMARY OF PLANNING BOARD ACTION

Received by Planning Board [Signature] Date April 7, 2022
Hearing Date _____ Parties of Interest Notified of Public Hearing _____
Decision Required by _____ Decision/Notices of Decision sent _____
Granted _____
Denied _____ Fee Paid _____ Fee Waived _____
Withdrawn _____

NOTE: Reports on Minor Projects must be issues within 35 days of filing date.

April 5, 2022

BY HAND DELIVERY, OVERNIGHT DELIVERY & ELECTRONIC MAIL

Town of Needham Planning Board Members
Public Service Administration Building
500 Dedham Avenue
Needham, MA 02492
Attn: Lee Newman, Planning Director

Re: 557 Highland Avenue, Needham Heights, Massachusetts (the "Property")

Dear Planning Board Members:

We are counsel to 557 Highland, LLC, an affiliate of The Bulfinch Companies, Inc. (the "Applicant") in connection with the redevelopment of approximately 9.27 acres of land, bordered by Highland Avenue to the south, Interstate 95/Route 128 to the east, Gould Street to the west, and TV Place (formerly known as Permil Road), a private way, to the north. The Property is the former site of the Muzi Ford and Chevrolet automotive dealership and service centers and the Muzi car wash.

The Applicant is proposing to redevelop the Property with approximately 496,694 square feet (sq. ft.) of office, laboratory and research and development uses (the "Project"). The Project will also include construction of one-level of below grade parking under each building and a separate stand-alone parking garage as well as approximately 10,000 sq. ft. of retail and restaurant uses. The Project will include two buildings, one on the northerly portion of the Property (the "North Building") and one on the southerly portion of the Property (the "South Building"), together with a shared connector atrium (the "Atrium").

As described below, zoning allows a maximum Floor Area Ratio ("FAR") of 1.35 for the Property generating a maximum build out of 542,000 sq. ft. The Application (defined below) proposes an FAR of 1.25, based on a buildout of 506,694 sq. ft., 35,306 sq. ft. less than the maximum buildout.

The materials and studies submitted with this Application (defined below) and in the Project's MEPA Environmental Notification Form have conservatively studied and presented an analysis based on a significantly higher build out for the Property of the approximately 531,000 sq. ft. Accordingly, the traffic generation numbers in these materials and studies can be reduced by approximately 5%, yielding lesser impacts than what was studied.

Pursuant to the Massachusetts Zoning Act, G.L. c. 40A, the Needham Zoning By-Law, and the Board Rules, enclosed is an Application for Site Plan Review and issuance of Special

Permits for the Project (the “Application”). In support of the Application, the Applicant is submitting the following materials and information (*5 copies of each unless otherwise indicated*):

1. Application for Site Plan Review;
2. Plan Set titled “557 Highland Avenue Needham, MA 02494 – Needham Special Permit Package” (the “Plan Set”), prepared by Stantec Architecture and Engineering P.C. (“Stantec”), which includes the following, all dated March 30, 2022 unless noted otherwise (*1 additional 11x17 copy mailed directly and sent via electronic mail to each Planning Board member*):
 - a. Proposed Site Plan
 - b. Site Aerial – Proposed
 - c. Street View – Proposed
 - d. G-000 – Cover Sheet
 - e. Civil Plan Set containing the following:
 - i. Sheet C-01 – Legend and General Notes
 - ii. Sheet C-02 – Overall Site Plan
 - iii. Sheet C-03 – Drainage and Erosion Control Plan
 - iv. Sheet C-04 – Utility Plan
 - v. Sheet C-05 – Site Details
 - vi. Sheet C-06 – Site Details
 - f. Landscape Plan Set containing the following:
 - i. Sheet L-1.0 – Site Plan
 - ii. Sheet L-2.0 – Site Grading Plan
 - iii. Sheet L-3.0 – Site Planting Plan
 - iv. Sheet L-4.0 – Site Lighting Plan
 - v. Sheet L-5.0 – Site Details #1
 - vi. Sheet L-5.1 – Site Details #2

- g. Architectural Plan Set containing the following:
 - i. Sheet G-010 – Zoning Gross Area Plans
 - ii. Sheet A-100G1 – Garage Level G1 – Overall Plan
 - iii. Sheet A-101 - Level 1 – Overall Plan
 - iv. Sheet A-102 Level 2 – Overall Plan
 - v. Sheet A-103 Level 3 – Overall Plan
 - vi. Sheet A-104 Level 4 – Overall Plan
 - vii. Sheet A-105 Level 5 – Overall Plan
 - viii. Sheet A-106 Level 6 – Overall Plan
 - ix. Sheet A-107 – Roof Plan
 - x. Sheet A-201 – Building Elevations – Locator Elevations
 - xi. Sheet A-202 – Building Elevations – North Bldg. – North
 - xii. Sheet A-203 – Building Elevations –North Bldg. – South & East
 - xiii. Sheet A-204 – Building Elevations – North Bldg. (Southwest) & South Bldg. (South)
 - xiv. Sheet A-205 – Building Elevations – North Bldg. (West) & South Bldg. (North & West)
 - xv. Sheet A-206 – Building Elevations – South Bldg. – North & East
 - xvi. Sheet A-211 – Building Sections – Overall
 - xvii. Sheet A-212 – Building Sections – North Bldg.
 - xviii. Sheet A-213 – Building Sections – North Bldg.
- h. Architectural – Garage Plan Set containing the following:
 - i. Sheet AG-100.B2 – Garage Level B2
 - ii. Sheet AG-100.B1 – Garage Level B1

- iii. Sheet AG-101 – Garage Level 1
 - iv. Sheet AG-102 – Garage Level 2
 - v. Sheet AG-103 – Garage Level 3 (Level 4-5 Sim.)
 - vi. Sheet AG-106 – Garage Level 6
 - vii. Sheet AG-211 – Garage Sections
 - viii. Sheet AG-212 – Garage Sections
 - ix. Sheet AG-301 – Elevations – North & East
 - x. Sheet AG-302 – Elevations – South & West
3. Transportation Impact and Access Study prepared by Vanasse Hangen Brustlin, Inc. (“VHB”), dated March 2022 (the “TIAS”);
 4. Stormwater Report prepared by VHB, dated March 2022 (the “Stormwater Report”);
 5. Fiscal Impact Analysis, prepared for the Town by the Barrett Planning Group, LLC of Plymouth, MA dated March 20, 2021, summarizing the anticipated revenues from various redevelopment scenarios of the Property and the adjacent parcels (the “Fiscal Analysis”);
 6. Check payable to the Town of Needham in the amount of \$98,992.90, representing the filing fee for Site Plan Review and Special Permit Application, calculated at \$1000 plus \$0.10 per square foot in excess of 10,000 sq. ft for 506,694 sq. ft. of office/lab/research and development/retail/restaurant uses and 483,235 sq. ft. of accessory parking uses.

The Applicant hereby requests pursuant to Zoning By-Law Section 7.4.4 that the Board waive the submission by Applicant of any required information not submitted herewith.

* * *

ZONING ANALYSIS DISCUSSION:

Background and Overview:

Pursuant to the Town of Needham Zoning Map, as amended by Article 6 of the Annual Town Meeting held on May 3, 2021 (as amended, the “Zoning Map”), the Property is located within the Highway Commercial 1 District (the “HC-1 District”). The HC-1 District was established by an amendment to the Town of Needham Zoning By-Law (as amended, the “By-Law”) adopted by a 168-37 vote of Town Meeting pursuant to Article 5 of the Annual Town

Meeting held on May 3, 2021. According to the Zoning Map, the Property is not located within any overlay districts.

The creation of the HC-1 District was the result of an extensive planning effort by the Town of Needham (the "Town"). The Town's Council of Economic Advisors ("CEA") began an evaluation of the Town's Industrial Zoning Districts in 2013. The CEA held public meetings with residents, neighbors, public officials, businesses, and landowners (collectively, the stakeholders) in 2014 and obtained a build-out analysis and a traffic impact report. The CEA made preliminary recommendations to the public and Select Board to upgrade the zoning adjacent to I-95/Route 128 to make these areas more economically competitive.

The Planning Board and Select Board decided to move forward with rezoning of the former Industrial-1 Zoning District circumscribed by I-95/Route 128, Highland Avenue, Gould Street, and the MBTA right of way, and occupied by the Muzi Ford and Chevrolet dealership, a car wash, and WCVB Channel 5. An Article proposing to rezone this Industrial-1 Zoning District was developed and presented to the October 2019 Special Town Meeting, where it received a majority vote but less than the required two-thirds.

In response to public concerns about density, traffic impacts, permitted and special permit uses, and environmental issues, a Town-wide community meeting was held with stakeholders in January 2020 to discuss overall land use goals for the HC-1 District. A working group, including representatives from the Planning Board, Select Board, Finance Committee, and CEA was formed. The working group then commissioned an updated traffic study of the area, to analyze the ability of the Town's traffic infrastructure to accommodate development at various densities and use profiles, as well as an updated fiscal impact analysis. From these efforts, the Planning Board drafted a revised Zoning Article to establish the HC-1 District. The revised Zoning Article reduced maximum floor area ratios and building height, increased building setback distances, required additional landscape buffering along Gould Street and Highland Avenue, increased open space requirements and established green building standards for issuance of a special permit.

In connection with the above process, the Town commissioned the Fiscal Analysis to study the potential financial benefit of such rezoning. Based on the Fiscal Analysis, a full-build out of the Property and the adjacent parcels at 1.35 FAR would yield an annual net financial benefit to the Town of approximately \$8,342,400. As described above, the Project proposes a build-out of approximately 60% of the full-build out, which results in a prorated annual net financial benefit of approximately \$5,000,000 to the Town from development of the Project.

The Applicant now proposes the Project to realize the goals of this re-zoning.

Proposed Project:

Use

The Property contains approximately 9.27 acres of land. It was most recently used as an automotive dealership and car wash making up a nearly entirely impervious surface which included parking for approximately 532 vehicles. As described above, the Project will remove environmentally-hazardous materials and redevelop the existing underutilized site to include approximately 496,694 square feet of office, laboratory and research and development uses. The Project will also feature approximately 10,000 square feet of retail and/or restaurant uses and accessory parking use in the form of underground parking garages and separate stand-alone parking structure. A breakdown of proposed uses and the approximate square footage of such uses is as follows:

USES	PROPOSED ¹
Office	248,347 sq. ft.
Lab/Research and Development	248,347 sq. ft.
Retail/Restaurant	10,000 sq. ft.
Accessory Parking	1,408 total parking spaces of which 343 will be located beneath the buildings, 1,021 will be located in a stand-alone parking garage, and 44 will be surface parking.

Pursuant to By-Law Section 3.2.7, professional, business, or administrative offices and laboratory uses are allowed by-right in the HC-1 District. Retail uses are also allowed by-right so long as no single retail establishment contains more than 5,750 square feet of gross floor area. Light-manufacturing uses—including manufacture of pharmaceutical, bio-pharmaceutical, medical, robotic, and micro-biotic products, which may be part of the Project tenants’ laboratory uses—are allowed by right and also as an accessory use to any lab/research development use. The Applicant anticipates that light-manufacturing uses accessory to research and development uses, including the production of prototypes, may be part of the Project depending upon the ultimate tenanting of the Project.

By-Law Section 3.2.7.1(m) allows all customary and proper uses accessory to lawful principal uses. Given that the accessory parking on the Property is intended to provide parking incidental to operation of the main uses described above, such accessory use is allowed by-right.

¹ The specific square footage breakdown is subject to final tenant demands and the Applicant requests that the Board allow the allocation among the uses (and floor plans) to change from time to time without further Board review or approval as long as the Project maintains the number of parking spaces required by the approvals. The Applicant requests the ability to construct the Project in phases, including the right to obtain a final certificate of occupancy for the parking garage and/or either building prior to completion of construction of both buildings.

Formerly, the Property showed 532 lined spaces, a portion of which were used for parking for customers and employees, and the balance of which were used for parking of new and used car inventory and auto repair activities in connection with the dealership on the Property. These spaces do not include any employees or visitors for the car wash.

The Applicant anticipates that the retail space may contain a tenant in excess of approximately 6,000 sq. ft., and a restaurant of approximately 4,000 sq. ft. Accordingly, the Project will require a Special Permit for the potential occupancy of a single retail tenant in excess of 5,750 sq. ft. and a Special Permit for restaurant use.

Parking

The Applicant plans to construct a total of 1,408 parking spaces to be provided between a one-level underground parking structure beneath the buildings and a separate above-ground parking garage.² The following chart describes the number of parking spaces required pursuant to By-Law Section 5.1.2.

Use	Space Required by Zoning	Proposed Parking Spaces
Research facilities/laboratories	828 spaces <i>(1 space per 300 sq. ft.)*</i>	
Office	828 spaces <i>(1 space per 300 sq. ft.)</i>	
Retail	20 spaces <i>(1 space per 300 sq. ft.)</i>	
Restaurant	13 spaces <i>(1 space per 3 seats plus 10 spaces per take-out service station)</i>	
Total	1,689	1,408 total parking spaces of which 343 will be located beneath the buildings, 1,021 will be located in a stand-alone parking garage, and 44 will be surface parking.
<i>*Provided that occupancy by a single tenant of more than 50,000 sq. ft. shall require one space per 300 sq. ft. for the first 50,000 sq. ft. and 1 space per 400 sq. ft. in excess of 50,000 sq. ft. Thus, the number of required parking spaces will be reduced if a single tenant occupies all of the North Building or the South Building, or both.</i>		

As shown above, the Applicant proposes 1,408 parking spaces. However, the By-Law's parking requirements assume a higher employee density than is typical for lab/research &

² The stand-alone garage will contain two levels of underground parking as shown in the Plan Set.

development uses. The By-Law also assumes that each employee will commute alone and does not take into account the Applicant’s proposed use of carpool, walking, biking, and public transit alternatives that will reduce the number of vehicles required to be parked on-site. Furthermore, the By-Law does not consider the potentially permanent changes in commuting patterns resulting from the COVID-19 pandemic, including hybrid/remote work programs. For these reasons, the Applicant’s proposed number of parking spaces is more reflective of expected demand than the parking requirement under the By-Law. Therefore, the Project will require a Special Permit from the Planning Board for the difference in its proposed 1,408 spaces from the required spaces under zoning owing to these special circumstances, or for less than 1,408 total spaces, as the Planning Board may deem sufficient based on a review of the Application.³

The parking spaces provided will comply with all design guidelines prescribed by By-Law Section 5.1.3 as shown on the Plan Set included with the Application.

Dimensional Requirements

The following chart sets forth dimensional requirements applicable to the Project:

Item	Required	Project	Compliance with Zoning?
Minimum Lot Area	20,000 sq. ft.	403,933 sq. ft. ⁽¹⁾	YES
Minimum Lot Frontage	100 ft.	At least 100 ft.	YES
Maximum Floor Area Ratio	0.70 as-of-right Up to 1.35 by special permit	1.25	YES – Special Permit Required
Front Setback from Highland Avenue and Gould Street	15 ft.	North Building: 200 ft. South Building: 50 ft.	YES
Landscape Buffer	50 ft. along Highland Ave. and Gould Street	50 ft.	YES
Increased Height Setback	200 ft. from Highland Ave. and Gould Street	North Building: 200ft.	YES
Side/Front Setback on Rt. 95	20 ft.	20 ft.	YES
Rear Setback	20 ft. (along TV	20 ft.	YES

³ As described below, the Planning Board is the special permit granting authority for all special permit relief for Major Projects under Section 7.4.3 of the By-Law, and accordingly may grant relief under Section 5.1.1.5 from both parking space requirements under Section 5.1.2 and parking plan.

Item	Required	Project	Compliance with Zoning?
	Place)		
Maximum Lot Coverage	65%	48%	YES
Maximum South Building Height* (within 200 ft. height limitation zone)	35 ft. as-of-right 42 ft. by special permit	42 ft.	YES – Special Permit Required
Maximum Building North Height* (outside 200 ft. height limitation zone)	56 ft. as-of-right 70 ft. by special permit	70 ft.	YES – Special Permit Required
Maximum Garage Height*	44 ft. as-of-right 55 ft. by special permit	55 ft.	YES – Special Permit Required
Maximum Stories* (within 200 ft. height limitation zone)	2.5 stories as-of-right Up to 3 stories by special permit	3 stories (South Building)	YES – Special Permit Required
Maximum Stories* (outside 200 ft. height limitation zone)	4 stories as-of-right Up to 5 stories by special permit	5 stories (North Building)	YES – Special Permit Required
Maximum Garage Footprint	42,000 sq. ft.	42,000 sq. ft.	YES
Minimum Open Space	25%	27.1%	YES
Maximum Uninterrupted Façade Length	200 ft.	200 ft. ⁽²⁾	YES
Building Parapet Height	5 ft.	5 ft.	YES
<i>*Pursuant to Section 4.11.1(e), structures erected on a building and not used for human occupancy, including mechanical equipment, may exceed the maximum building height provided that no part of such structures extends more than 15 ft. above the maximum allowable building height (e.g., 57 ft and 85 ft., respectively for each building) and such structures do not cover more than 25% of the building roof.</i>			

Item	Required	Project	Compliance with Zoning?
<p>(1) The Applicant’s property at 0 Gould Street containing approximately 7,127 sq. ft. is not included in calculation of lot area and other measurements.</p> <p>(2) As shown in the Plan Set, the façade length of the stand-alone garage will be broken up through the use of banners which will result in interruptions of the façade so as to make it less than 200 ft.</p>			

Based on the foregoing, the Project will require Site Plan Review (described below) and Special Permits from the Planning Board as follows: (i) to allow a maximum Floor Area Ratio of 1.25; (ii) to allow a maximum height of 70 feet for the North Building; (iii) to allow a maximum of 5 stories in height for the North Building; (iv) to allow a maximum height of 42 feet for the South Building; (v) to allow a maximum of 3 stories in height for the South Building; and (vi) to allow a maximum building height of 55 feet for the above-ground parking structure.

With respect to clause (i) above, pursuant to By-Law Section 4.11.1(5) the Planning Board may allow an FAR of up to 1.35 by issuance of a Special Permit. The grant of a Special Permit pursuant to this section must consider the factors detailed further below.

With respect to clauses (ii) through (vi) above, pursuant to By-Law Section 4.11.1(1), buildings within 200 ft. of Highland Avenue and Gould Street are limited to a height of 35 ft. and 2.5 stories. The Planning Board may grant a Special Permit to increase the height of buildings within the 200 ft. height limitation zone to 42 ft. and 3 stories and may further increase the height of buildings beyond the 200 ft. height limitation zone to up to 70 ft. and 5 stories. The 200 ft. height limitation envelopes allowing for such height increases are depicted in Figure 1 and Figure 2 of By-Law Section 4.11.1(f), which provides for such figures to clarify the limits of the required setbacks and allowed envelopes. Additionally, pursuant to Section 4.11.2, the Planning Board may grant a Special Permit to increase the height of a parking structure up to 55 ft.⁴

The Project will also require a Special Permit to allow for retaining wall height greater than 4 ft. and other applicable design requirements for retaining walls pursuant to By-Law Section 6.11.5.

Major Project Site Plan Review and Special Permit:

Site Plan Review and Approval, in the form of a Planning Board Special Permit, is required for any “Major Project”. Pursuant to Section 7.4.2 a “Major Project” is any project in the HC-1 District that involves the construction of 10,000 or more square feet, an increase in gross floor area of 5,000 or more square feet, or the creation of 25 or more new off-street parking

⁴ In lieu of applying the height/story limitation in Section 4.11.1, the By-Law sets parking garage height at 44 ft. and allows an increase up to 55 ft. by Special Permit pursuant to Section 4.11.2(1).

spaces. The Project will exceed each of the foregoing thresholds and therefore qualifies as a Major Project subject to Site Plan Review.

Pursuant to By-Law Section 7.4.3, “the special permit granting authority for all permits the issuance of which is necessary for the construction or use of a Major Project shall be the Planning Board.”

Based on the above, the Project will require Site Plan Review and Approval pursuant to By-Law Section 7.4 from the Planning Board and subject to review by the Design Review Board. Additionally, as a Major Project, the Project will require a Special Permit from the Planning Board in connection with Site Plan Review. As provided by By-Law Section 7.4.3, the Planning Board may also issue any other Special Permits required for the Project given its status as a Major Project.

Relief Requested:

Based on the foregoing analysis and in accordance with By-Law Sections 3.2.7.2, 4.11, 5.1.1.5, 6.11.5, 7.2, 7.4, 7.5 and 7.6, and such other By-Law Sections as may apply, the following items of zoning relief are requested:

1. Special Permit in accordance with By-Law Section 4.11.1(5) for an FAR of 1.25 for the Project.
2. Special Permit, in accordance with By-Law Section 4.11.1(1) for a building height of 70 feet for the North Building.
3. Special Permit, in accordance with By-Law Section 4.11.1(1) for 5 stories for the North Building.
4. Special Permit, in accordance with By-Law Section 4.11.1(1) for a building height of 42 feet for the South Building.
5. Special Permit, in accordance with By-Law Section 4.11.1(1) for 3 stories for the South Building.
6. Special Permit, in accordance with By-Law Section 3.2.7.2 (g), for restaurant use.
7. Special Permit, in accordance with By-Law Section 3.2.7.2 (d), for retail use by a single tenant of between 5,750 – 10,000 sq. ft.
8. Special Permit, in accordance with By-Law Section 4.11.2(1) for a parking garage structure height of 55 feet.

9. Site Plan Review and Approval of the Project as a Major Project in accordance with Section 7.4.
10. Special Permit, in accordance with By-Law Section 5.1.1.5, for deviation from the required parking space number under By-Law Section 5.1.2 to be provided as part of the Project.
11. Special Permit, in accordance with By-Law Section 6.11.5, for deviation from the design requirements for retaining walls.
12. Any additional Special Permits required for the permitting of the Project.

Satisfaction of Criteria for Granting Relief Requested:

In connection with granting the above-requested relief, the Planning Board must make certain findings related to the Project as set forth in the applicable Sections of the By-Law. The applicable criteria are set forth in bold below and are followed by the Applicant's description of how the Project complies or will comply with such criteria. Explanatory notes from the By-Law are provided in italics.

- I. Pursuant to By-Law Section 7.6.1, the Planning Board must make the following findings and determinations when issuing a Special Permit, as delineated in By-Law Section 7.5.2.1:**

Prior to granting a special permit, the Planning Board, shall make a finding and determination that the proposed use, building structure, off-street parking or loading, modification of dimensional standards, screening or landscaping, or other activity, which is the subject of the application for the special permit:

- (a) Complies with such criteria or standards as may be set forth in the section of this By-Law which refers to the granting of the requested special permit;**

As set forth below, the Project complies with the specific criteria and standards for the special permit relief requested herein.

- (b) is consistent with: 1) the general purposes of this By-Law as set forth in subparagraph 1.1, and 2) the more specific objectives and purposes applicable to the requested special permit which may be set forth elsewhere in this By-Law, such as, but not limited to, those at the beginning of the various sections;**

The Project is consistent with the general purposes of the By-Law, including the promotion of health, safety, convenience, morals, and welfare for Needham residents

because it redevelops an underutilized and environmentally compromised site into an economically viable and eco-friendly development with public amenities.

The Project will promote the welfare of the inhabitants of Needham through a significant increase in property tax revenues, providing approximately \$5,000,000⁵ in annual additional real estate and personal property taxes which will support the Town's educational and recreational programs, housing initiatives, community and open spaces, and other Town priorities. The Project includes traffic mitigation measures and bicycle lane improvements to lessen congestion on area streets. This is an appropriate use of the land, specifically contemplated by the recent rezoning of the area. With the requested special permits, the Project will comply with the applicable use, height, area, and building location requirements of the By-Law.

By-Law Section 1.2 requires that any building or structure erected and any use of premises established must be in conformity with the By-Law. With the requested special permits, the Project will be in conformity with the By-Law.

(c) is designed in a manner that is compatible with the existing natural features of the site and is compatible with the characteristics of the surrounding area.

The site has few natural features, as it is almost entirely covered with the foundations of the former car dealership and car wash buildings and associated impervious areas used for parking and for the display of motor vehicles for sale. The Project is compatible with the characteristics of the surrounding area. The orientation of the buildout with the parking garage located near the "rear" of the Property will result in limited visibility of the parking structures from the major surrounding roads, including Highland Avenue and Gould Street. Extensive landscaping will be provided around the entire Project site, including a circumferential walking path with exercise stations for use by tenants' employees, neighbors, and the general public.

Where the Planning Board determines that one or more of the following objectives are applicable to the particular application for a special permit, the Planning Board shall make a finding and determination that the objective will be met:

(d) the circulation patterns for motor vehicles and pedestrians which would result from the use or structure which is the subject of the special permit will not result in conditions that unnecessarily add to traffic congestion or the potential for traffic accidents on site or in the surrounding area; and

⁵ As described above, this is an approximate proration based on the development scenarios for a full-buildout of the Property and the adjacent parcels described in the Fiscal Analysis and as applied to the Project, which is for approximately 60% of the full-buildout scenario.

The Transportation Impact and Access Study prepared by VHB analyzes existing traffic conditions on area roadways and at area intersections, under current conditions and as projected to exist in seven years with and without construction of the Project. The study recommends, and the Applicant has committed to implement, several measures to prevent the Project from increasing traffic congestion or the potential for traffic accidents. These measures include the grant of an easement to the Town to widen and reconfigure Gould Street at the intersection with Highland Avenue and at the intersection with the site entrance (opposite the Wingate Residences entrance), and adding sidewalks along Gould Street. The internal circulation pattern has been designed to control vehicle speeds and to reduce vehicle-pedestrian interactions by providing wide sidewalks.

- (e) the proposed use, structure or activity will not constitute a demonstrable adverse impact on the surrounding area resulting from:**
- 1) excessive noise, level of illumination, glare, dust, smoke, or vibration which are higher than levels now experienced from uses permitted in the surrounding area,**
 - 2) emission or discharge of noxious or hazardous materials or substances, or**
 - 3) pollution of water ways or ground water.**

The proposed use, structures and activity at the Property will not have a demonstrable adverse impact on the surrounding area. Any minimal noise, illumination or glare associated with the Project will be mitigated with the design features such as landscaping and cut-off lighting, as more particularly demonstrated in the Plan Set. No noxious or hazardous substances are anticipated to be emitted as a result of the Project, and no waterways or groundwater will be polluted.

As referenced in the foregoing criteria, certain Sections of the By-Law prescribe additional criteria to be considered for particular Special Permit relief. Such criteria, and how the Project complies or will comply with such criteria, are provided below:

1. Special Permit criteria for relief for FAR of 1.25, pursuant to By-Law Section 4.11.1(5):

In granting such special permit, the Planning Board shall consider the following factors:

- (i) the ability of the existing or proposed infrastructure to adequately service the proposed facility without negatively impacting existing uses or infrastructure, including but not limited to, water supply, drainage, sewage, natural gas, and electric services;**

As set forth in the Stormwater Report, the TIAS and based on our engineer's independent review of the infrastructure, the existing or proposed infrastructure

can adequately service the Project without negatively impacting existing uses or infrastructure, including but not limited to, water supply, drainage, sewage, natural gas, and electric services.

(ii) impact on traffic conditions at the site, on adjacent streets, and in nearby neighborhoods, including, but not limited to, the adequacy of the roads and intersections to safely and effectively provide access and egress;

As set forth in the TIAS, the Project will include off-site mitigation that will counterbalance the intersection capacity impacts of the additional Project-generated trips added to the roadway network. The applicant will grant an easement to the Town which will expand the cross-section of Gould Street, as recommended by the Town's traffic consultant during the rezoning of the Site in 2020. The Project will also include a robust Traffic Demand Management (TDM) program to incentivize reduced single occupant driving and increase use of alternative forms of transportation.

(iii) the Environmental impacts of the proposal; and

Regarding direct Environmental Impacts, the Applicant is committed to taking all feasible steps to reduce carbon emissions and minimize energy usage. Energy modeling will evaluate several emissions mitigation measures including hybrid electric/gas heating with electric heating being the first to operate whenever capacity allows, high efficiency glycol heat recovery loop, reduced laboratory exhaust through exhaust monitoring, electric water heating, and more. The Project will also be studying options to include photovoltaic solar panels at the roof of the parking garage and roof of the North & South Buildings. In addition to these emission reduction strategies, the Project will utilize the LEED v4 BD+C rating system for the Core and Shell building components to incorporate other sustainability strategies. The current goal is to achieve LEED Silver Certified with higher targets being evaluated.

In addition, the Project has utilized the MEPA Environmental Justice tool, which demonstrates that this Project is not within 1-mile of any Environmental Justice community. The Project will not exceed any air quality thresholds or cause impacts outside of the 1-mile radius and therefore will not negatively impact such communities.

Regarding future impacts due to Sea Level Rise/Storm Surge and other climate change considerations, the Project is not exposed to Sea Level Rise/Storm Surge or Extreme Precipitation-Riverine Flooding. Although the Property has a high risk of Extreme Precipitation-Urban Flooding and a high risk of Extreme Heat, the Project will combat these risks by including measures to reduce the threat of

urban flooding from extreme precipitation and developing appropriate strategies for a changing climate in the near term, as well as planning for a longer-term adaptation strategy over the course of the Project's life span.

No part of the Property has a historic structure, or a structure within a historic district listed in the State Register of Historic Places or the Inventory of Historic and Archaeological Assets of the Commonwealth.

(iv) the fiscal implications of the proposal to the Town

Based on the Fiscal Analysis, a full-build out of the Property and the adjacent parcels at 1.35 FAR would yield a net annual financial benefit to the Town of approximately \$8,342,400. As described above, the Project proposes a build-out of approximately 60% of the full-build out, which results in a prorated net annual financial benefit of approximately \$5,000,000 to the Town from development of the Project, plus personal property taxes which would also generate significant additional revenue.

(v) In granting a special permit, the Planning Board shall also consider any proposed mitigation measures and whether the proposed project's benefits to the Town outweigh the costs and adverse impacts, if any, to the Town.

The Project will include significant mitigation as described above and below. In addition, based on the Fiscal Analysis, the Project is anticipated to provide a net annual financial benefit to the Town of approximately \$5,000,000, plus personal property taxes which would also generate significant additional revenue.

2. Pursuant to By-Law Section 4.11.3, in addition to the foregoing criteria, the Planning Board must consider the below design guidelines when issuing a Special Permit for relief under By-Law Section 3.2.7.2 and/or Section 4.11:

(a) The proposed development should provide or contribute to providing pedestrian and neighborhood connections to surrounding properties, e.g., by creating inviting buildings or street edge, by creating shared publicly accessible green spaces, and/or by any other methods deemed appropriate by the Planning Board;

The Proposed Development will contain various pedestrian and neighborhood connections and amenities. The south end of the South Building, near the main intersection of Gould and Highland will contain the "retail zone" which will have approximately 10,000 sq. ft. of retail or restaurant use. This area is being developed with retail plaza and landscapes visible from the public streets, making it a vibrant and cohesive part of the neighborhood. A landscaped ½ mile public walking loop is

planned around the site, with various exercise areas planned at intervals on the loop, and including a pond and water feature.

- (b) Any parking structure should have a scale, finish and architectural design that is compatible with the new buildings and which blunts the impact of such structures on the site and on the neighborhood;**

The parking structure will be primarily constructed of structural precast concrete columns and spandrel beams with color and finish intended to coordinate with the color and finish of the lab buildings. In addition, the overall scale of the stand-alone parking structure will be broken up through the use of fabric banners hung from the upper levels, which will result in visual interruptions and a softening of the façades onto the sides most visible to the neighborhood. The parking structure will be in the northeast corner of the site, downgradient and well way from Gould Street. Its presence will be masked to the south and southwest by the North Building. The structure will also comply with the specific dimensional criteria developed for this district to integrate with the surrounding area.

- (c) The proposed development should encourage creative design and mix of uses which create an appropriate aesthetic for this gateway to Needham, including but not limited to, possible use of multiple buildings to enhance the corner of Highland Avenue and Gould Street, possible development of a landscape feature or park on Gould Street or Highland Avenue, varied façade treatments, streetscape design, integrated physical design, and/or other elements deemed appropriate by the Planning Board;**

The Project will include two buildings, the North Building on the northerly portion of the Property, and the South Building on the southerly portion of the Property and the shared Atrium to connect them and will help break down the scale of the overall project into smaller pieces. As noted above, the south end of the South Building, near the main intersection Gould Street and Highland Avenue is planned to contain the “retail zone” which will have approximately 10,000 sq. ft. of public retail or restaurant use. This area is being developed with retail plaza featuring soft and hardscape landscaping, outdoor seating, and a water feature at the former location of Muzi pond at the Gould Street and Highland Avenue intersection. Together the proposed R&D, Office, Lab use mixed with Retail use at the corner will create an active gateway condition visible from the public streets. A landscaped ½ mile public walking loop is planned around the site, with various exercise areas planned at intervals around the buildings, and including a pond and water feature.

- (d) The proposed development should promote site features and a layout which is conducive to the uses proposed;**

The building massing was designed to take advantage of unique view corridors, interesting topography, solar orientation, and comply with the zoning requirements outlined above. The building will provide flexible floorplates that are desirable for today's tenants looking for access to light and views and opportunities for shared indoor and outdoor amenities. In addition, a ½ mile fitness/walking loop rings the entire site culminating at the retail plaza at Gould & Highland providing an opportunity for internal and external users to enjoy the site.

(e) The proposed development should incorporate as many green building standards as practical, given the type of building and proposed uses;

The Project is committed to taking all feasible steps to reduce carbon emissions and minimize energy usage. Energy modeling will evaluate several emissions mitigation measures including hybrid electric/gas heating with electric heating being the first to operate whenever capacity allows; high efficiency glycol heat recovery loop; high efficiency chilled water plant; reduced laboratory exhaust through exhaust monitoring; electric water heating; improved envelope insulation and infiltration without thermal bridging; and high-performance lighting and controls.

In addition to emission reduction strategies, the Project will utilize the LEED v4 BD+C rating system for the core and shell building components to incorporate other sustainability strategies such as: green vehicle parking; open space; rainwater management; heat island reduction; construction and demolition waste management; and building product disclosure and optimization. The current goal is to achieve LEED Silver Certified with higher targets being evaluated. In addition, the Project will be Energy Star rated and certified as a WELL Building.

The WELL Building Standard takes a holistic approach to health in the built environment addressing behavior, operations and design. WELL is a performance-based system for measuring, certifying, and monitoring features of the built environment that impact human health and well-being, through air, water, nourishment, light, fitness, comfort and mind. WELL is grounded in a body of medical research that explores the connection between the buildings where we spend more than 90 percent of our time, and the health and wellness impacts on us as occupants. WELL Certified™ spaces can help create a built environment that improves the nutrition, fitness, mood, sleep patterns and performance of its occupants.

(f) The proposed development should be designed and conditioned to reduce or mitigate adverse impacts on adjacent properties or the surrounding area such as those resulting from excessive traffic congestion or excessive demand for parking; and

The Project will include off-site mitigation that will counterbalance the intersection capacity impacts of the additional Project-generated trips added to the roadway network. The car wash previously reported 1,360 peak vehicle trips to the car wash during the winter months, or roughly 600 vehicles daily during peak periods. The car wash coupled with Muzi employees, visitors, new and used car sales, parts distribution, etc., yielded an additional 600 single occupancy vehicles such that there will be little, if any, increase in traffic from the Project. Nevertheless, as recommended by GPI, the Applicant will grant an easement to the Town to expand the cross-section of Gould Street, as recommended by the Town's traffic consultant during the rezoning of the Site in 2020. The Project will also look to augment the Town's rezoning concept with dedicated bicycle lanes on Gould Street that connect the Project and its future pedestrian and open space amenities to the bicycle lane network along Highland Avenue. As set forth above, the Project will also include a robust TDM program to incentivize reduced single occupant driving and increase use of alternative forms of transportation. Based on the TIAS, the roadway network as improved through the Project's proposed transportation mitigation, can safely and adequately handle the trips associated with the Project.

- (g) The proposed development shall include participation in a transportation demand management program to be approved by the Planning Board as a traffic mitigation measure, including but not limited to, membership and participation in an integrated or coordinated shuttle program.**

As set forth above, the Project will also include a robust TDM program to incentivize reduced single occupant driving and increase use of alternative forms of transportation. The Applicant will explore and look to implement shuttle connectivity through its future proactive involvement in the Route 128 Business Council to improve public transportation access and accessibility to the Property.

3. Pursuant to By-Law Section 6.11.5, the Planning board must consider the specific criteria given below when issuing a Special Permit for relief from retaining wall requirements in By-Law 6.11:

- (a) That the retaining wall will not cause an increase of water flow off the property;**

The 4-6 foot high retaining wall proposed along the eastern property boundary will be located along the side of the proposed fire lane/fitness path and adjacent to the I-95/Route 128 off ramp. The retaining wall will direct stormwater discharge toward the site's proposed drainage system and not to the MassDOT's ROW. This is a significant improvement over existing conditions, under which sheet drainage discharges untreated runoff off to adjacent properties and roadways.

(b) That the requested retaining wall will not adversely impact adjacent property or the public;

The requested retaining walls will face the Exit 35C ramp from I-95/Route 128 to Highland Avenue. As such, it will have little, if any, impact on adjacent property or the public. Additionally, the retaining wall has a low profile and there is a wide vegetated shoulder from the roadway before the wall.

(c) That the report of the Design Review Board has been received and considered.

We anticipate that any comments from the Design Review Board will continue to be considered and incorporated into the Project.

II. Special Permit in accordance with By-Law Section 5.1.1.5 waiving adherence to the required number of parking spaces and/or parking design requirements:

Such a special permit waiving strict adherence to the minimum number of required parking spaces may be granted only after it is demonstrated by an applicant that either:

(i) special circumstances in a particular use of structure does not warrant the minimum number of spaces required under Section 5.1.2; or

The By-Law's required parking ratios assume a higher employee density than is typical for lab/research & development uses. The By-Law also assumes that each office employee will commute alone, by motor vehicle. By contrast, the Applicant is committed to a transportation demand management program to encourage the use of carpool, walking, biking, and public transit alternatives to single occupancy vehicle trips. Also, the By-Law's parking ratio does not consider the potentially permanent changes in commuting patterns resulting from the COVID-19 pandemic, including hybrid/remote work programs. For these reasons, the minimum number of spaces that would be required under the By-Law is not warranted for the Project

(ii) the extent of existing building coverage on a particular lot is such that in laying out parking spaces in accordance with the design requirements of Subsection 5.1.3, the requirement for minimum number of spaces under Section 5.1.2 cannot be met.

As noted above, the proposed quantity of parking spaces is sufficient to satisfy the anticipated parking demand for the Project.

In reviewing a request for a special permit under this Section 5.1.1.5, the Planning Board shall consider the following:

- (a) The issuance of a special permit will not be detrimental to the Town or to the general character and visual appearance of the surrounding neighborhood and abutting uses, and is consistent with the intent of this Zoning By-Law;**

The Project redevelops an underutilized site into an economically viable development with public amenities. The addition of the Project will be a source of employment for Needham residents, will generate significant additional tax revenues for the Town, introduces uses, including retail/restaurant uses which will contribute to making the Project a vibrant and cohesive part of the neighborhood and will be designed to enhance the aesthetic of a prominent entry to Needham.

- (b) In the case of waiving strict adherence to the requirements of Section 5.1.2 under subparagraph (i) above, the special permit shall define the conditions of the use of structure so as to preclude changes that would alter the special circumstances contributing to the reduced parking need or demand;**

The Applicant anticipates working with the Board to incorporate appropriate conditions regarding such changes.

- (c) [Not Applicable]**

- (d) Provisions to demonstrate the ability to provide for additional parking consistent with Section 5.1.2 and/or parking designed in accordance with the particular requirements of Section 5.1.3; and**

As noted above, the proposed quantity of parking spaces is sufficient to satisfy the anticipated parking demand for the Project.

- (e) The granting of a special permit under this Section shall not exempt a structure, use or lot from future compliance with the provisions of Section 5.1.2 and/or 5.1.3.**

The special permit decision will not so exempt the structure, use, or lot.

III. Site Plan Review and Special Permit for Major Project

In conducting the Site Plan Review, the Planning Board shall consider the following matters:

- (a) Protection of adjoining premises against seriously detrimental uses by provision for surface water drainage, sound and sight buffers and preservation of views, light, and air;**

The Project maintains a significant landscape buffer between the proposed structures and Highland Avenue and Gould Street, which themselves provide a buffer for residential and other properties nearby. The buffer includes landscaped berms planted with shade trees and conifers. The buildings are far enough from the property lines so there will no shade cast towards any residential properties beyond the property boundary. Except for a small surface parking lot next to Gould Street, all parking will be contained below the buildings or within the parking garage. Service and loading areas are located within the buildings. A tree-lined fitness path is proposed around the site perimeter.

As detailed in the Stormwater Report, stormwater will be contained within the project boundary and catch basins with sumps and hoods, oil/water separators, rain gardens, and vegetated swales to improve storm water quality discharges, are provided. Stormwater will be infiltrated to mitigate storm water volumes. The retention pond is incorporated into the pedestrian and fitness path loop around the development.

(b) Convenience and safety of vehicular and pedestrian movement within the site and on adjacent streets, the location of driveway openings in relation to traffic or to adjacent streets and, when necessary, compliance with other regulations for the handicapped, minors and the elderly;

The parking garages and other parking areas proposed to be created will contain enough parking to accommodate all vehicles on the Property and the parking spaces provided will comply with the design criteria set forth in By-Law Section 5.1.3. The Project will provide a primary entrance on Gould Street, across from the existing curb cut for the Wingate senior housing community via a signalized intersection. An internal drive loop will mitigate traffic queuing in and out of the property. There will be a secondary entrance/exit from the parking garage to TV Place. The Applicant will grant an easement to the Town to allow for the proposed transportation mitigation, including the widening of Gould Street to better handle traffic movements and volume. Internal sidewalks and a bike lane connected to Gould Street will encourage multimodal transportation opportunities. Bicycle storage for short-term and long-term use is incorporated into the project design. Handicapped parking will be provided in compliance with applicable requirements. All access walks and paths are designed with slopes of less than 5%, so no ramps will be needed. Crosswalks are proposed at the Gould Street signalized intersection.

(c) Adequacy of the arrangement of parking and loading spaces in relation to the proposed uses of the premises;

Parking and loading spaces have been adequately arranged in relation to the proposed uses on the Property, and in compliance with parking plan and design requirements under By-Law Section 5.1.3. Structured parking is provided under the buildings, and

in a parking garage. A small surface parking area will provide handicapped parking near the primary building entrances, and parking for adjacent retail and/or restaurant space. Loading areas are included in each section of the buildings.

(d) Adequacy of the methods of disposal of refuse and other wastes resulting from the uses permitted on the site;

Adequate methods for disposal of refuse and waste will be provided by the Project. Solid waste and refuse will be disposed of in compliance with all applicable rules and regulations. The wastewater system will be connected to the municipal sewer system. Tenants will be required to comply with all regulations applicable to the handling and disposal of wastes.

(e) Relationship of structures and open spaces to the natural landscape, existing buildings and other community assets in the area and compliance with other requirements of this By-Law; and

The Project will comply with the setback and landscape buffer requirements of the By-Law that were specifically developed to create an appropriate relationship between the Project and the surrounding area. A curvilinear walking/jogging and bike path is proposed along the perimeter of the Property, to be available for use by the general public. Fitness stations will be provided along the path.

(f) Mitigation of adverse impacts on the Town's resources including the effect on the Town's water supply and distribution system, sewer collection and treatment, fire protection, and streets; and may require when acting as the Special Permit Granting Authority or recommend in the case of minor projects, when the Board of Appeals is acting as the Special Permit Granting Authority, such appropriate conditions, limitations, and safeguards necessary to assure the project meets the criteria of a through f.

The Project will not have any adverse impact on the Town's water supply and distribution system, sewer collection and treatment, fire protection, or streets. The Project will not have any adverse impact on the Town's water or wastewater infrastructure. Sufficient pump stations provide support for the area. The proposed buildings will be fully accessible for the Town's firefighting apparatus.

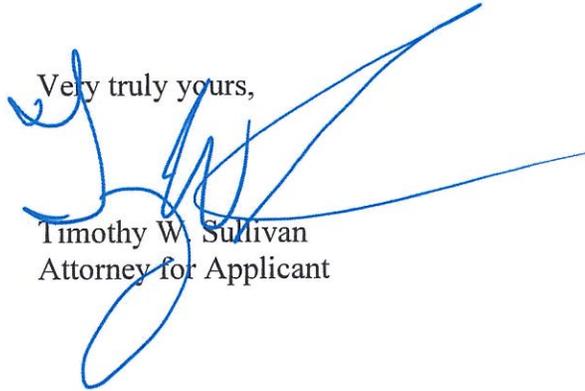
As detailed above and in the materials submitted herewith, the Project satisfies each of the applicable criteria for the requested relief.

As required by G.L. 40A and the By-Law, the Applicant has submitted a copy of these applications to the Town Clerk.

Planning Board Members
April 5, 2022
Page 24 of 24

We appreciate your attention to this matter. The Applicant and the entire Project team look forward to meeting with you and discussing the Project on June 7, 2022 or any earlier date that is convenient for the Board.

Very truly yours,

A handwritten signature in blue ink, appearing to be 'Timothy W. Sullivan', is written over the typed name. The signature is fluid and cursive, with a large loop at the end.

Timothy W. Sullivan
Attorney for Applicant

Enclosures



557 Highland Ave
Needham, MA 02494

Needham Special Permit Package
03/30/2022





Proposed
Site Plan



Aerial – Looking North



Aerial – Looking West



Aerial – Looking South



Aerial – West Entry Drive

Site Aerial - Proposed



Gould Street – Looking North-East



Fitness Loop – Looking South

Street View - Proposed

557 HIGHLAND AVE NEEDHAM, MA 02494



PROJECT TEAM

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TIMOTHY SULLIVAN

Contact:
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CODE CONSULTANT:

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email: norton@remmerconsulting.net

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email: boneil@mcphailgeo.com

MEPFP ENGINEER:

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email: robert_andrews@aha-engineers.com

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email: jford@kalinassociates.com

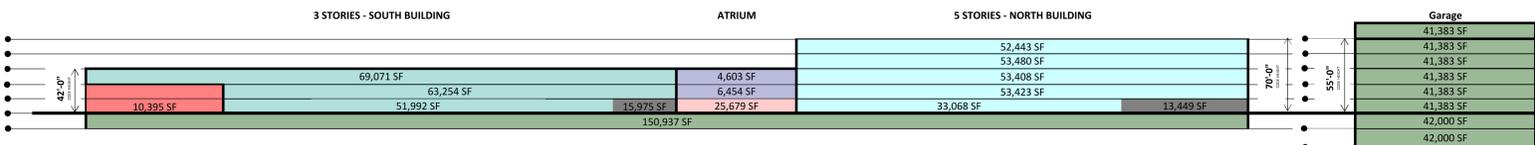


DRAWING INDEX-SUBMISSION MATRIX

DRAWING NUMBER	DRAWING NAME
GENERAL	
G-010	COVER SHEET
G-010	ZONING GROSS AREA PLANS
CIVIL	
C-01	LEGEND AND GENERAL NOTES
C-02	OVERALL SITE PLAN
C-03	DRAINAGE AND EROSION CONTROL PLAN
C-04	UTILITY PLAN
C-05	SITE DETAILS
C-06	SITE DETAILS
LANDSCAPE	
L-10	SITE LAYOUT & MATERIALS PLAN
L-20	SITE GRADING PLAN
L-30	SITE PLANTING PLAN
L-40	SITE LIGHTING PLAN
L-50	SITE DETAILS I
L-51	SITE DETAILS II
ARCHITECTURAL	
A-100G1	GARAGE LEVEL G1 - OVERALL PLAN
A-101	LEVEL 1 - OVERALL PLAN
A-102	LEVEL 2 - OVERALL PLAN
A-103	LEVEL 3 - OVERALL PLAN
A-104	LEVEL 4 - OVERALL PLAN
A-105	LEVEL 5 - OVERALL PLAN
A-106	LEVEL 6 - OVERALL PLAN

DRAWING INDEX-SUBMISSION MATRIX

DRAWING NUMBER	DRAWING NAME
A-107	ROOF PLAN
A-201	BUILDING ELEVATIONS - LOCATOR ELEVATIONS
A-202	BUILDING ELEVATIONS - NORTH BLDG - NORTH
A-203	BUILDING ELEVATIONS - NORTH BLDG - SOUTH & EAST
A-204	BUILDING ELEVATIONS - NORTH BLDG (SOUTHWEST) & SOUTH BLDG (SOUTH)
A-205	BUILDING ELEVATIONS - NORTH BLDG (WEST) & SOUTH BLDG (NORTH & WEST)
A-206	BUILDING ELEVATIONS - SOUTH BLDG - NORTH & EAST
A-211	BUILDING SECTIONS - OVERALL
A-212	BUILDING SECTIONS - NORTH BLDG
A-213	BUILDING SECTIONS - NORTH BLDG
ARCHITECTURAL - GARAGE	
AG-100 R2	GARAGE LEVEL R2
AG-100 B1	GARAGE LEVEL B1
AG-101	GARAGE LEVEL 1
AG-102	GARAGE LEVEL 2
AG-103	GARAGE LEVEL 3 (LEVEL 4.3 SIM)
AG-106	GARAGE LEVEL 6
AG-211	GARAGE SECTIONS
AG-212	GARAGE SECTIONS
AG-301	ELEVATIONS
AG-302	ELEVATIONS



GROUND FLOOR	
Program	SF
A1 Retail	10,395 SF
A2 Amenity	25,679 SF
A3 Office/Lab	430,139 SF
A4 Tenant Bridge	11,057 SF
A5 BOH	29,424 SF
A6 PARKING & GARAGE (TOTAL)	483,235 SF
Total FAR SF (A1 + A2 + A3 + A4 + A5)	506,694 SF

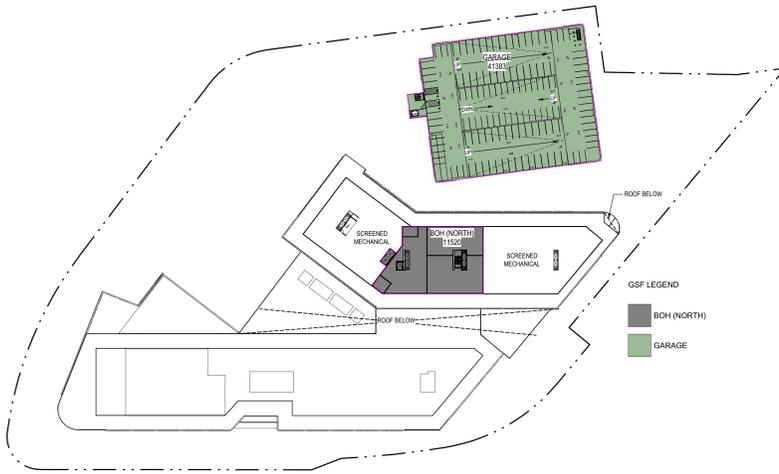
Parking Space Totals					
Level	Building Parking Count (Below Grade)				
	Standard	Parallel	Compact	ADA - VAN	ADA
Level G1	200	8	127	2	6
Total by Type	200	8	127	2	6
Total Parking	343				
% Compact	37%				

Level	Garage Parking Count			
	Standard	Compact	ADA - VAN	ADA
Level B2	71	55	0	3
Level B1	70	58	0	3
Level 1	64	58	3	1
Level 2	70	58	0	3
Level 3	71	58	0	2
Level 4	71	58	0	2
Level 5	71	58	0	2
Roof	71	38	0	2
Total by Type	559	441	3	18
Total Parking	1021			
% Compact	43%			

Site Totals		
Program		Proposed
P1 Total FAR SF (Office + Garage)		506,694 SF
P2 Total Office/Lab SF (A3 + A4)		441,196 SF
P3 Site Parking and Drive Aisles		51,598 SF
P4 Total Lot Coverage (P7 - P4)		252,681 SF
P5 Total Open Space		151,252 SF
P6 Parking Spaces Required at 1/300sf		1689.0
TOTAL SITE SF		403,933 SF
SITE FAR		1.25

Site Parking Totals	
	Proposed
SP1 Surface Parking	44
SP2 Office/Lab Building	343
SP3 Garage	1021
Total Parking (SP1 + SP2 + SP3)	1408

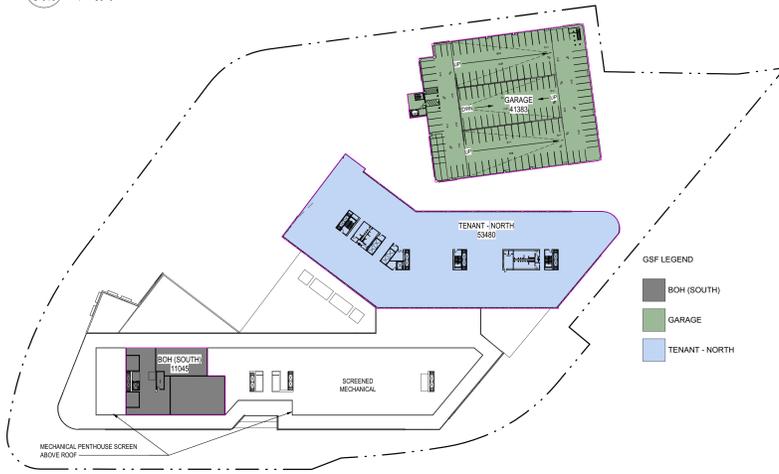
BUILDINGS ABB (GROSS - OFFICE ONLY)			BUILDINGS ABB (GROSS - GARAGE ONLY)		
BUILDING	GSF (SF)	Comments	BUILDING	GSF (SF)	Comments
LEVEL G1 PARKING	150937	EXCLUDED	LEVEL G2 GARAGE	42000	EXCLUDED
LEVEL 1 ATRIUM	25679		LEVEL G1 GARAGE	42000	EXCLUDED
BOH (NORTH)	13449		LEVEL 1 GARAGE	41383	
BOH (SOUTH)	15975		LEVEL 2 GARAGE	41383	
RETAIL	10366		LEVEL 3 GARAGE	41383	
TENANT - NORTH	33068		LEVEL 4 GARAGE	41383	
TENANT - SOUTH	51992		LEVEL 5 GARAGE	41383	
	150558		TOTAL	302596	



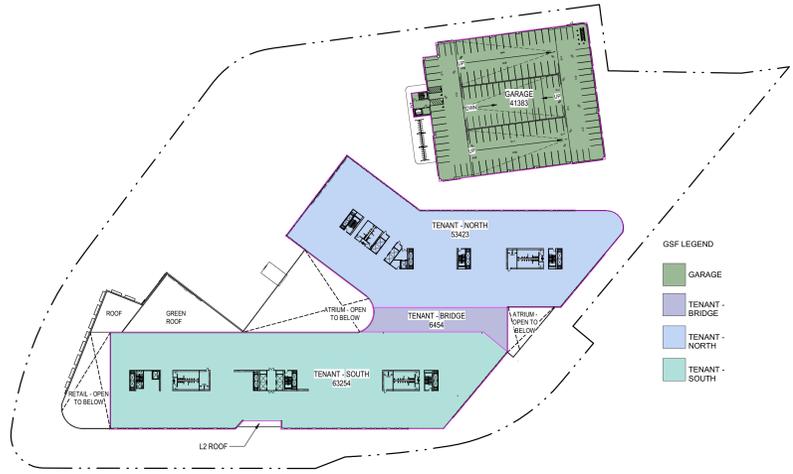
6 GSF - ROOF
 1" = 80'-0"



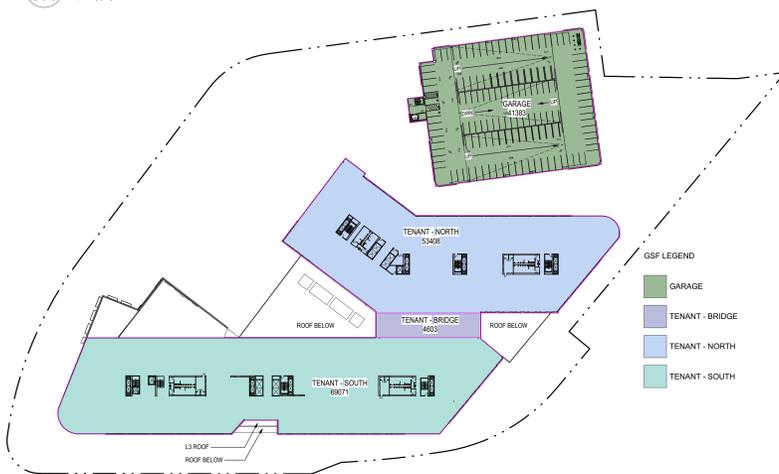
5 LEVEL 5 - BLDG B
 1" = 80'-0"



4 GSF - LEVEL 4
 1" = 80'-0"



2 GSF - LEVEL 2
 1" = 80'-0"



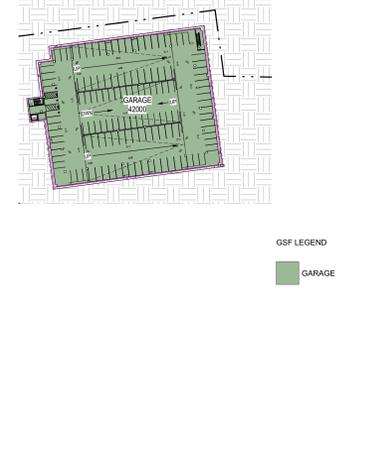
3 GSF - LEVEL 3
 1" = 80'-0"



1 GSF - LEVEL 1
 1" = 80'-0"

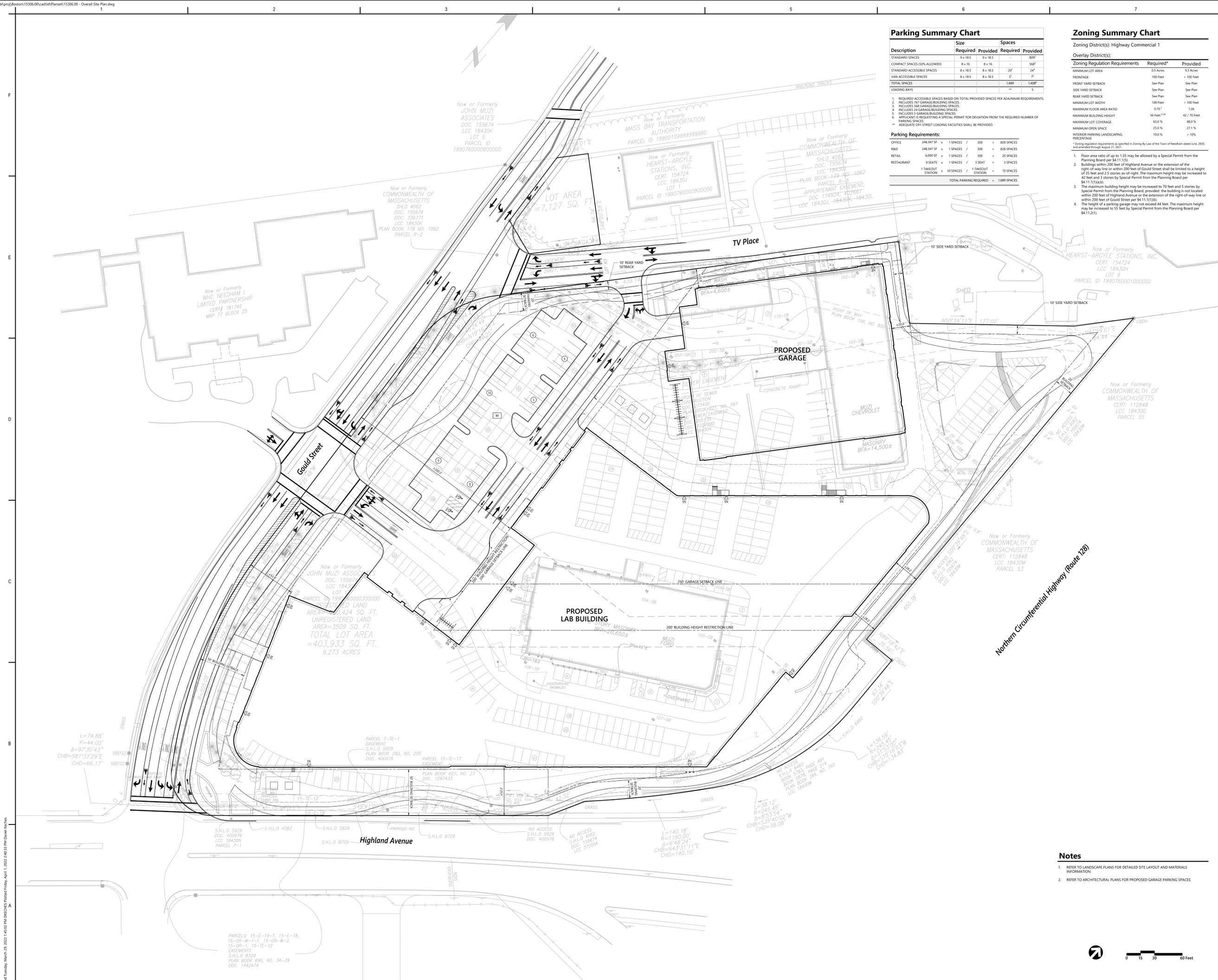


G1 GSF - LEVEL G1
 1" = 80'-0"



G2 GSF - LEVEL G2
 1" = 80'-0"

GENERAL NOTE: ALL AREAS ARE IN PROGRESS AND SHOULD NOT BE CONSIDERED FINAL.



Parking Summary Chart

Description	Size		Spaces	
	Required	Provided	Required	Provided
STANDARD SPACES	9 x 18.5	9 x 18.5	-	809*
COMPACT SPACES (50% ALLOWED)	8 x 16	8 x 16	-	568*
STANDARD ACCESSIBLE SPACES	8 x 18.5	8 x 18.5	20†	24†
VAN ACCESSIBLE SPACES	8 x 18.5	8 x 18.5	5†	7†
TOTAL SPACES			1,689	1,408*
LOADING BAYS			22	5

1. REQUIRED ACCESSIBLE SPACES BASED ON TOTAL PROVIDED SPACES PER ADA/MAAS REQUIREMENTS.
 2. INCLUDES 787 GARAGE/BUILDING SPACES.
 3. INCLUDES 568 GARAGE/BUILDING SPACES.
 4. INCLUDES 24 GARAGE/BUILDING SPACES.
 5. INCLUDES 5 GARAGE/BUILDING SPACES.
 6. APPLICANT IS REQUESTING A SPECIAL PERMIT FOR DEVIATION FROM THE REQUIRED NUMBER OF PARKING SPACES.
 * ADEQUATE OFF-STREET LOADING FACILITIES SHALL BE PROVIDED.

Parking Requirements:
 OFFICE 248,347 SF x 1 SPACES / 300 = 828 SPACES
 R&D 248,347 SF x 1 SPACES / 300 = 828 SPACES
 RETAIL 6,000 SF x 1 SPACES / 300 = 20 SPACES
 RESTAURANT 9 SEAT x 1 SPACES / 3 SEAT = 3 SPACES
 1 TAKEOUT STATION x 10 SPACES / 1 TAKEOUT STATION = 10 SPACES
TOTAL PARKING REQUIRED = 1,689 SPACES

Zoning Summary Chart

Zoning District(s): Highway Commercial 1

Zoning Regulation Requirements	Required*	Provided
MINIMUM LOT AREA	0.5 Acres	9.3 Acres
FRONTAGE	100 Feet	> 100 Feet
FRONT YARD SETBACK	See Plan	See Plan
SIDE YARD SETBACK	See Plan	See Plan
REAR YARD SETBACK	See Plan	See Plan
MINIMUM LOT WIDTH	100 Feet	> 100 Feet
MAXIMUM FLOOR AREA RATIO	0.70†	1.26
MAXIMUM BUILDING HEIGHT	56 Feet ¹¹⁴	42 / 70 Feet
MINIMUM LOT COVERAGE	65.0 %	48.0 %
MINIMUM OPEN SPACE	25.0 %	27.1 %
INTERIOR PARKING LANDSCAPING PERCENTAGE	10.0 %	> 10%

* Zoning regulation requirements as specified in Zoning By-Law of the Town of Needham dated June, 2020, and amended through August 21, 2021.

- Floor area ratio of up to 1.35 may be allowed by a Special Permit from the Planning Board per §4.11.1(1).
- Buildings within 200 feet of Highland Avenue or the extension of the right-of-way line or within 200 feet of Gould Street shall be limited to a height of 35 feet and 2.5 stories as-of-right. The maximum height may be increased to 42 feet and 3 stories by Special Permit from the Planning Board per §4.11.1(1)(a).
- The maximum building height may be increased to 70 feet and 5 stories by Special Permit from the Planning Board, provided the building is not located within 200 feet of Highland Avenue or the extension of the right-of-way line or within 200 feet of Gould Street per §4.11.1(1)(b).
- The height of a parking garage may not exceed 44 feet. The maximum height may be increased to 55 feet by Special Permit from the Planning Board per §4.11.2(1).

Notes

- REFER TO LANDSCAPE PLANS FOR DETAILED SITE LAYOUT AND MATERIALS INFORMATION.
- REFER TO ARCHITECTURAL PLANS FOR PROPOSED GARAGE PARKING SPACES.

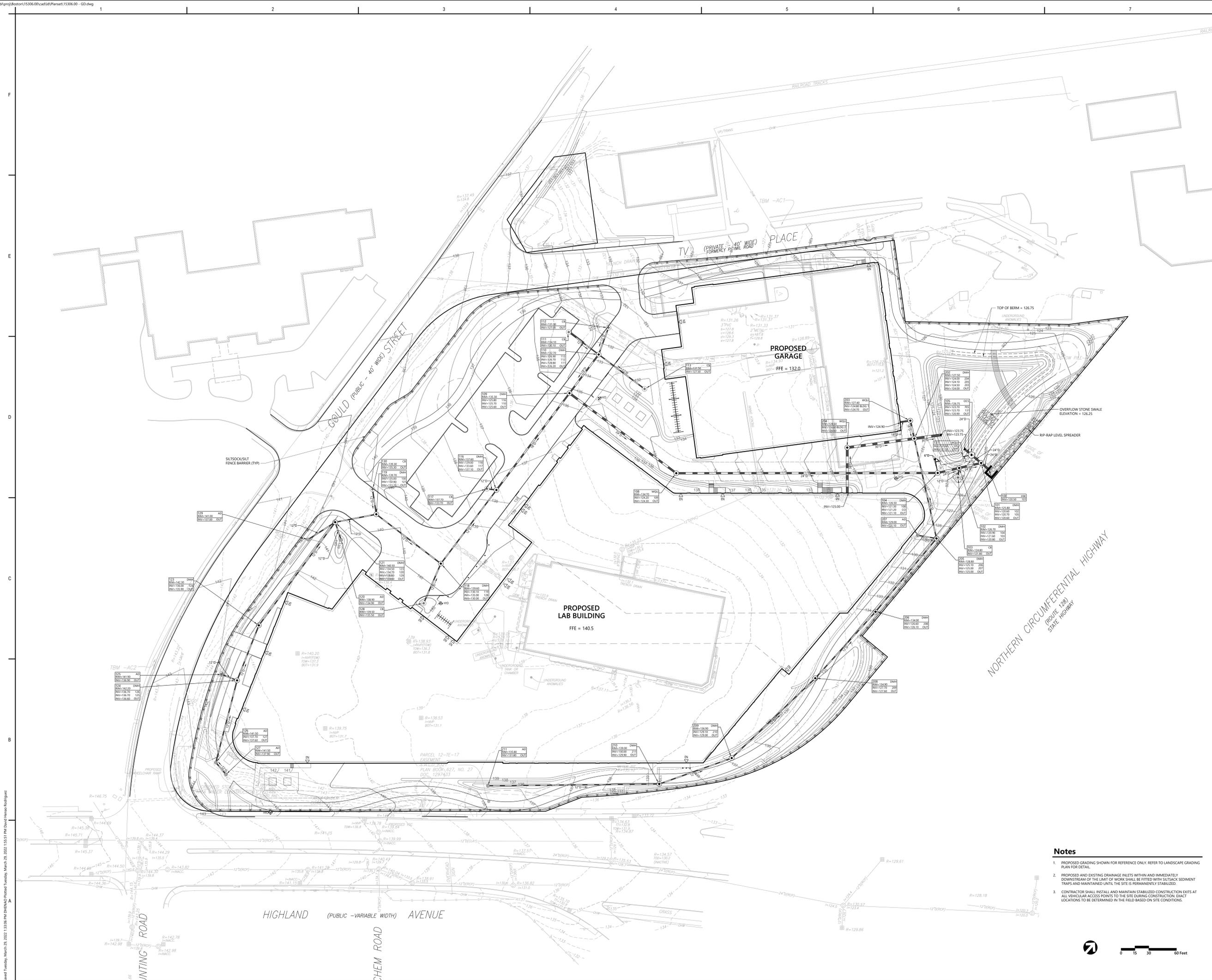
Stantec
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Permit/Seal
 COMMONWEALTH OF MASSACHUSETTS
 NICHOLAS J. BUCK
 CIVIL
 No. 10297
 REGISTERED PROFESSIONAL ENGINEER
 Issue/Revision
 By: [Signature] Date: 11/14/2023

Bulfinch
 557 Highland Ave
 Project No.: 15216.00
 Scale: 1" = 30'-0"
 Author: Designer: Checker: 2023.03
 Date: 11/14/2023
 Title: OVERALL SITE PLAN
 Revision:
 Drawing No.: C-02

Save: Tuesday, March 29, 2022 1:33:06 PM D:\HELMAD\Project\Tuesday, March 29, 2022 1:55:51 PM David Hensho Rodriguez



- Notes**
1. PROPOSED GRADING SHOWN FOR REFERENCE ONLY. REFER TO LANDSCAPE GRADING PLAN FOR DETAIL.
 2. PROPOSED AND EXISTING DRAINAGE INLETS WITHIN AND IMMEDIATELY DOWNSTREAM OF THE LIMIT OF WORK SHALL BE FITTED WITH SILTSACK SEDIMENT TRAPS AND MAINTAINED UNTIL THE SITE IS PERMANENTLY STABILIZED.
 3. CONTRACTOR SHALL INSTALL AND MAINTAIN STABILIZED CONSTRUCTION EXITS AT ALL VEHICULAR ACCESS POINTS TO THE SITE DURING CONSTRUCTION. EXACT LOCATIONS TO BE DETERMINED IN THE FIELD BASED ON SITE CONDITIONS.



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Permit/Seal: [Professional Engineer Seal for Nicholas J. Scully, No. 5871]

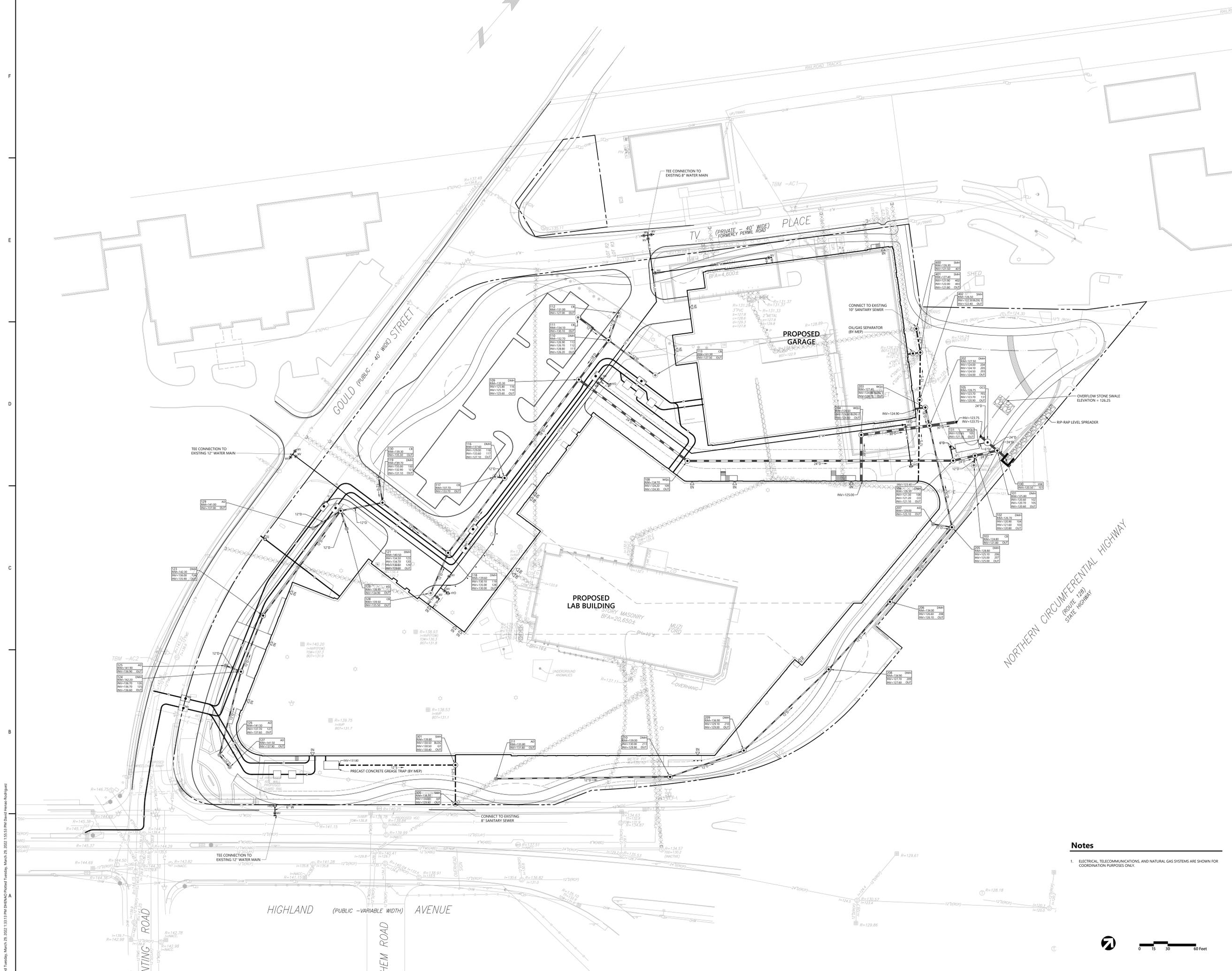
Bulfinch
 557 Highland Ave
 Boston, MA 02118
 Tel: (617) 261-1770

Client/Project: [Redacted]
 Project No.: 15216.00
 Scale: 1" = 30'-0"
 Author: [Redacted] Designer: [Redacted] Checker: 2222.03
 Date: [Redacted] Drawn: [Redacted] Checked: [Redacted] Plotted: [Redacted]

Title: DRAINAGE AND EROSION CONTROL PLAN
 Revision: [Redacted]
 Drawing No.: C-03

Sheet Tuesday, March 29, 2022 1:31:13 PM D:\HELMAD\Project Tuesday, March 29, 2022 1:55:53 PM David Renevo Rodriguez

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Notes

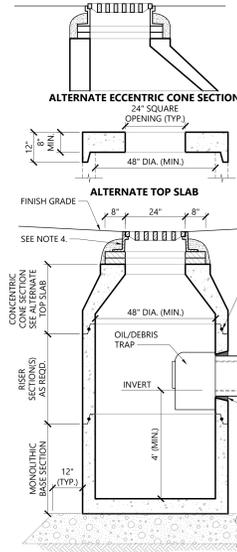
1. ELECTRICAL, TELECOMMUNICATIONS AND NATURAL GAS SYSTEMS ARE SHOWN FOR COORDINATION PURPOSES ONLY.



Stantec
Vhb
 101 Walnut Street
 PO Box 9151
 Worcester, MA 02471
 517.844.1770

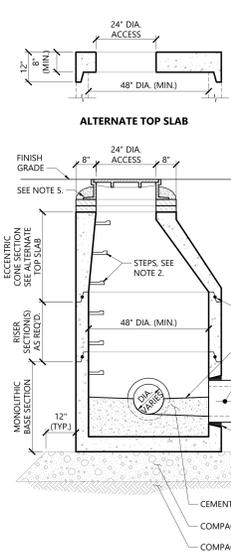
Permit/Seal
 NICHOLAS J. SKOLY
 CIVIL
 No. 58677
 PROFESSIONAL ENGINEER
 State of Massachusetts
 Issue/Revision

Bulfinch
 557 Highland Ave
 Project No: 15216.00
 Scale: 1" = 30'-0"
 Author: Designer/Checker: 2022.03.01
 Date: 03/29/22
 Title: UTILITY PLAN
 Revision: Drawing No. **C-04**



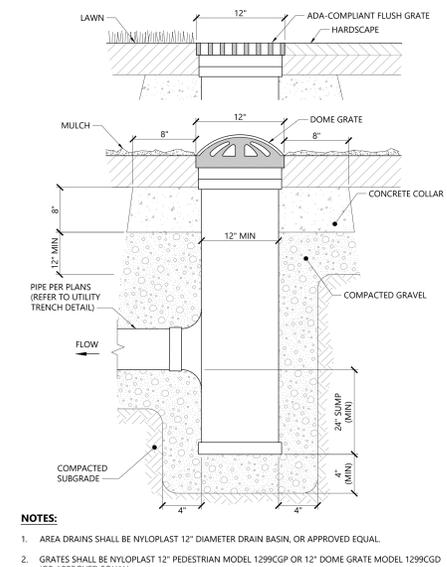
- NOTES**
- ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING.
 - FOR HDPE, PVC, AND DI PIPE, PROVIDE FLEXIBLE BOOT CONNECTION INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. FOR RCP, PROVIDE OPENINGS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE AND MORTAR CONNECTIONS.
 - JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PERFORMED BUTYL RUBBER.
 - CATCH BASIN FRAME AND GRATE SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (2 BRICK COURSES TYPICALLY, 5 BRICK COURSES MAXIMUM).

Catch Basin (CB) With Oil/Debris Trap
N.T.S. Source: VHB 3/21 LD_101

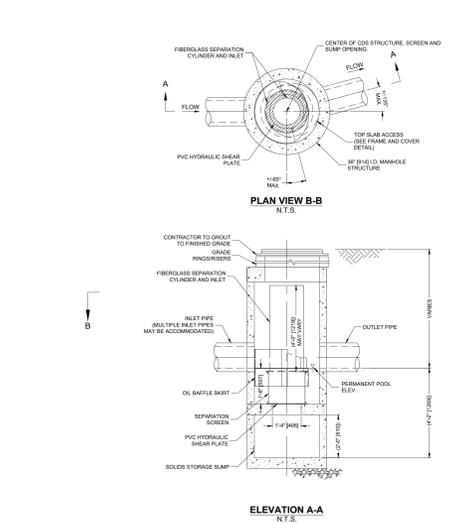


- NOTES**
- ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING. DIAMETER OF STRUCTURES SHALL BE COORDINATED WITH PIPE CONFIGURATIONS.
 - COPOLYMER MANHOLE STEPS SHALL BE INSTALLED AT 12" O.C. FOR THE FULL DEPTH OF THE STRUCTURE.
 - FOR HDPE, PVC, AND DI PIPE, PROVIDE FLEXIBLE BOOT CONNECTION INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. FOR RCP, PROVIDE OPENINGS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE AND MORTAR CONNECTIONS.
 - JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PERFORMED BUTYL RUBBER.
 - DRAIN MANHOLE FRAME AND COVER SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (2 BRICK COURSES TYPICALLY, 5 BRICK COURSES MAXIMUM).

Drain Manhole (DMH)
N.T.S. Source: VHB 11/19 LD_115



Area Drain (AD) Type 1
N.T.S. Source: VHB 12/19 LD_193



WQU-203 (CDS1515-3)
N.T.S. Source: Contech

CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 8.0 GPM PER LOCAL REGULATIONS. THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.

FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

GENERAL NOTES

- CONTRACTOR TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE: www.contech.com
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CONTROLS TO MATCH PIPE DIMENSIONS AND ELEVATIONS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL GROUT BE PUMPED INVERTS ARE GROUTED.

INSTALLATION NOTES

- ANY SUBGRADE, BACKFILL DEPTH, AND/OR ANTI-FILLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CONTROLS TO MATCH PIPE DIMENSIONS AND ELEVATIONS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL GROUT BE PUMPED INVERTS ARE GROUTED.

CDS2020-5-C DESIGN NOTES

CDS2020-5-C RATED TREATMENT CAPACITY IS 2.2 GPM, OR PER LOCAL REGULATIONS. THE STANDARD CDS2020-5-C CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION

GRADED INLET WITH PALET PIPES OR PIPES
CURB INLET ONLY (NO PALET PIPES)
CURB INLET WITH PALET PIPE COPIES

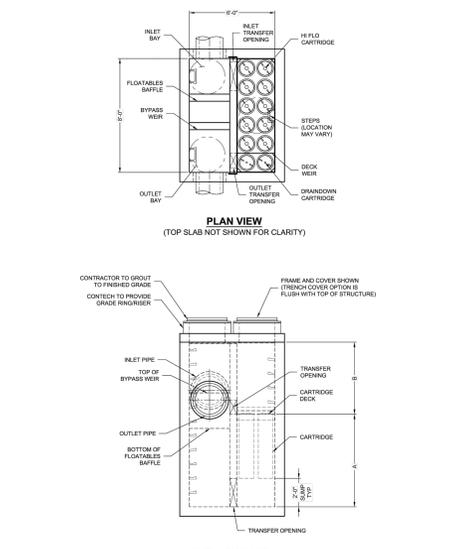
FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

GENERAL NOTES

- CONTRACTOR TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE: www.contech.com
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CONTROLS TO MATCH PIPE DIMENSIONS AND ELEVATIONS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL GROUT BE PUMPED INVERTS ARE GROUTED.

INSTALLATION NOTES

- ANY SUBGRADE, BACKFILL DEPTH, AND/OR ANTI-FILLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CONTROLS TO MATCH PIPE DIMENSIONS AND ELEVATIONS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL GROUT BE PUMPED INVERTS ARE GROUTED.



WQU-204 (CD2020-5)
N.T.S. Source: Contech

JELLYFISH DESIGN NOTES

JELLYFISH TREATMENT CAPACITY IS A FUNCTION OF THE CARTIDGE LENGTH AND THE NUMBER OF CARTIDGES. THE STANDARD PEAK OMBERSION STYLE AND PROPOSED TOP SLAB DESIGN. ALTERNATE CONFIGURATIONS ARE AVAILABLE. PEAK OMBERSION CAPACITY TO BE DETERMINED BY ENGINEER OF RECORD.

CARTIDGE LENGTH	36"	48"	72"	108"
FLOW RATE (GPM) (BASED ON 1.0 GPM PER CART)	0.178 / 0.269	0.133 / 0.207	0.089 / 0.566	0.049 / 0.025
MAX. TREATMENT TIME (MIN)	1.00	1.43	2.14	3.24
DECK TO INVERT TOP (MIN) (ft)	5.00	4.00	3.00	2.00

FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

24" TRENCH COVER
(LENGTH VARIES)
N.T.S.

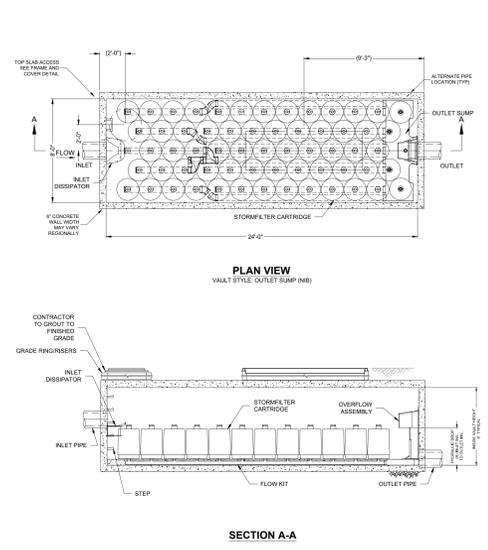
GENERAL NOTES

- CONTRACTOR TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE: www.contech.com
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CONTROLS TO MATCH PIPE DIMENSIONS AND ELEVATIONS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL GROUT BE PUMPED INVERTS ARE GROUTED.

INSTALLATION NOTES

- ANY SUBGRADE, BACKFILL DEPTH, AND/OR ANTI-FILLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE.
- CONTRACTOR TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CONTROLS TO MATCH PIPE DIMENSIONS AND ELEVATIONS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL GROUT BE PUMPED INVERTS ARE GROUTED.

WQU-108 (Jellyfish JFPD086-8-2)
N.T.S. Source: Contech



STORMFILTER DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTIDGE SELECTION AND THE NUMBER OF CARTIDGES. THE STANDARD VALLI STYLE IS SHOWN WITH THE MAXIMUM NUMBER OF CARTIDGES (81). VALLI STYLE STORMFILTERS SHALL BE SET IN FULL MORTAR BED WITH 2" CLEARANCE TO OUTLET BAY (S). INLET BAY SHALL BE 18" HIGH. BAY HEIGHT BAY SHALL BE 18". STORMFILTER BOX PEAK HYDRAULIC CAPACITY IS 1.8 GPM. IF THE SITE CONDITIONS EXCEED 1.8 GPM AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTIDGE SELECTION	18"	24"	36"	48"	LOW FLOW
RECOMMENDED HYDRAULIC GROUP (H)	3.00	1.50	1.00	0.75	0.50
SPECIFIC FLOW RATE (GPM/FT)	2.00	1.50	1.00	0.75	0.50
CARTIDGE FLOW RATE (GPM)	22.5	18.75	13.5	10.125	7.5
CARTIDGE FLOW RATE (GPM)	22.5	18.75	13.5	10.125	7.5

* 1.67 gpm/ft SPECIFIC FLOW RATE IS APPROVED WITH POSIHOOD® (PPOB) MEDIA ONLY.

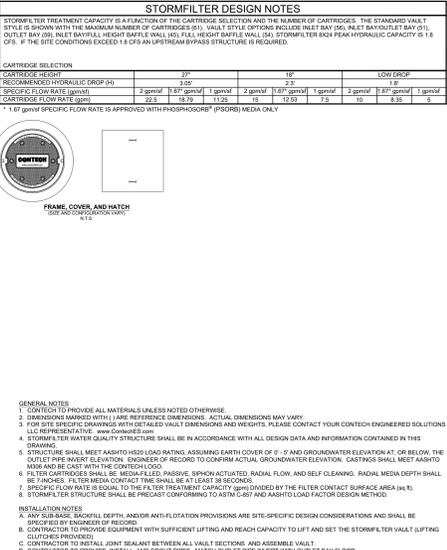
GENERAL NOTES

- CONTRACTOR TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
- DIMENSIONS MARKED WITH (1) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
- FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS REPRESENTATIVE: www.contech.com
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER VALLI (S) UNIT.
- CONTRACTOR TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CONTROLS TO MATCH PIPE DIMENSIONS AND ELEVATIONS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL GROUT BE PUMPED INVERTS ARE GROUTED.

INSTALLATION NOTES

- ANY SUBGRADE, BACKFILL DEPTH, AND/OR ANTI-FILLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER VALLI (S) UNIT.
- CONTRACTOR TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CONTROLS TO MATCH PIPE DIMENSIONS AND ELEVATIONS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL GROUT BE PUMPED INVERTS ARE GROUTED.

WQU-131 (StormFilter SF0824 with 57-18" Cartridges)
N.T.S. Source: Contech



OVERFLOW STONE SWALE

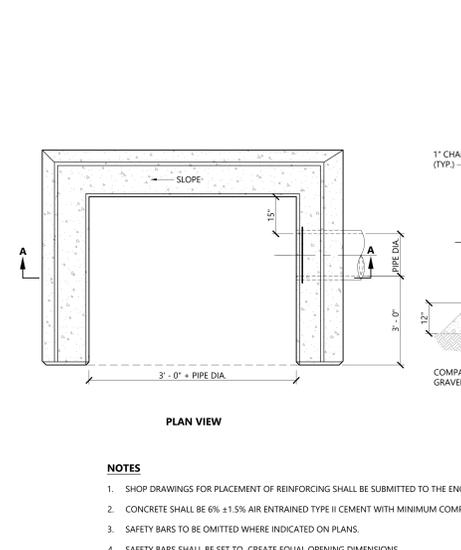
GENERAL NOTES

- SHOP DRAWINGS FOR PLACEMENT OF REINFORCING SHALL BE SUBMITTED TO THE ENGINEER BY THE CONTRACTOR.
- CONCRETE SHALL BE 6% ± 1.5% AIR ENTRAINMENT TYPE II CEMENT WITH MINIMUM COMPRESSIVE STRENGTH OF 4,000 PSI.
- SAFETY BARS TO BE OMITTED WHERE INDICATED ON PLANS.
- SAFETY BARS SHALL BE SET TO CREATE EQUAL OPENING DIMENSIONS.

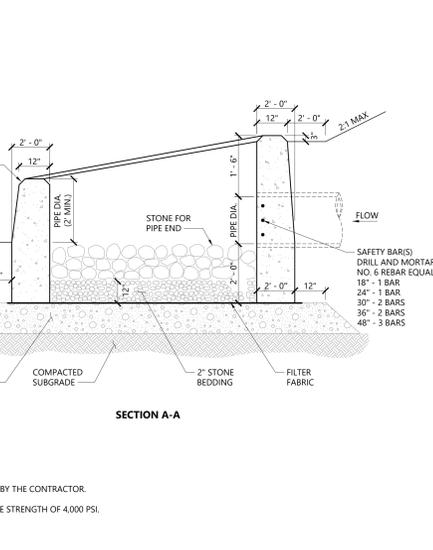
INSTALLATION NOTES

- ANY SUBGRADE, BACKFILL DEPTH, AND/OR ANTI-FILLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
- CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER VALLI (S) UNIT.
- CONTRACTOR TO PROVIDE, INSTALL AND GROUT INLET AND OUTLET PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CONTROLS TO MATCH PIPE DIMENSIONS AND ELEVATIONS.
- CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL GROUT BE PUMPED INVERTS ARE GROUTED.

Overflow Stone Swale
N.T.S. Source: VHB REV LD_161



Directional Headwall
N.T.S. Source: VHB 10/20 LD_135



StormFilter SF0824 with 57-18" Cartridges
N.T.S. Source: Contech

Stantec
Stantec Architecture and Engineering P.C.
311 Summer Street
Tel: (617) 234-1000 • www.stantec.com

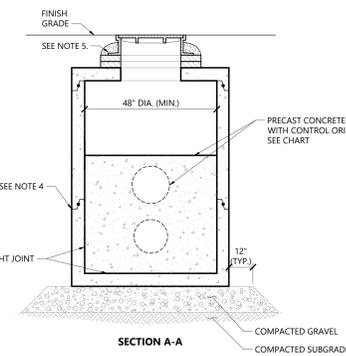
Vhb
101 Walnut Street
PO Box 9151
Worcester, MA 02471
Tel: (508) 853-1770

Permit/Seal
MICHAEL SKOBY
Civil Engineer
No. 02877
Professional Seal

Bulfnch
557 Highland Ave
Project No.: 15216.00
Scale: As Shown
Author: Designer Checker: 2022.03.01
Date: Dwg. Date: 11/11/2020
Title: Site Details
Revision: Drawing No.: C-05

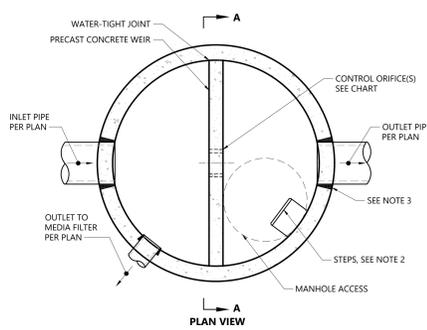
OUTLET STRUCTURE CHART

DETENTION BASIN	STRUCTURE NUMBER	TOP OF WATER ELEVATION	DIMENSIONS ORIFICE A	INVERT ORIFICE A	DIMENSIONS ORIFICE B	INVERT ORIFICE B
P1	105	125.0	N/A	N/A	N/A	N/A



Outlet Control Structure with Weir (OCS)

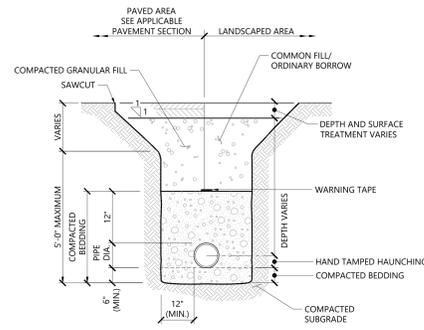
N.T.S. Source: VHB REV 3/20 LD_162A



NOTES

1. ALL SECTIONS SHALL BE DESIGNED FOR HS-20 LOADING. DIAMETER OF STRUCTURES SHALL BE COORDINATED WITH PIPE CONFIGURATIONS.
2. COPOLYMER MANHOLE STEPS SHALL BE INSTALLED AT 12" O.C. FOR THE FULL DEPTH OF THE STRUCTURE.
3. FOR HDPE, PVC, AND DI PIPE, PROVIDE FLEXIBLE BOOT CONNECTION INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. FOR RCP, PROVIDE OPENINGS FOR PIPES WITH 2" MAX. CLEARANCE TO OUTSIDE OF PIPE AND MORTAR CONNECTIONS.
4. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PERFORMED BUTYL RUBBER.
5. DRAIN MANHOLE FRAME AND COVER SHALL BE SET IN FULL MORTAR BED. ADJUST TO GRADE WITH CLAY BRICK AND MORTAR (2 BRICK COURSES TYPICALLY, 5 BRICK COURSES MAXIMUM).

N.T.S. Source: VHB REV 3/20 LD_162A

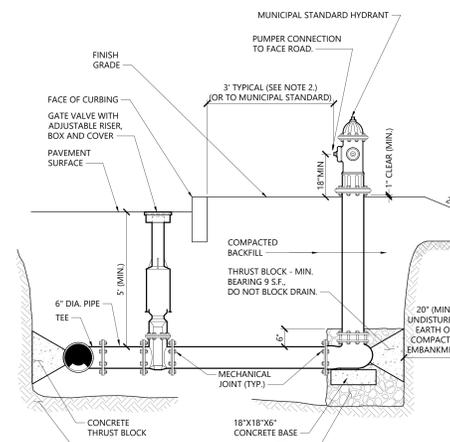


NOTES

1. WHERE UTILITY TRENCHES ARE CONSTRUCTED THROUGH DETENTION BASIN BERMS OR OTHER SUCH SPECIAL SECTIONS, PLACE TRENCH BACKFILL WITH MATERIALS SIMILAR TO THE SPECIAL SECTION REQUIREMENTS.
2. USE METALLIC TRACING/WARNING TAPE OVER ALL PIPES.
3. COMPACTED GRANULAR FILL MAY CONSIST OF GRAVEL, CRUSHED STONE, SAND, OR OTHER MATERIAL AS APPROVED BY ENGINEER.

Utility Trench

N.T.S. Source: VHB REV 11/19 LD_300



NOTES

1. CONCRETE THRUST BLOCKS TO BE USED ONLY WHERE THEY CAN BEAR ON UNDISTURBED EARTH AS SHOWN. USE CLAMPS AND THE RODS OR OTHER ACCEPTABLE METHOD OF JOINT RESTRAINT WHERE SOIL CONDITIONS PROHIBIT THE USE OF THRUST BLOCKS.
2. HYDRANT IN SIDEWALK AREAS TO BE LOCATED TO PROVIDE MINIMUM CLEAR SIDEWALK PASSAGE WIDTH OF 3 FEET AT HYDRANT.
3. A 36-INCH CLEAR SPACE SHALL BE MAINTAINED AROUND THE CIRCUMFERENCE OF THE HYDRANT UNLESS OTHERWISE APPROVED BY AUTHORITY HAVING JURISDICTION.

Hydrant Construction

N.T.S. Source: VHB REV 12/19 LD_250

RESTRAINED JOINTS

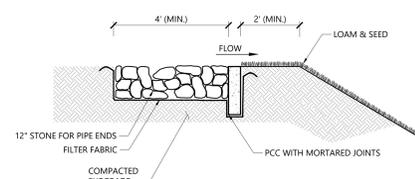
FITTINGS	NUMBER OF JOINTS TO RESTRAIN ON EITHER SIDE OF FITTING (BASED ON 18-FOOT PIPE LENGTH)
90 DEGREE BEND	3
45 DEGREE BEND	2
22-1/2 DEGREE BEND	2
TEE	3
BRANCH	3
RUN	2

NOTES

1. PIPE WITH RESTRAINED JOINTS SHALL BE INSTALLED IN ALL AREAS WHERE THE PIPE IS WITHIN FILL MATERIALS AND ALSO AT LOCATIONS SHOWN ON THE DRAWINGS. RESTRAINED JOINTS SHALL BE INSTALLED AT BENDS, REDUCERS, TEES, VALVES, DEAD ENDS, AND HYDRANTS. THE MINIMUM LENGTH OF PIPE TO BE RESTRAINED ON EITHER SIDE OF THE JOINT SHALL BE AS SHOWN ON THE TABLE ABOVE THE FITTINGS OF THE NEW PIPING SHALL BE FOR RESTRAINED JOINTS AS MARKED ON THE DRAWINGS.
2. NO RESTRAINING IS REQUIRED IN THE DIRECTION OF THE EXISTING PIPE IF ONLY A SHORT LENGTH OF IT IS EXPOSED IN THE TRENCH FOR MAKING A CONNECTION.
3. RESTRAINED JOINT ASSEMBLIES FOR PUSH-ON PIPE AND FITTINGS SHALL BE MADE IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES.

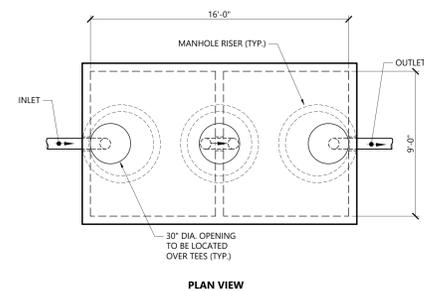
Restrained Joints for Water Pipe

N.T.S. Source: VHB REV 3/20 LD_261



Level Spreader Section

N.T.S. Source: VHB REV 3/20 LD_162A

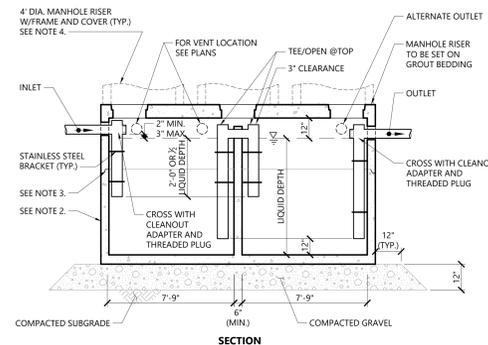


NOTES

1. STRUCTURE SHALL BE DESIGNED FOR HS-20 LOADING.
2. EXTERIOR SURFACES SHALL BE GIVEN TWO COATS OF BITUMINOUS WATER-PROOFING MATERIAL.
3. JOINT SEALANT BETWEEN PRECAST SECTIONS SHALL BE PERFORMED BUTYL RUBBER.
4. STANDARD 30-INCH SEWER MANHOLE FRAME AND COVER SHALL BE LOCATED OVER CROSSES AND SET IN FULL MORTAR BED. ADJUST TO GRADE WITH SEWER BRICK AND MORTAR (2 BRICK COURSES TYPICALLY, 5 BRICK COURSES MAXIMUM).
5. PIPING SHALL BE SCH 40 PVC WITH SOLVENT WELDED JOINTS. INTERNAL PIPE DIAMETER SHALL BE SAME SIZE AS OUTLET PIPE.
6. FINAL DESIGN OF GREASE TRAP TO BE BY PLUMBING ENGINEER.
7. THE INSTALLATION OF GREASE TRAP, THE PIPING TO AND 10 FEET BEYOND IS BY PLUMBER.

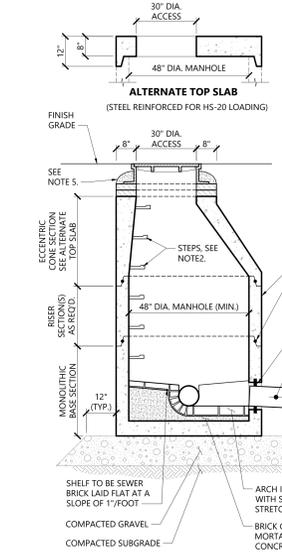
Precast Concrete Grease Trap (GT)

N.T.S. Source: VHB REV 12/19 LD_211



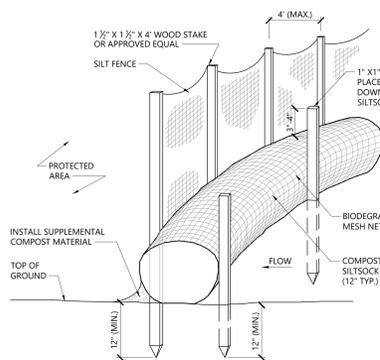
GREASE TRAP

SIZE (GAL.)	LIQUID DEPTH
4,000	4'-0"
5,000	5'-0"
6,000	6'-0"
7,000	7'-0"
8,000	8'-0"
9,000	9'-0"
10,000	10'-0"



Sanitary Sewer Manhole (SMH)

N.T.S. Source: VHB REV 1/16 LD_200

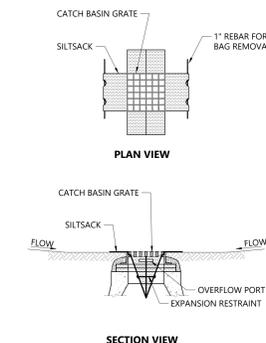


NOTES

1. SILT SOCK SHALL BE FILTREXX SILT SOCK, OR APPROVED EQUAL.
2. SILT SOCKS SHALL OVERLAP A MINIMUM OF 12 INCHES.
3. SILT SOCK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS, AND REPAIR OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED.
4. UPON SITE STABILIZATION, COMPOST MATERIAL SHALL BE DISPERSED ON SITE, AS DETERMINED BY THE ENGINEER.
5. IF NON BIODEGRADABLE NETTING IS USED THE NETTING SHALL BE COLLECTED AND DISPOSED OF OFF SITE.

Siltsock / Silt Fence Barrier

N.T.S. Source: VHB REV 10/20 LD_658-A

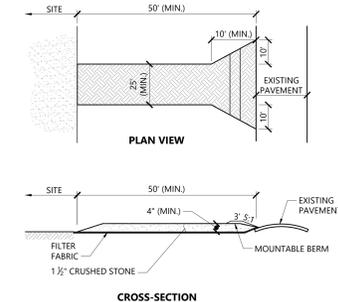


NOTES

1. INSTALL SILT SACK IN ALL CATCH BASINS WHERE INDICATED ON THE PLAN BEFORE COMMENCING WORK OR IN PAVED AREAS AFTER BINDER COURSE IS PLACED AND HAY BALES HAVE BEEN REMOVED.
2. GRATE TO BE PLACED OVER SILT SACK.
3. SILT SACK SHALL BE INSPECTED PERIODICALLY AND AFTER ALL STORM EVENTS AND CLEANING OR REPLACEMENT SHALL BE PERFORMED PROMPTLY AS NEEDED. MAINTAIN UNTIL UPSTREAM AREAS HAVE BEEN PERMANENTLY STABILIZED.

Siltsock Sediment Trap

N.T.S. Source: VHB REV 1/20 LD_674

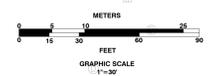
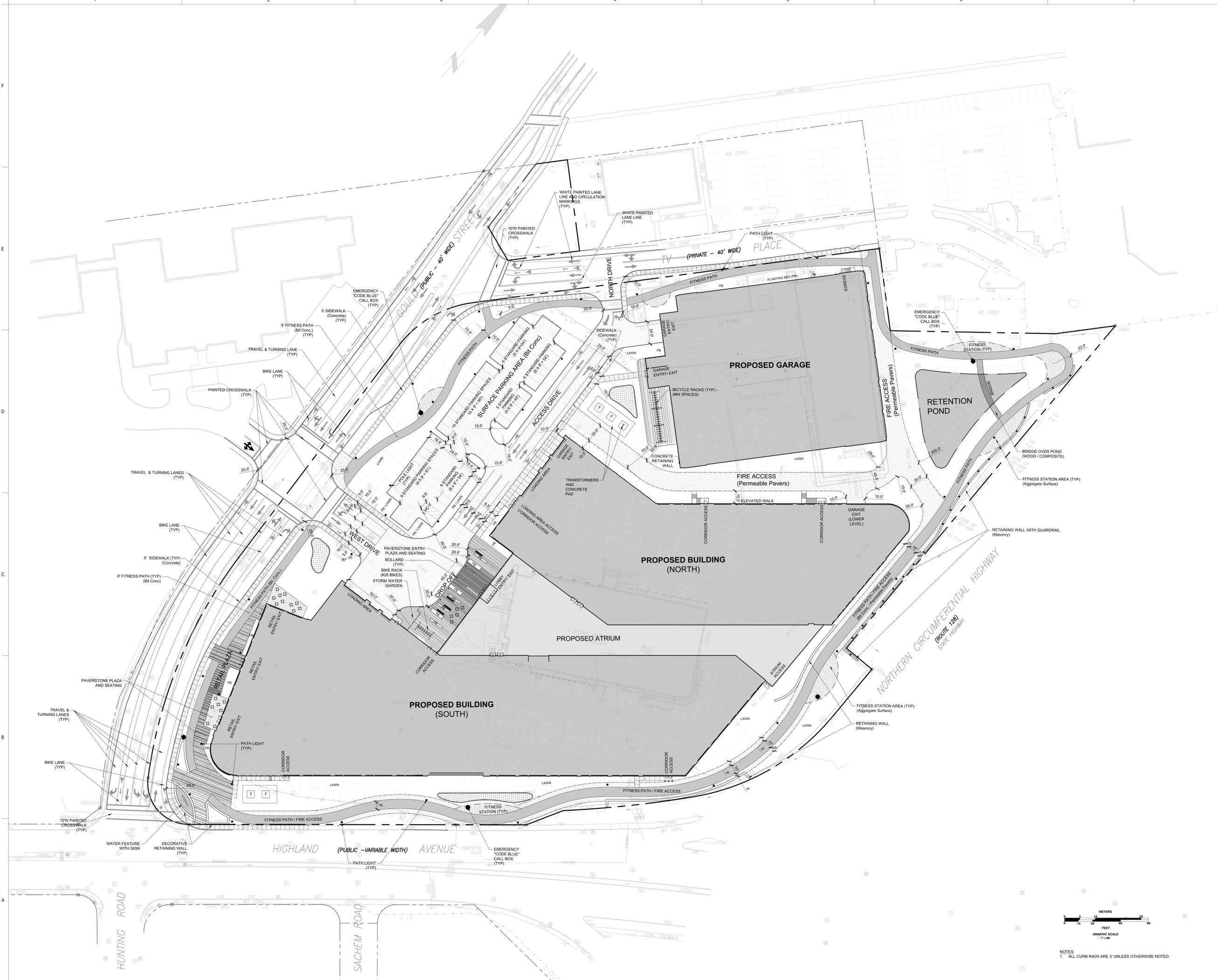


NOTES

1. EXIT WIDTH SHALL BE TWENTY-FIVE (25) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
2. THE EXIT SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY. BERM SHALL BE PERMITTED. PERIODIC INSPECTION AND MAINTENANCE SHALL BE PROVIDED AS NEEDED.
3. STABILIZED CONSTRUCTION EXIT SHALL BE REMOVED PRIOR TO FINAL FINISH MATERIALS BEING INSTALLED.

Stabilized Construction Exit

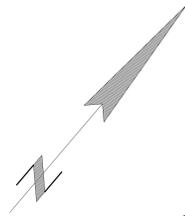
N.T.S. Source: VHB REV 1/16 LD_682



NOTES:
 1. ALL CURB RADII ARE 3' UNLESS OTHERWISE NOTED.

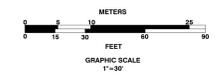
NO.	DATE	DESCRIPTION
1	02/20/23	ISSUED FOR PERMIT
2	03/01/23	REVISION





Label	Lum. Lumens	Lum. Watts	LLF	Description	Qty
S4	8865	71	0.900	HRZ-1-T5-32L-7-40K-UNV 12' MH	5
S3	6303	56	0.900	HRZ-1-T2-16L-1-40K-UNV 12' MH	30
S2	6888	56	0.900	NV-1-T3-16L-1-40K-UNV 18' MH	6
S1	6776	56	0.900	NV-1-T4-16L-1-40K-UNV 18' MH	2
WM	2440	27.2	0.900	MV-30041-M-W40	25
CB1				CB 1-S	5

Label	Units	Avg	Max	Min	Avg/Min	Max/Min
SITE_Planar	Fc	0.71	39.4	0.0	N.A.	N.A.
Retail Plaza	FC	2.89	39.4	0.1	28.90	394.00
Surface Parking	FC	1.38	10.2	0.1	13.90	102.00

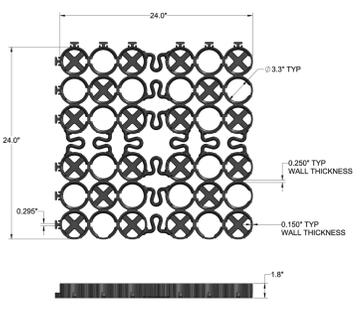


Permit/Seal

PROJECT NO.	218421343
DATE	2022.03.30
BY	AP/ST
CHECKED/REVISION	YYMMDD

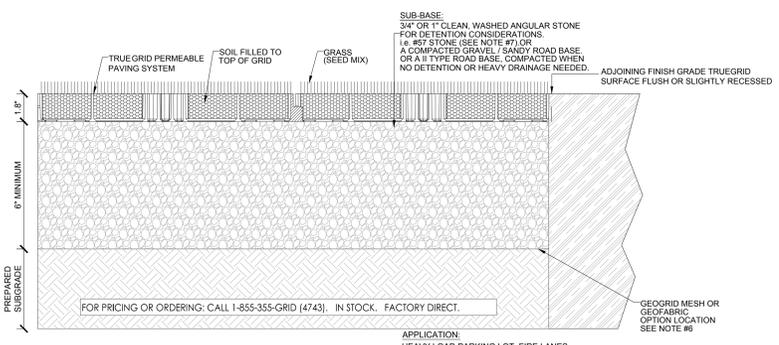


F
E
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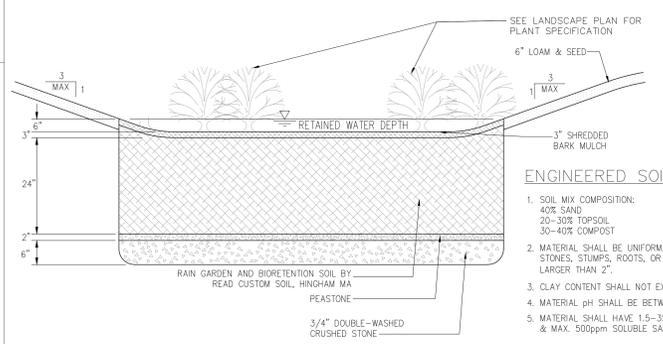


- NOTES:**
- SUB-BASE DEPTH AND PREPARATION IS DEPENDENT ON SITE CONDITIONS PLUS LOADING REQUIREMENTS.
 - TRUEGRID PRO PLUS PRODUCTS ARE SUFFICIENTLY RATED FOR H-20 HS-20 LOADING AND GREATER.
 - TYPICAL SEEDING OR HYDROSEEDING METHODS FOR GRASS GROWTH ARE ACCEPTABLE WITH TRUEGRID.
 - SOD CAN BE LAID ON SOIL FILLED GRID FOR IMMEDIATE GRASS (TYPICAL FOR FIRE LANES)
 - FOR HIGHER TRAFFIC SOD INSTALLATIONS, RECESS SOIL LEVEL WITHIN TRUEGRID AND PRESS IN SOD SO THAT TOP OF GRID IS AT SOIL LEVEL.
 - GEOGRID MESH OR GEOFABRIC MAY BE REQUIRED BETWEEN SUBGRADE & SUBBASE FOR CERTAIN SOILS AND SITE SPECIFIC REQUIREMENTS.
 - FILTER FABRIC MAY BE REQUIRED BETWEEN TRUEGRID AND SUB-BASE MATERIAL IF HIGH VOID RATIO IN SUB-BASE MATERIAL.
 - NO STAKING NECESSARY WITH TRUEGRID PRO PLUS WHEN SLOPE IS BELOW 10 DEGREES. ASSESS PROJECT, AS NEEDED.
 - FINAL ENGINEERED CROSS SECTION AGGREGATES AND DEPTH SHOULD ALLOW FOR EXPECTED INFILTRATION RATES, STORAGE CAPACITIES, OUTLET FLOW RATES, AND OTHER SITE SPECIFIC CONDITIONS AND LOAD REQUIREMENTS.
 - THIS CROSS SECTION IS FOR INFORMATION ONLY.

REINFORCED LAWN - PLAN VIEW



REINFORCED LAWN
NOT TO SCALE



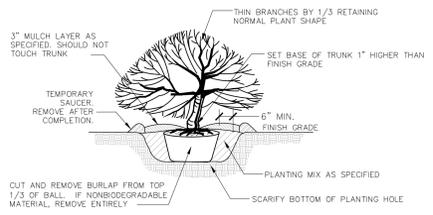
RAIN GARDEN
NOT TO SCALE

ENGINEERED SOIL MIX SPECIFICATIONS

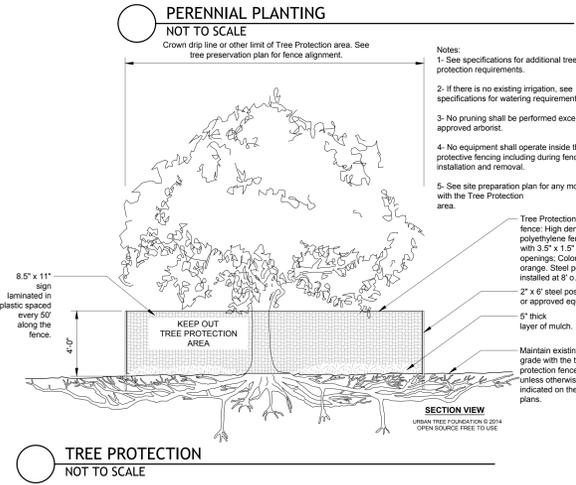
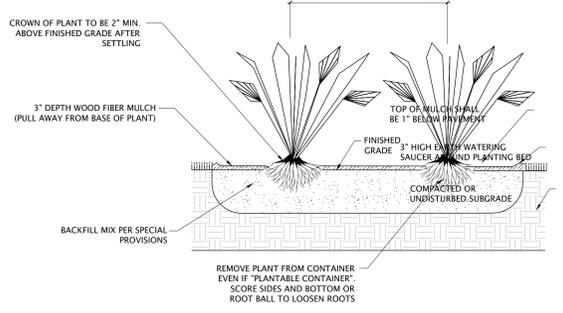
- SOIL MIX COMPOSITION:
40% SAND
20-30% TOPSOIL
30-40% COMPOST
- MATERIAL SHALL BE UNIFORM, FREE FROM STONES, STUMPS, ROOTS, OR OBJECTS LARGER THAN 2".
- CLAY CONTENT SHALL NOT EXCEED 5%.
- MATERIAL PH SHALL BE BETWEEN 5.5-6.5.
- MATERIAL SHALL HAVE 1.5-3% ORGANIC CONTENT & MAX. 500ppm SOLUBLE SALT.
- SAND COMPONENT SHALL MEET ASTM D 422 AND THE FOLLOWING GRADATION:

SEIVE SIZE	% PASSING
2-INCH	100
3/4 INCH	70-100
1/4 INCH	50-80
No. 4	15-40
No. 200	0-3

- TOPSOIL SHALL BE A SANDY LOAM, LOAMY SAND, OR LOAM.
- COMPOST SHALL BE PROCESSED FROM YARD WASTE IN ACCORDANCE WITH DEP GUIDELINES AND SHALL NOT CONTAIN BIO-SOLIDS.



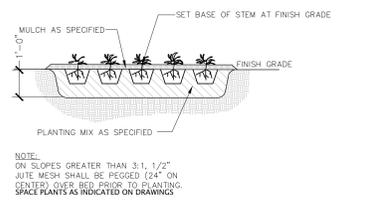
SHRUB PLANTING
NOT TO SCALE



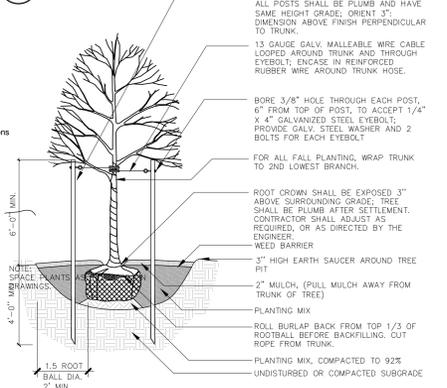
TREE PROTECTION
NOT TO SCALE



TYPICAL SEEDED NO-MOW LAWN
NOT TO SCALE



GROUND COVER PLANTING
NOT TO SCALE

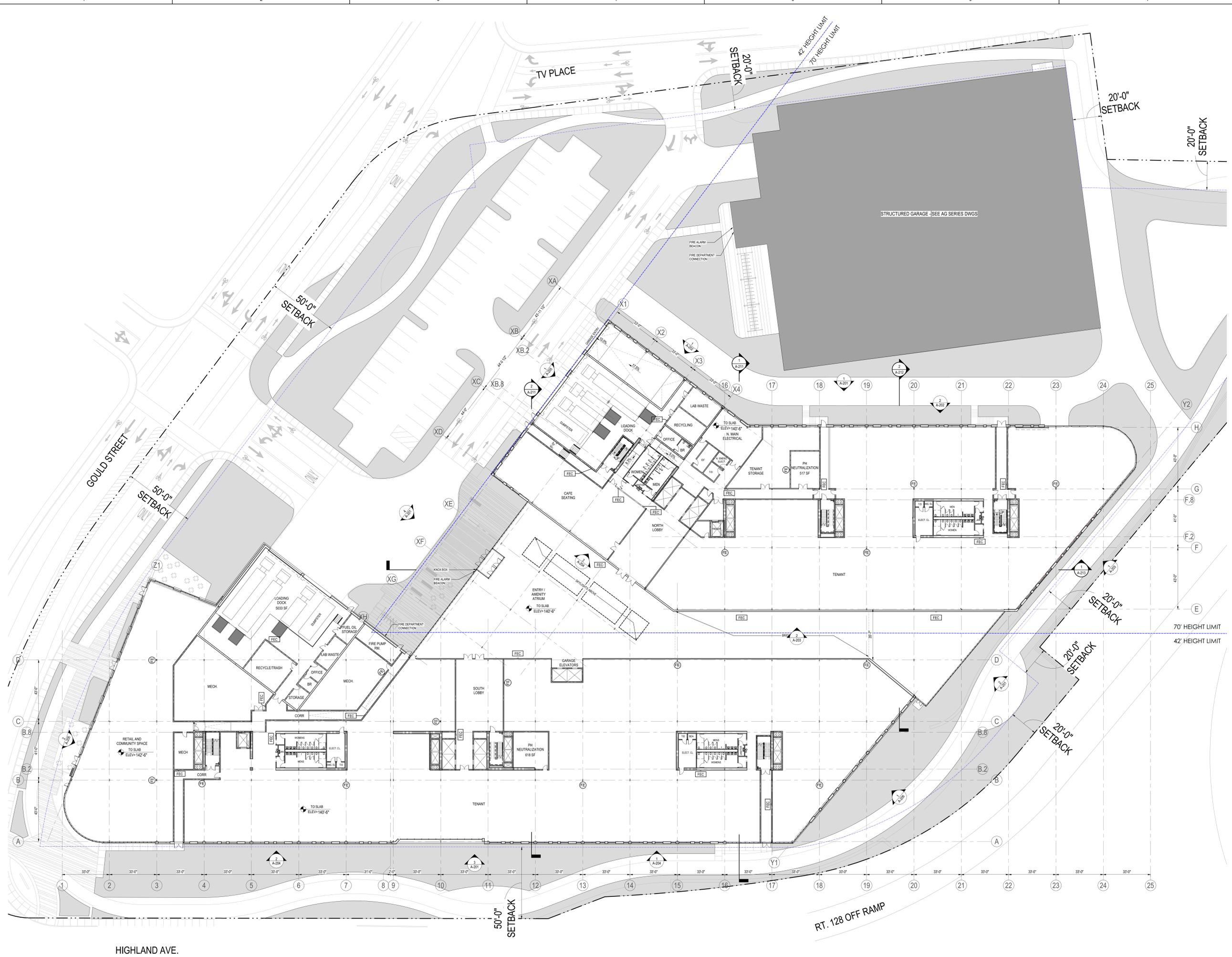


TYPICAL TREE PLANTING
NOT TO SCALE

Permit/Seal

DATE	BY
2023.03.27	APSP
2023.03.27	YMYMAD





1 LEVEL 1 PLAN - ENTRY LEVEL
 A-101 1" = 20'-0"

Consultant

Project No.	2022.03.30
Issue/Revision	Issue 1 / Revision 0



KEY PLAN

LEGEND

(W)	WHEELED FIRE EXTINGUISHER
(B)	FIRE EXTINGUISHER BRACKET WALL MTD
(FEC)	FIRE EXTINGUISHER CABINET WALL MTD

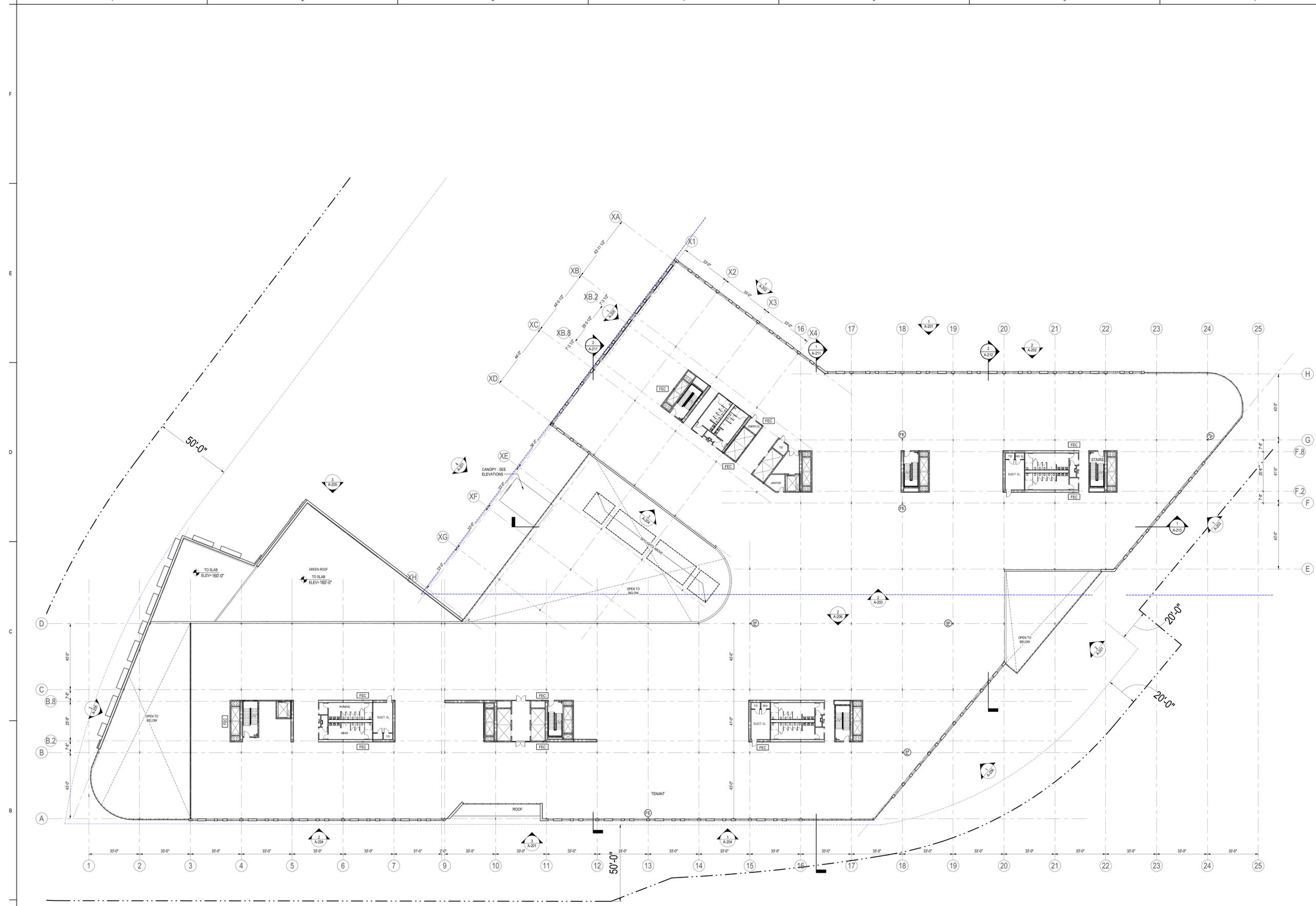
75'-0" MAX. DISTANCE PER CODE, TYP.

Client/Project
Bulfinch
 557 HIGHLAND AVE
 NEEDHAM, MA 02464

Project No.: 218421343
 Scale: As Indicated

Author: Designer
 Date: 2022.03.30
 Title: LEVEL 1 - OVERALL PLAN

Revision:
 Drawing No. **A-101**



1 LEVEL 2 PLAN - FULL PLAN
 A-102 1" = 20'-0"

Consultant

PROJECT NO.	2022.03.0
DATE	11/14/22
BY	MM
ISSUE/REVISION	



LEGEND

WFE	WHEELED FIRE EXTINGUISHER
FE	FIRE EXTINGUISHER BRACKET WALL MTD
FEC	FIRE EXTINGUISHER CABINET WALL MTD

75'-0" MAX. DISTANCE PER CODE, TYP.

2/27/2022 4:53:27 PM
 ORIGINAL SHEET ARCH1

Consultant

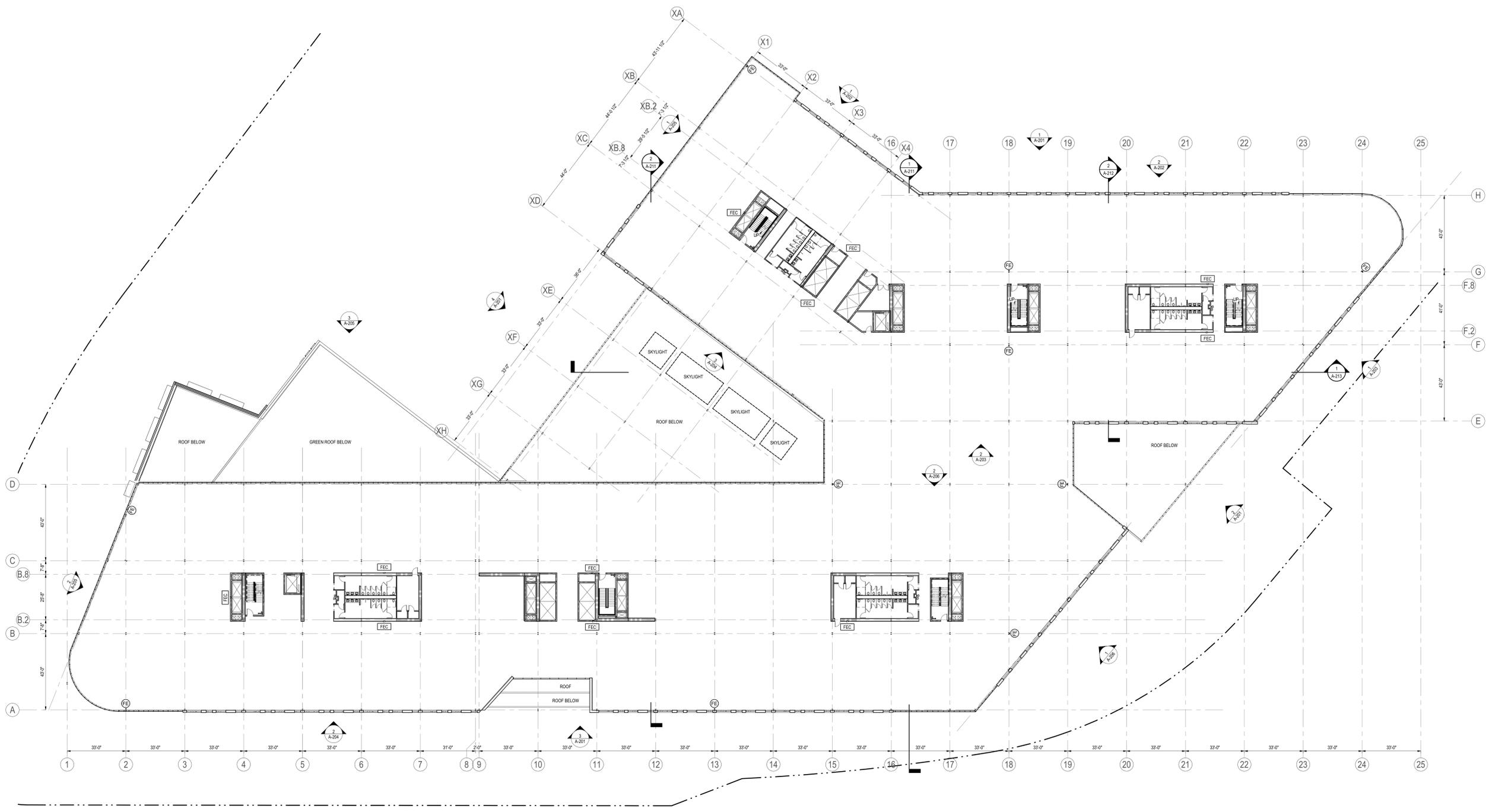
Project No.	20220330
Issue/Revision	1
By	MM
Checked	MM
Special Equipment	



LEGEND

- (W) WHEELED FIRE EXTINGUISHER
- (F) FIRE EXTINGUISHER BRACKET WALL MTD
- (FEC) FIRE EXTINGUISHER CABINET WALL MTD

75'-0" MAX. DISTANCE PER CODE, TYP.



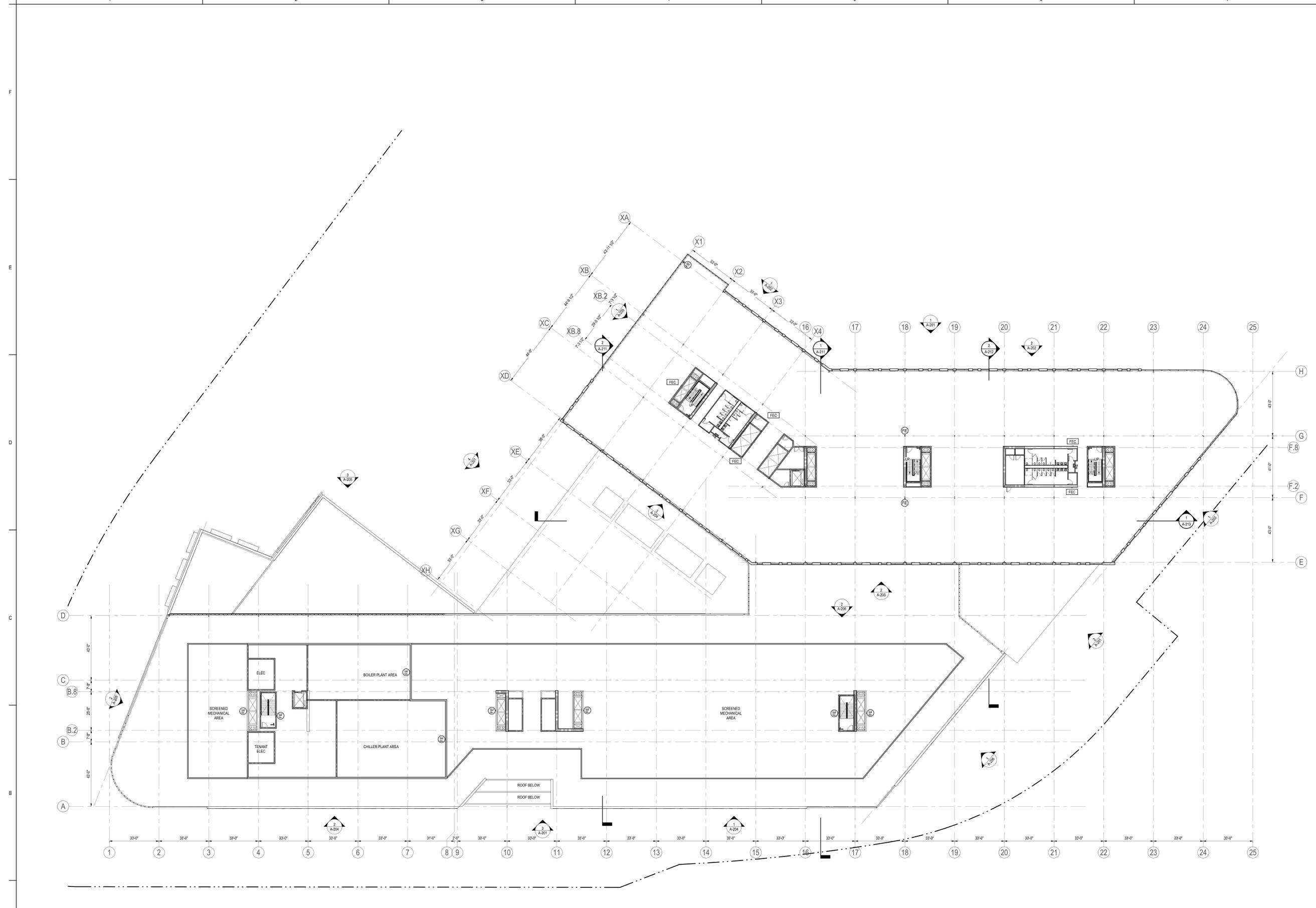
1
 A-103
 LEVEL 3 - FULL PLAN
 1" = 20'-0"

Client/Project
Bulfinch
 557 HIGHLAND AVE
 NEEDHAM, MA 02464

Project No.: 218421343
 Title: MA
 Scale: As Indicated
 Author: Designer
 Checker: 2022.03.30
 Date: Designer
 Date: Checker

Title
LEVEL 3 - OVERALL PLAN

Revision:
 Drawing No.



1
A-104
LEVEL 4 - FULL PLAN
1" = 20'-0"

Consultant

Project No.	2022.03.0
Issue/Revision	Issue 1 / Revision 0
By	MM
Check	MM
Drawn	MM
Scale	As Indicated

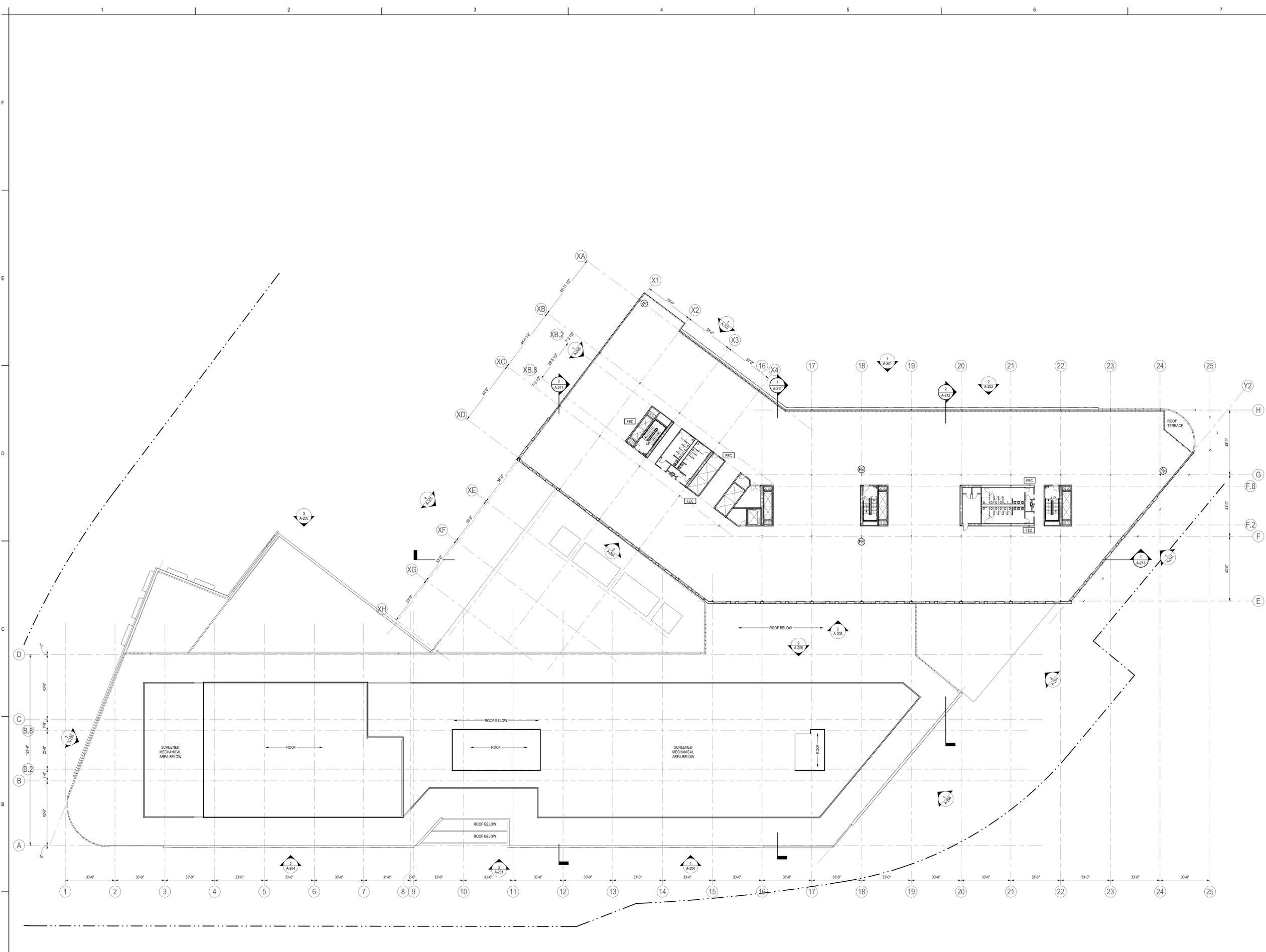


LEGEND

- (E) WHEELED FIRE EXTINGUISHER
- (E) FIRE EXTINGUISHER BRACKET WALL MTD
- (E) FIRE EXTINGUISHER CABINET WALL MTD

75'-0" MAX. DISTANCE PER CODE TYP.

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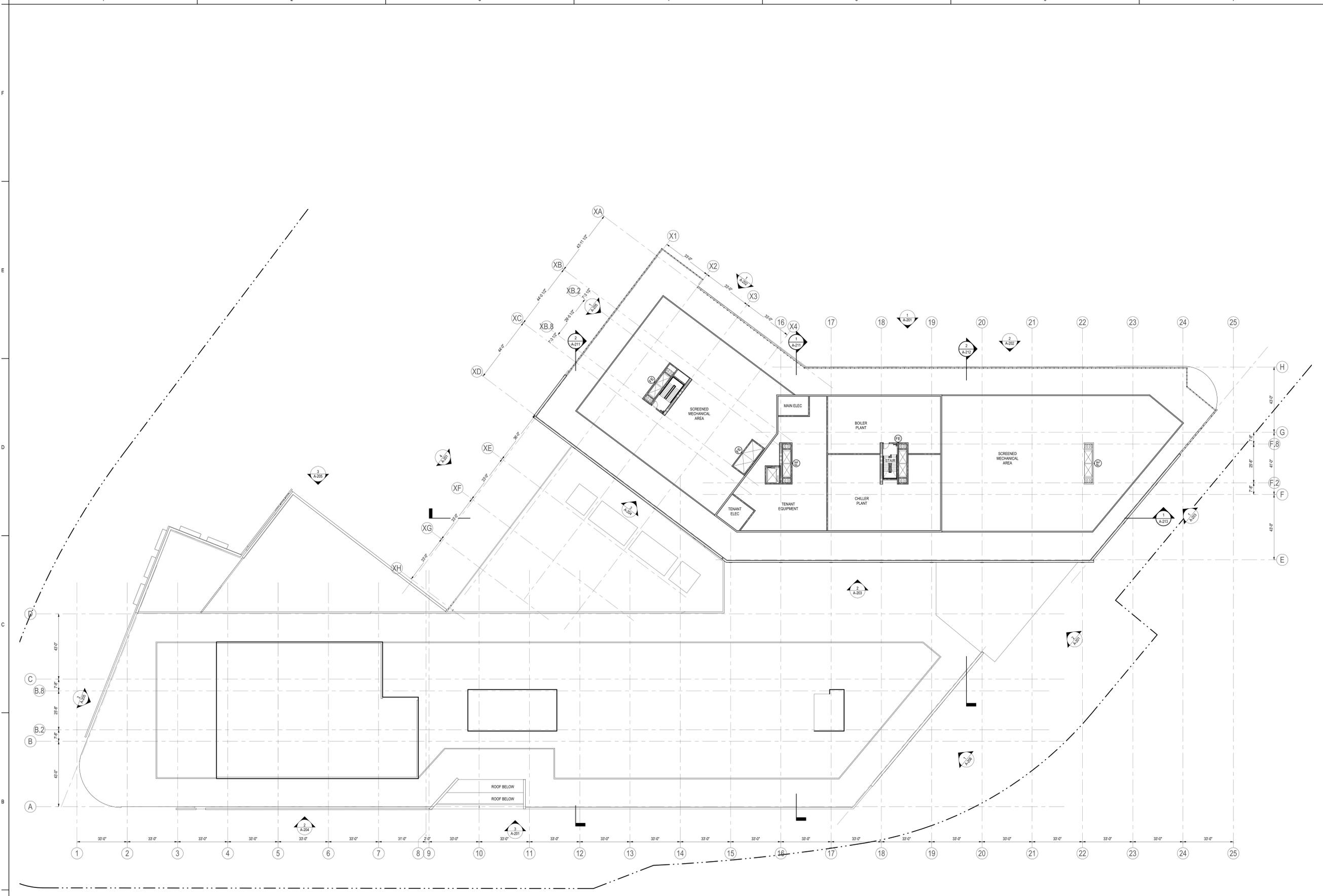


1 LEVEL 5 - FULL PLAN
 A-105
 1" = 20'-0"

Permit/Seal	Consultant
 No. 95162 BOSTON MA	By: YYYMMZD Title: SPECIAL ENGINEER Issue: 01/2023



2/27/2023 10:58 AM
 20230330 10:58 AM
 20230330 10:58 AM



1 PENTHOUSE - NORTH
A-106 1" = 20'-0"

Consultant

Project No.	2022.03.0
Issue/Revision	Issue/Revision
By	YMM/MLD
Checked	YMM/MLD
Approved	YMM/MLD



LEGEND

(A-201)	WHEEL FIRE EXTINGUISHER
(A-202)	FIRE EXTINGUISHER BRACKET WALL MTD
(A-203)	FIRE EXTINGUISHER CABINET WALL MTD

75'-0" MAX. DISTANCE PER CODE, TYP.

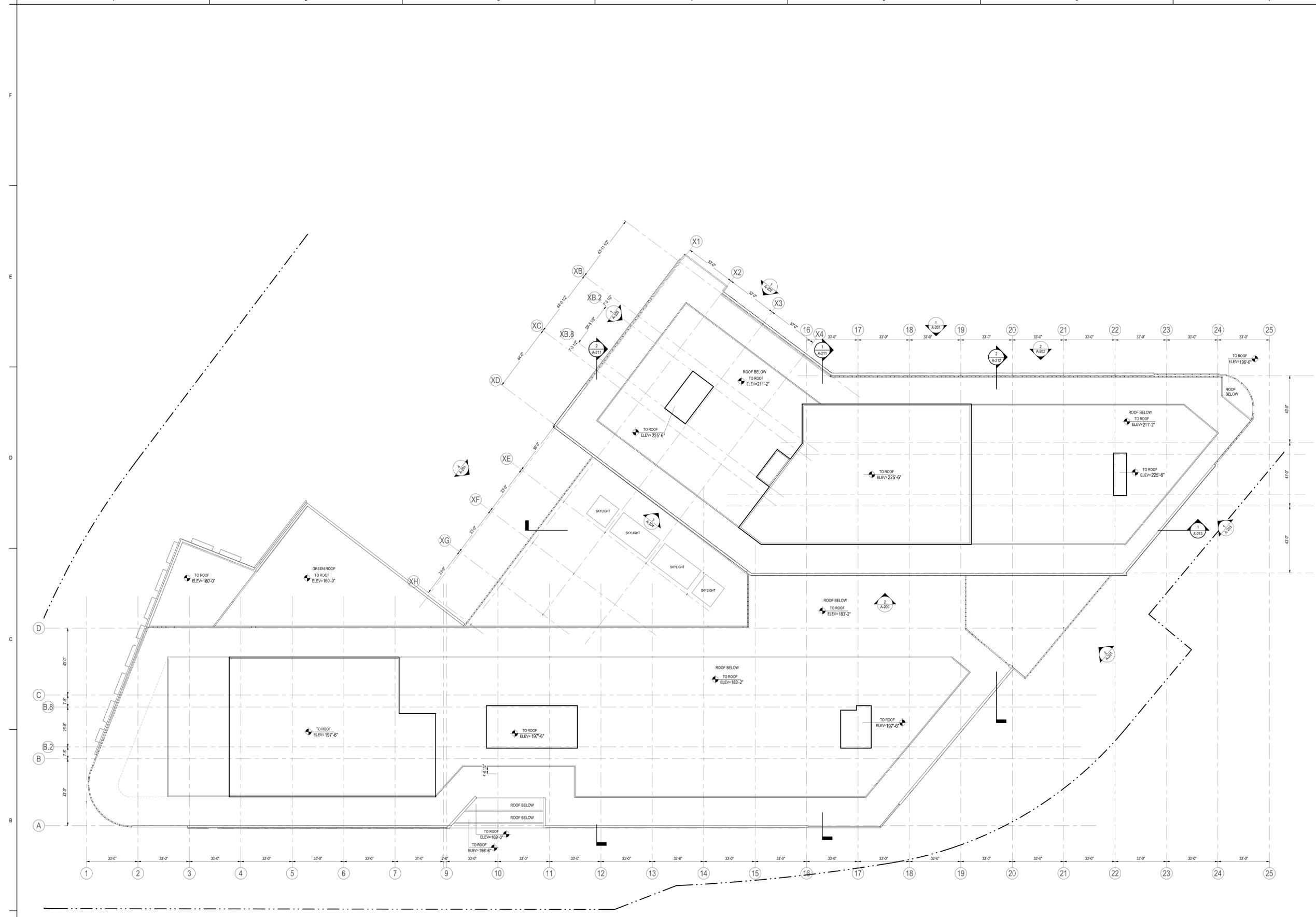
Client/Project
Bulfinch
557 HIGHLAND AVE
NEEDHAM, MA 02464

Project No.: 218421343
Scale: As Indicated

Author: Designer
Date: 2022.03.30
Checked: YMM/MLD

Title
LEVEL 6 - OVERALL PLAN

Revision:
Drawing No.
A-106



1 ROOF PLAN
A-107 1" = 20'-0"

Consultant

PROJECT	2022.03.30
DATE	2022.03.30
BY	MM
ISSUED/REVISION	17/11/2022



LEGEND

(WFE)	WHEELED FIRE EXTINGUISHER
(FE)	FIRE EXTINGUISHER BRACKET WALL MTD
(FEC)	FIRE EXTINGUISHER CABINET WALL MTD
(FEC-MTD)	FIRE EXTINGUISHER CABINET WALL MTD

75'-0" MAX. DISTANCE PER CODE, TYP.

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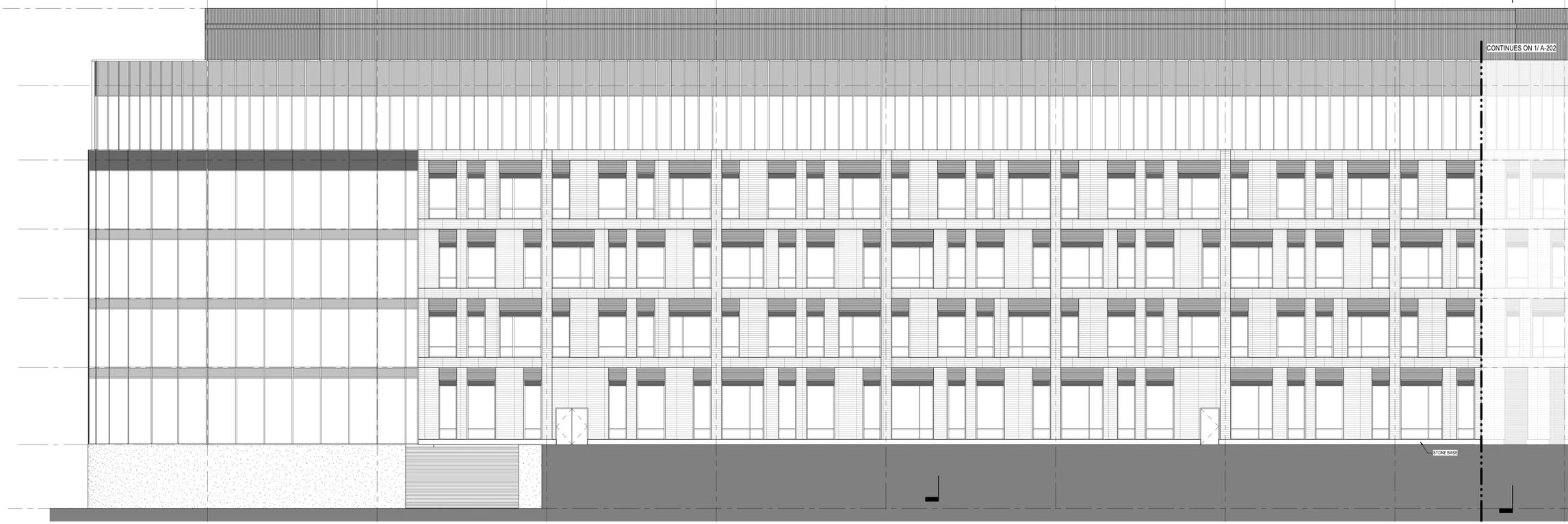
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19

18

17

16



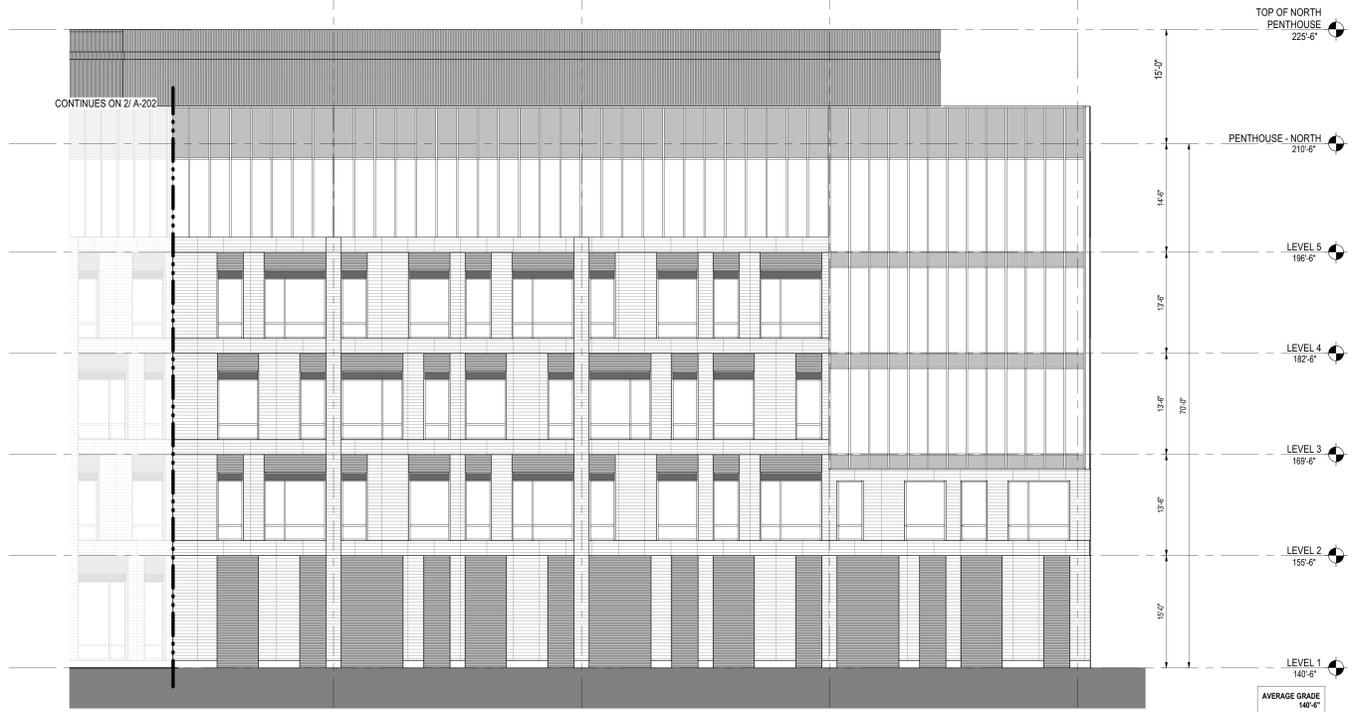
2
A-202
ENLARGED ELEVATION - NORTH BUILDING - NORTH
1/8" = 1'-0"

X4

X3

X2

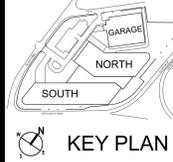
X1



1
A-202
ENLARGED ELEVATION - NORTH BUILDING - NORTH (ANGLED WALL)
1/8" = 1'-0"

Consultant

Issue/Revision	By	Date
SPECIAL PERMITS PACKAGE	MM	2/22/23
Issue/Revision		



KEY PLAN

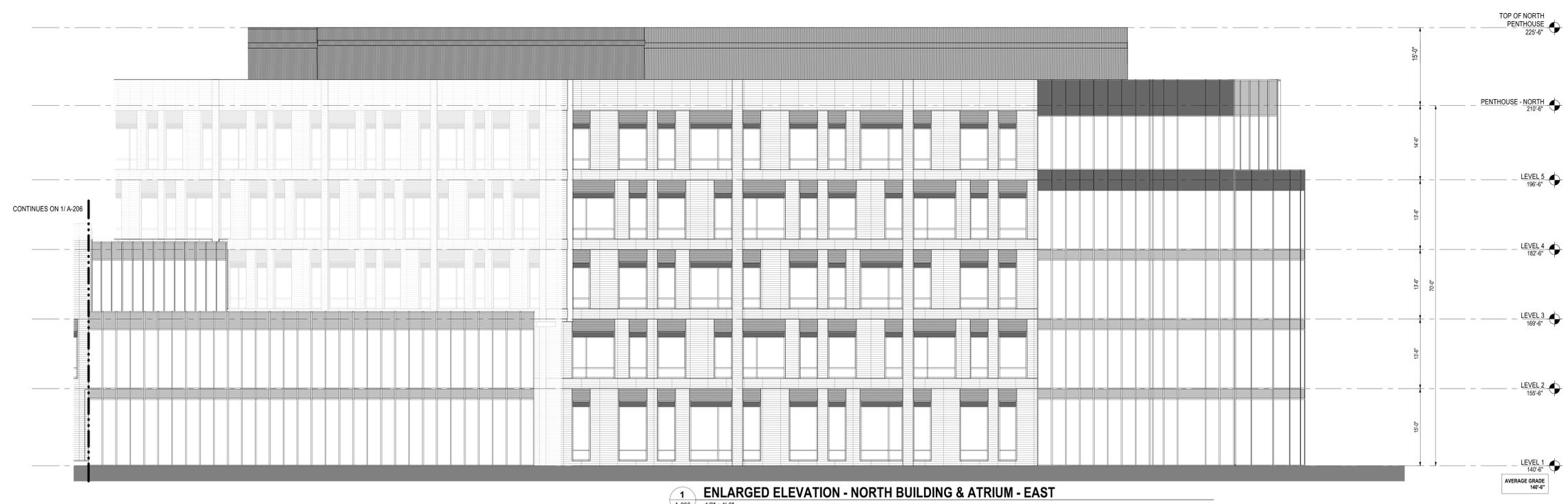
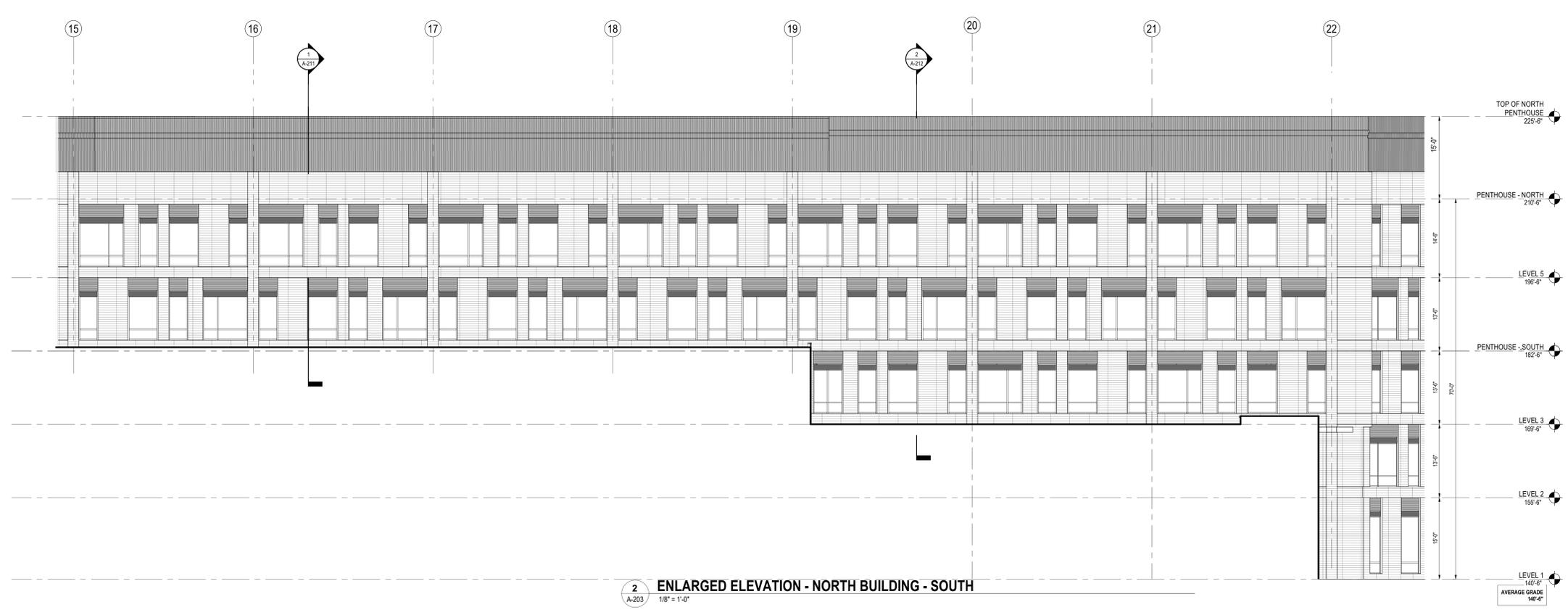
Client/Project
Bulfinch
557 HIGHLAND AVE
NEEDHAM, MA 02464

Project No.: 218421343
Title: BUILDING ELEV - NORTH BLDG - NORTH

Scale: 1/8" = 1'-0"
Author: Designer: Checker: 2/22/23
Dwn: Dgn: Chk: YMM/MM/23

Revision:
Drawing No.
A-202

F
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A



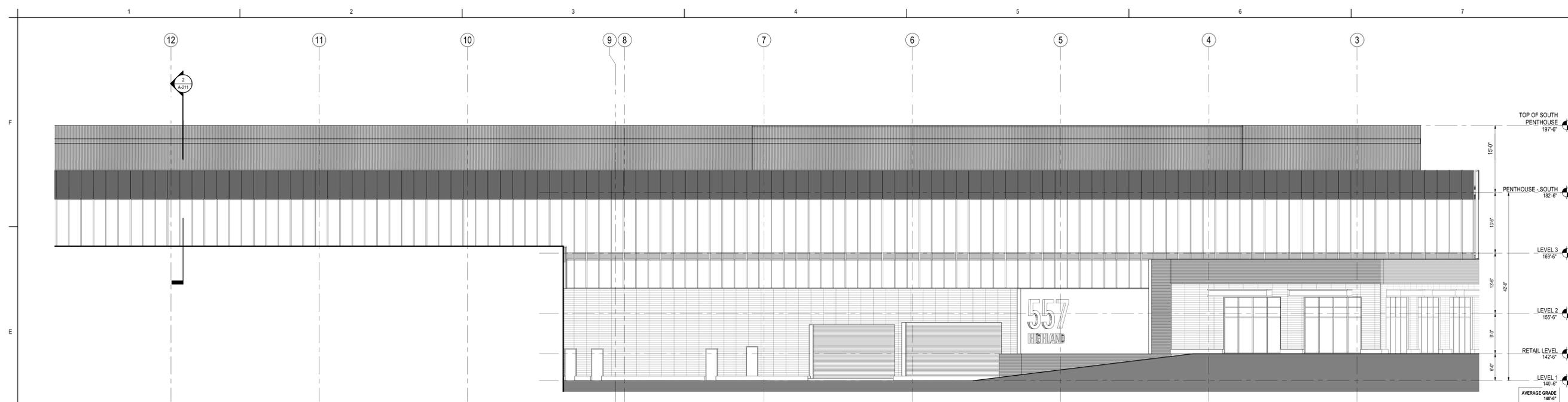
CONTINUES ON 1/A-206

Consultant

Issue/Revision	By	Date
SPECIAL EMERGENCY ISSUE	MM	2023.03.30
PERMIT/SEAL	MM	2023.03.30



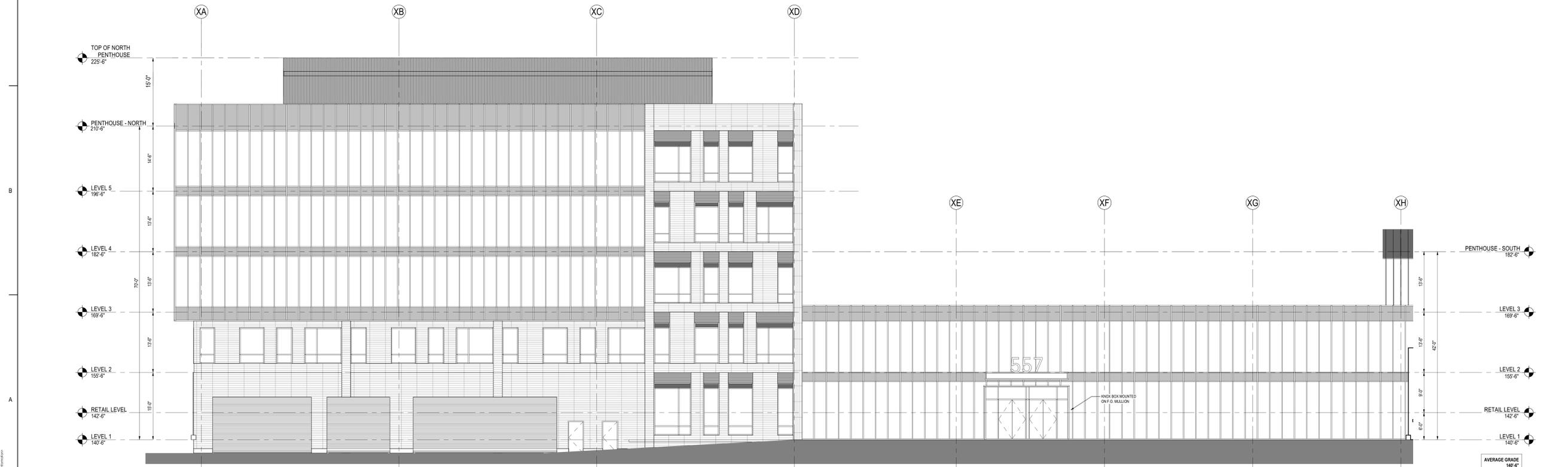
KEY PLAN



3 ENLARGED ELEVATION - SOUTH BUILDING - NORTH (1)
A-205 1/8" = 1'-0"



2 ENLARGED ELEVATION - SOUTH BUILDING - WEST
A-205 1/8" = 1'-0"



1 ENLARGED ELEVATION - NORTH BUILDING - WEST
A-205 1/8" = 1'-0"

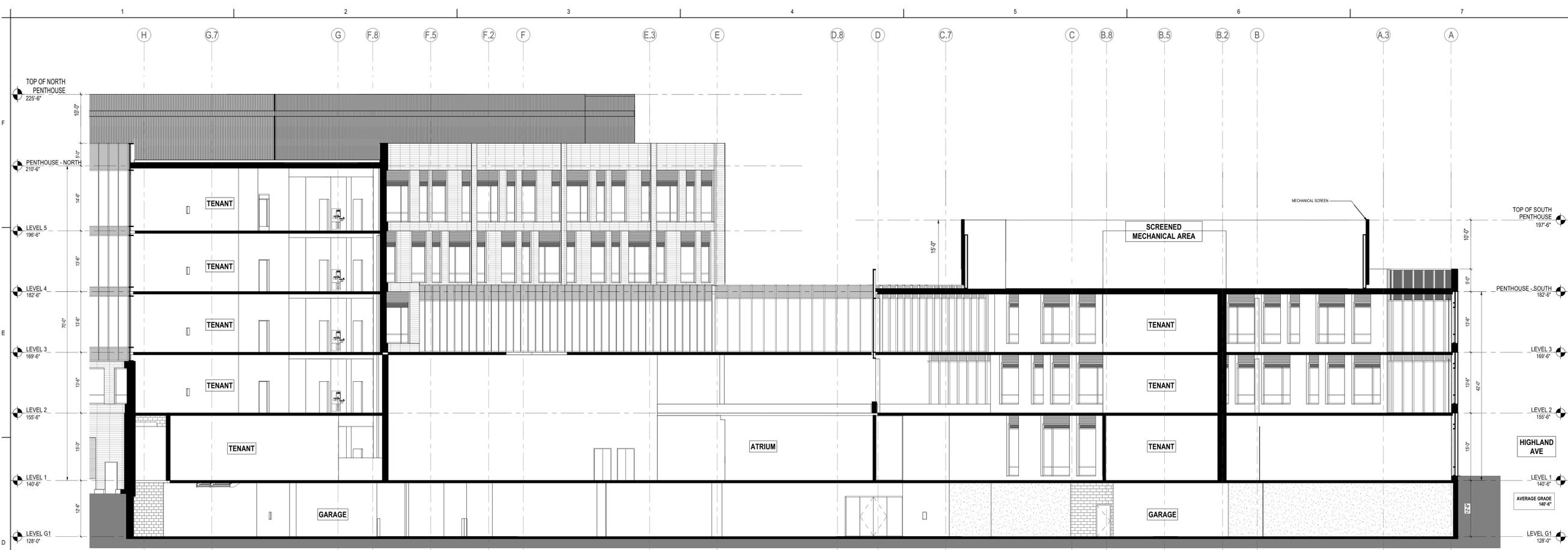
Consultant

Project No.	2022.03.0
Issue/Revision	By: [Signature] Date: 11/14/22

Permit/Seal



KEY PLAN



2 SECTION - N-S NEAR GRID 12
A-211 1/8" = 1'-0"



1 SECTION - N-S NEAR GRID 16
A-211 1/8" = 1'-0"

Consultant

Project No.	2022.03.0
Issue/Revision	Issue 1/Revision 1



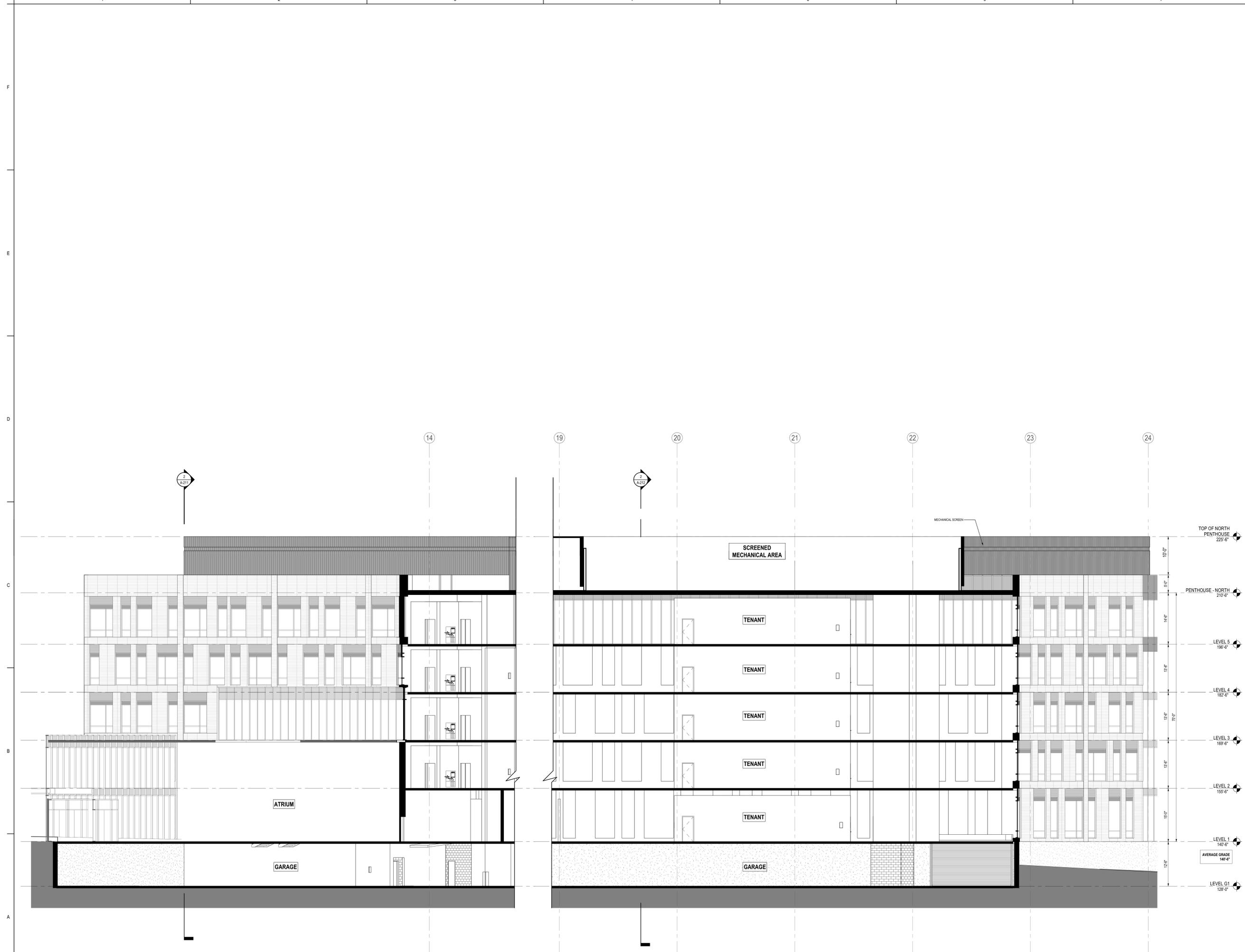
KEY PLAN

Bulfinch
557 HIGHLAND AVE
NEEDHAM, MA 02464

Client/Project
Project No.: 218421343
Scale: 1/8" = 1'-0"
Author: Designer: Checker: 2022.03.30
Date: YYYMMZB

Title
BUILDING SECTIONS - OVERALL
Revision:
Drawing No.
A-211

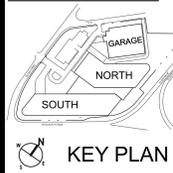
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1 SECTION - NORTH BUILDING - SECTION E-W
 A-213 1/8" = 1'-0"

Consultant

Project No.	2022.03.0
Issue/Revision	Issue 1/Revision 1
By	MM
Check	MM
Scale	1/8" = 1'-0"
Author	MM
Designer	MM
Checker	MM
Date	2022.03.0



Client/Project
Bulfinch
 557 HIGHLAND AVE
 NEEDHAM, MA 02464

Project No.: 218421343
 Scale: 1/8" = 1'-0"

Title
 BUILDING SECTIONS - NORTH BLDG

Revision:
 Drawing No.
A-213

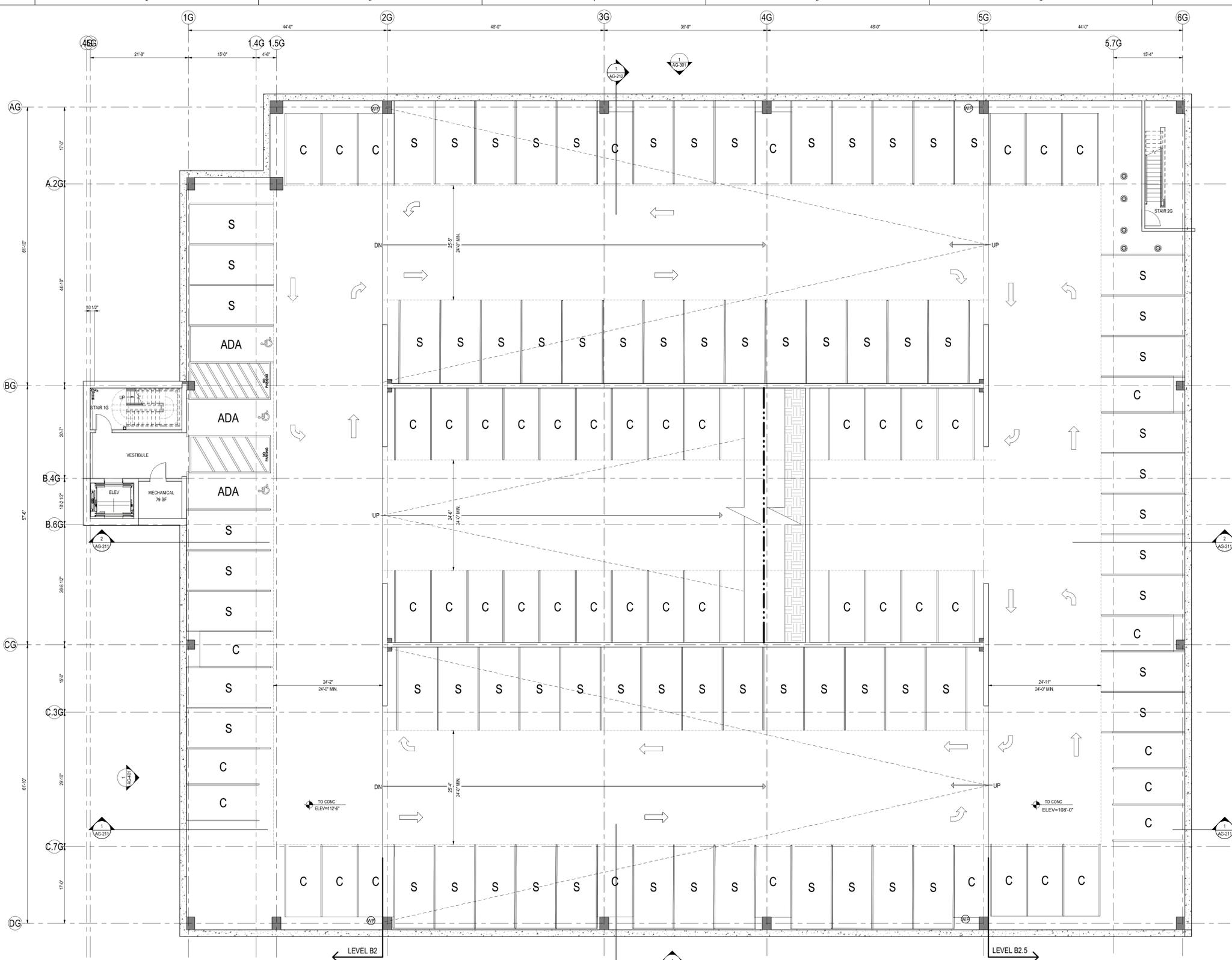
A

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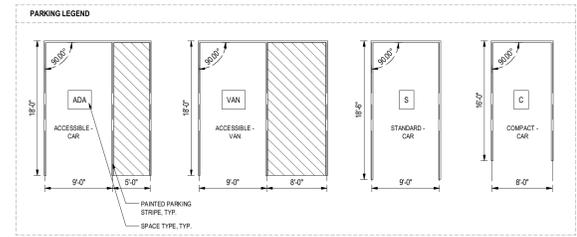
E

F



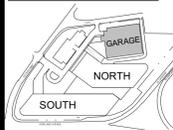
1 GARAGE - LEVEL B2
AG-100.B2 1/8" = 1'-0"

LEGEND
 WHEELED FIRE EXTINGUISHER
 75'-0" MAX. DISTANCE PER CODE, TYP.



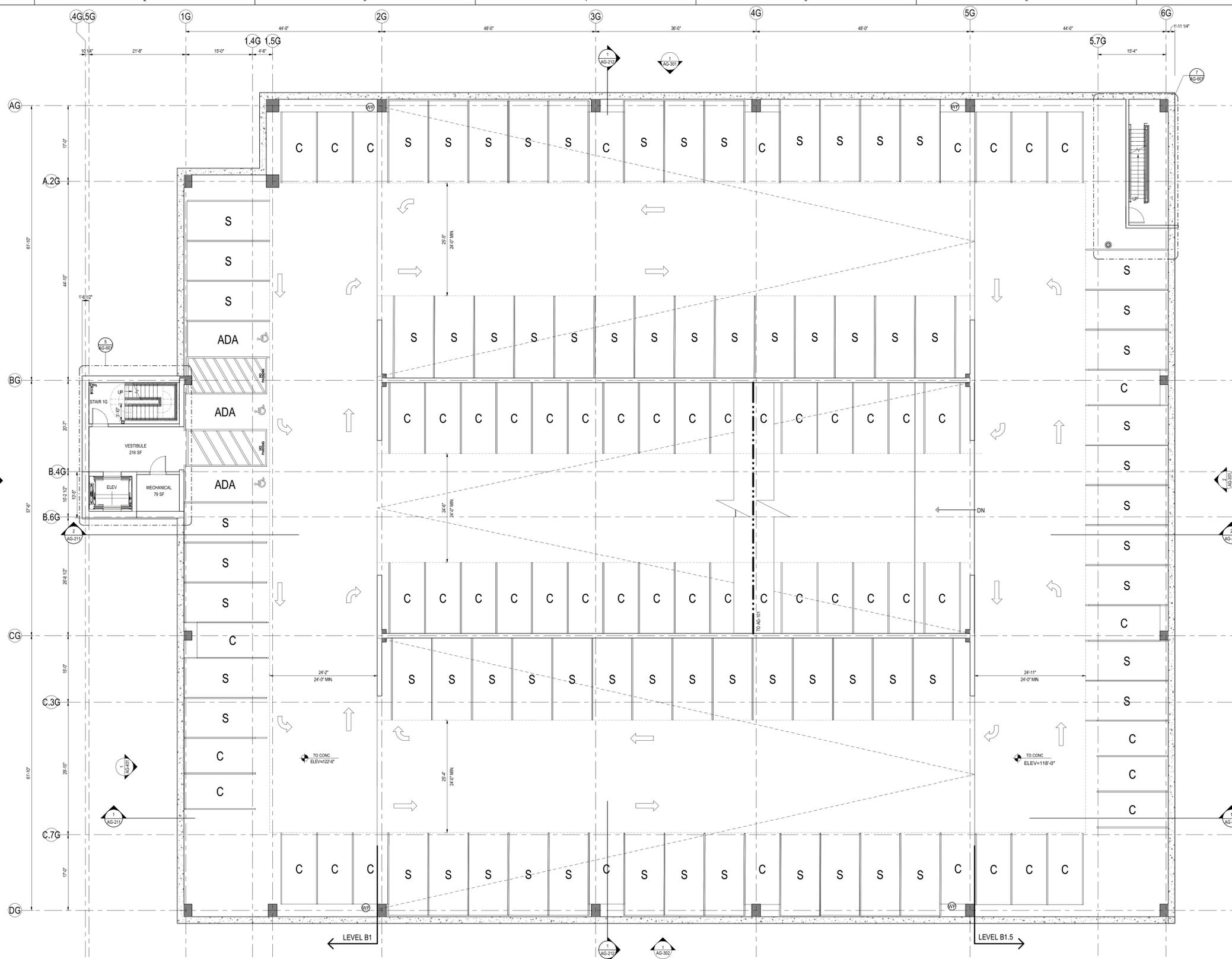
Consultant

NO.	DATE	BY	APP'D	REVISION
1	02/23/20	MM	MM	CONCEPT DEVELOPMENT
2	03/03/20	MM	MM	ISSUE FOR PERMIT



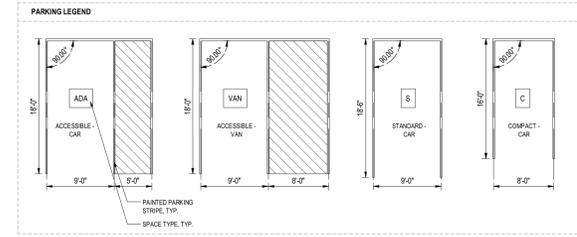
KEY PLAN

GARAGE PARKING COUNT	
PARKING TYPE	COUNT
GARAGE - LEVEL B2	
ACCESSIBLE	3
COMPACT	55
STANDARD	71
TOTAL	129
GARAGE - LEVEL B1	
ACCESSIBLE	3
COMPACT	58
STANDARD	70
TOTAL	131
GARAGE - LEVEL 1	
ACCESSIBLE	1
ACCESSIBLE VAN	3
COMPACT	58
STANDARD	64
TOTAL	126
GARAGE - LEVEL 2	
ACCESSIBLE	3
COMPACT	70
STANDARD	70
TOTAL	143
GARAGE - LEVEL 3	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
GARAGE - LEVEL 4	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
GARAGE - LEVEL 5	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
GARAGE - LEVEL 6	
ACCESSIBLE	2
COMPACT	38
STANDARD	71
TOTAL	111
TOTAL 1021	1021



1 GARAGE - LEVEL B1
AG-100.B1 1/8" = 1'-0"

LEGEND
 (W) WHEELED FIRE EXTINGUISHER
 75'-0" MAX. DISTANCE PER CODE, TYP.



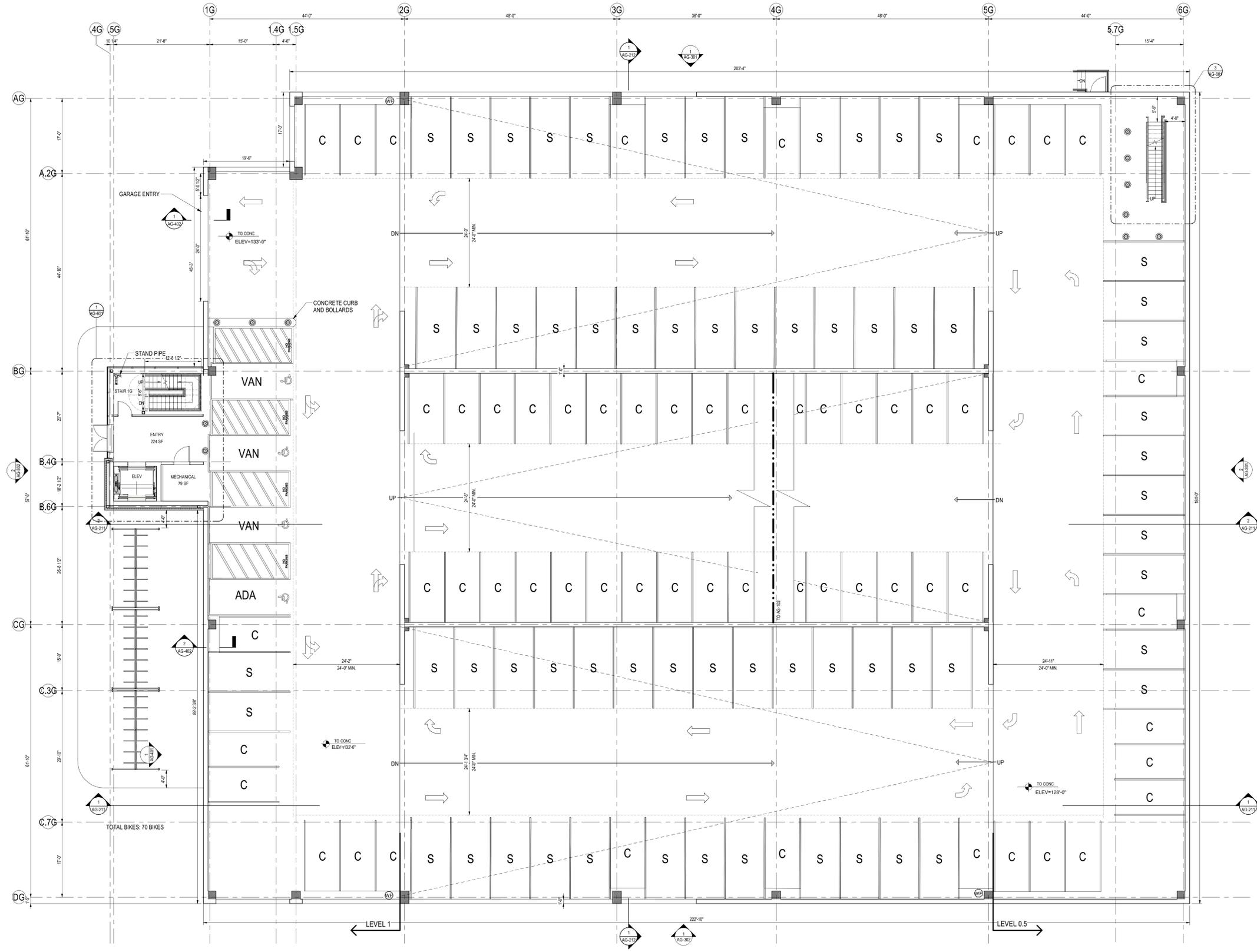
Consultant

NO.	DATE	BY	APP'D	REVISION
1	02/23/20	YMM/AMM/DD		CONCEPT DEVELOPMENT
2	03/13/20	YMM/AMM/DD		ISSUE FOR PERMIT



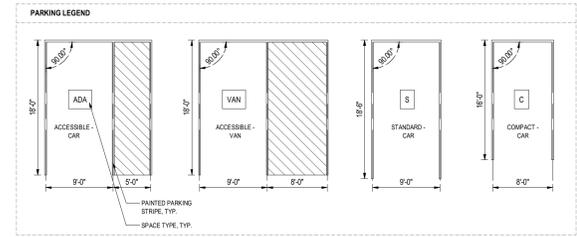
KEY PLAN

GARAGE PARKING COUNT	
PARKING TYPE	COUNT
GARAGE - LEVEL B2	
ACCESSIBLE	3
COMPACT	58
STANDARD	71
TOTAL	132
GARAGE - LEVEL B1	
ACCESSIBLE	3
COMPACT	58
STANDARD	70
TOTAL	131
GARAGE - LEVEL 1	
ACCESSIBLE	1
ACCESSIBLE VAN	3
COMPACT	58
STANDARD	64
TOTAL	126
GARAGE - LEVEL 2	
ACCESSIBLE	3
COMPACT	58
STANDARD	70
TOTAL	131
GARAGE - LEVEL 3	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
GARAGE - LEVEL 4	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
GARAGE - LEVEL 5	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
GARAGE - LEVEL 6	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
TOTAL 1021	1021



1 GARAGE - LEVEL 1-
1/8" = 1'-0"

LEGEND
 WHEELED FIRE EXTINGUISHER
 75'-0" MAX. DISTANCE PER CODE, TYP.



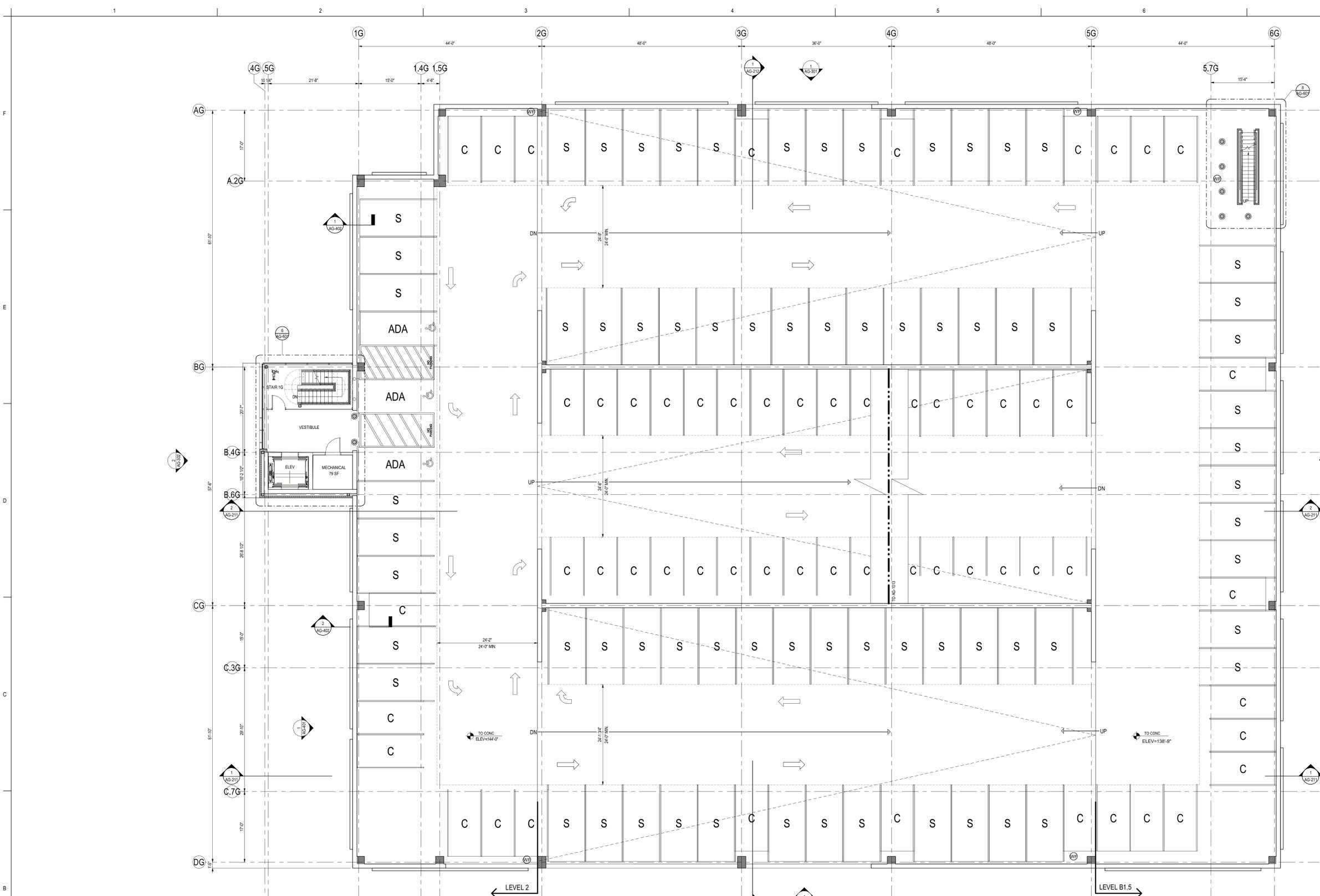
Consultant

NO.	DATE	BY	REVISION
1	02/23/20	YMYM/AMDD	CONCEPT DESIGN
2	03/13/20	YMYM/AMDD	ISSUE FOR PERMIT



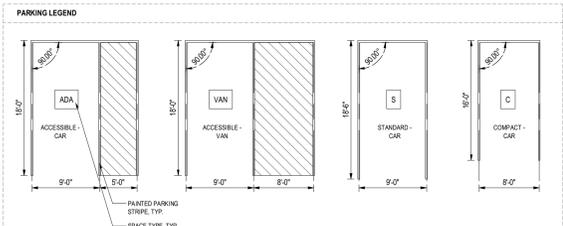
KEY PLAN

GARAGE PARKING COUNT	
PARKING TYPE	COUNT
GARAGE - LEVEL B2	
ACCESSIBLE	3
COMPACT	55
STANDARD	71
TOTAL	129
GARAGE - LEVEL B1	
ACCESSIBLE	3
COMPACT	58
STANDARD	70
TOTAL	131
GARAGE - LEVEL 1	
ACCESSIBLE	1
ACCESSIBLE VAN	3
COMPACT	58
STANDARD	64
TOTAL	126
GARAGE - LEVEL 2	
ACCESSIBLE	3
COMPACT	58
STANDARD	70
TOTAL	131
GARAGE - LEVEL 3	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
GARAGE - LEVEL 4	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
GARAGE - LEVEL 5	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
GARAGE - LEVEL 6	
ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	131
TOTAL 1021	1021



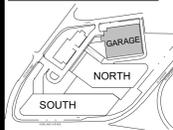
1 GARAGE - LEVEL 2
1/8" = 1'-0"

LEGEND
 (W) WHEELED FIRE EXTINGUISHER
 75'-0" MAX. DISTANCE PER CODE, TYP.



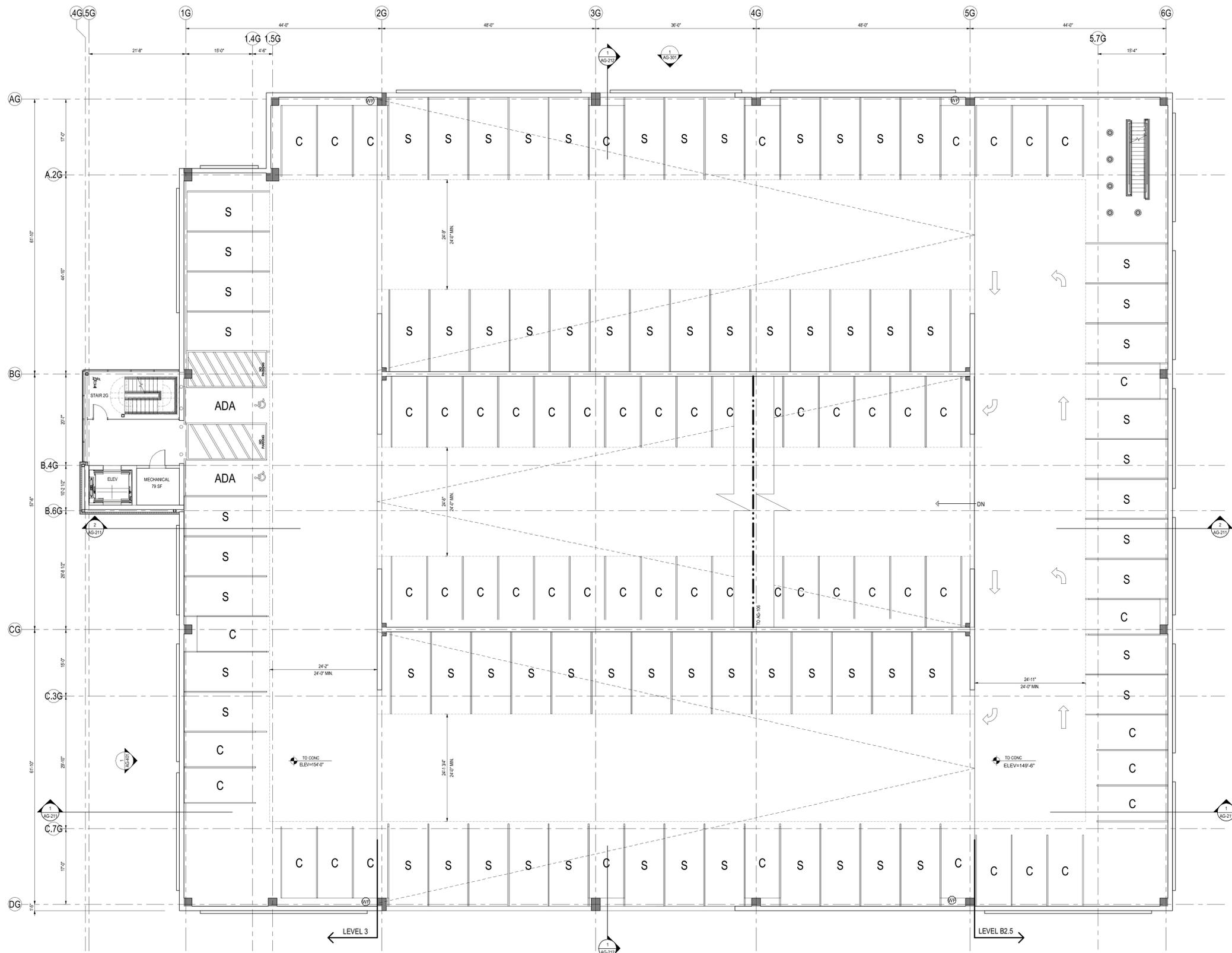
Consultant

NO.	DATE	BY	APP'D	REVISION
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2	03/01/23	YMM	YMM	ISSUE FOR PERMIT



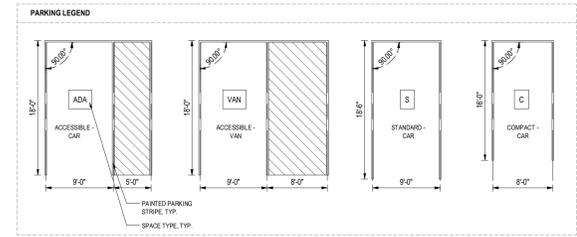
KEY PLAN

GARAGE PARKING COUNT	PARKING TYPE	COUNT
GARAGE - LEVEL B2	ACCESSIBLE	3
	COMPACT	55
	STANDARD	71
	TOTAL	129
GARAGE - LEVEL B1	ACCESSIBLE	3
	COMPACT	58
	STANDARD	70
	TOTAL	131
GARAGE - LEVEL 1	ACCESSIBLE	1
	ACCESSIBLE VAN	3
	COMPACT	58
	STANDARD	64
	TOTAL	126
GARAGE - LEVEL 2	ACCESSIBLE	3
	COMPACT	58
	STANDARD	70
	TOTAL	131
GARAGE - LEVEL 3	ACCESSIBLE	2
	COMPACT	71
	STANDARD	131
	TOTAL	131
GARAGE - LEVEL 4	ACCESSIBLE	2
	COMPACT	58
	STANDARD	71
	TOTAL	131
GARAGE - LEVEL 5	ACCESSIBLE	2
	COMPACT	58
	STANDARD	71
	TOTAL	131
GARAGE - LEVEL 6	ACCESSIBLE	2
	COMPACT	58
	STANDARD	71
	TOTAL	131
TOTAL 1021		1021



1 GARAGE - LEVEL 3
1/8" = 1'-0"

LEGEND
 WHEELED FIRE EXTINGUISHER
 75'-0" MAX. DISTANCE PER CODE, TYP.



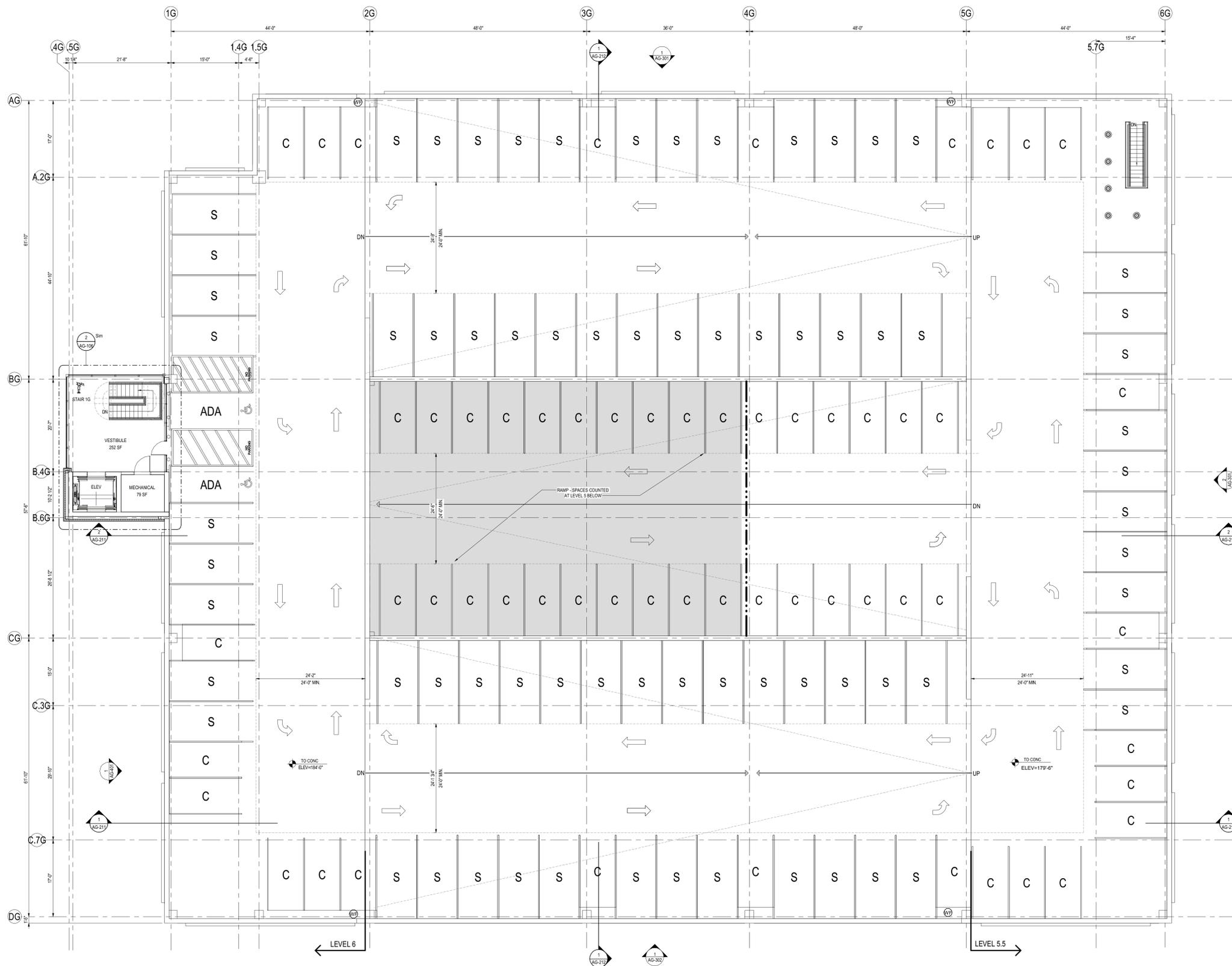
Consultant

NO.	DATE	BY	REVISION
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2	2023.03.30	YMM/AMM/DD	ISSUE FOR PERMIT

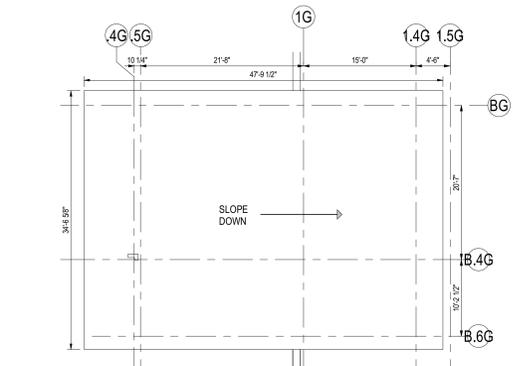


GARAGE PARKING COUNT

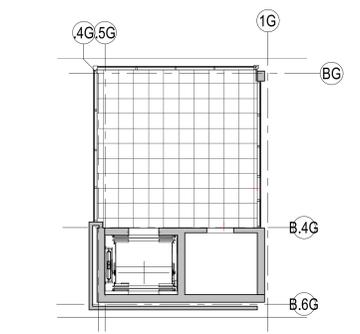
GARAGE	PARKING TYPE	COUNT
GARAGE - LEVEL B2	ACCESSIBLE	3
	COMPACT	55
	STANDARD	71
129		
GARAGE - LEVEL B1	ACCESSIBLE	3
	COMPACT	58
	STANDARD	70
131		
GARAGE - LEVEL 1	ACCESSIBLE	1
	ACCESSIBLE VAN	3
	COMPACT	58
64		
GARAGE - LEVEL 2	ACCESSIBLE	3
	COMPACT	58
	STANDARD	70
131		
GARAGE - LEVEL 3	ACCESSIBLE	2
	COMPACT	58
	STANDARD	71
131		
GARAGE - LEVEL 4	ACCESSIBLE	2
	COMPACT	58
	STANDARD	71
131		
GARAGE - LEVEL 5	ACCESSIBLE	2
	COMPACT	58
	STANDARD	71
131		
GARAGE - LEVEL 6	ACCESSIBLE	2
	COMPACT	58
	STANDARD	71
131		
TOTAL		1021



1 GARAGE - LEVEL 6
1/8" = 1'-0"

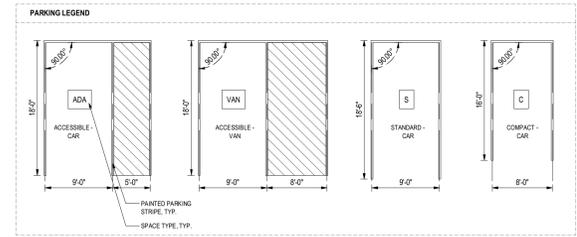


2 GARAGE - MAIN ENTRY ROOF
1/8" = 1'-0"



3 GARAGE - LEVEL 6 - RCP
1/8" = 1'-0"

LEGEND
 WHEELED FIRE EXTINGUISHER
 75'-0" MAX. DISTANCE PER CODE, TYP.



Consultant

NO.	DATE	DESCRIPTION	BY	APP'D
1	02/23/20	CONCEPT DEVELOPMENT	YMM	YMM
2	03/11/20	ISSUE FOR PERMIT	YMM	YMM



KEY PLAN

GARAGE PARKING COUNT	
PARKING TYPE	COUNT
GARAGE - LEVEL B2	
ACCESSIBLE	3
COMPACT	55
STANDARD	71
GARAGE - LEVEL B1	129
ACCESSIBLE	3
COMPACT	58
STANDARD	70
GARAGE - LEVEL 1	131
ACCESSIBLE	1
ACCESSIBLE VAN	3
COMPACT	58
STANDARD	64
GARAGE - LEVEL 2	126
ACCESSIBLE	3
COMPACT	58
STANDARD	70
GARAGE - LEVEL 3	131
ACCESSIBLE	2
COMPACT	58
STANDARD	71
GARAGE - LEVEL 4	131
ACCESSIBLE	2
COMPACT	58
STANDARD	71
GARAGE - LEVEL 5	131
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ACCESSIBLE	2
COMPACT	58
STANDARD	71
TOTAL	1021

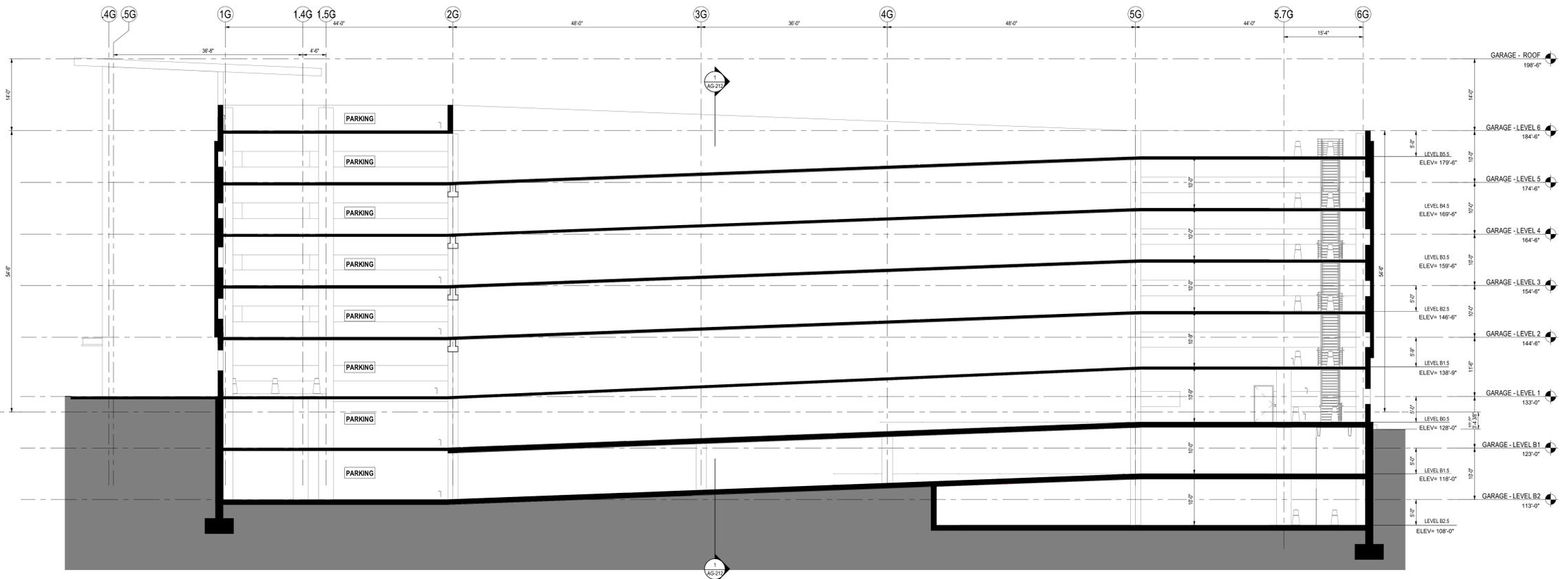
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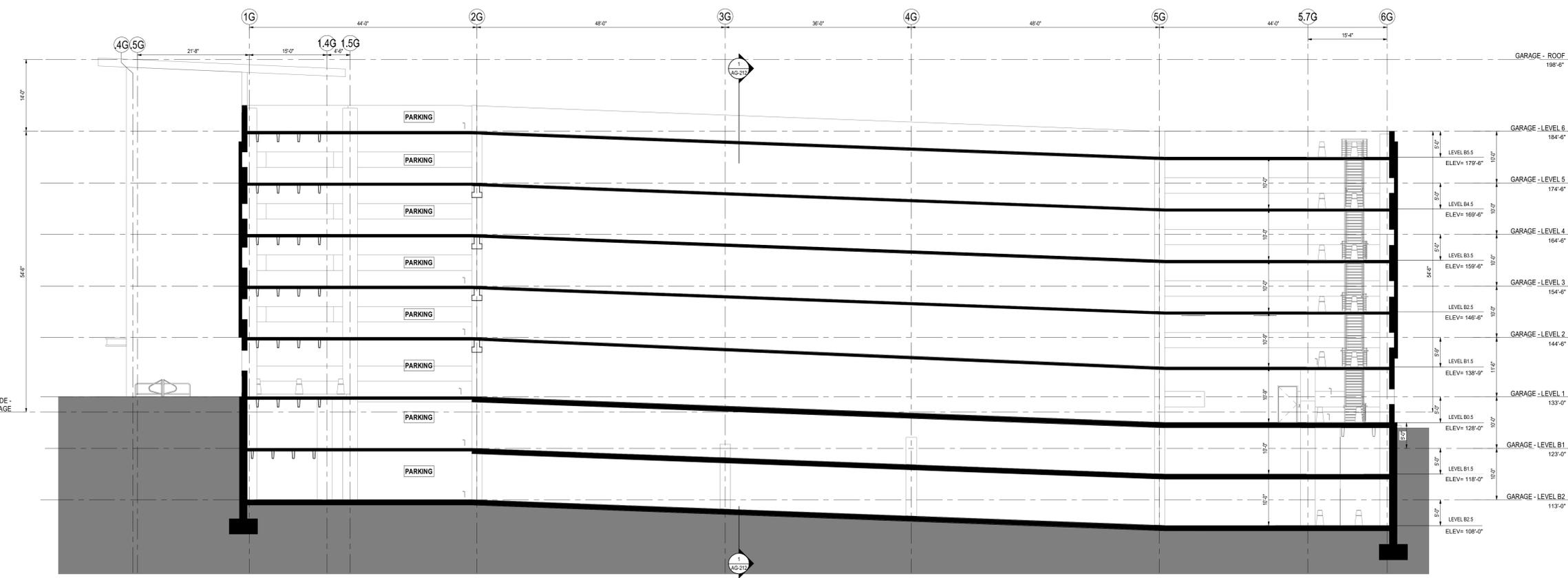
Permit/Seal



KEY PLAN



2 GARAGE SECTION BB - CENTRAL RAMP
 AG-211 1/8" = 1'-0"

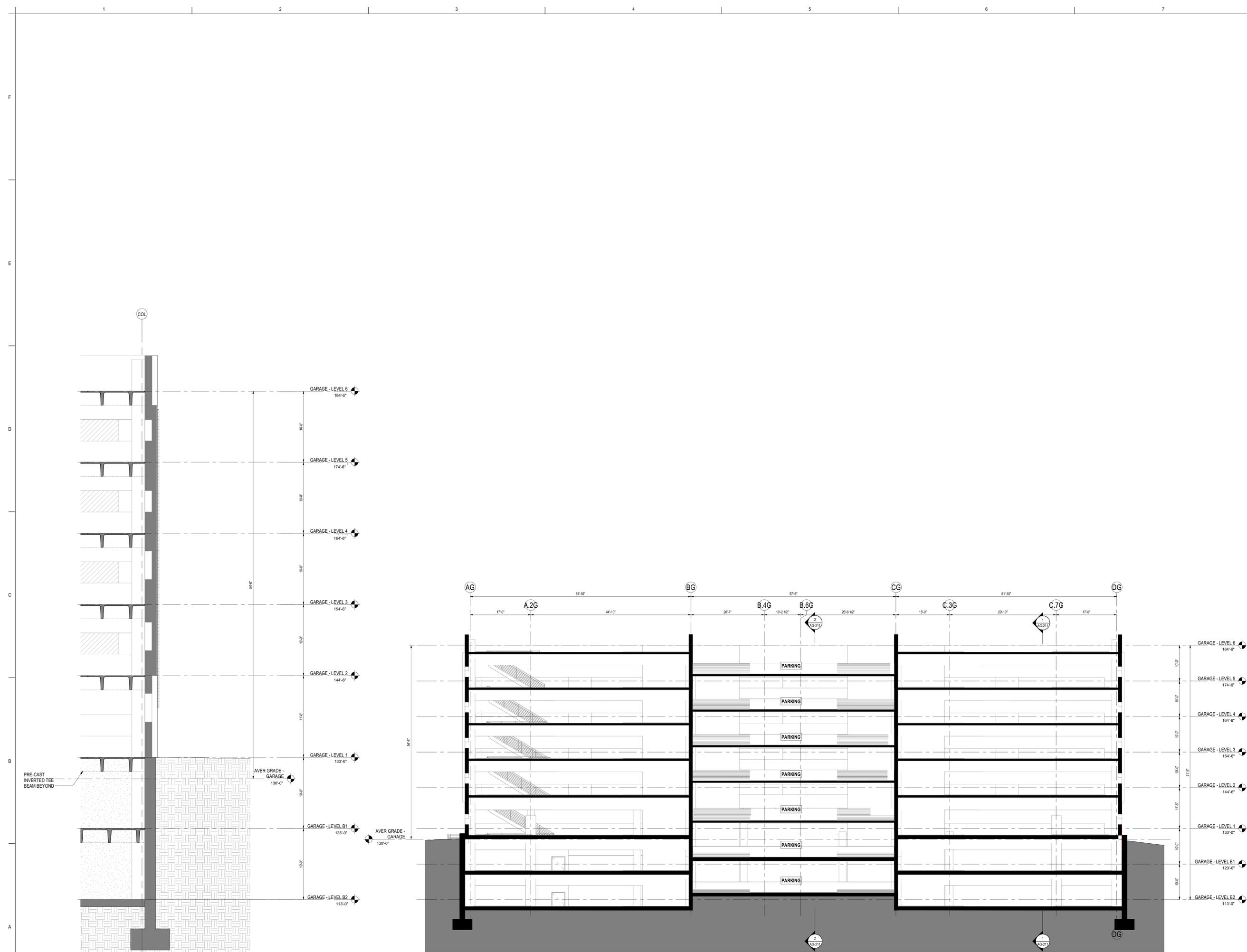


1 GARAGE SECTION AA - OUTER RAMP
 AG-211 1/8" = 1'-0"

Bulfinch
 557 Highland Ave
 BOSTON, MA
 HIGHLAND GARAGE

Client/Project
 Project No.: 218421343
 Title: HIGHLAND GARAGE
 Scale: 1/8" = 1'-0"
 Author: YMM/AMM
 Designer: YMM/AMM
 Checker: YMM/AMM

Revision: 2
 Drawing No.: **AG-211**
GARAGE

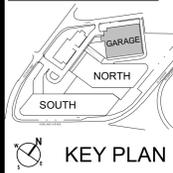


2 TYP. BAY SECTION - FOUNDATION OUTBOARD
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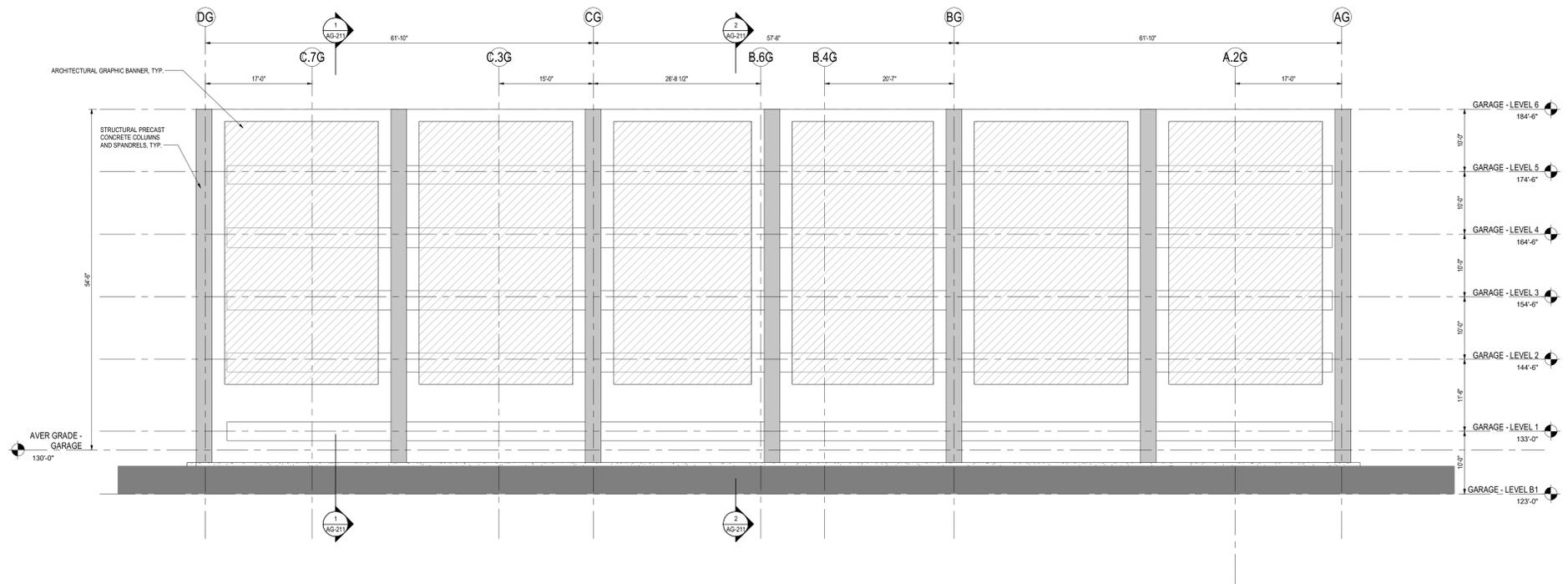
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Consultant

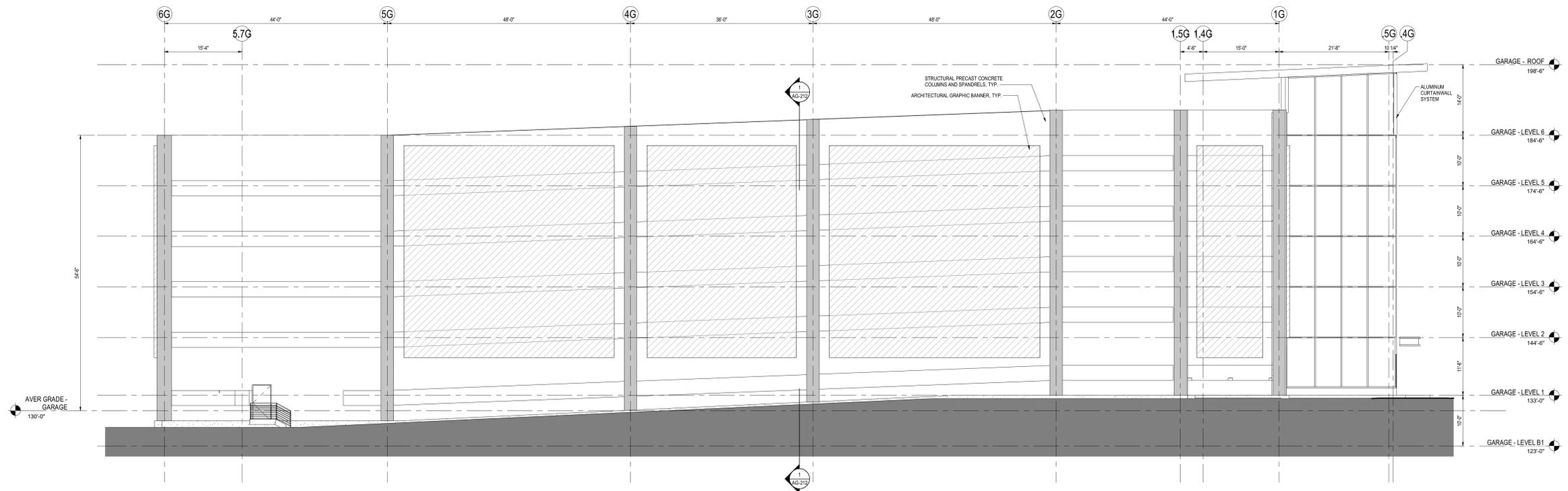
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1	02/23/20	MM	MM	MM	Issue of Revision



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2 EAST ELEVATION
1/8" = 1'-0"



1 NORTH ELEVATION
1/8" = 1'-0"

Consultant

NO.	DATE	BY	APP'D	REVISION
1	02/23/20	YMM	YMM	ISSUE FOR PERMIT
2	02/23/20	YMM	YMM	ISSUE FOR PERMIT



Client/Project
Bulfinch
557 Highland Ave
HIGHLAND GARAGE

Project No.: 218421343
Title: ELEVATIONS - NORTH & EAST

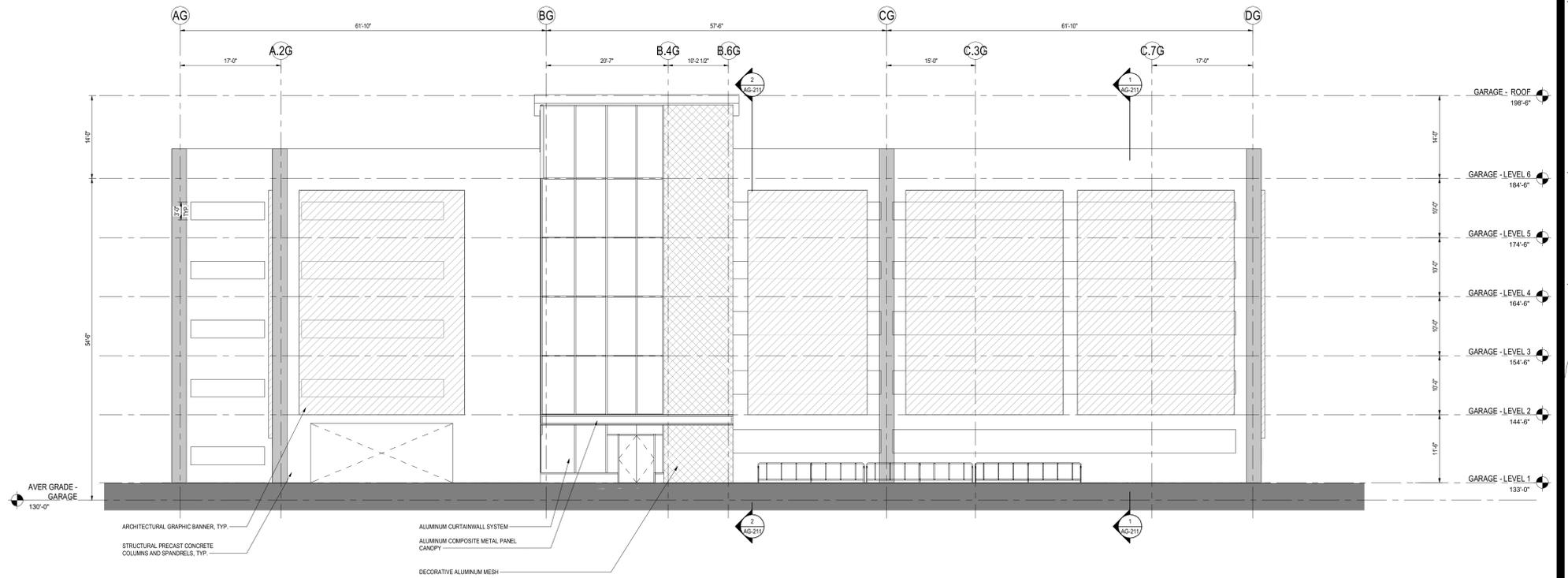
Scale: 1/8" = 1'-0"
Author: YMM
Designer: YMM
Checker: YMM

Revision: 2
Drawing No.: **AG-301**
GARAGE

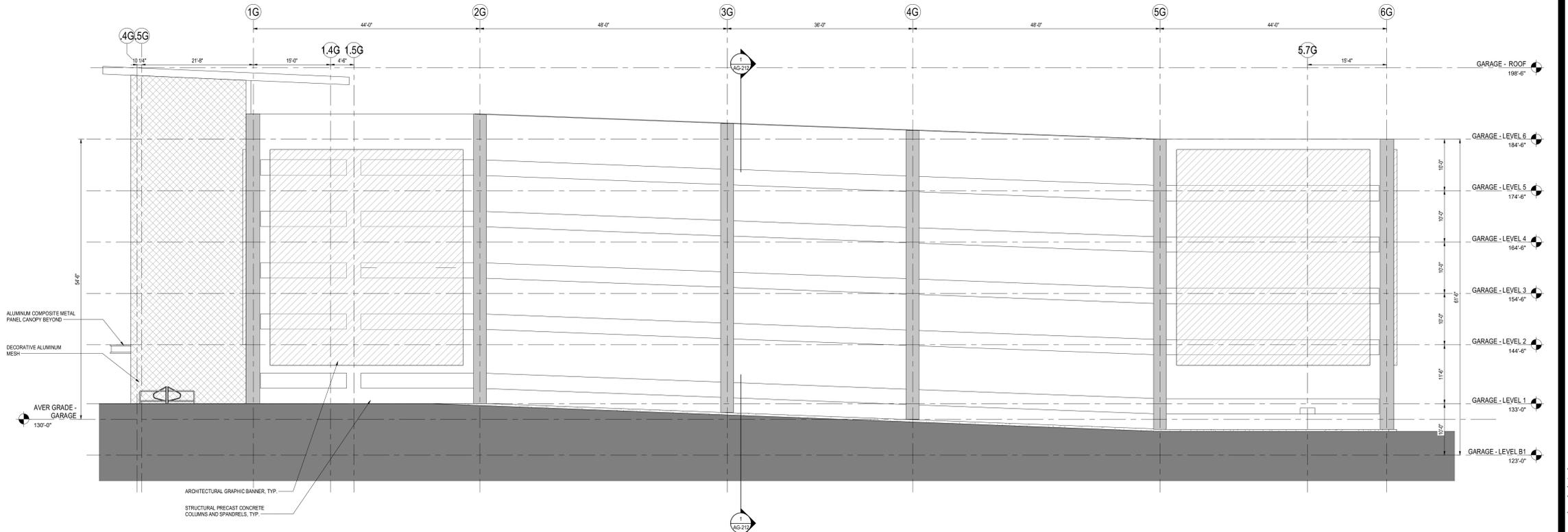
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ORIONK SHEET ARCH1



2 WEST ELEVATION
AG-302 1/8" = 1'-0"



1 SOUTH ELEVATION
AG-302 1/8" = 1'-0"

Consultant

NO.	DATE	BY	APP'D	REVISION
1	02/23/20	MM	MM	ISSUE FOR PERMIT
2	03/11/20	MM	MM	ISSUE FOR PERMIT



KEY PLAN

Bulfinch
557 Highland Ave
HIGHLAND GARAGE

Client/Project
Project No.: 218421343
Title: ELEVATIONS - SOUTH & WEST

Revision: 2
Drawing No.: **AG-302**
GARAGE

Highland Innovation Center

557 Highland Avenue
Needham, Massachusetts

PREPARED FOR

557 Highland, LLC

c/o

The Bulfinch Companies, Inc.
116 Huntington Avenue
Boston, MA 02116

PREPARED BY



101 Walnut Street
PO Box 9151
Watertown, MA 02471
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MARCH 2022

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Introduction

Vanasse Hangen Brustlin, Inc. (VHB) has evaluated the potential traffic impacts associated with the proposed development at 557 Highland Avenue in Needham, Massachusetts (the “Site”). The proposed development Project includes up to 506,694 SF of rentable space, with approximately 248,347 SF of office space, approximately 248,347 SF of research and development space, and approximately 10,000 SF of retail space. The Project will also accommodate up to 1,408 off-street parking spaces. The parcel of land was formerly occupied for several decades by a car dealership and car wash.

The Project is consistent with local redevelopment goals for the area as previously studied by the Town of Needham’s Department of Planning and Community Development. To support the rezoning effort, a Traffic Study commissioned by the Town of Needham was completed by GPI in November 2020.¹ That study considered rezoning the Muzi Motors and WCVB/Channel 5 properties from Industrial 1 to Highway Commercial 1 while providing a maximum floor area ratio of 1.35. This rezoning was formally codified in the creation of a new use district called Highway Commercial 1 and a corresponding zoning map amendment, which were adopted by Needham Town Meeting on May 3, 2021.

This Transportation Impact and Access Study (TIAS) provides an evaluation and summary of the Project’s transportation elements and quantified impacts. It includes an analysis of estimated trip generation characteristics and describes anticipated parking conditions, loading and service activities, drop-off amenities, and other important transportation mitigation and improvement actions that will be provided in connection with the Project. The purposes of these analyses are to:

- › Describe the transportation-related characteristics of the Project;
- › Quantify the transportation impacts of the Project;
- › Develop and clearly commit to a set of mitigation strategies and traffic improvement measures that will help to lessen the transportation effects of the Project, and
- › Demonstrate that these transportation mitigation efforts will serve as exceptional public benefits as they relate to transportation issues.

The sections below provide an overview of the Project and a summary of the TIAS findings. Subsequent sections provide a more detailed discussion of estimated traffic generation of the

¹ Traffic Impact Study, Muzi Motors Redevelopment, Greenman-Pederson, Inc. November 20, 2020

Project. The final section presents a detailed summary of transportation mitigation and improvement actions that the Proponent is committed to implementing in connection with the Project. Note that this mitigation plan is reflective of those actions that have been delineated by the Town of Needham in connection with its own recent evaluation supporting rezoning of this site and other adjacent sites.

Summary of Findings and Transportation Mitigation

The Project will result in additional trips generated to and from the Project Site. These new trips can be expected to produce some localized impacts on the surrounding transportation infrastructure. The Proponent has developed a comprehensive series of improvement actions to address existing operating conditions and constraints and to help mitigate future new impacts. Generally, the Project will adopt and incorporate nearly all transportation improvements that were delineated in the Traffic Study commissioned by the Town of Needham in support of their recent rezoning effort for the area. The improvements and the proposed mitigation program are intended to offset the Project's impacts and to provide improved transportation infrastructure to the surrounding area for all users supporting significantly improved area mobility. The Proponent is also committed to implementing an extensive travel demand management (TDM) program in connection with the Project's development and operation. A summary of key findings and mitigation and improvement actions are described below:

- › The net-new traffic generated by the Project is estimated to total 583 trips during the morning peak hour (515 entering and 68 exiting), and 565 trips during the evening peak hour (92 entering and 473 exiting).
- › The Project will generate 5,005 net new weekday daily trips – or approximately 44% fewer trips than that estimated by GPI's traffic study supporting the recent Town of Needham rezoning effort.
- › The Proponent is committed to funding the design and construction of key mitigation and improvement measures, including:
 - Installation of on-road bicycle lanes in each direction of Gould Street between Highland Avenue and just north of TV Place.
 - Addition of shared lane pavement markings and signage in each direction for bicyclists along Gould Street for approximately ½ mile between just north of TV Place and Central Avenue.
 - Design and installation of a fully-actuated traffic signal at the intersection of Gould Street and the main Project Site driveway opposite the Wingate Driveway.
 - Geometric improvements at the intersection of Highland Avenue at Gould Street / Hunting Road.
 - Design and installation of a fully-actuated traffic signal at the intersection of Gould Street and Central Avenue, including associated geometry improvements.
 - Geometric improvements at the intersection of Gould Street at TV Place including turn lanes into and out of TV Place.
- › The Proponent will work with the Town of Needham to fund a study of the feasibility of converting the former MBTA railroad ROW north of the Project Site and the Channel 5 property into a shared use path that would connect with Needham Heights to the south and the Charles River to the north.

- › The Project includes significant pedestrian and open space amenities, including new sidewalks and accessible crossings adjacent to the site and at key off-site locations (as noted above). An approximately 0.5-mile walking path around the Project Site with landscaping, lighting, and other public amenities will be included and will be open to all members of the general public.
- › Connections to the future bicycle accommodations on Highland Avenue that will extend toward Newton to the east and toward Needham Heights to the west.
- › Up to 70 bicycle parking spaces will be provided consisting of covered bicycle storage/long-term bicycle parking on-site and outdoor public bike racks/short-term bicycle parking.
- › The Project Proponent will explore and look to implement shuttle connectivity through its future proactive involvement in the Route 128 Business Council to improve public transportation access and accessibility to the Project Site.
- › On-site parking will be adequate to accommodate the expected employee and visitor demands of the Project. The Project will include up to 1,408 spaces (an increase of 876 net-new spaces over the 532 parking spaces previously provided on Site). This parking demand will be accommodated primarily in a structured parking garage to be located on the northeast portion of the Site adjacent to TV Place. Additional below-grade parking will be provided under each building, and in a surface parking lot intended to be used by visitors.
- › Parking facilities will be equipped with Electric Vehicle charging stations, with consideration as to how increased EV capacity can be implemented in the future as warranted by demand and market conditions.
- › The Project will include dedicated off-street loading docks to ensure that loading and service operations are handled internal to the buildings and will not impact traffic operations or pedestrian flow on adjacent streets.
- › The Proponent will implement a wide array of Transportation Demand Management (TDM) measures to incentivize reduced single occupant driving and increased use of alternative forms of transportation to access the workplace. Key TDM actions to be implemented in connection with the Project include:
 - Providing an Employee Transportation Advisor who will coordinate with the 128 Business Council;
 - Exploring the feasibility of providing shuttle service connectivity to nearby public transportation nodes (commuter rail and Green Line)
 - 50 percent transit pass subsidy to be offered by future tenants to their employees;
 - Carpool assistance and incentives;
 - Emergency ride home;
 - Bicycling/walking incentives and amenities;
 - Telecommuting and compressed workweeks, when feasible;
 - Display in the Main Lobby transportation-related information for employees and visitors; and
 - Promotional efforts.
- › The Proponent is also committed to a robust transportation monitoring program to evaluate the effectiveness of its TDM program and to measure the Project's impacts on the transportation network. The monitoring program will include the annual collection of traffic counts and parking garage activity by employees and visitors to the Project Site. The transportation monitoring

program will begin six months after full occupancy of the proposed development and continue for a period of five years. The results of each transportation monitoring program will be summarized in a report and provided to MassDOT and to the Town of Needham.

Study Methodology

This Transportation Study has been performed in conformance with the Massachusetts Executive Office of Energy and Environmental Affairs (EEA)/Executive Office of Transportation (EOT) guidelines. Prior to completing this study, VHB completed a Traffic Scoping Letter (TSL) process with MassDOT to get buy-in on the many facets of the traffic study. That TSL was submitted to MassDOT on November 2, 2021. MassDOT issued an approved scope to the Proponent on February 2, 2022. This study is reflective of the approved scope. TSL materials and related MassDOT correspondence are included in the Appendix to this report for reference. VHB also held preliminary consultation with Town of Needham transportation staff on traffic study requirements and that input is reflected within this Study.

VHB prepared the traffic assessment in three stages. The first stage involved an assessment of existing traffic conditions within the Project study area, including: an inventory of existing roadway geometry; observations of traffic flow, including daily and peak period traffic counts; a summary of existing public transit facilities in the area; and a review of vehicular crash data.

The second stage of the study established the framework for evaluating the transportation impacts of the Project. Specific travel demand forecasts for the Project were assessed along with future traffic demands on the study area roadways due to projected background traffic growth and other proposed area developments that may occur independent of the Project. The year 2029, a seven-year time horizon, was selected as the design year for analysis for the preparation of this traffic impact and access assessment in accordance with the standard industry practices in Massachusetts.

The third and final stage of the study discusses possible measures to improve existing and future traffic operations in the area and offsetting the traffic-related impacts associated with the Project.

Analysis Conditions

This study contains transportation analyses conducted under the following three conditions during the weekday morning and weekday evening peak hours:

- › 2022 Existing Conditions
- › 2029 No Build Conditions
- › 2029 Build Conditions

The 2022 Existing Conditions analyses provide a snapshot of conditions today in the study area. The 2022 Existing Conditions have been conducted based on pre-COVID-19 conditions, and do not take into account the change in travel patterns caused by the COVID-19 pandemic. The 2029 No Build Conditions and 2029 Build Conditions analyses provide a picture of what transportation conditions will look like in the study area in the future with and without the Project in place. These three analyses allow for a comparison of the Project's impact on the transportation network and help to determine what transportation mitigation measures are necessary to offset the impacts of the Project.



Project Description

A detailed review of the proposed building program and Site access plan was conducted as part of this evaluation and is described in the following sections. Included in the review of the Project Site access plan are descriptions of the proposed pedestrian accommodations, bicycle accommodations, loading and delivery activities, and parking supply.

Building Program

The development proposal for the Project Site includes up to 506,694 SF of rentable space, consisting of the following uses:

- › Approximately 248,347 SF of office space;
- › Approximately 248,347 SF of research and development space; and
- › Approximately 10,000 SF of retail.

The building is conceived as one structure articulated as three distinct parts. The first part, the “South Building”, is a three-story building located along Highland Avenue and extending toward Gould Street, creating a scale that is recognizable and related to the adjacent context. The second part, “the North Building”, is a five-story building that is set back from Highland Avenue and Gould Street by 200 feet and extends toward the Southbound Exit 35C from I-95/Route 128. The third part is a two-story atrium connecting the South Building and the North Building that provides the main entry for the buildings. The atrium will allow opportunities to bring daylight into the deeper sections of the floorplate and allow for internal connections between the South Building and the North Building. Visually, the atrium will create a break within the massing ensuring visual interest and clarity of each of the parts. A five-story parking garage will be located north of the North Building, closest to TV Place.

The Project will create new office and lab space at a highly visible location adjacent to Exit 35C on I-95/Route 128. Under existing conditions, the Project Site consists of a former car dealership and car wash. Both the car dealership and car wash ceased operation in late 2021.

The previous uses of a car dealership and a car wash were frequented throughout the day, as opposed to most of the traffic entering and exiting during the peak hours, as is typical of office and lab uses. Of note, car washes are generally the busiest during the weekends when people are most likely to get their vehicles washed. The former car wash on-Site typically handled up to 18,000 car

washes per month, based on review of sales data and conversation with the former operator. This level of activity translates to about 600 washes/day during peak months (which tend to be during the winter).

The Project will have most traffic entering and exiting during the weekday morning and evening peak hours, meaning that the impacts on the roadway network will be less on the weekends. The Project will match existing office and lab uses located along the I-95/Route 128 corridor, and with the proposed mitigation described in detail in this study, the roadway network will be able to accommodate the Project-generated trips during the busiest weekday peak hours.

Site Access

Existing Site Access

The Project Site is located along Highland Avenue and Gould Street in Needham, Massachusetts. The Project Site is bounded by Highland Avenue to the south, TV Place to the north, Gould Street to the west, and the I-95/Route 128 Exit 35C southbound off-ramp to the east. Access to the Project Site is currently provided by two driveways off Gould Street and one driveway off Highland Avenue. The northern driveway off Gould Street, referred to as TV Place, provides access to the car wash and an egress from the car dealership. TV Place also provides access to an office building and the Channel 5 studios, which are not included in the Project Site and will remain in place with access from TV Place. The southern driveway off Gould Street provides the main access to the car dealership. The driveway off Highland Avenue is for limited use by the dealership and is gated.

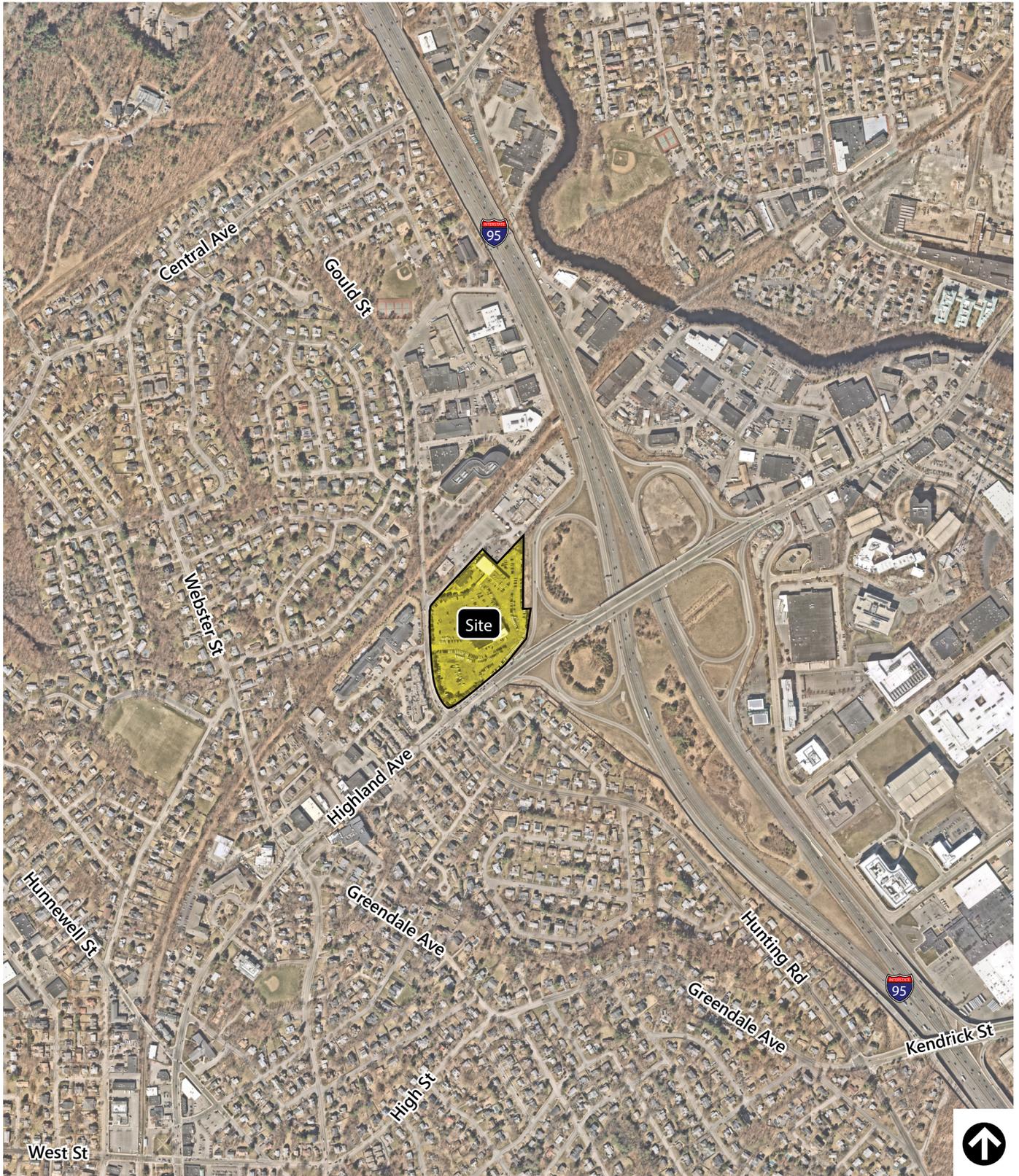
A Site location map is provided in Figure 1.

Project Site Access

The Project will include office, research and development, and retail space within newly constructed buildings and a stand-alone parking garage. Existing driveways off Gould Street will remain in place and a full connection will be provided between TV Place and the Project Site. There will be no curb cuts along Highland Avenue with the existing, gated driveway being eliminated.

An internal roadway within the Project Site will connect between the Gould Street driveway and TV Place. This internal roadway will provide connections to the above-ground parking garage, the parking garages located below each building, a small surface parking lot, and all loading and service areas.

Figure 2 illustrates the site plan and external access points for the Project and includes the garage and loading access points.

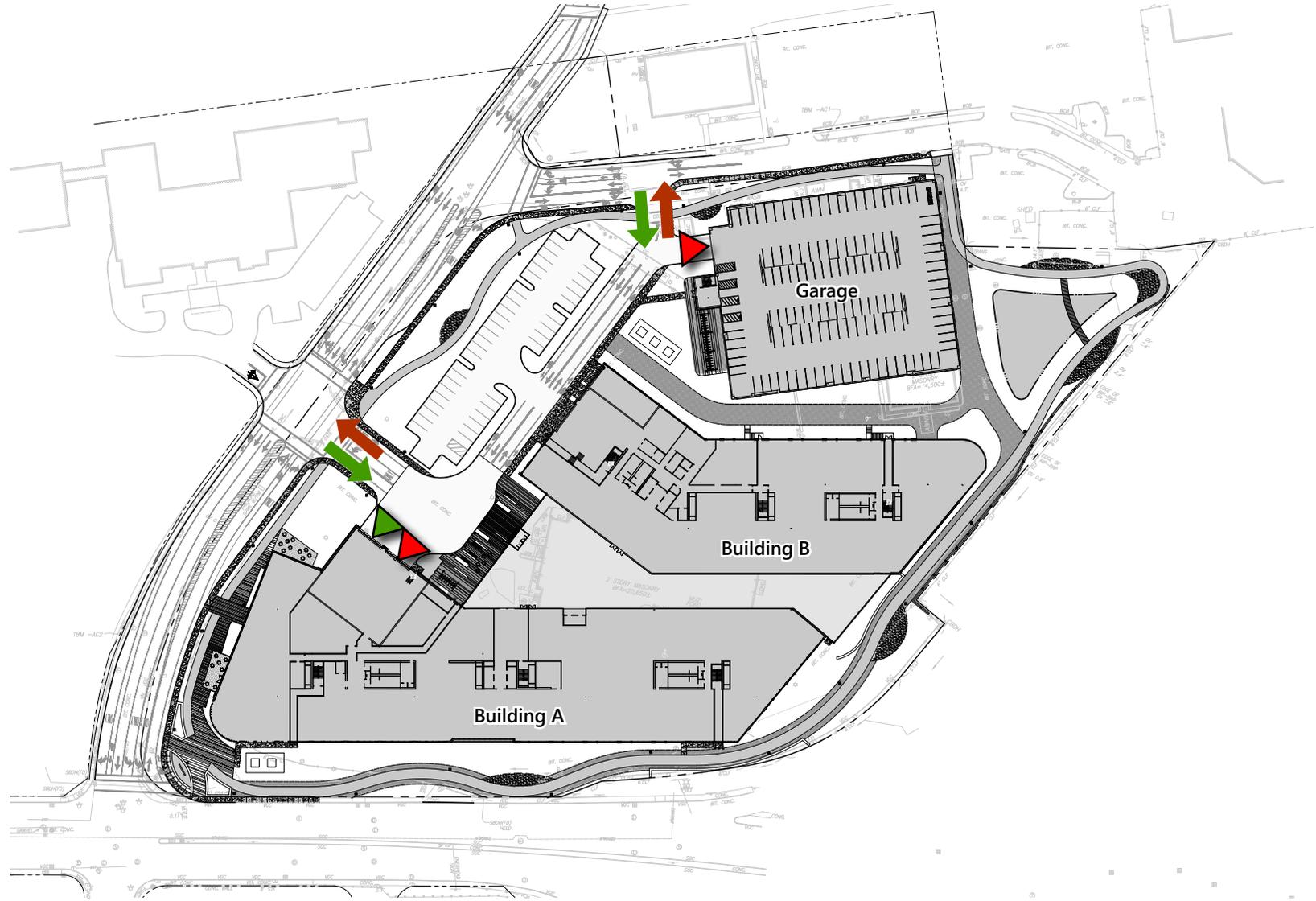


Source: NearMap



Figure 1
Site Location Map

**Highland Science Center
Needham, Massachusetts**



Source: Paul Finger Associates

-  Vehicle Access
-  Vehicle Egress
-  Garage Access
-  Loadings Access



Figure 2
Site Plan & Circulation

**Highland Science Center
Needham, Massachusetts**

Pedestrian Accommodations

As part of the Project, new sidewalks will be provided along the proposed internal street. The internal sidewalks will connect to the sidewalk on the west side of Gould Street at the proposed signalized intersection of Gould Street at the Project Site driveway/Wingate driveway. The signalized intersection will include pedestrian phasing and will have ADA-compliant crosswalks across all four approaches, providing a protected pedestrian crossing of Gould Street that does not currently exist. In addition, a new sidewalk will be provided along the Project Site frontage on the east side of Gould Street where none exists today.

A key aspect of the Project will be the new perimeter path and open spaces. An approximately 0.5-mile walking path will be constructed to circulate around the Project Site with landscaping, lighting, and other public amenities. The walking path will be open to the public and will be used by both employees and visitors to the Project Site and by nearby neighbors. Connections to the walking path will be provided to Highland Avenue and Gould Street.

Bicycle Accommodations

The Project Site will be designed to encourage workers and visitors to travel via bicycle. The internal street network will consist of a low-speed street that will allow for shared bicycle and vehicular traffic. Bicycle lanes will be provided on both Project Site driveways to provide dedicated access for bicyclists. Bicycle racks will be placed in visible, convenient locations on Site for visitors and customers and secure, indoor bicycle spaces will be provided for employees.

The Project Site is adjacent to Highland Avenue, which is currently the subject of a MassDOT construction project that will provide continuous dedicated bicycle facilities for approximately two miles along Highland Avenue and Needham Street between Webster Street in Needham and Route 9 in Newton. Most of the corridor will be constructed with separated bicycle lanes. Located directly on Highland Avenue, the Project Site will have strong bicycle connections with Needham Heights to the southwest and Newton to the northeast.

As mitigation for the Project, the Proponent is proposing to install bicycle lanes in both directions along Gould Street between Highland Avenue and the former MBTA railroad ROW just north of TV Place. Between the former MBTA railroad ROW and Central Avenue, a distance of approximately ½ mile, the Proponent will fund the installation of shared lane pavement markings and signage in each direction. These improvements will provide a new north-south bicycle corridor within this area of Needham and will improve bicycle connectivity to the Project Site with connections to bicycle lanes on TV Place and the Project Site driveway.

In addition, the Proponent will work with the Town of Needham to fund a study of the feasibility of converting the former MBTA railroad ROW north of the Project Site and the Channel 5 property into a shared use path that would connect with Needham Heights in the south and the Charles River in the north.

Bicycle Parking

The Project's potential bicycle parking needs will be accommodated through the provision of secured bicycle parking within the Project building and/or building garages and by outdoor bicycle racks

throughout the Site. Up to 70 bicycle spaces will be provided in outdoor bicycle racks located throughout the Site and in indoor/secure locations.

In addition to designated bicycle parking spaces, a bicycle maintenance station will be available on-site for tenants' employees.

Loading and Deliveries

A service and loading dock location will be provided for the Project Site in the North Building and South Building. The service and loading dock will be accessed via a dedicated driveway off of the internal circulating roadway.

The exact number and timing of deliveries will vary depending on the nature of the various retail establishments, in addition to standard office delivery activity. Retail delivery activity typically occurs during morning hours so as not to interfere with the operation of the business. Due to the smaller sizes of the retail uses, most deliveries likely will be made by smaller, single-unit trucks. These trucks can easily be accommodated and should typically only be on Site for a short time.

Vehicle Parking

The Project will include up to 1,408 off-street parking spaces. The site was formerly occupied by a car dealership and car wash for many years that contained approximately 532 parking spaces². Taking into account the previous parking on Site that will be removed, the Project will include construction of up to 876 net new parking spaces. The existing Site plan showing the number of parking spaces provided for the car dealership and the car wash is included in the Appendix to this report.

Vehicle Parking Demand

Zoning requirements for the Town of Needham require a minimum of one parking space per 300 square feet, which results in an expected employee density for the Project Site of 3.33 employees per 1,000 SF (assuming each parking space corresponds to one employee). However, R&D uses typically have a lower employee per square foot density than office uses due to the square footage needed for lab space. Based on a review of employee density for existing R&D spaces in Cambridge, the average employee density for R&D space is approximately 2.46 employees per 1,000 SF³.

In addition, the one parking space per 300 SF ratio assumes that each employee will commute alone via private vehicle. In reality, some employees will commute via carpool, walking, biking, or public transit. The Proponent will encourage the use of alternative commuting modes beyond single occupancy vehicles with the implementation of the TDM program outlined in this report. Therefore, it is likely that the Project Site will generate fewer occupied parking spaces than required by zoning.

Table 1 provides a summary of the anticipated parking demand for the Project Site.

² The 532 previous parking spaces on Site include spaces that were used to support new and used car inventory. It is estimated that up to 100 parking spaces were used primarily by employees and customers.

³ Calculations by VHB based on 2018 PTDM Monitoring Reports provided by the City of Cambridge for four existing R&D facilities located at 7 Cambridge Center, 610 Main Street, Tech Square, and Binney Street.

Table 1 Parking Generation Calculations

Use	SF	Employee/Patron Density^a	Reduction for non-SOV^b	Parking Demand
Office	248,347	3.33/ksf	0.92	762 spaces
R&D	248,347	2.46/ksf	0.92	562 spaces
Retail	10,000	3.33/ksf	0.92	31 spaces
Total				1,355 spaces

a Based on Town of Needham zoning requirements for office and retail and data from existing R&D uses in Cambridge for R&D.

b Estimated 8-percent reduction in required parking spaces to account for incentivized modes of transportation beyond single occupancy vehicles (SOV).

As shown in Table 1, the actual vehicle parking demand for the Project Site may be around 1,355 parking spaces. With approximately 1,408 parking spaces proposed on-Site, there will be adequate parking provided for the Project Site.

The parking calculations above do not consider changes in travel patterns caused by the COVID-19 pandemic. With the rise in popularity of employees working from home either full time or on certain days of the week, it is likely that not all employees for the office and R&D uses will be on-Site all at the same time. Therefore, the future parking demand may be lower than what is reported in Table 1.



Existing Conditions

Evaluation of the transportation impacts associated with the Project requires an understanding of the existing transportation conditions in the study area including: an inventory of the traffic control, roadway, driveway, and intersection geometry in the study area; the collection of peak hour traffic volumes; a review of existing bicycle and pedestrian accommodations in the study area; a summary of public transit options in the area; and a review of recent crash history. Each of these elements is described in detail below.

Study Area

Based on VHB's knowledge of the area transportation network and the operational characteristics of the Project, as well as input from the Town of Needham and MassDOT, a study area comprising of the following intersections in Needham and their approach roadways were selected for review:

- › 1: Central Avenue at Cedar Street
- › 2: Central Avenue at Webster Street
- › 3: Central Avenue at Gould Street
- › 4: Central Avenue at Hampton Avenue
- › 5: Central Avenue at River Park Street
- › 6: Gould Street at Ellis Street
- › 7: Gould Street at Kearney Road
- › 8: Gould Street at Station Road
- › 9: Gould Street at Noanett Road
- › 10: Gould Street at TV Place
- › 11: Gould Street at Muzi Ford/Wingate Residences driveways
- › 12: Highland Avenue at West Street
- › 13: Highland Avenue at Hunnewell Street
- › 14: Highland Avenue at Webster Street
- › 15: Highland Avenue at Gould Street / Hunting Road

- › 16: Highland Avenue at I-95 SB Ramps
- › 17: Highland Avenue at I-95 NB Ramps
- › 18: Highland Avenue at 1st Avenue
- › 19: Highland Avenue at 2nd Avenue
- › 20: Kendrick Street at Hunting Road

A map of the study area intersections is provided in Figure 3.

The Project Site is located in the Needham Heights neighborhood less than ¼ mile from the Newton town line. The Project Site is directly served by Highland Avenue and Gould Street. Highland Avenue connects the Project Site to the Needham Heights neighborhood to the southwest and to I-95 and Newton in the northeast. The nearest transit stop to the Project Site is Needham Heights on the Needham Branch of the MBTA commuter rail, approximately 0.8 miles southwest of the Project Site.

Roadway Network

Descriptions of the study area roadways and intersections are provided below, including descriptions of the existing lane configurations, traffic control at the study intersections, and the roadway jurisdiction in this area.

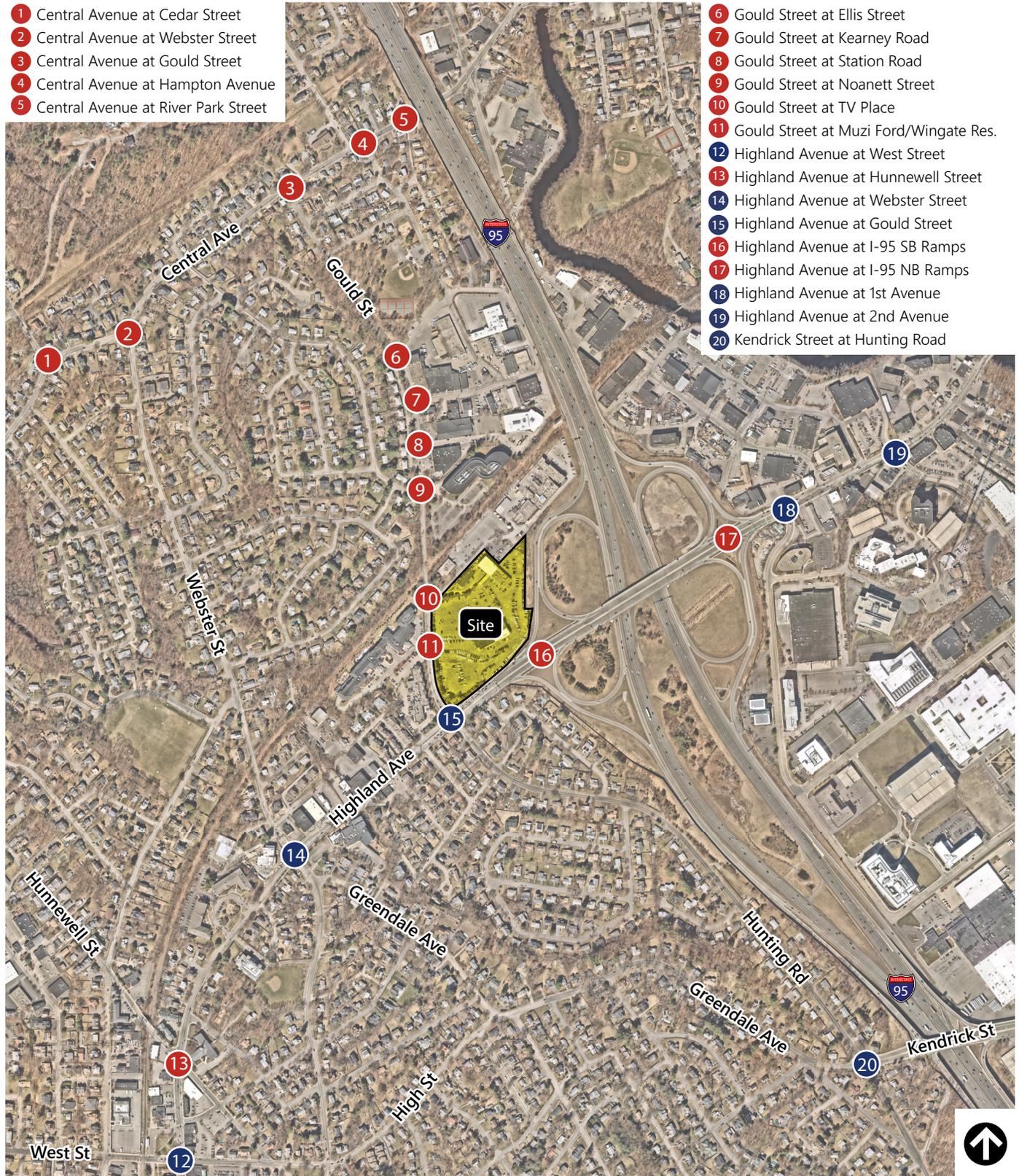
MassDOT is currently reconstructing portions of Highland Avenue.⁴ The reconstruction project will enhance bicycle and pedestrian accommodations along the corridor and improve traffic flow. In addition, the MassDOT project will change the lane geometry at several intersections. A functional design report for the reconstruction project was submitted in August 2017 and construction on the project is underway. The roadway and intersection descriptions below are based on existing conditions as of early 2022 and do not take into consideration this ongoing corridor reconstruction project. Full details of the reconstruction project are included later in this TIA.

Study Area Roadways

Highland Avenue

Highland Avenue begins at Great Plain Avenue in the south and turns into Needham Street at the Newton City Line to the north. Within the study area, Highland Avenue is under MassDOT jurisdiction east of Webster Street, *i.e.*, adjacent to the Project Site, and under local jurisdiction west of Webster Street. The roadway within the study area is classified as a principal urban arterial west of I-95/Route 128 and as a minor urban arterial east of I-95/Route 128. Highland Avenue runs in a generally northeast/southwest direction within the study area. Highland Avenue generally consists of two travel lanes in each direction between Gould Street and 2nd Avenue and one travel lane in each direction west of Gould Street and east of 2nd Avenue. There is no posted speed limit within the study area along Highland Avenue. Sidewalks are provided on both sides of the roadway and crosswalks are provided at major intersections. Land use around Highland Avenue is mainly commercial.

⁴ Functional Design Report, Reconstruction of Highland Avenue, Needham Street, and Charles River Bridge; MassDOT Project No. 606635; Submitted by Stantec Consulting Services, Inc.; August 2017.



Source: NearMap

- # Unsignalized Intersection
- # Signalized Intersection



Figure 3
Study Area Intersections

**Highland Science Center
Needham, Massachusetts**

Gould Street

Gould Street runs from Central Avenue in the north and turns into Hunting Road once it crosses Highland Avenue to the south. It is classified as an urban minor arterial roadway under local jurisdiction. Gould Street runs in a generally north/south direction and consists of one travel lane in each direction. There is no posted speed limit along Gould Street. Sidewalks are provided along one side of the road, along the western side in proximity to the Project Site. Land use along Gould Street is primarily commercial and residential.

Study Area Intersections

1: Central Avenue at Cedar Street

Central Avenue and Cedar Street form a three-way unsignalized intersection. Central Avenue runs east/west and Cedar Street intersects from a southbound approach. Each approach to the intersection consists of a single general-purpose lane.

The southbound approach operates under STOP control while the eastbound and westbound approaches are free flowing. Sidewalks are provided on all sides of the intersection. Crosswalks are provided across the southbound approach of Cedar Street and across the westbound approach of Central Avenue. Land use around the intersection is residential.

2: Central Avenue at Webster Street

Central Avenue and Webster Street form a three-way unsignalized intersection. Central Avenue runs east/west and Webster Street intersects from a northbound approach. Each approach to the intersection consists of a single general-purpose lane. An island separates the approach and exit lanes along Webster Street.

The northbound approach operates under STOP control while the eastbound and westbound approaches are free flowing. Sidewalks are provided on the northern, western, and eastern sides of the intersection. Crosswalks are provided across the southbound approach of Webster Street. Land use around the intersection is residential.

3: Central Avenue at Gould Street

Central Avenue and Gould Street form a three-way unsignalized intersection. Central Avenue runs east/west and Gould Street intersects from a northbound approach. Each approach to the intersection consists of a single general-purpose lane.

The northbound approach operates under STOP control while the eastbound and westbound approaches are free flowing. Sidewalks are provided on all sides of the intersection. Crosswalks are provided across the northbound approach of Gould Street and across the westbound approach of Central Avenue. Land use around the intersection is residential.

4: Central Avenue at Hampton Avenue

Central Avenue and Hampton Street form a three-way unsignalized intersection. Central Avenue runs east/west and Hampton Street intersects from a northbound approach. Each approach to the intersection consists of a single general-purpose lane.

The northbound approach operates under STOP control while the eastbound and westbound approaches are free flowing. Sidewalks are provided on all sides of the intersection. Crosswalks are provided across the northbound approach of Hampton Street and across the westbound approach of Central Avenue. Land use around the intersection is residential.

5: Central Avenue at River Park Street

Central Avenue and River Park Street form a three-way unsignalized intersection. Central Avenue runs east/west and River Park Street intersects from a northbound approach. Each approach to the intersection consists of a single general-purpose lane.

The northbound approach operates under STOP control while the eastbound and westbound approaches are free flowing. Sidewalks are provided on the eastern and western sides of the intersection and no crosswalks are provided. Land use around the intersection is residential.

6: Gould Street at Ellis Street

Gould Street and Ellis Street form a three-way unsignalized intersection. Gould Street runs north/south, and Ellis Street intersects from a westbound approach. Each approach to the intersection consists of a single general-purpose lane.

The westbound approach operates under STOP control while the northbound and southbound approaches are free flowing. Sidewalks are provided on the western side of the intersection. Crosswalks are not provided at this intersection. The land use around the intersection is mostly commercial with some residential buildings on the western side.

7: Gould Street at Kearney Road

Gould Street and Kearney Road form a three-way unsignalized intersection. Gould Street runs north/south and Kearney Road intersects from a westbound approach. Each approach to the intersection consists of a single general-purpose lane.

The westbound approach operates under STOP control while the northbound and southbound approaches are free flowing. Sidewalks are provided on the western side of the intersection. Crosswalks are not provided at this intersection. The land use around the intersection is commercial.

8: Gould Street at Station Road

Gould Street and Station Road form a three-way unsignalized intersection. Gould Street runs north/south and Station Road intersects from a westbound approach. Each approach to the intersection consists of a single general-purpose lane.

The westbound approach operates under STOP control while the northbound and southbound approaches are free flowing. Sidewalks are provided on the western side of the intersection. Crosswalks are not provided at this intersection. The land use around the intersection is commercial.

9: Gould Street at Noanett Road

Gould Street and Noanett Road form a four-way unsignalized intersection with a commercial driveway to the east. Gould Street runs north/south and Noanett Road intersects from an eastbound approach. Each approach to the intersection consists of a single general-purpose lane.

The eastbound and westbound approaches operate under STOP control while the northbound and southbound approaches are free-flowing. Crosswalks are not provided at this intersection. The land uses around the intersection are commercial and residential.

10: Gould Street at TV Place

Gould Street and TV Place form a three-way unsignalized intersection. Gould Street runs north/south and TV Place intersects from a westbound approach. TV Place is a private way and connects to the Project Site as well as the WCVB Channel 5 studios and an office building. Each approach to the intersection consists of a single general-purpose lane.

The westbound approach operates under STOP control while the northbound and southbound approaches are free flowing. Sidewalks are provided on the western side of the intersection. Crosswalks are not provided at this intersection. The land use around the intersection is commercial.

11: Gould Street at Muzi Ford Driveway/Wingate Driveway

Gould Street intersects with the entrances of two establishments, the former Muzi Ford dealership and Wingate Residence, and forms a four-way unsignalized intersection. Gould Street runs north/south and the Muzi Ford entrance intersects from a westbound approach while the entrance of Wingate Residence intersects from an eastbound approach. Each approach to the intersection consists of a single general-purpose lane.

The eastbound and westbound approaches operate under STOP control while the northbound and southbound approaches are free flowing. Sidewalks are provided on the western side of this intersection. The land use around the intersection is commercial.

12: Highland Avenue at West Street

Highland Avenue and West Street form a four-way signalized intersection. Highland Avenue runs north/south and West Street runs east/west. The southbound and northbound approach of Highland Avenue to the intersection consists of a single general-purpose lane with adjacent parking provided. The eastbound and westbound approach of West Street to the intersection consists of a left-turn lane and a shared through/right-turn lane.

All approaches to the intersection are signalized. Sidewalks are provided on all sides of the intersection and a crosswalk is provided across all approaches to the intersection. The land use around the intersection is commercial.

13: Highland Avenue at Hunnewell Street

Highland Avenue and Hunnewell Street form a four-way unsignalized intersection. Highland Avenue runs north/south and Hunnewell Street runs southeast/northwest. Each approach to the intersection consists of a single general-purpose lane.

The northwest bound and southeast bound approaches operate under STOP control while the northbound and southbound approaches are free flowing. Sidewalks are provided on all sides of the intersection and crosswalks are provided at the eastbound and westbound approach and through the middle of the intersection across Highland Avenue. The land use around the intersection is commercial and residential.

14: Highland Avenue at Webster Street

Highland Avenue and Webster Street form a four-way signalized intersection. Highland Avenue runs east/west and Webster Street runs north/south. The eastbound and westbound approach of Highland Avenue to the intersection consists of a left-turn lane and shared through/right-turn lane. The northbound approach of Webster Street consists of a shared through/left-turn lane and right-turn lane. The southbound approach of Webster Street consists of a shared through/left-turn lane and a shared through/right-turn lane.

All approaches are signalized. Sidewalks are provided on all sides of the intersection and a crosswalk is provided on all sides of this intersection. The land uses around the intersection are commercial and residential.

15: Highland Avenue at Gould Street/Hunting Road

Highland Avenue and Gould Street/Hunting Road form a four-way signalized intersection. Highland Avenue runs east/west and Gould Street/Hunting Road runs north/south. The eastbound and westbound approach of Highland Avenue to the intersection consists of a left-turn lane and two through lanes. The northbound approach of Hunting Road consists of a shared through/left-turn lane and right-turn lane. The southbound approach of Gould Street consists of a left-turn lane and a shared left/through/right-turn lane.

All approaches are signalized. Sidewalks are provided on all sides of the intersection and a crosswalk is provided on all sides of this intersection. The land uses around the intersection are commercial and residential.

16: Highland Avenue at I-95 SB Ramps

Highland Avenue and I-95 SB on and off ramps have an unsignalized interchange with merging and diverging lanes along Highland Avenue. Highland Avenue runs east/west and the ramps run parallel. The eastbound and westbound travel lanes of Highland Avenue consist of two travel lanes and one merge/diverge lane. All four I-95 SB ramps consist of one lane.

Sidewalks are provided along Highland Avenue and crosswalks are provided across each of the I-95 SB ramps.

17: Highland Avenue at I-95 NB Ramps

Highland Avenue and I-95 NB have an unsignalized and signalized interchange with merging and diverging lanes along Highland Avenue. Highland Avenue runs east/west and the ramps run parallel. The eastbound and westbound travel lanes of Highland Avenue consist of two travel lanes and one merge/diverge lane. All four I-95 NB ramps consist of one lane except for the off-ramp to Highland Avenue eastbound which consists of 2 lanes.

All approaches are unsignalized, except for the off-ramp to Highland Avenue eastbound which is signalized with Highland Avenue. Sidewalks are provided along Highland Avenue and crosswalks are provided across each of the I-95 NB ramps.

18: Highland Avenue at 1st Avenue

Highland Avenue and 1st Avenue form a four-way signalized intersection. Highland Avenue runs east/west and 1st Avenue approaches the intersection from a northbound approach with a commercial driveway approaching from the north. No left turns are permitted from Highland Avenue. The eastbound approach of Highland Avenue consists of two through lanes, a right-turn lane, and a bike lane. The westbound approach of Highland Avenue to the intersection consists of two through lanes and a bike lane. The northbound approach of 1st Avenue consists of a left-turn and a shared left/through/right-turn lane.

All approaches are signalized. Sidewalks are provided on all sides of the intersection and a crosswalk is provided on the northern, southern, and eastern sides of this intersection. The land use around the intersection is commercial.

19: Highland Avenue at 2nd Avenue

Highland Avenue and 2nd Avenue form a four-way signalized intersection with a commercial driveway to the north. Highland Avenue runs east/west and 2nd Avenue approaches the intersection from a northbound approach. The eastbound and westbound approaches of Highland Avenue to the intersection consist of a shared through/left-turn lane and a shared through/right-turn lane. The northbound approach of 2nd Avenue consists of a left-turn lane, shared through/left-turn lane and a right turn lane. The southbound approach consists of a shared through/left-turn lane and a right turn lane.

All approaches are signalized. Sidewalks are provided on all sides of the intersection and a crosswalk is provided on all approaches to the intersection. The land use around the intersection is commercial.

20: Kendrick Street at Hunting Road

Kendrick Street and Hunting Road form a four-way signalized intersection. Kendrick Street runs east/west and Hunting Road runs north/south. The eastbound approach of Kendrick Street to the intersection consists of a shared through/left-turn lane and a shared through/right-turn lane. The westbound approach of Kendrick Street consists of a left-turn lane and a shared through/right-turn lane. The southbound approach of Hunting Road consists of a shared right-turn/through lane and a left-turn lane. The northbound approach of Hunting Road consists of a left-turn/through lane and a channelized right-turn lane.

All approaches are signalized. Sidewalks are provided on all sides of the intersection and a crosswalk is provided on the northern, southern, and western sides of this intersection. The land use around the intersection is residential.

Existing Traffic Volumes

Traffic volumes were collected during the weekday morning and weekday evening peak periods at each of the study area intersections. Due to the current coronavirus (COVID-19) pandemic, traffic volumes may not represent normal travel conditions along Massachusetts roadways. In accordance with MassDOT guidelines, traffic counts collected after March 13, 2020 may not be representative of

typical traffic volumes and 2019 data should be considered as existing traffic volumes.⁵ Based on MassDOT guidance, VHB identified traffic counts conducted prior to the start of the COVID-19 pandemic at most of the study area intersections. At locations where pre-pandemic counts were not available, new traffic counts were conducted in July 2021 and adjusted to represent “pre-pandemic” conditions based on traffic volumes at nearby intersections. The following section documents the initial data collection, the review of adjustment data, and a summary of the 2022 Existing Condition traffic volumes.

Data Collection

Weekday morning and weekday evening turning movement counts for the study area intersections were gathered from several sources, including recently published traffic studies in the area. Based on MassDOT guidance, an emphasis was placed on identifying traffic counts that were conducted prior to the start of the COVID-19 pandemic, between 2014 and 2020. Specifically, data from the following traffic studies were used to develop the existing traffic volumes:

- › Traffic Impact Study, Muzi Motors Redevelopment, GPI, November 2020
- › Draft Environmental Impact Report, The Northland Newton Development, VHB, August 2020
- › Traffic Impact Study, 100-110 West Street, McMahan Associates, April 2020
- › Route 128 Add-a-Lane Post Construction Study. McMahan Associates, November 2019
- › Functional Design Report, Reconstruction of Highland Avenue, Needham Street, and Charles River Bridge, Stantec, August 2017

For locations where pre-pandemic counts were not available, new traffic counts were conducted by VHB in July 2021. All traffic count data is included in the Appendix to this report.

Traffic Volume Adjustment

Based on MassDOT’s guidance on traffic count data, the existing volumes were adjusted, if necessary, for both seasonality and annual growth rates.

The traffic data collected for the study area was obtained during the months of January, February, April, June, July, October, and December. To quantify the seasonal variation of traffic volumes in the area, the MassDOT statewide traffic data 2019 weekday seasonal factors were reviewed based on the roadway classification of the approach to each intersection. For locations where the counts were conducted in months that have traffic volumes slightly lower than average month conditions, each movement was adjusted accordingly to represent average conditions. To provide a conservative analysis, no downward adjustments were made for locations where the counts were conducted in months that have traffic volumes higher than average month conditions. The seasonal adjustment factors are included in the Appendix to this report.

The traffic counts were conducted between 2015 and 2021. As stated previously, MassDOT considers volumes from 2019 to represent “Existing” Conditions. For the counts conducted between 2015 and 2018, the MassDOT Yearly Growth Rates were reviewed based on the roadway classification of the approach to each roadway. Based on those growth rates, the counts conducted between 2015 and

⁵ MassDOT Guidance on Traffic Count Data. Apr 2020.

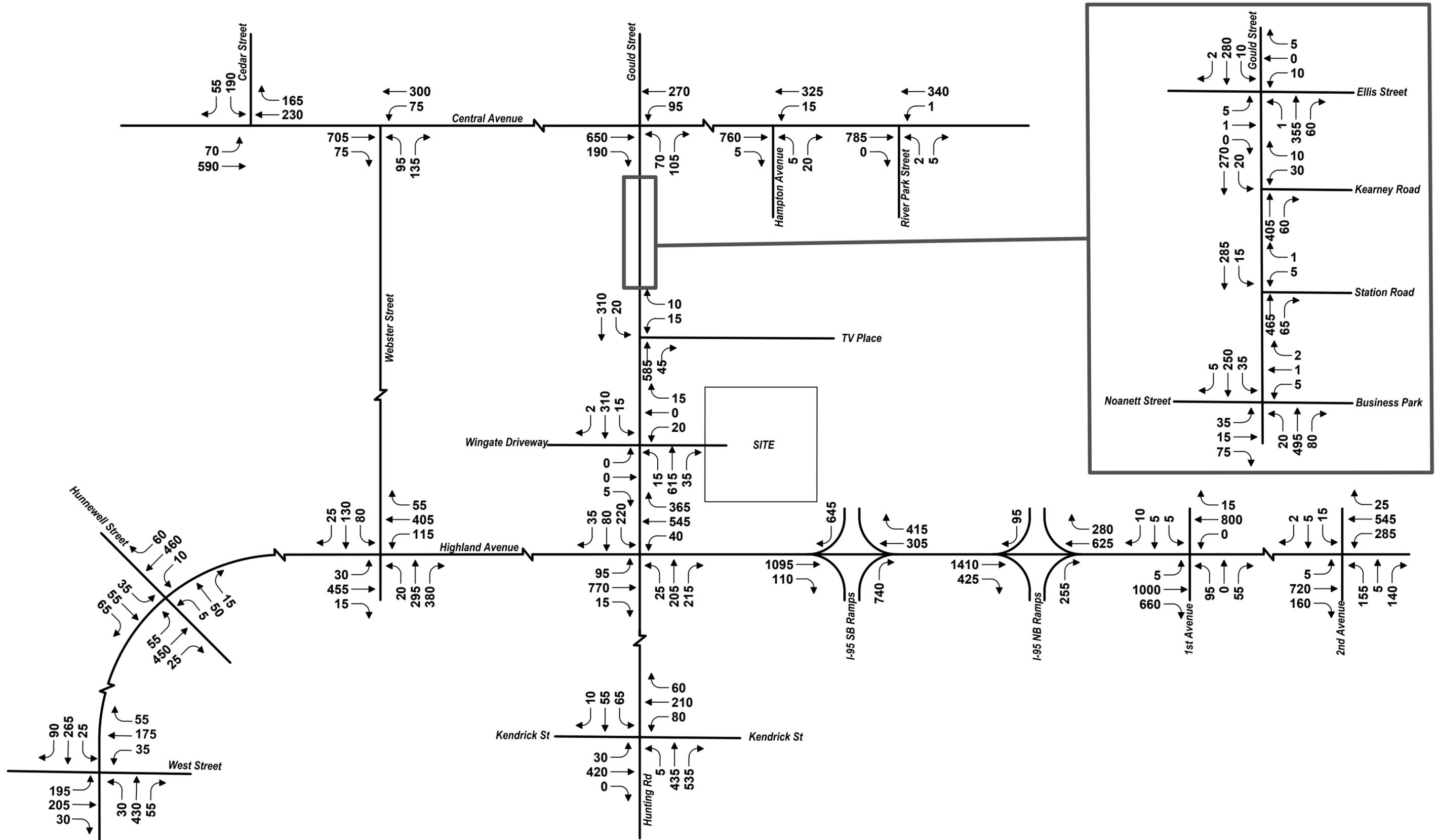
2018 were adjusted accordingly to represent 2019 conditions. The MassDOT yearly growth rate factors are included in the Appendix to this report.

To provide a similar analysis to the Traffic Impact Study completed by GPI in November 2020 to support the rezoning of the Project Site, the volumes used from that study have not been adjusted for seasonal adjustment or annual growth. As stated in the GPI study, the volumes presented in the report have already been adjusted for seasonality. In addition, as stated in that study, a comparison of traffic data between 2015 and 2019 showed that volumes decreased in that period at the intersection of Highland Avenue at Gould Street/ Hunting Road. Therefore, the volumes presented in the GPI study related to the Town of Needham rezoning were not adjusted upward to account for an annual growth rate.

To provide a conservative analysis, traffic volumes were balanced between adjacent intersections where no cross streets intersect the traffic stream. To be consistent with MassDOT's guidance that 2019 volumes represent Existing Conditions, the traffic volumes conducted in 2021 were balanced with adjacent intersections where traffic counts were conducted prior to the start of the COVID-19 pandemic.

2022 Existing Conditions Traffic Volumes

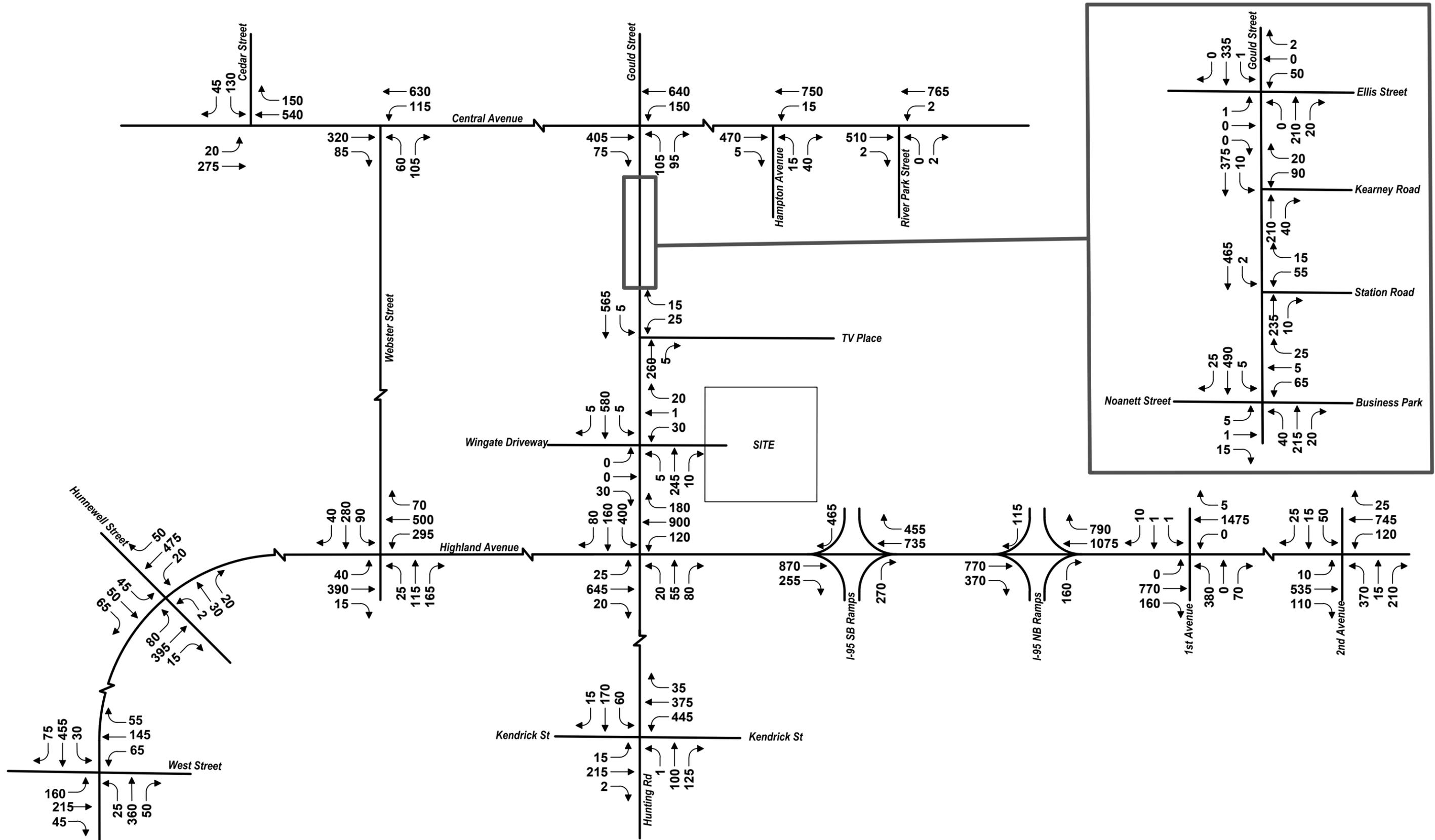
The 2022 Existing Conditions were developed by applying the adjustment factors described above to the counts conducted between 2015 and 2021. Based on MassDOT guidance, the 2022 Existing Conditions represent a pre-pandemic condition and do not take into account any shift in travel patterns caused by the pandemic. The resulting 2022 Existing Conditions weekday morning and weekday evening peak hour traffic volumes are shown in Figures 4, and 5, respectively.



Not to Scale



Existing Conditions Vehicle Volumes
 Weekday Morning Peak Hour
 Highland Science Center
 Needham, Massachusetts **Figure 4**



Not to Scale



Existing Conditions Vehicle Volumes
 Weekday Evening Peak Hour
 Highland Science Center
 Needham, Massachusetts

Figure 5

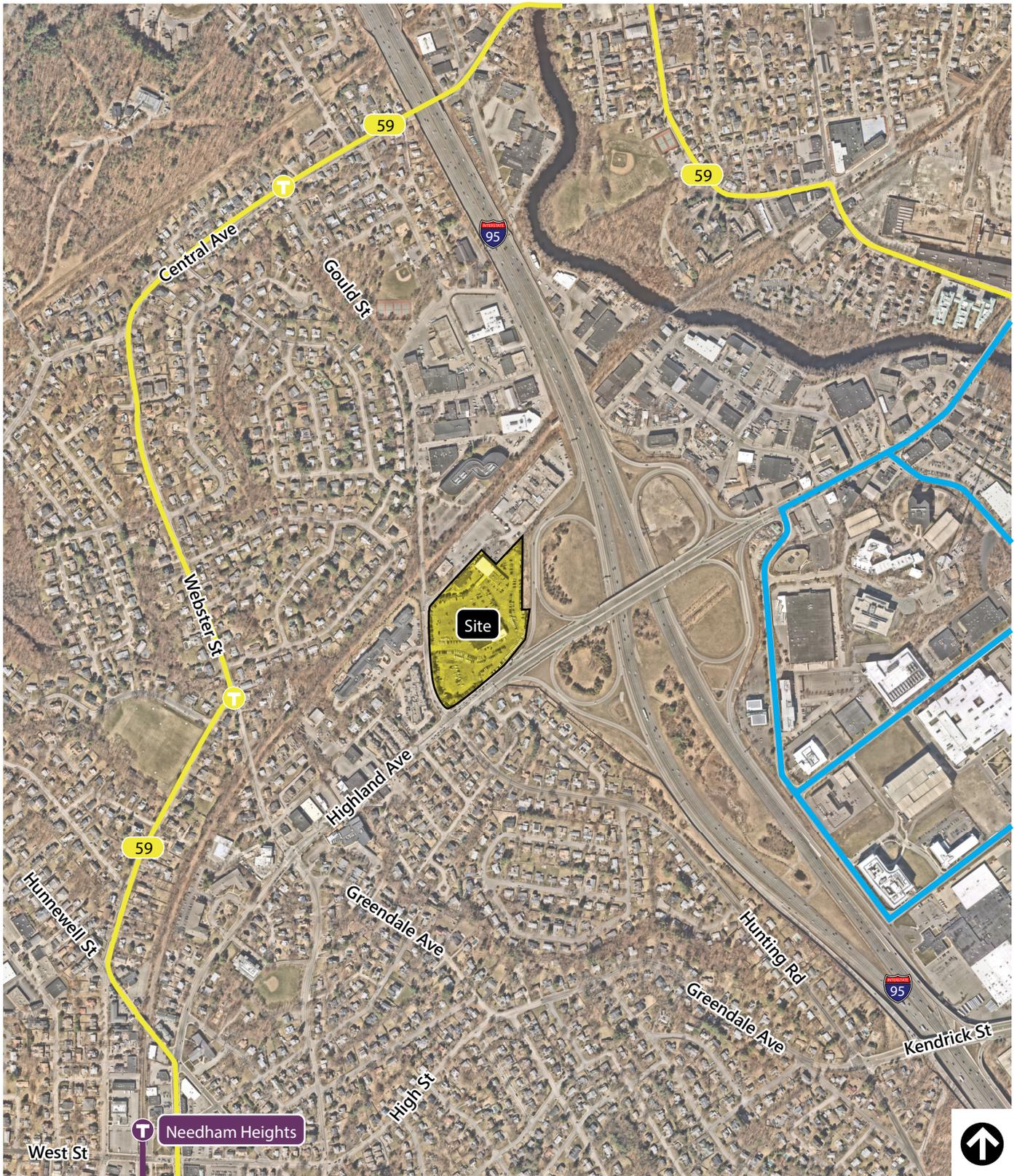
Public Transportation

Public transportation in Needham is provided by the Massachusetts Bay Transportation Authority (MBTA). The proposed development is indirectly served by one MBTA bus route: Bus Route #59. Additional service within close proximity of the Project Site includes the D Branch of the Green Line and the Needham Line of the commuter rail. Figure 6 displays the existing public transportation services provided in the study area. Descriptions of each transit service is provided below, and detailed maps and schedules can be found in the Appendix to this report. The descriptions and analyses of transit services in the area are based on pre-COVID-19 conditions and do not include any temporary changes in service due to COVID-19.

- › Bus Route 59 travels between Watertown Square in Watertown and Needham Junction in Needham via Newton. The nearest stops to the Project Site are at the intersections of Hillside Avenue and Webster Street and Central Avenue at Gould Street, both approximately a half mile from the Project Site. Bus Route 59 runs seven days a week and during peak periods has a frequency of approximately 30-40 minutes. Bus Route 59 provides connections to the D Branch of the Green Line at Newton Highlands, to the Needham Line of the commuter rail at Needham Highlands, Needham Center, and Needham Junction, and to the Worcester Line of the MBTA Commuter Rail at Newtonville.
- › The D branch of the Green Line connects Newton with Brookline and Boston and travels from Riverside in Newton to Government Center in Downtown Boston. The nearest stop to the Project Site on the D branch of the Green Line is Eliot, approximately two miles northeast of the Project Site on Route 9. Service is provided seven days a week and runs approximately every eight minutes during peak hours.
- › The Needham Line of the MBTA Commuter Rail travels between Needham Heights and Back Bay Station and South Station in Boston. The nearest stop to the Project Site is Needham Heights, approximately 0.7 miles southwest of the Project Site on Highland Avenue. Service is provided six days a week, Monday through Saturday; during peak periods, service is provided every 30-50 minutes in peak directions.

Private Shuttle Service

In addition to the MBTA, a private shuttle service is provided in the area by the 128 Business Council. The 128 Business Council operates the Needham Shuttle between the Newton Highlands MBTA Station on the Green Line and different companies in and around the Needham Crossing area that are Council members. The Needham Shuttle runs Monday through Friday and makes seven trips during the weekday morning and weekday evening peak periods. Service is provided approximately every hour between 6:30 AM and 9:22 AM and between 3:15 PM and 6:25 PM. Fares are free for employees who work at member companies and are \$4 per ride for non-members. The current nearest stop to the Project Site is at 200 A Street, approximately 3,000 feet east of the Project Site.



Source: NearMap / MBTA 2021 Sytem Map

-  Local Bus Stop near Site
-  Local Bus Route
-  128 Business Council Needham Private Shuttle Bus Route
-  Commuter Rail



Figure 6
Public & Private Transportation

**Highland Science Center
Needham, Massachusetts**

Active Transportation Infrastructure

Pedestrian Environment

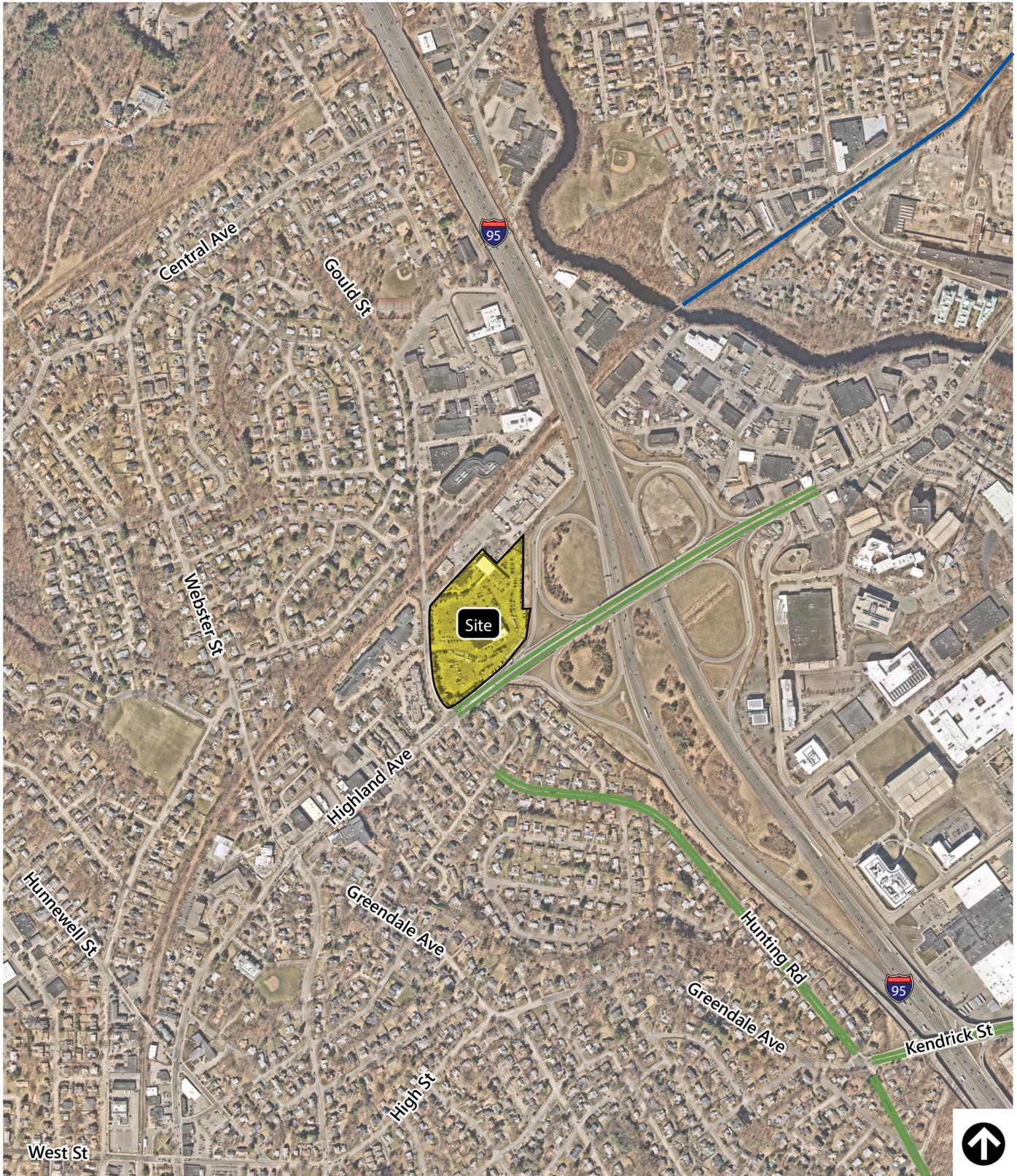
Varying levels of pedestrian accommodations are provided throughout the study area and are representative of the level of pedestrian accommodations throughout Needham. Sidewalks are provided on both sides of all major roadways in the study area, except along the east side of Gould Street between Highland Avenue and Beech Street where the sidewalk terminates in front of the Project Site. Crosswalks are provided at all signalized intersections. At the study area, signalized intersections with pedestrian accommodations provide pedestrian signals for all crosswalks. Crosswalk ramps are provided for most crosswalk approaches, and tactical warning strips are provided on some, but not all, crosswalk ramps.

Significant enhancements to the pedestrian network within the study area are proposed independent of the Project in the next several years.

Bicycle Amenities

Existing dedicated bicycle facilities in the study area are limited. On-street bicycle lanes are provided on both sides of Highland Avenue between Wexford Street and Gould Street/ Hunting Road, on Hunting Road south of Highland Avenue, and on a section of Kendrick Street between Hunting Road and 3rd Avenue. No dedicated on-road bicycle facilities are provided on any of the other study area roadways.

A graphic illustrating the existing pedestrian and bicycle network in the vicinity of the Project Site is provided in Figure 7.



Source: NearMap

-  Bike Lane
-  Trail



Figure 7
Existing Bicycle Facilities

**Highland Science Center
Needham, Massachusetts**

Crash History

A detailed crash analysis was conducted to identify potential vehicle accident trends and/or roadway deficiencies in the traffic study area. The most current vehicle accident data for the traffic study area intersections were obtained from MassDOT for the years 2015 to 2019. The MassDOT database comprises crash data from the Massachusetts Registry of Motor Vehicles (RMV) Division primarily for use in traffic studies and safety evaluations. Data files are provided for an entire city or town for an entire year, though it is possible that some crash records may be omitted either due to individual crashes not being reported, or the municipality's crash records not being provided in a compatible format for RMV use. A summary of the vehicle accident history for the study intersections based on the available RMV data is presented in Table 2 and the detailed crash data is provided in the Appendix to this report for reference.

Crash rates are calculated based on the number of accidents at an intersection and the volume of traffic traveling through that intersection on a daily basis. Rates that exceed MassDOT's average for accidents at intersections in the MassDOT district in which the town or city is located could indicate safety or geometric issues for a particular intersection. For the study area, the calculated crash rates were compared to MassDOT's District 6 average, as Needham is located in District 6. In District 6, the average crash rate is 0.71 for signalized intersections and 0.52 for unsignalized intersections. These rates imply that, on average, 0.71 accidents occurred per million vehicles entering signalized intersections throughout District 6 and 0.52 accidents occurred per million vehicles entering unsignalized intersections in District 6. The locations of some accidents cannot be precisely determined from the database. These locations typically involve interchange intersections. Additionally, some accidents may have occurred but were either not reported or not included in the database, and therefore not considered.

Table 2 Vehicular Crash Summary (2015-2019)

Year	1. Central Ave at Cedar St	2. Central Ave at Webster St	3. Central Ave at Gould St	4. Central Ave at Hampton Ave	5. Central Ave at River Park	6. Gould St at Ellis St	7. Gould St at Kearney Rd
2015	1	1	3	0	2	0	0
2016	0	0	0	0	1	1	0
2017	2	0	6	0	0	0	0
2018	1	0	3	0	0	1	0
2019	0	0	2	1	0	0	0
Total	4	1	14	1	3	2	0
Average	0.80	0.20	2.80	0.20	0.60	0.40	0.00
Collision Type							
Angle	0	1	12	0	0	2	0
Front to Front	0	0	0	0	0	0	0
Head-on	0	0	0	0	0	0	0
Rear-end	2	0	2	1	2	0	0
Rear-to-Rear	0	0	0	0	0	0	0
Sideswipe, opp. direction	0	0	0	0	0	0	0
Sideswipe, same dir.	0	0	0	0	0	0	0
Single vehicle crash	2	0	0	0	1	0	0
<u>Unknown/Not reported</u>	0	0	0	0	0	0	0
Total	4	1	14	1	3	2	0
Crash Severity							
Fatal injury	0	0	0	0	0	0	0
Non-fatal injury	0	0	2	1	0	0	0
Property damage only	4	1	11	0	3	2	0
<u>Unknown/Not Reported</u>	0	0	1	0	0	0	0
Total	4	1	14	1	3	2	0
Time of Day							
Weekday, 7 AM - 9 AM	0	0	1	0	0	0	0
Weekday, 4 PM - 6 PM	0	0	5	0	0	0	0
Saturday, 11 AM - 2 PM	0	0	1	0	0	1	0
Weekday, other time	3	1	6	1	3	1	0
<u>Weekend, other time</u>	1	0	1	0	0	0	0
Total	4	1	14	1	3	2	0
Pavement Conditions							
Dry	4	1	11	0	1	1	0
Wet	0	0	1	0	1	0	0
Snow	0	0	1	0	1	1	0
Slush	0	0	0	0	0	0	0
Ice	0	0	0	0	0	0	0
Not reported	0	0	1	1	0	0	0
Other	0	0	0	0	0	0	0
<u>Unknown</u>	0	0	0	0	0	0	0
Total	4	1	14	1	3	2	0
Non Motorist (Bike, Ped)	0	0	0	0	0	0	0
MassDOT Crash Rates	0.22	0.04	0.46	0.04	0.11	0.26	0.00

Table 2 Vehicular Crash Summary (2015-2019) (cont.)

Year	8. Gould St at Station Rd	9. Gould St at Noanett Rd	10. Gould St at TV Place	11. Gould St at Muzi Ford/Wingate Driveway	12. Highland Ave at West St	13. Highland Ave at Hunnewell St	14. Highland Ave at Webster St
2015	0	0	0	0	6	1	2
2016	0	0	0	0	3	1	3
2017	0	0	0	0	5	1	0
2018	0	0	0	2	3	3	2
2019	0	0	0	0	5	2	2
Total	0	0	0	2	22	8	9
Average	0.00	0.00	0.00	0.40	4.40	1.60	1.80
Collision Type							
Angle	0	0	0	0	8	5	1
Front to Front	0	0	0	0	0	0	0
Head-on	0	0	0	1	1	0	0
Rear-end	0	0	0	1	4	2	6
Rear-to-Rear	0	0	0	0	0	0	0
Sideswipe, opp. direction	0	0	0	0	0	0	0
Sideswipe, same dir.	0	0	0	0	6	0	0
Single vehicle crash	0	0	0	0	3	1	2
<u>Unknown/Not reported</u>	0	0	0	0	0	0	0
Total	0	0	0	2	22	8	9
Crash Severity							
Fatal injury	0	0	0	0	0	0	0
Non-fatal injury	0	0	0	1	2	0	3
Property damage only	0	0	0	0	19	8	6
<u>Unknown/Not Reported</u>	0	0	0	1	1	0	0
Total	0	0	0	2	22	8	9
Time of Day							
Weekday, 7 AM - 9 AM	0	0	0	1	2	1	0
Weekday, 4 PM - 6 PM	0	0	0	0	3	2	0
Saturday, 11 AM - 2 PM	0	0	0	1	0	1	0
Weekday, other time	0	0	0	0	13	2	5
<u>Weekend, other time</u>	0	0	0	0	4	2	4
Total	0	0	0	2	22	8	9
Pavement Conditions							
Dry	0	0	0	2	18	7	4
Wet	0	0	0	0	3	1	4
Snow	0	0	0	0	0	0	0
Slush	0	0	0	0	0	0	0
Ice	0	0	0	0	0	0	0
Not reported	0	0	0	0	1	0	0
Other	0	0	0	0	0	0	0
<u>Unknown</u>	0	0	0	0	0	0	1
Total	0	0	0	2	22	8	9
Non Motorist (Bike, Ped)	0	0	0	0	3	0	1
MassDOT Crash Rates	0.00	0.00	0.00	0.11	0.86	0.35	0.29

Table 2 Vehicular Crash Summary (2015-2019) (cont.)

Year	15.Highland Ave at Gould St/ Hunting Rd	16. Highland Ave at I-95 SB Ramps	17. Highland Ave at I-95 NB Ramps	18.Highland Ave at 1st Ave	19. Highland Ave at 2nd Ave	20. Hunting Rd at Kendrick St
2015	5	0	8	1	4	5
2016	6	1	2	8	7	3
2017	4	3	2	4	4	3
2018	4	0	1	3	9	4
2019	5	2	0	8	9	5
Total	24	6	13	24	33	20
Average	4.80	1.20	2.60	4.80	6.60	4.00
Collision Type						
Angle	6	0	0	6	9	9
Front to Front	0	0	0	0	0	0
Head-on	0	0	0	0	2	0
Rear-end	6	5	12	7	6	4
Rear-to-Rear	0	0	0	0	1	0
Sideswipe, opp. direction	0	0	0	0	2	0
Sideswipe, same dir.	8	0	0	9	7	2
Single vehicle crash	2	1	1	1	5	4
<u>Unknown/Not reported</u>	2	0	0	1	1	1
Total	24	6	13	24	33	20
Crash Severity						
Fatal injury	0	0	0	0	0	0
Non-fatal injury	4	1	4	4	2	5
Property damage only	18	5	9	20	31	14
<u>Unknown/Not Reported</u>	2	0	0	0	0	1
Total	24	6	13	24	33	20
Time of Day						
Weekday, 7 AM - 9 AM	3	4	3	8	5	2
Weekday, 4 PM - 6 PM	4	0	1	1	2	1
Saturday, 11 AM - 2 PM	1	0	1	0	1	0
Weekday, other time	12	1	5	13	22	12
<u>Weekend, other time</u>	4	1	3	2	3	5
Total	24	6	13	24	33	20
Pavement Conditions						
Dry	17	5	13	20	24	14
Wet	6	0	0	2	7	3
Snow	0	0	0	0	0	0
Slush	0	0	0	0	0	1
Ice	0	0	0	0	0	1
Not reported	0	1	0	2	0	1
Other	1	0	0	0	1	0
<u>Unknown</u>	0	0	0	0	1	0
Total	24	6	13	24	33	20
Non Motorist (Bike, Ped)	0	0	0	0	2	2
MassDOT Crash Rates	0.44	0.10	0.20	0.41	0.64	0.63

As shown in Table 2, the accident data indicates that the intersection of Highland Avenue at West Street is the only study area intersection above the district crash rate averages.

The majority of crashes throughout the study area were angle crashes and rear-end crashes occurring on dry pavement resulting in property damage only. Based on the MassDOT records, there were no fatal accidents that occurred within the study area during the five-year period studied. The intersection that saw the highest number of crashes involving pedestrians or bicycles was the intersection of Highland Avenue at West Street, which saw three crashes involving pedestrians or bicyclists over the five-year period.

Several of the study area intersections have been reconstructed in recent years or are expected to be reconstructed in future years as part of the MassDOT roadway reconstruction project. These improvements are not reflected in the crash data presented in Table 2 and will address some of the existing safety concerns. The intersections of Highland Avenue at the I-95 Northbound and Southbound Ramps were reconstructed in 2017 and the intersection of Highland Avenue at 1st Avenue was reconstructed in 2018. In addition, several other study area intersections on Highland Avenue are expected to be reconstructed within the next few years. However, all the crash data presented above is from 2015-2019 and does not fully reflect these recent or future improvements.

Highway Safety Improvement Program

In addition to calculating the crash rate, study area intersections also were reviewed in the MassDOT's Highway Safety Improvement Program (HSIP) database. An HSIP-eligible cluster is one in which the total number of "equivalent property damage only"⁶ crashes in the area is within the top 5 percent of all clusters in that region. Being HSIP-eligible makes the location eligible for FHWA and MassDOT funds to address the identified safety issues at these locations.

None of the study area intersections are potential HSIP-eligible clusters based on the most recently available data at the time of the HSIP review.

⁶ Equivalent property damage only" is a method of combining the number of crashes with the severity of the crashes based on a weighted scale. Crashes involving property damage only are reported at a minimal level of importance, while collisions involving personal injury (or fatalities) are weighted more heavily.



Future Conditions

Traffic volumes in the study area were projected to the year 2029, reflecting a typical seven-year traffic-planning horizon as required by MassDOT. Independent of the Project, volumes on the roadway network under year 2029 No Build Condition were assumed to include existing traffic and new traffic resulting from background traffic. Anticipated Site-generated traffic volumes were added to the 2029 No Build Condition traffic volumes to reflect the 2029 Build Condition in the study area.

2029 No Build Condition

Traffic volumes in the study area were projected to a seven-year traffic-planning horizon. Independent of the Project, volumes on the roadway network under the future 2029 No Build condition were assumed to include existing traffic and new traffic resulting from background traffic growth. Under the Build condition, Project generated traffic volumes were added to the No-Build volumes to reflect the Build conditions within the Project study area.

Background Traffic Growth

Traffic growth on area roadways is a function of the expected land development, economic activity, and changes in demographics. Several methods can be used to estimate this growth. A procedure frequently employed is to estimate an annual percentage increase and apply that increase to study area traffic volumes. An alternative procedure is to identify estimated traffic generated by planned new major developments that would be expected to impact the Project study area roadways. For the purpose of this assessment, both methods were considered.

Historic Traffic Growth

Historic traffic data and previously submitted traffic studies in the vicinity of the Project Site were reviewed to determine an appropriate growth rate. Based on this research and correspondence with the Town of Needham, a growth rate of 1.0 percent was determined to be appropriate for this study. This growth rate is consistent with the Traffic Impact Study prepared by GPI to support the rezoning of the Project Site, which was submitted in November 2020, and overlaps with a majority of the study area.

Project-Specific Growth

In addition to accounting for background growth, the traffic associated with other planned and/or approved developments near the Project Site was also considered. Based on research by VHB and discussions with the Town of Needham, it was determined that there are several planned development projects within the vicinity of the study area that would need to be considered as part of the future traffic conditions, independent of the Project. The planned/approved projects are described below in detail and the traffic volumes associated with them have been included in the No-Build and Build conditions. The associated traffic volumes are included in the Appendix to this report.

- › **100 West Street** – This project involves the conversion of a former mill building into 83 assisted living units and 72 independent senior living units. Projected traffic volumes expected to be generated by this project were obtained from the published traffic study submitted as part of the permitting process for the project.
- › **Newton Northland Development** – This project involves the redevelopment of 22.6 acres of land on the corner of Needham Street and Oak Street in Newton, Massachusetts. The project will include approximately 1.4 million SF of development including 193,200 SF of office space, 115,100 SF of retail/commercial space, and 800 residential units. Projected traffic volumes expected to be generated by this project were obtained from the published traffic study submitted as part of the permitting process for the project.
- › **Boston Children’s Hospital at Founders Park** – This project involves the full build-out of the Founders Park development by Boston Children’s Hospital. The project will include an approximately 224,000 SF pediatric ambulatory center and 228,000 SF of office space for the hospital. Projected traffic volumes expected to be generated by this project were obtained from the published traffic study submitted as part of the permitting process for the project.
- › **589 Highland Avenue** – This project involves the conversion of 142-bed nursing home into 50 independent living units at the existing Wingate at Needham development. Based on a review of estimated trip generation for the existing and proposed uses, the project is expected to result in a net decrease in trips. Therefore, this project is mentioned for reference purposes only and no trips were added or removed from the roadway network to provide a conservative analysis.

Roadway Improvements

In assessing future traffic conditions, proposed and recently completed roadway improvements within the study area were considered. Based on research by VHB and discussions with the Town of Needham and MassDOT, there is one project that may affect traffic volumes within the seven-year horizon and was incorporated into the No-Build and Build condition traffic analyses. The proposed roadway improvement project is described in detail below:

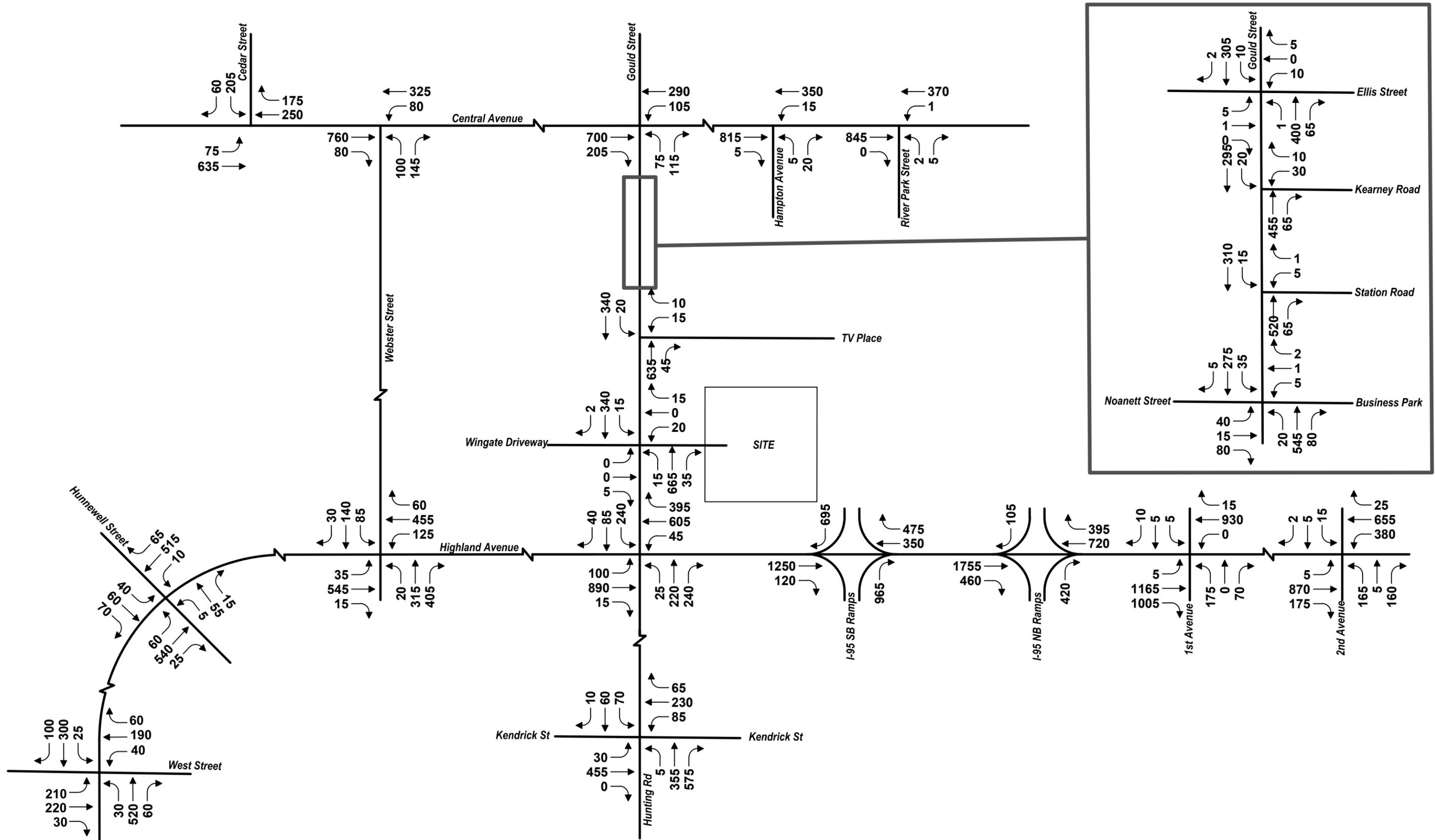
- › **Needham-Newton Corridor Project** – This project involves the redesign of Highland Avenue, Needham Street, and Winchester Street in Needham and Newton (MassDOT Project No. 606635). The project involves reconstruction of portions of these three roadways to improve traffic operations, safety, and multimodal accommodations and includes three different segments: Highland Avenue from Webster Street to the I-95 Southbound ramps, Highland Avenue from Wexford Street to Needham Street just west of Oak Street (including the bridge over the Charles

River), and Needham Street from just east of Oak Street to Winchester Street at the Route 9 Eastbound ramps. The project will involve the following improvements:

- New traffic signals at the intersections of Needham Street at Charlemont Street, Winchester Street at Route 9 EB Service Road, and Winchester Street at Route 9 WB Service Road;
- Updated signal timings throughout the corridor to include leading pedestrian intervals and adaptive signal timing technology;
- Raised bike lanes / multiuse off-road paths throughout the corridor;
- Reconstructed sidewalks;
- Seven additional crosswalks: four at signalized intersections and three unsignalized with Rectangular Rapid Flashing Beacons along Needham Street south of Industrial Place, north of Jaconnet Street, and south of Easy Street;
- Additional left-turn lanes along Highland Avenue at unsignalized intersections east of I-95/Route 128; and
- Construction of cantilevered shared use paths on both sides of the bridge over the Charles River to allow for two northbound travel lanes and one southbound travel lane on the bridge.

No-Build Traffic Volumes

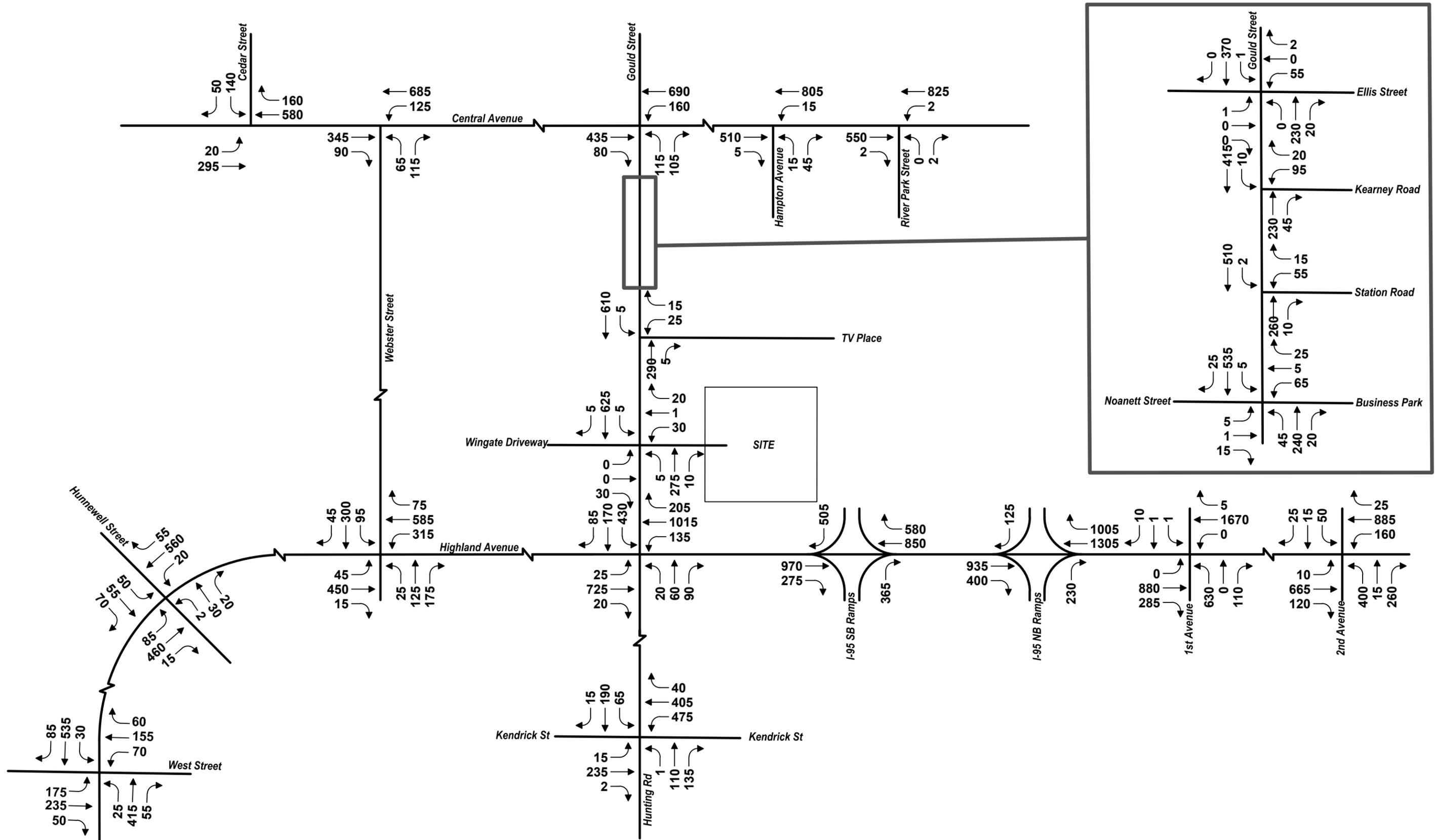
The 2029 No-Build traffic volumes were developed using a growth rate of 1.0 percent per year and adding in the background projects and roadway improvement projects described above. The resulting 2029 No-Build weekday morning and weekday evening peak hour traffic volume networks are illustrated in Figures 8 and 9, respectively.



Not to Scale



No-Build Conditions Vehicle Volumes
 Weekday Morning Peak Hour
 Highland Science Center
 Needham, Massachusetts **Figure 8**



Not to Scale



No-Build Conditions Vehicle Volumes
 Weekday Evening Peak Hour
 Highland Science Center
 Needham, Massachusetts **Figure 9**

2029 Build Condition

The rate at which any proposed development generates traffic is dependent upon the size, location, and concentration of surrounding developments. As described previously, the Project comprises office, research & development, and retail uses. The ITE *Trip Generation Manual*⁷ categorizes these land uses and provides weekday daily, weekday morning, and weekday evening peak hour unadjusted vehicle trip generation estimates for each use. The trip generation estimates for the proposed uses were projected using the following Land Use Codes:

- › LUC 710 – General Office Building
- › LUC 760 – Research and Development Center
- › LUC 822 – Retail Plaza (<40,000 SF)

Project Trip Generation

Estimating future conditions volumes for the Project Site involved a review of the existing development on those parcels, along with the additional trip generation expected from the Project. Adjustments for the site-generated traffic were made based on internal capture rates and pass-by trips.

Existing Site-Generated Traffic

The Site currently is occupied by a former car dealership and car wash. Prior to the closure of these businesses in the Fall of 2021, counts of the Project Site were conducted by VHB in July 2021.

Table 3 summarizes the traffic counts for the existing uses on-Site. The count sheets are included in the Appendix to this report.

Table 3 Existing Site-Generated Trips

Existing Site Trips ^a	
Weekday Daily	
Enter	410
<u>Exit</u>	<u>477</u>
Total	887
Weekday Morning	
Enter	37
<u>Exit</u>	<u>24</u>
Total	61
Weekday Evening	
Enter	29
<u>Exit</u>	<u>57</u>
Total	86

^a Based on actual counts by VHB in July 2021.

⁷ Trip Generation Manual, 11th Edition, Institute of Transportation Engineers, Washington, D.C., 2021.

As shown in Table 3, the existing Site with a car dealership and car wash generated approximately 887 vehicle trips (410 entering/ 477 exiting) over the course of a typical weekday in July 2021, with approximately 61 vehicle trips (37 entering/ 24 exiting) during the weekday morning peak hour and 86 vehicle trips (29 entering/ 57 exiting) during the weekday evening peak hour.

As stated previously, the former uses also likely generated similar, or higher, volumes on weekends. Specifically, car washes are generally busier on weekends than on weekdays because people are more likely to get their vehicles washed on weekends. However, because the Project will consist of mostly office and lab space, the Project Site in the future will generate most trips during the weekday peak periods. Therefore, this study focuses on the roadway impacts of the Project Site-generated trips during an average weekday during traditional morning and evening peak commuter periods.

In addition, trips generated by the car wash were likely to vary by season based on demand, with volumes typically highest in the Winter and lowest in the Summer. Because the existing traffic counts were conducted in July, the Project Site-generated volumes presented in Table 2-3 may represent below-average conditions for the former uses.

The former Wash World typically handled up to 18,000 car washes per month, based on review of sales data and conversation with the former operator. This level of activity translates to about 600 washes/day during peak months (which tend to be during the winter). However, to provide a conservative analysis of the impacts of the Project, and in particular to conservatively assess appropriate infrastructure improvements that will be needed along both Gould Street and Highland Avenue, the existing site-generated trips counted in July 2021 were not adjusted to account for the seasonality of trips generated by the former car wash.

Unadjusted Project-Generated Traffic

The proposed development will consist of a mixture of office, lab, and supporting retail uses. Specifically, the Project is proposed to include approximately 248,347 SF of office space, approximately 248,347 SF of lab space, and approximately 10,000 SF of supporting retail uses.

In March 2022, an Environmental Notification Form (ENF) was submitted for the Project based on a building program of up to 260,500 SF of office space, 260,500 SF of lab space, and 10,000 SF of supporting retail uses. The ENF included a transportation impact and access study based on those proposed square footages. To be consistent with the trip generation and the intersection capacity analyses presented in the ENF, the Project-generated trips presented in this report are also based on the larger building program. This provides a conservative analysis of the trip generation impact of the Project and presents a "worst-case" scenario of the Project's impacts on the roadway network.

Traffic associated with the office space was estimated using ITE LUC 710, traffic associated with the lab space was estimated using ITE LUC 760, and traffic associated with the retail uses was estimated with ITE LUC 822. The retail uses are expected to be smaller businesses catering to the employees on-site and nearby residential neighbors. Potential uses will include small eating establishments, coffee shops, or convenience store uses. While these do not fit the exact description of a traditional ITE "Strip Retail Plaza," retail traffic was estimated using this land use code, which results in an overly conservative (likely high) estimate of traffic associated with this specific use.

The unadjusted vehicle trip estimates are presented in Table 4, and trip generation worksheets are included in the Appendix to this report.

Table 4 Project Trip Generation – ITE Unadjusted Vehicle Trips

	Office ^a	R&D ^b	Retail ^c	Total Unadjusted Vehicle Trips
Weekday Daily				
Enter	1,335	1,387	326	3,048
Exit	<u>1,335</u>	<u>1,387</u>	<u>326</u>	<u>3,048</u>
Total	2,669	2,775	652	6,096
Weekday Morning				
Enter	336	210	17	563
Exit	<u>46</u>	<u>46</u>	<u>12</u>	<u>104</u>
Total	381	256	29	667
Weekday Evening				
Enter	62	39	39	140
Exit	<u>305</u>	<u>205</u>	<u>39</u>	<u>549</u>
Total	368	244	78	689

- a Based on ITE LUC 710 (General Office Building) for 260,500 SF, providing a conservative estimate for the currently proposed 248,347 SF of office space.
- b Based on ITE LUC 760 (Research and Development Center) for 260,500 SF, providing a conservative estimate for the currently proposed 248,347 SF of lab space.
- c Based on ITE LUC 822 (Strip Retail Plaza (<40,000 sf)) for 10,000 SF.

Internal Capture Trips

Because the proposed development is a mixed-use project, the trip generation characteristics of the Project Site will be different from a single-use project. Some of the traffic to be generated by the proposed development will be contained on the Project Site as “internal” or “shared vehicle” trips. For example, workers at the office space on site may patronize the retail uses during lunch or after work. While these shared trips represent new traffic to the individual uses, they would not show up as new vehicle trips on the surrounding roadway network.

As described in the ITE Trip Generation Handbook:

because of the complementary nature of these land uses, some trips are made among the on-site uses. This capture of trips internal to the Site has the net effect of reducing vehicle trip generation between the overall development Site and the external street system (compared to the total number of trips generated by comparable land uses developed individually on stand-alone sites) an internal capture rate can generally be defined as the percentage of total person trips generated by a site that are made entirely within the site. The trip origin, destination, and travel path are all within the site.

Based on the methodology outlined in the ITE Trip Generation Handbook, internal capture rates were applied to the gross person trips. The internal capture rate calculations are included in the Appendix to this report.

Mode Share

It is expected that visitors and commuters to the Project Site will use a variety of transportation options, including private vehicles, walking, bicycling, and public transportation. The Project is connected to the rest of Needham with sidewalks, and the roadway improvements along Highland

Avenue will include separated bicycle facilities providing a connection between the Project Site and Newton. While public transit is provided within Needham, the nearest public transit to the Project Site is located approximately 0.5 miles north, with MBTA bus route 59 traveling on Central Avenue.

To provide a conservative analysis and to account for the lack of public transit immediately serving the Project Site, no mode share credits are applied to the trip generation estimates and the Project-generated trips assume that 100-percent of the Project Site traffic will access the Project Site via private vehicles.

Pass-By Trips

While the ITE rates provide estimates for all the traffic associated with each land use, not all of the traffic generated by the Project will be new to the area roadways. A portion of the vehicle-trips generated by the retail land use will likely be drawn from the traffic volume roadways adjacent to the Project Site. For example, someone traveling on Gould Street may choose to deviate from their original travel path to visit the Project Site retail, before heading back to continue to their final destination. For this evaluation, ITE pass-by rates for LUC 821 (Shopping Plaza) were utilized for the retail trip generation and applied to existing trips on Gould Street. Specifically, 40 percent of the Project Site trip generation was assumed to be drawn from the surrounding roadway network during the weekday evening peak hour, as outlined in the ITE Trip Generation Manual. All other time periods studied assume a 25 percent pass-by rate.

Project-Generated Trips

As described above, internal capture credit and pass-by credit for the Project was applied to the unadjusted new vehicle trips presented in Table 4 to develop the net trips expected to be generated by the Project Site. Table 5 presents the Project-generated net new trips.

Table 5 Project-Generated Trips

	<u>Adjusted Vehicle Trips^a</u>				Pass-By ^b	Existing Site Trips ^c	Total Net New Vehicle Trips
	Office	R&D	Retail	Total			
Weekday Daily							
Enter	1,330	1,382	313	3,025	(-79)	(-410)	2,536
Exit	<u>1,328</u>	<u>1,381</u>	<u>316</u>	<u>3,025</u>	<u>(-79)</u>	<u>(-477)</u>	<u>2,469</u>
Total	2,658	2,763	629	6,050	(-158)	(-887)	5,005
Weekday Morning							
Enter	334	209	11	554	(-2)	(-37)	515
Exit	<u>42</u>	<u>44</u>	<u>9</u>	<u>94</u>	<u>(-2)</u>	<u>(-24)</u>	<u>68</u>
Total	376	253	20	649	(-4)	(-61)	584
Weekday Evening							
Enter	62	39	36	136	(-15)	(-29)	92
Exit	<u>303</u>	<u>204</u>	<u>38</u>	<u>545</u>	<u>(-15)</u>	<u>(-57)</u>	<u>473</u>
Total	365	242	74	681	(-30)	(-86)	565

a Includes adjustments for internal capture between retail and office/lab uses.

b Pass-by includes trips for the retail uses already traveling on the roadway network under Existing Conditions.

c Existing Site-Generated trips based on empirical counts conducted by VHB in July 2021.

As shown in Table 5, the Project is expected to generate a total of 6,050 daily trips during an average weekday and 649 and 681 new vehicle trips during the respective weekday morning and weekday evening peak hours. However, these totals include traffic already being generated by the Project Site under existing conditions as well as pass-by trips currently on the roadway network. After considering this existing traffic generation and pass-by, the Project will result in an additional 5,005 vehicle trips (2,536 entering/ 2,469 exiting) over the course of a typical weekday, with approximately 584 vehicle trips (515 entering/68 exiting) during the weekday morning peak hour and 565 vehicle trips (92 entering/473 exiting) during the weekday evening peak hour.

Rideshare Trip Generation

In the past decade, a rapidly increasing mode of transportation has been the use of transportation network companies (TNCs), such as Uber and Lyft. That said, it is difficult from a trip generation perspective to estimate the total number of TNC users on any given day. Many riders use TNCs for shopping or entertainment purposes and alternate TNC trips with transit and private vehicle trips. In addition, because the popularity of TNCs is a relatively new phenomenon, ITE does not provide any hard data on the effects of TNCs on trip generation.

It is expected that during the peak hours analyzed, the primary reason for travel to and from the Project Site will be for commuting between people's homes and workplaces. It is likely that a higher percentage of TNC trips will be made during off-peak hours when people are more likely to be traveling for non-work activities. In addition, in the build year 2029 it is unknown what share of trips will be done via TNCs. Seven years prior to 2022 TNCs were just starting to have a notable presence in the Boston area and today they are a regular feature on all area roadways. As such, it would be challenging to forecast the share of TNC trips seven years into the future due to changing travel patterns and technology. Therefore, a separate TNC mode share percentage has not been developed and it is included in the vehicle mode shares presented in the previous sections.

Comparison to Previous Zoning Traffic Study

As noted previously, GPI prepared a Traffic Impact Study in November 2020 to support the rezoning of the Project Site. In that study, a trip generation analysis was conducted estimating the number of new trips that could be generated by the Muzi site and the adjacent Channel 5 site. A comparison of the trip generation presented in the 2020 traffic study with the currently proposed trip generation is provided below in Table 6.

Table 6 Trip Generation Comparison for Previous Zoning Traffic Study

	Currently Proposed Project ^a	Rezoning Assessment ^b	Difference
Weekday Daily			
Enter	2,536	4,494	(-1,958)
Exit	<u>2,469</u>	<u>4,494</u>	<u>(-2,025)</u>
Total	5,005	8,988	(-3,983)
Weekday Morning			
Enter	515	625	(-110)
Exit	<u>68</u>	<u>-5</u>	<u>+73</u>
Total	583	620	(-37)
Weekday Evening			
Enter	92	126	(-34)
Exit	<u>473</u>	<u>743</u>	<u>(-270)</u>
Total	565	869	(-304)

a Total Net New Vehicle Trips as reported in Table 5.

b New Primary Trips for the “No Residential” trip generation alternative (Table 2), Traffic Impact Study to support rezoning of the Muzi site, GPI, November 2020.

As shown in Table 6, the current Project is expected to generate significantly less traffic than what was estimated in the 2020 traffic study supporting the rezoning effort. During the weekday morning and weekday evening peak hours, the Project is expected to generate approximately 37 and 204 fewer trips, respectively, than what was analyzed in the 2020 rezoning memo. Overall, the Project trip generation is estimated to be over 40 percent lower than that estimated during the rezoning effort.⁸

Project Trip Distribution

The directional distribution of the traffic approaching and departing the Project Site is a function of population densities, the location of employment opportunities, existing travel patterns, and the efficiency of the roadway system. Trips made to and from the proposed office/laboratory spaces during the peak hours are expected to be predominantly home-to-work and work-to-home trips in the morning and evening peak hours, respectively. Accordingly, the trip distribution for the office/laboratory portions of the proposed development has been derived based on Journey-to-Work data for the City of Needham with the 2010 U.S. Census data. The retail-generated trips are expected to follow trip distribution patterns similar to the office and lab uses.

Table 7 provides a summary of the trip distribution. Detailed trip distribution calculations are provided in the Appendix to this report.

⁸ It should be noted that the traffic study prepared by GPI to support the rezoning of the site assumed redevelopment of both the Muzi parcel and the Channel 5 parcel. The current proposed Project does not include the Channel 5 parcel, and trips generated by the Channel 5 studios are assumed to remain on the network in the 2029 Build Conditions

Table 7 **Trip Distribution Summary**

Travel Route	Direction	Trips
I-95 North	North	32%
I-95 South	South	32%
Needham Street	East	7%
Highland Avenue	West	7%
Central Street	East	7%
Central Street	West	5%
Kendrick Street	East	4%
Cedar Street	North	3%
<u>West Street</u>	<u>West</u>	<u>3%</u>
Total		100%

Source: 2010 US Census Data

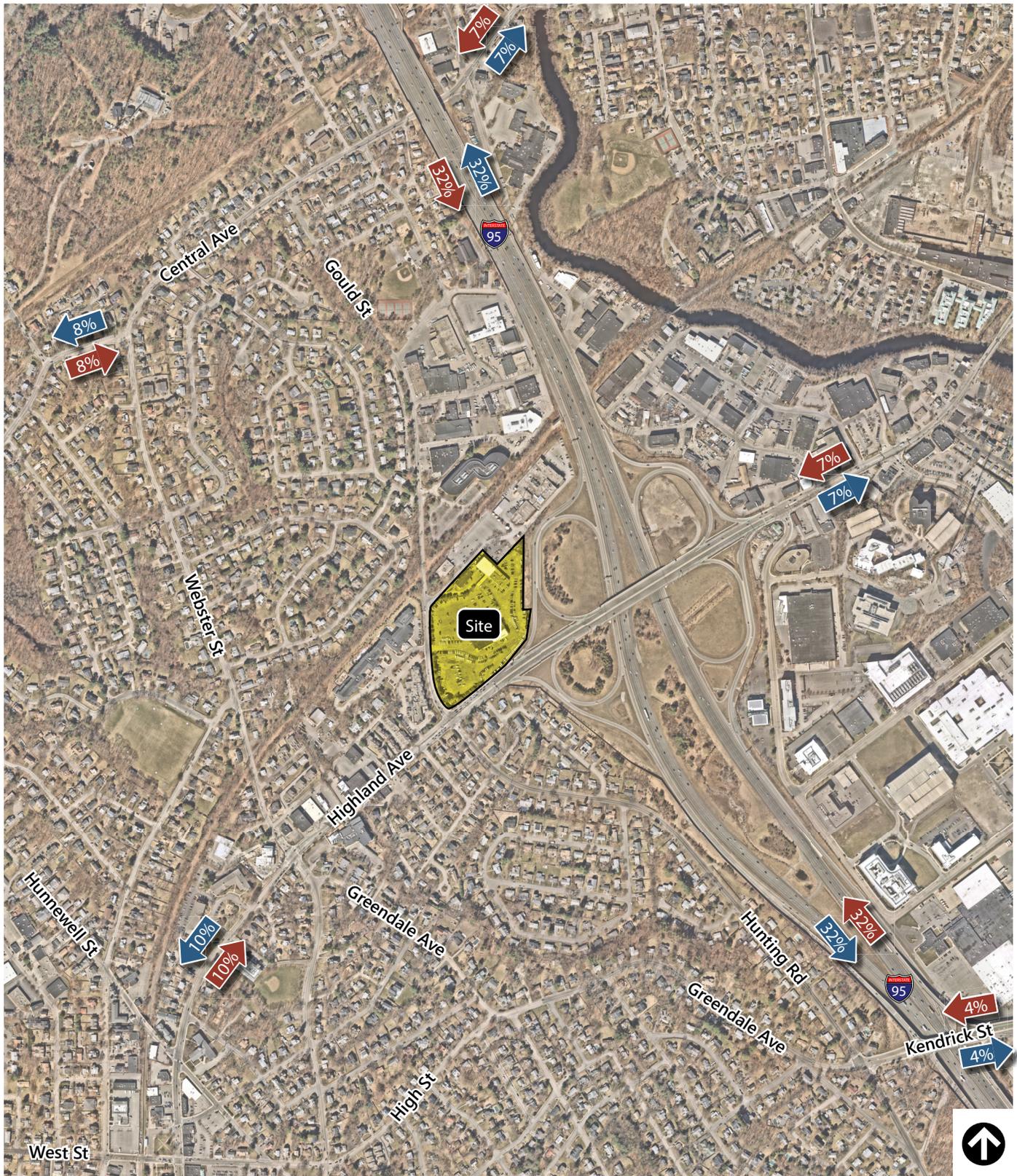
Figure 10 provides an illustration of the Project Site trip distribution.

Vehicles will be able to access the Project Site via Gould Street from both the main driveway across from the Wingate driveway and from TV Place. The trip distribution calculations assume that of the Project Site-generated trips accessing the Project Site to/from the south on Gould Street, 80-percent will use the main Project Site driveway and 20-percent will use TV Place. Conversely, of the Project Site-generated trips accessing the Project Site to/from the north on Gould Street, it is assumed that 20-percent will use the main Project Site driveway and 80-percent will use TV Place to access the Project Site.

Project Trip Assignment

The Project-related traffic volumes for the Build Condition are assigned to the study area roadway network based on the trip distribution patterns shown in Table 7. The assigned volumes are then added to the 2029 No-Build peak hour traffic volume networks to develop the 2029 Build Condition for the weekday morning and weekday evening peak hour traffic volume networks, respectively. The site-generated trip traffic volume networks for the morning and evening peak periods are shown in Figures 11 and 12.

The 2029 Build Condition traffic volumes are shown in Figures 13 and 14 for the weekday morning and weekday evening, respectively.



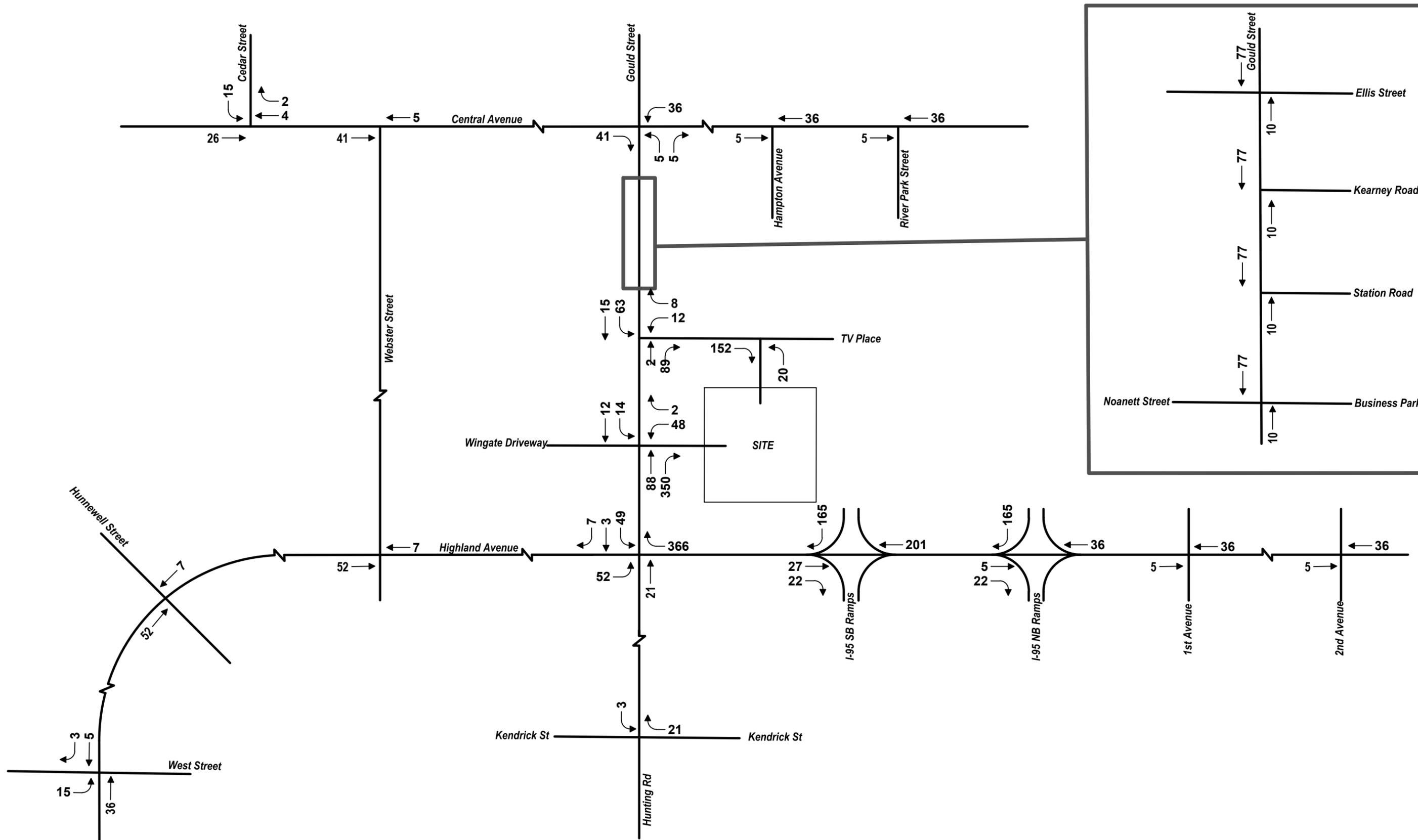
Source: NearMap

▶ % Outbound
◀ % Inbound



Figure 10
Trip Distribution

**Highland Science Center
Needham, Massachusetts**

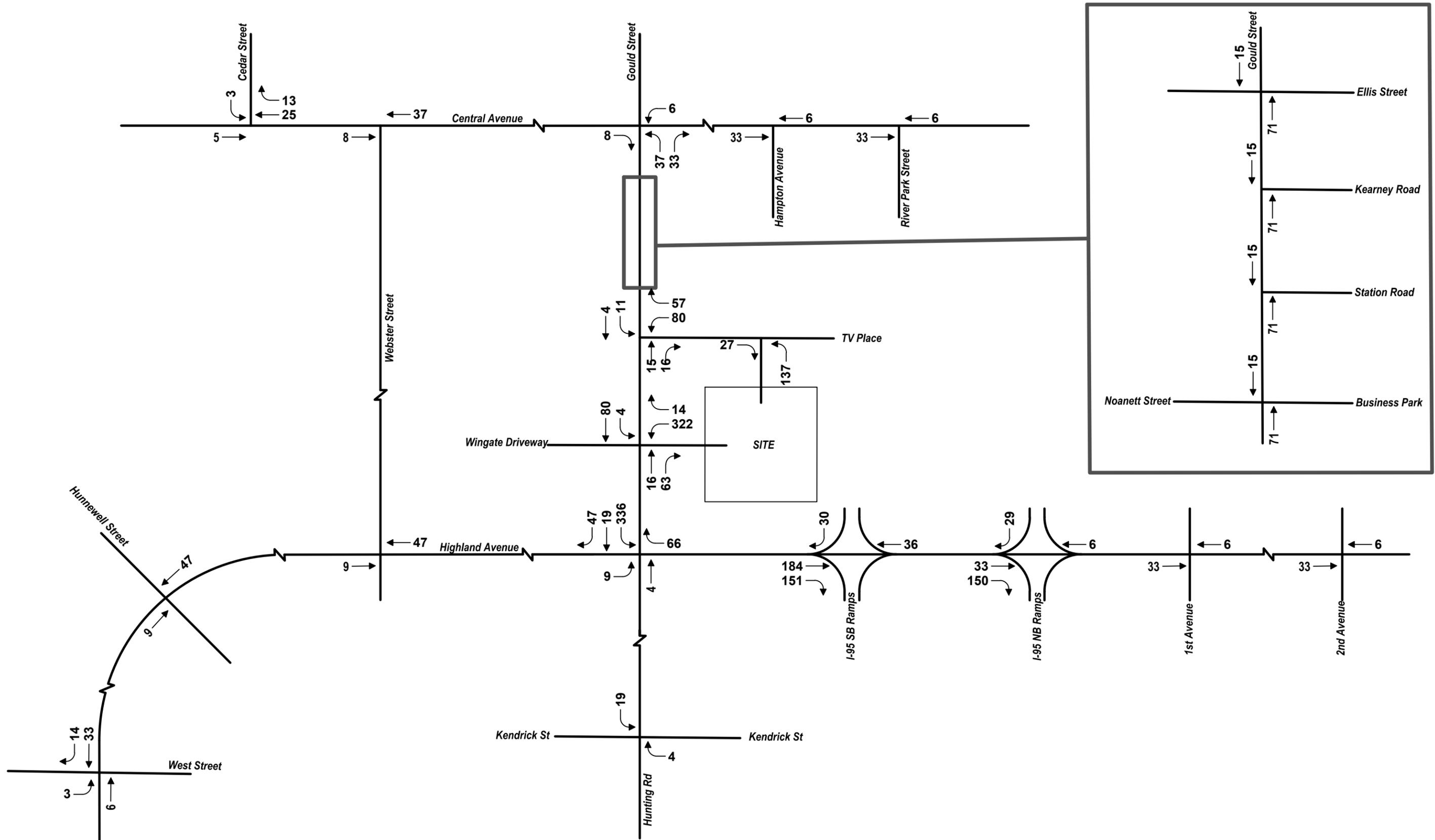


Not to Scale



Project Generated Vehicle Volumes
 Weekday Morning Peak Hour
 Highland Science Center
 Needham, Massachusetts

Figure 11

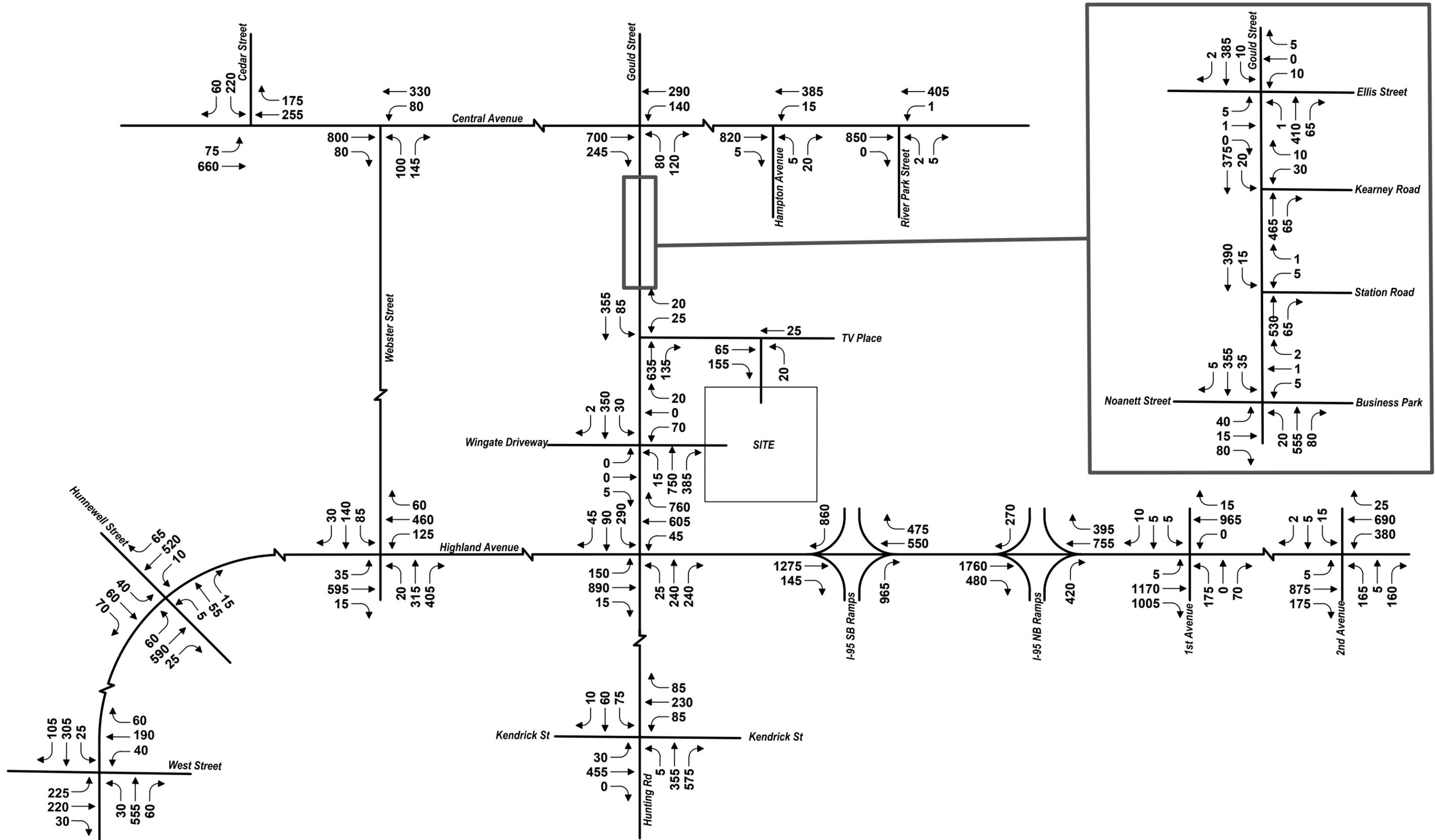


Not to Scale



Project Generated Vehicle Volumes
 Weekday Evening Peak Hour
 Highland Science Center
 Needham, Massachusetts

Figure 12

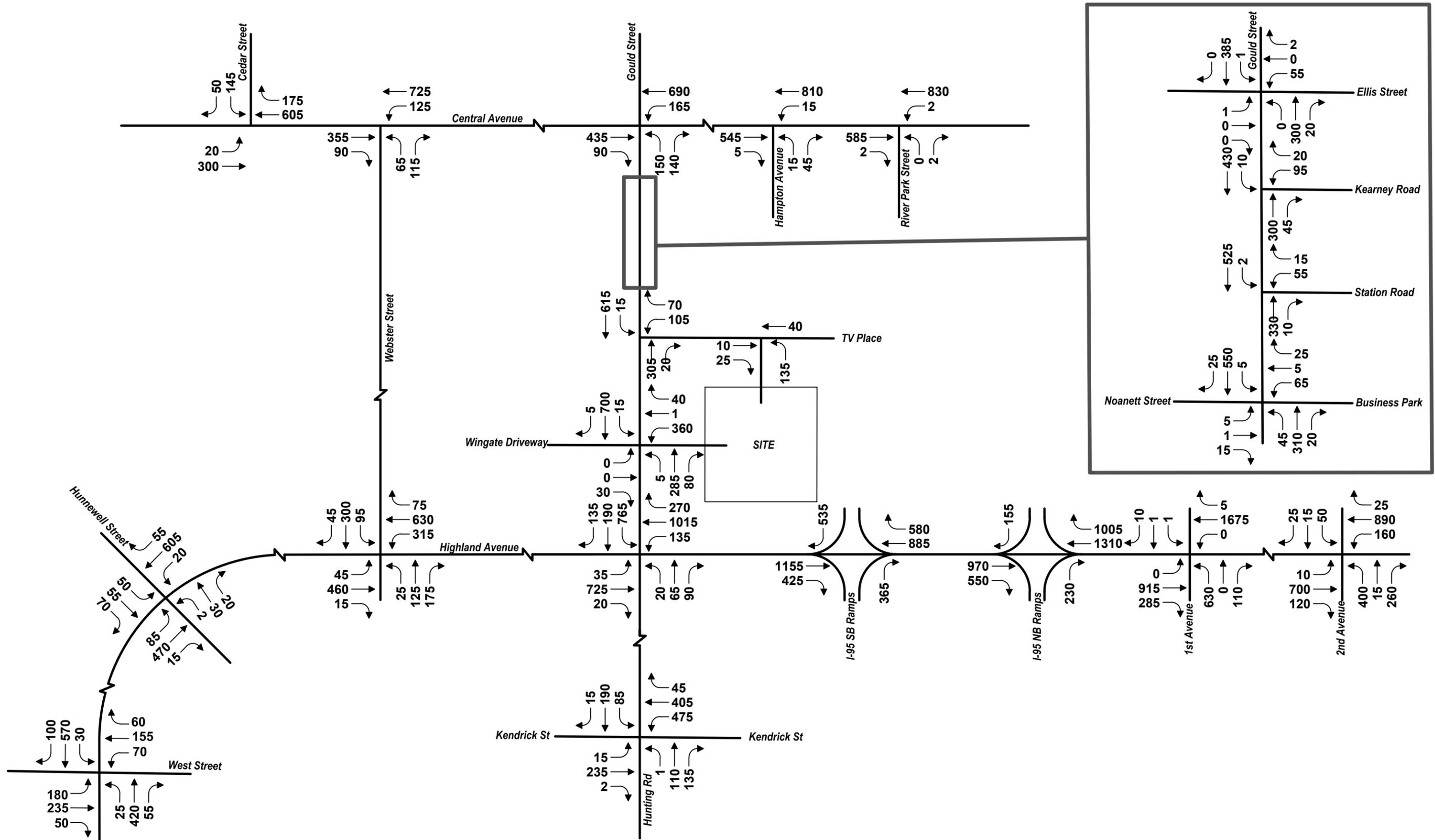


Not to Scale



Build Conditions Vehicle Volumes
 Weekday Morning Peak Hour
 Highland Science Center
 Needham, Massachusetts

Figure 13



Not to Scale



Build Conditions Vehicle Volumes
 Weekday Evening Peak Hour
 Highland Science Center
 Needham, Massachusetts

Figure 14



Transportation Operations Analyses

Measuring existing traffic volumes and projecting future traffic volumes quantifies traffic flow within the study area. To assess the quality of flow, roadway capacity analyses were conducted with respect to Existing and projected No-Build and Build traffic volumes for both weekday morning and weekday evening peak hours. Capacity analyses provide an indication of how well the roadway facilities can serve the traffic demands placed upon them. Roadway operating conditions are classified by calculated levels of service.

Intersection Capacity Analyses

Consistent with MassDOT guidelines, Synchro 10 software was used to model LOS operations at the Project Study Area intersections. Both signalized and unsignalized intersection capacity analyses were conducted under 2022 Existing, 2029 No-Build, and 2029 Build conditions.

Level-of-Service Criteria

The evaluation criteria used to analyze area intersections in this traffic study are based on the Highway Capacity Manual (HCM).⁹ The term 'Level of Service' (LOS) denotes the different operating conditions that occur on a given roadway segment under various traffic volume loads. It is a qualitative measure that considers a number of factors including roadway geometry, speed, travel delay and freedom to maneuver. LOS provides an index to the operational qualities of a roadway segment or an intersection. LOS designations range from A to F, with LOS A representing the best operating conditions and LOS F representing the worst operating conditions.

In addition to LOS, two other measures of effectiveness are typically used to quantify the traffic operations at intersections; volume-to-capacity ratio (v/c) and delay (expressed in seconds per vehicle). For example, an existing v/c ratio of 0.90 for an intersection indicates that the intersection is operating at 90 percent of its available capacity. A delay of 15 seconds for a particular vehicular movement or approach indicates that vehicles on the movement or approach will experience an average additional travel time of 15 seconds. For a given LOS letter designation there may be a wide

⁹ Transportation Research Board, *Highway Capacity Manual*, 6th Edition, Washington, D.C., 2016.

range of values for both v/c ratios and delay. Comparison of intersection capacity results therefore requires that, in addition to the LOS, the other measures of effectiveness should also be considered.

The LOS designations, which are based on delay, are reported differently for signalized and unsignalized intersections. For signalized intersections, the analysis considers the operation of all traffic entering the intersection and the LOS designation is for overall conditions at the intersection. For unsignalized intersections, however, the analysis assumes that traffic on the mainline is not affected by traffic on the side streets. Thus, the LOS designation is for the critical movement exiting the side street and for the conflicting movement on the mainline, which is generally the left turn from the mainline into a side street or driveway. Table 8 shows the LOS criteria for both signalized intersections and unsignalized intersections.

Table 8 Intersection Level-of-Service Criteria

Level of Service	Signalized Intersection Delay	Unsignalized Intersection Delay
A	0 to 10 seconds	0 to 10 seconds
B	10 to 20 seconds	10 to 15 seconds
C	20 to 35 seconds	15 to 25 seconds
D	35 to 55 seconds	25 to 35 seconds
E	55 to 80 seconds	35 to 50 seconds
F	Greater than 80 seconds	Greater than 50 seconds

Source: Highway Capacity Manual, 6th Edition.

The analytical methodologies typically used for unsignalized intersections use conservative analysis parameters, such as long critical gaps. Actual field observations indicate that drivers on minor streets generally accept shorter gaps in traffic than those used in the analysis procedures and therefore experience less delay than reported by the analysis software. The analysis methodologies also do not fully take into account the beneficial grouping effects caused by nearby signalized intersections. The net effect of these analysis procedures is the over-estimation of calculated delays at unsignalized intersections in the study area. Cautious judgment should therefore be exercised when interpreting the capacity analysis results at unsignalized intersections.

Signalized Intersection Capacity Analyses

Table 9 summarizes the intersection capacity analyses for the signalized study area intersections and the capacity analysis worksheets are included in the Appendix to this report.

Table 9 Signalized Intersection Capacity Analysis Summary

Location / Movement	2022 Existing Condition					2029 No-Build Condition					2029 Build Condition				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Highland Avenue at West Street															
<i>Weekday Morning</i>															
West St EB L	0.62	28.3	C	83	#210	0.83	50.7	D	105	#225	0.89	61.0	E	114	#258
West St EB T/R	0.36	21.6	C	102	236	0.42	27.5	C	128	252	0.42	27.5	C	128	252
West St WB L	0.16	30.6	C	19	58	0.20	35.9	D	25	65	0.20	35.9	D	25	65
West St WB T/R	0.69	39.4	D	141	286	0.78	51.1	D	176	313	0.78	51.1	D	176	313
Highland Ave NB L/T/R	0.82	29.0	C	265	#648	0.88	33.7	C	367	#842	0.92	40.3	D	407	#913
Highland Ave SB L/T/R	0.58	19.6	B	150	376	0.59	19.3	B	183	439	0.60	19.7	B	189	453
Overall	0.73	27.4	C	-	-	0.83	34.1	C	-	-	0.88	37.9	D	-	-
<i>Weekday Evening</i>															
West St EB L	0.54	25.1	C	64	142	0.60	26.2	C	70	154	0.61	26.7	C	73	159
West St EB T/R	0.43	20.8	C	110	228	0.46	20.9	C	123	251	0.46	20.9	C	123	251
West St WB L	0.35	30.9	C	33	84	0.36	30.7	C	35	88	0.36	30.7	C	35	88
West St WB T/R	0.65	36.0	D	108	213	0.66	36.3	D	117	229	0.66	36.3	D	117	229
Highland Ave NB L/T/R	0.71	21.9	C	175	#547	0.82	28.1	C	225	#664	0.83	29.0	C	229	#675
Highland Ave SB L/T/R	0.83	28.3	C	236	#726	0.97	50.7	D	320	#889	1.05	72.0	E	369	#978
Overall	0.72	26.2	C	-	-	0.81	35.3	D	-	-	0.85	43.3	D	-	-
Highland Ave at Webster Street															
<i>Weekday Morning</i>															
Highland Ave EB L	0.11	12.1	B	7	22	0.14	22.7	C	13	50	0.14	22.7	C	13	50
Highland Ave EB T/R	0.79	22.3	C	138	#236	1.00	67.6	E	290	#745	1.08	93.4	F	330	#830
Highland Ave WB L	0.43	9.8	A	20	40	0.55	20.9	C	32	109	0.55	21.5	C	32	109
Highland Ave WB T/R	0.56	9.7	A	102	167	0.64	18.5	B	180	473	0.64	18.6	B	182	480
Webster St NB L/T	0.66	19.4	B	105	#204	0.90	56.0	E	189	#471	0.90	56.0	E	189	#471
Webster St NB R	0.41	12.7	B	45	105	0.40	24.4	C	25	122	0.40	24.4	C	25	122
Webster St SB L/T/R	0.38	15.1	B	36	66	>1.20	35.0	D	69	#160	>1.20	35.0	D	69	#160
Overall	0.75	15.3	B	-	-	0.91	39.2	D	-	-	0.95	46.3	D	-	-
<i>Weekday Evening</i>															
Highland Ave EB L	0.18	14.2	B	10	32	0.21	26.0	C	19	67	0.22	26.2	C	20	68
Highland Ave EB T/R	0.79	24.2	C	125	#275	0.88	47.0	D	260	#656	0.90	49.4	D	268	#673
Highland Ave WB L	0.86	28.2	C	51	#171	0.88	44.0	D	109	#399	0.90	48.7	D	115	#409
Highland Ave WB T/R	0.63	11.0	B	117	229	0.69	19.1	B	231	#672	0.74	20.6	C	257	#750
Webster St NB L/T	0.32	14.5	B	39	75	0.56	36.9	D	83	191	0.56	36.9	D	83	191
Webster St NB R	0.23	10.1	B	30	56	0.33	22.7	C	62	162	0.33	22.7	C	62	162
Webster St SB L/T/R	0.51	15.6	B	62	96	0.80	44.1	D	134	#271	0.80	44.1	D	134	#271
Overall	0.77	17.3	B	-	-	0.85	35.1	D	-	-	0.87	36.4	D	-	-

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- ~ Volume exceeds capacity, queue is theoretically infinite.
- # 95th percentile volume exceeds capacity, queue may be longer.

Table 9 Signalized Intersection Capacity Analysis Summary (cont.)

Location / Movement	2022 Existing Condition					2029 No-Build Condition					2029 Build Condition				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Highland Avenue at Gould Street and Hunting Road															
<i>Weekday Morning</i>															
Highland Ave EB L	1.14	>120	F	~68	#235	1.04	>120	F	~93	#234	>1.20	>120	F	~190	#353
Highland Ave EB T/R	0.72	28.0	C	232	413	0.86	40.2	D	364	#512	0.79	36.6	D	364	#512
Highland Ave WB L	0.51	45.8	D	23	72	0.58	58.6	E	36	83	0.61	65.3	E	38	83
Highland Ave WB T/R	0.79	31.1	C	220	410	0.94	52.1	D	362	#545	1.15	117.8	F	~616	#841
Hunting Rd NB L/T	0.79	47.5	D	137	#395	0.96	89.0	F	206	#434	1.13	>120	F	~263	#480
Hunting Rd NB R	0.15	28.9	C	0	46	0.48	39.8	D	48	102	0.51	44.0	D	52	102
Gould St SB L	0.71	45.6	D	96	#246	0.82	64.8	E	145	#281	0.91	84.5	F	182	#347
Gould St SB SB L/T/R	0.67	43.4	D	91	#224	0.78	59.4	E	137	#264	0.88	77.3	E	175	#335
Overall	0.77	38.8	D	-	-	0.98	55.1	E	-	-	1.20	100.2	F	-	-
<i>Weekday Evening</i>															
Highland Ave EB L	0.47	45.1	D	15	40	>1.20	>120	F	19	57	>1.20	>120	F	27	72
Highland Ave EB T/R	0.57	24.8	C	173	242	0.81	42.30	D	287	440	0.81	42.40	D	290	442
Highland Ave WB L	0.53	37.2	D	67	120	0.86	83.30	F	100	194	0.87	84.50	F	101	196
Highland Ave WB T/R	0.70	21.5	C	206	368	1.00	61.70	E	~535	#774	1.07	84.00	F	~599	#861
Hunting Rd NB L/T	0.94	112.1	F	52	#130	0.56	51.40	D	66	127	0.58	52.20	D	70	134
Hunting Rd NB R	0.05	28.9	C	0	23	0.10	35.70	D	4	24	0.10	35.70	D	4	24
Gould St SB L	1.09	109.8	F	~262	#393	0.91	61.10	E	295	#574	>1.20	>120	F	~681	#1051
Gould St SB SB L/T/R	1.05	96.0	F	~244	#377	0.88	56.90	E	284	#554	>1.20	>120	F	~653	#1022
Overall	0.86	47.2	D	-	-	1.03	59.50	E	-	-	>1.20	>120	F	-	-
Highland Avenue at I-95 NB Ramps															
<i>Weekday Morning</i>															
Highland Ave EB T	0.68	8.3	A	165	232	0.75	9.3	A	268	327	0.75	9.2	A	270	328
I-95 Off Ramp NB R	0.54	23.3	C	53	118	1.03	85.2	F	~146	#371	1.04	87.8	F	~151	#380
Overall	0.65	9.6	A	-	-	0.80	21.1	C	-	-	0.80	21.4	C	-	-
<i>Weekday Evening</i>															
Highland Ave EB T	0.47	5.6	A	50	89	0.56	7.3	A	75	129	0.55	7.0	A	82	138
I-95 Off Ramp NB R	0.42	13.7	B	16	44	0.44	15.0	B	30	70	0.46	16.6	B	33	77
Overall	0.46	6.4	A	-	-	0.53	8.1	A	-	-	0.52	8.0	A	-	-
a	Volume to capacity ratio.														
b	Average total delay, in seconds per vehicle.														
c	Level-of-service.														
d	50th percentile queue, in feet.														
e	95th percentile queue, in feet.														
~	Volume exceeds capacity, queue is theoretically infinite.														
#	95th percentile volume exceeds capacity, queue may be longer.														

Table 9 Signalized Intersection Capacity Analysis Summary (cont.)

Location / Movement	2022 Existing Condition					2029 No-Build Condition					2029 Build Condition				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Highland Avenue at 1st Avenue															
<i>Weekday Morning</i>															
Highland Ave EB L/T	0.57	12.4	B	181	#470	0.77	21.2	C	~607	#802	0.77	21.3	C	~611	#806
Highland Ave EB R	0.44	5.2	A	0	35	0.70	8.6	A	11	#103	0.70	8.6	A	11	#103
Highland Ave WB L/T	0.41	8.3	A	55	226	0.55	16.2	B	193	337	0.57	16.5	B	203	354
1 st Ave NB L	0.45	38.5	D	49	91	0.44	32.8	C	73	140	0.44	32.8	C	73	140
1 st Ave NB L/T/R	0.06	36.1	D	0	18	0.13	30.4	C	7	58	0.13	30.4	C	7	58
Driveway SB L/T/R	0.19	39.3	D	15	10	0.19	39.3	D	15	10	0.19	39.3	D	15	10
Overall	0.55	11.3	B	-	-	0.74	17.0	B	-	-	0.74	17.2	B	-	-
<i>Weekday Evening</i>															
Highland Ave EB L/T	0.43	13.0	B	101	273	0.65	23.6	C	192	#418	0.68	24.2	C	203	#444
Highland Ave EB R	0.11	3.0	A	0	10	0.19	2.4	A	0	12	0.19	2.4	A	0	12
Highland Ave WB L/T	0.81	17.2	B	163	#674	>1.20	>120	F	~626	#975	>1.20	>120	F	~630	#980
1 st Ave NB L	0.74	41.3	D	149	210	0.69	27.3	C	222	296	0.69	27.3	C	222	296
1 st Ave NB L/T/R	0.47	32.7	C	71	134	0.55	23.9	C	144	216	0.55	23.9	C	144	216
Driveway SB L/T/R	0.10	44.5	D	2	15	0.10	44.5	D	2	15	0.10	44.5	D	2	15
Overall	0.79	18.6	B	-	-	0.99	81.5	F	-	-	0.99	82.0	F	-	-
Highland Avenue at 2nd Avenue															
<i>Weekday Morning</i>															
Highland Ave EB L	-	-	-	-	-	0.02	9.5	A	1	11	0.02	9.0	A	1	11
Highland Ave EB T/R	-	-	-	-	-	0.61	14.3	B	201	485	0.59	13.6	B	203	488
Highland Ave EB L/T/R	0.47	6.2	A	42	143	-	-	-	-	-	-	-	-	-	-
Highland Ave WB L/T/R	>1.20	15.5	B	184	#383	>1.20	24.6	C	157	#672	>1.20	27.9	C	164	#731
2 nd Ave NB L	0.41	38.2	D	49	91	0.41	36.6	D	52	126	0.43	39.1	D	52	126
2 nd Ave NB L/T	0.42	38.3	D	51	93	0.42	36.6	D	53	127	0.44	39.2	D	53	127
2 nd Ave NB R	0.10	36.3	D	0	27	0.11	30.2	C	0	57	0.11	32.6	C	0	57
Driveway SB L/T	0.38	44.2	D	17	32	0.29	41.1	D	16	36	0.29	43.2	D	16	36
Driveway SB R	0.00	42.3	D	0	0	0.00	39.9	D	0	0	0.00	41.9	D	0	0
Overall	0.76	15.1	B	-	-	0.62	21.6	C	-	-	0.61	23.0	C	-	-
<i>Weekday Evening</i>															
Highland Ave EB L	-	-	-	-	-	0.06	15.1	B	4	22	0.06	15.1	B	4	22
Highland Ave EB T/R	-	-	-	-	-	0.53	19.3	B	179	389	0.56	19.6	B	190	412
Highland Ave EB L/T/R	0.40	4.9	A	129	34	-	-	-	-	-	-	-	-	-	-
Highland Ave WB L/T/R	0.74	19.4	B	220	#420	0.90	26.9	C	211	#722	0.92	29.3	C	213	#733
2 nd Ave NB L	0.69	40.4	D	125	187	0.73	43.3	D	135	268	0.73	43.3	D	135	268
2 nd Ave NB L/T	0.68	40.2	D	125	187	0.72	42.7	D	134	266	0.72	42.7	D	134	266
2 nd Ave NB R	0.15	31.9	C	0	56	0.38	30.0	C	44	142	0.40	30.2	C	48	148
Driveway SB L/T	0.59	44.5	D	53	74	0.55	43.0	D	52	91	0.55	43.0	D	52	91
Driveway SB R	0.02	38.9	D	0	0	0.02	38.8	D	0	0	0.02	38.8	D	0	0
Overall	0.78	21.4	C	-	-	0.95	28.2	C	-	-	0.02	38.8	C	-	-

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- ~ Volume exceeds capacity, queue is theoretically infinite.
- # 95th percentile volume exceeds capacity, queue may be longer.

Table 9 Signalized Intersection Capacity Analysis Summary (cont.)

Location / Movement	2022 Existing Condition					2029 No-Build Condition					2029 Build Condition				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Greendale Avenue and Kendrick Street at Hunting Road															
<i>Weekday Morning</i>															
Kendrick St EB L/T/R	0.42	21.0	C	102	#226	0.43	19.5	B	109	#252	0.43	19.6	B	110	#253
Kendrick St WB L	0.22	12.2	B	19	68	0.23	11.0	B	20	71	0.23	11.0	B	20	71
Kendrick St WB T/R	0.30	13.7	B	66	195	0.31	12.4	B	72	213	0.33	12.7	B	78	227
Hunting Rd NB T/R	>1.20	>120	F	~390	#579	>1.20	>120	F	~285	#461	>1.20	>120	F	~285	#461
Hunting Rd NB R	0.36	0.6	A	0	0	0.39	0.7	A	0	0	0.39	0.7	A	0	0
Hunting Rd SB L	0.37	37.2	D	29	62	0.42	38.0	D	32	65	0.45	38.2	D	34	69
Hunting Rd SB T/R	0.12	23.0	C	25	57	0.14	24.3	C	28	60	0.14	24.3	C	27	60
Overall	0.72	66.5	E	-	-	0.68	41.7	D	-	-	0.68	42.1	D	-	-
<i>Weekday Evening</i>															
Kendrick St EB L/T/R	0.43	31.2	C	59	86	0.57	36.3	D	68	97	0.57	36.5	D	68	97
Kendrick St WB L	0.53	7.8	A	115	180	0.58	9.0	A	126	196	0.58	9.2	A	126	196
Kendrick St WB T/R	0.37	7.0	A	100	157	0.41	7.8	A	112	174	0.42	8.0	A	113	176
Hunting Rd NB T/R	0.61	38.1	D	58	100	0.58	35.2	D	64	109	0.58	35.2	D	64	109
Hunting Rd NB R	0.10	0.10	A	0	0	0.10	0.10	A	0	0	0.10	0.1	A	0	0
Hunting Rd SB L	0.25	24.4	C	24	54	0.26	23.5	C	26	57	0.33	23.7	C	34	71
Hunting Rd SB T/R	0.44	26.2	C	77	136	0.46	25.4	C	87	150	0.45	25.2	C	87	150
Overall	0.61	15.4	B	-	-	0.65	16.5	B	-	-	0.65	16.6	B	-	-

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- ~ Volume exceeds capacity, queue is theoretically infinite.
- # 95th percentile volume exceeds capacity, queue may be longer.

As shown in Table 9, the following signalized intersections are expected to see a degrade in overall LOS between the 2029 No-Build Conditions and the 2029 Build Conditions:

- › **Highland Avenue at West Street** – LOS C to LOS D during the weekday morning peak period (increase in overall delay of 4 seconds).
- › **Highland Avenue at Gould Street/Hunting Road** – LOS E to LOS F during the weekday morning and weekday evening peak periods (increase in overall delay of greater than 30 seconds).

All other intersections and time periods are expected to see the overall LOS maintained from the 2029 No-Build Condition to the 2029 Build Conditions.

To offset the impacts of the additional Project-generated trips at the intersection of Highland Avenue at Gould Street / Hunting Road, the proponent is proposing geometric and signal timing mitigation. Details of the proposed mitigation are described later in this report.

Unsignalized Intersection Capacity Analyses

Table 10 summarizes the intersection capacity analyses for the unsignalized study area intersections and the capacity analysis worksheets are included in the Appendix to this report.

Table 10 Unsignalized Intersection Capacity Analysis Summary

Location / Movement	2022 Existing Condition				2029 No-Build Condition				2029 Build Condition			
	v/c ^a	Del ^b	LOS ^c	95 Q ^d	v/c	Del	LOS	95 Q	v/c	Del	LOS	95 Q
Central Avenue at Cedar Street												
<i>Weekday Morning</i>												
Cedar St SB L/R	>1.20	>120	F	759	>1.20	>120	F	926	>1.20	>120	F	1027
<i>Weekday Evening</i>												
Cedar St SB L/R	0.69	43.9	E	116	0.83	64.7	F	162	0.90	81.6	F	188
Central Avenue at Webster Street												
<i>Weekday Morning</i>												
Webster St NB L/R	>1.20	>120	F	434	>1.20	>120	F	554	>1.20	>120	F	587
<i>Weekday Evening</i>												
Webster St NB L/R	0.86	76.2	F	166	1.12	>120	F	254	>1.20	>120	F	281
Central Avenue at Gould Street												
<i>Weekday Morning</i>												
Gould St NB L/R	0.99	100.1	F	227	>1.20	>120	F	327	>1.20	>120	F	428
<i>Weekday Evening</i>												
Gould St NB L/R	>1.20	>120	F	662	>1.20	>120	F	828	>1.20	Err ^e	F	Err
Central Avenue at Hampton Avenue												
<i>Weekday Morning</i>												
Hampton Ave NB L/R	0.08	17.3	C	7	0.09	18.7	C	8	0.10	19.0	C	8
<i>Weekday Evening</i>												
Hampton Ave NB L/R	0.18	18.0	C	16	0.21	19.5	C	19	0.22	20.5	C	20
Central Avenue at River Park Street												
<i>Weekday Morning</i>												
River Park St NB L/R	0.02	17.7	C	2	0.03	19.2	C	2	0.03	19.6	C	2
<i>Weekday Evening</i>												
River Park St NB L/R	0.00	11.8	B	0	0.00	12.2	B	0	0.00	12.6	B	0
Gould Street at Ellis Street / Driveway												
<i>Weekday Morning</i>												
Driveway EB L/T/R	0.04	18.4	C	3	0.04	20.5	C	3	0.05	23.5	C	4
Ellis St WB L/T/R	0.07	16.6	C	6	0.08	18.3	C	6	0.09	20.6	C	7
<i>Weekday Evening</i>												
Driveway EB L/T/R	0.01	16.6	C	1	0.01	18.1	C	1	0.02	20.5	C	1
Ellis St WB L/T/R	0.21	19.1	C	20	0.26	21.9	C	25	0.31	26.1	D	31

a Volume to capacity ratio.

b Average total delay, in seconds per vehicle.

c Level-of-service.

d 95th percentile queue, in feet.

e Movement beyond capacity, no results reported.

Table 10 Unsignalized Intersection Capacity Analysis Summary (cont.)

Location / Movement	2022 Existing Condition				2029 No-Build Condition				2029 Build Condition			
	v/c ^a	Del ^b	LOS ^c	95 Q ^d	v/c	Del	LOS	95 Q	v/c	Del	LOS	95 Q
Gould Street at Kearney Road												
<i>Weekday Morning</i>												
Kearney Rd WB L/R	0.15	17.4	C	13	0.17	19.2	C	15	0.19	21.8	C	17
<i>Weekday Evening</i>												
Kearney Rd WB L/R	0.38	20.7	C	43	0.44	24.6	C	54	0.51	30.0	D	67
Gould Street at Station Road												
<i>Weekday Morning</i>												
Station Rd WB L/R	0.02	15.9	C	1	0.02	17.3	C	2	0.02	19.0	C	2
<i>Weekday Evening</i>												
Station Rd WB L/R	0.18	15.6	C	17	0.20	17.0	C	19	0.23	19.0	C	22
Gould Street at Noanett Road and Driveway												
<i>Weekday Morning</i>												
Driveway WB L/T/R	0.04	23.4	C	3	0.05	26.8	D	4	0.05	30.2	D	4
<i>Weekday Evening</i>												
Driveway WB L/T/R	0.35	23.5	C	38	0.40	27.8	D	45	0.46	33.9	D	55
Gould Street at TV Place												
<i>Weekday Morning</i>												
TV Place WB L/R	0.14	18.4	C	12	0.15	20.5	C	13	0.36	32.0	D	39
<i>Weekday Evening</i>												
TV Place WB L/R	0.17	19.3	C	15	0.19	21.7	C	17	0.88	72.7	F	183
Gould Street at Muzi Fold Driveway and Wingate Res. Driveway												
<i>Weekday Morning</i>												
Muzi Ford WB L	0.14	31.4	D	12	0.17	37.5	E	14	1.15	>120	F	152
<i>Weekday Evening</i>												
Muzi Ford WB L	0.20	26.9	D	19	0.24	31.2	D	22	>1.20	Err ^e	F	Err
Highland Avenue at Hunnewell Street												
<i>Weekday Morning</i>												
Hunnewell St EB L/T//R	>1.20	>120	F	314	>1.20	Err ^e	F	Err	>120	Err ^e	F	Err
<i>Weekday Evening</i>												
Hunnewell St EB L/T//R	1.01	118.2	F	220	>1.20	>120	F	383	>1.20	>120	F	433

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 95th percentile queue, in feet.
- e Movement beyond capacity, no results reported.

As shown in Table 10, the critical movements at the majority of the unsignalized study area intersections currently operate at acceptable levels of service, with a few key exceptions. These conditions generally are expected to continue under the future 2029 conditions with and without the addition of site-generated traffic.

Examples of unsignalized movements that are expected to operate at LOS F (delay greater than 50 seconds) under 2029 No Build Conditions and 2029 Build Conditions include:

- › Cedar Street southbound approach to Central Avenue during the weekday morning and weekday evening peak periods.
- › Webster Street northbound approach to Central Avenue during the weekday morning and weekday evening peak periods.

- › Gould Street northbound approach to Central Avenue during the weekday morning and weekday evening peak periods.
- › Hunnewell Street eastbound approach to Highland Avenue during the weekday morning and weekday evening peak periods.

Unsignalized Site Driveway Operations

At the unsignalized Project Site driveway and TV Place, operations are expected to operate at poor conditions. The Project Site driveway is expected to operate at LOS F with v/c ratios greater than 1.00 during both the weekday morning and weekday evening peak period. The TV Place approach is expected to operate at LOS F with a v/c ratio of 0.88 during the weekday evening peak period.

To improve operations at the Project Site driveway that will improve the LOS and reduce the v/c ratios to lower than 1.00, the Proponent is proposing mitigation that includes adding a traffic signal to the intersection. To improve operations at TV Place, the Proponent is proposing mitigation that includes dedicated left-turn and right-turn lanes. Details of the proposed mitigation are described later in this report.

Ramp Junction Capacity Analyses

At the interchange of Highland Avenue at I-95, the intersection generally does not operate as a standard signalized or unsignalized intersection. Traffic enters and exits the interstate ramps through merge, diverge, and weaving movements, similar to traffic operations on an interstate. Therefore, the conflicting movements have been analyzed using methodology for merge, diverge, and weaving conflicts.

The one exception to this is the junction of the I-95 northbound ramp with Highland Avenue eastbound. At this intersection, both approaches are signalized. Therefore, results for that ramp junction are summarized previously in the signalized intersection capacity analyses.

Level-of-Service Criteria

The capacity analyses conducted include merge/diverge analyses and weave analyses. Each analysis is based on procedures presented in the Highway Capacity Manual (HCM).

A merge or diverge segment is defined as a location that involves the interaction between freeway mainline through traffic and traffic merging from or diverging to ramps. The analyses for merge and diverge segments takes into account geometric and operational factors such as the length and taper of the acceleration/deceleration lanes, free-flow vehicle speed along the mainline and on the ramps themselves, and the number of vehicles in the right-most (or left-most for left exits) two lanes of the mainline. The focus of the analysis is at the ramp junction with the mainline where entering vehicles attempt to find gaps in the adjacent traffic stream. The action of this merging traffic creates vehicle turbulence along the mainline which can affect freeway operations. The converse of this action is the diverge movement which forces exiting vehicles to shift in advance and occupy the correct travel lane in order to exit the freeway causing temporary instability as the vehicles shift lanes and decelerate. According to the HCM, the influence area for both of these movements is approximately 1,500 feet before the diverge areas and beyond the merge areas (including acceleration and deceleration lanes).

A weaving segment is defined as a location that involves the interaction between two or more crossing traffic streams traveling in the same direction. A common weaving segment is formed by a one-lane freeway on-ramp followed by a one-lane freeway off-ramp, with the two connected by an auxiliary lane, which describes the geometry of Highland Avenue in both directions between the I-95 northbound and southbound ramps. The analysis for a weaving segment takes into account geometric and operational factors such as the length of the weaving section, free-flow vehicle speed along the mainline facility, and the number of vehicles in the weaving lanes. The focus of the analysis is within the weaving segment itself, where vehicles must attempt to find gaps and also accelerate or decelerate as they traverse the weaving segment.

Table 11 shows the level-of-service criteria for basic merge/diverge and weaving segments.

Table 11 Level-of-Service Criteria for Highway Capacity Analyses

Level-of-Service	Merge/Diverge Segment Density Range ^a	Weaving Segment Density Range ^b
A	0 to 10 pc/mi/ln	0 to 12 pc/mi/ln
B	10 to 20 pc/mi/ln	12 to 24 pc/mi/ln
C	20 to 28 pc/mi/ln	24 to 32 pc/mi/ln
D	28 to 35 pc/mi/ln	32 to 36 pc/mi/ln
E	Greater than 35 pc/mi/ln	36 to 40 pc/mi/ln
F	Demand Exceeds Capacity	Greater than 40 pc/mi/ln

Source: Highway Capacity Manual, Washington, D.C., 2016.

Note: Criteria measured in vehicle density (passenger car/mile/lane).

a Merge/Diverge density range (HCM, Exhibit 14-3).

b Weaving segment density range for multilane highways or C-D Roads (HCM, Exhibit 13-6).

Merge/Diverge Segment Analyses

Merge and diverge segment analyses were conducted at the following three ramp junction locations:

- › Highland Avenue Eastbound at the I-95 Southbound On-Ramp (diverge location)
- › Highland Avenue Westbound at the I-95 Northbound On-Ramp (diverge location)
- › Highland Avenue Westbound at the I-95 Southbound Off-Ramp (merge location)

Analyses were conducted during the weekday morning and weekday evening peak hours under the 2022 Existing, 2029 No Build, and 2029 Build Conditions. A summary of the merge and diverge segment analyses are presented in Table 12 and the detailed analysis worksheets are provided in the Appendix to this report.

Table 12 Merge/Diverge Capacity Analysis Summary

Location/Period	2022 Existing Conditions		2029 No Build Conditions		2029 Build Conditions	
	Density ^a	LOS ^b	Density	LOS	Density	LOS
Highland Avenue EB at I-95 SB On-Ramp (Diverge Movement)						
Weekday Morning	13.5	B	15.6	B	15.8	B
Weekday Evening	11.6	B	13.0	B	14.7	B
Highland Avenue WB at I-95 NB On-Ramp (Diverge Movement)						
Weekday Morning	9.8	A	10.8	B	11.2	B
Weekday Evening	13.5	B	16.2	B	16.3	B
Highland Avenue WB at I-95 SB Off-Ramp (Merge Movement)						
Weekday Morning	12.1	B	13.3	B	16.4	B
Weekday Evening	14.4	B	16.0	B	16.5	B

a density in ramp influence area, in passenger cars per mile per lane
 b level of service

As shown in Table 12, the merge and diverge locations for the interchange of Highland Avenue at I-95 are expected to operate at LOS B or better during the weekday morning and weekday evening peak hours under the 2022 Existing, 2029 No Build, and 2029 Build Conditions.

Weave Segment Analyses

Weaving segment analyses were conducted at the following two ramp junction locations:

- › Highland Avenue Eastbound between the I-95 Southbound Off-Ramp and the I-95 Northbound On-Ramp
- › Highland Avenue Westbound between the I-95 Northbound Off-Ramp and the I-95 Southbound On-Ramp

Analyses were conducted during the weekday morning and weekday evening peak hours under the 2022 Existing, 2029 No Build, and 2029 Build Conditions. A summary of the weave segment analyses is presented in Table 13 and the detailed analysis worksheets are provided in the Appendix to this report.

Table 13 Weave Segment Capacity Analysis Summary

Location/Period	2022 Existing Conditions			2029 No Build Conditions			2029 Build Conditions		
	v/c ^a	Density ^b	LOS ^c	Demand	Density	LOS	Demand	Density	LOS
Highland Avenue EB between I-95 SB Off-Ramp and I-95 NB On-Ramp									
Weekday Morning	0.53	18.5	B	0.66	24.3	C	0.66	24.7	C
Weekday Evening	0.30	10.2	A	0.38	13.0	B	0.44	15.2	B
Highland Avenue WB between I-95 NB Off-Ramp and I-95 SB On-Ramp									
Weekday Morning	0.22	6.5	A	0.26	7.9	A	0.34	10.1	A
Weekday Evening	0.31	10.9	A	0.38	13.9	B	0.40	14.3	B

- a volume to capacity ratio
- b density, in passenger cars per mile per lane
- c level of service

As shown in Table 13, the weaving locations for the interchange of Highland Avenue at I-95 are expected to operate at LOS C or better during the weekday morning and weekday evening peak hours under the 2022 Existing, 2029 No Build, and 2029 Build Conditions.

Signal Warrant Analysis

To determine the feasibility of potential mitigation measures, signal warrant analyses were conducted at two intersections: Central Avenue at Gould Street and Gould Street at the Project Site driveway / Wingate Driveway. Signalization of both intersections was proposed as mitigation for redevelopment of the Muzi site in the traffic memo conducted by GPI in 2020.

Warrant Analysis Summary

The Federal Highway Administration (FHWA) has established criteria for evaluating the need for traffic signal control at an intersection. Several warrants, published in the Manual on Uniform Traffic Control Devices (MUTCD),¹⁰ provide guidelines for determining the need for a signal based on such factors as traffic volume, pedestrian volume, progressive movement of traffic, vehicular delay, and others. While satisfaction of one or more of these warrants alone does not necessarily justify installation of a traffic signal, warrants in combination with capacity analysis, crash analysis, and a study of intersection safety provide valuable criteria for evaluating the need for a traffic signal.

There are nine warrants defined in the MUTCD. The warrants consider the roadway geometry, traffic volume entering the intersection, travel speeds, pedestrian activity, and special considerations such as proximity to schools and active railroad grade crossings. Even if these warrants are satisfied, other considerations such as traffic flow progression, sight distance, and physical constraints must be considered before pursuing traffic signal control.

Traffic volumes were evaluated for the following three volume-based warrants:

¹⁰ Manual on Uniform Traffic Control Devices, 2009 Edition; U.S. Department of Transportation Federal Highway Administration, Washington DC, December 2009.

- › **Warrant 1 (Eight Hour Vehicular Volume)** – Warrant 1 is based on any eight hours of a day where the traffic entering the intersection reaches a threshold that warrants considering signal control.
- › **Warrant 2 (Four Hour Vehicular Volume)** – Warrant 2 is for any four hours of a day.
- › **Warrant 3 (Peak Hour)** – Warrant 3 is for the peak hour of any given day.

The signal warrant analysis was conducted based on the 2022 Existing Conditions, 2029 No Build Conditions, and 2029 Build Conditions for the intersection of Central Avenue at Gould Street and based on the 2029 Build Conditions for the intersection of Gould Street at the Project Site driveway / Wingate driveway. The daily distribution of site-generated volumes was based on the Institute of Transportation Engineers (ITE) Trip Generation Manual, and the daily distribution of existing and future roadway traffic was based on the proportion of peak hour traffic experienced throughout the rest of the day at a nearby MassDOT count station on Highland Avenue. Calculations projecting the hourly volumes at each intersection are included in the Appendix to this report.

Table 14 presents the results of the three-traffic volume-based warrant analyses at the intersections of Central Avenue at Gould Street and Gould Street at the Project Site driveway / Wingate driveway. The signal warrant analysis worksheets are provided in the Appendix to this report.

Table 14 Traffic Signal Warrants Analysis Summary

Location	Condition	Warrant 1 (8-Hour) Met	Warrant 2 (4-Hour) Met	Warrant 3 (Peak Hour) Met
Central Avenue at Gould Street	2022 Existing	Yes	Yes	No
	2029 No Build	Yes	Yes	Yes
	2029 Build	Yes	Yes	Yes
Gould Street at Project Site Driveway / Wingate Driveway	2022 Existing	n/a	n/a	n/a
	2029 No Build	n/a	n/a	n/a
	2029 Build	Yes	Yes	Yes

Note: Based on 85th-percentile speeds under 40 miles per hour.

As shown in Table 14, all the volume-based warrants are met at the intersection of Central Avenue at Gould Street under all conditions, except for the peak hour warrant under 2022 Existing Conditions, and all the volume-based warrants are met at the intersection of Gould Street at the Project Site driveway / Wingate driveway under the 2029 Build Conditions.

In addition to the three warrants described above, there are six other traffic signal warrants outlined in the MUTCD. While none of the six additional warrants are met at this intersection, the warrants are listed below with the reasoning why they do not apply at this location:

- › **Warrant 4 (Pedestrian Volume)** – This warrant is not applicable because the current number of pedestrians at either location does not meet the minimum number of pedestrians required to meet any of the cases for Warrant 4.
- › **Warrant 5 (School Crossing)** – This warrant is not applicable because there are not established school crossing across Central Avenue or Gould Street in these locations.
- › **Warrant 6 (Coordinated Signal System)** – This warrant is not applicable because Central Avenue and Gould Street do not currently contain a coordinated traffic signal system with spacing of 1,000 feet.

- › **Warrant 7 (Crash Experience)** – Warrant 7 is satisfied when five collisions correctable by signalization occur over the most recent 12 months. A review of crash data determines that this warrant is not applicable at either location because less than five total crashes occurred over the most recent 12-month period with data available.
- › **Warrant 8 (Roadway Network)** – This warrant is not applicable because the study intersections are not the common intersection of two major routes.
- › **Warrant 9 (Intersection Near a Grade Crossing)** – This warrant is not applicable because the intersections are not near active grade crossings.



Transportation Mitigation

In general, the Project will have a minor impact at most study area intersections on the operations or safety of the roadway network. This is reflected in the operational analyses presented previously in this study. The following chapter discusses actions that the Project Proponent will implement to limit the Project's impacts to the roadway system and to enhance the overall transportation network in the area, including off-site roadway mitigation and a robust transportation demand management system.

Off-Site Roadway Mitigation

To mitigate the impacts of the Project and to improve the overall transportation network, the Proponent is proposing improved pedestrian and bicycle accommodations as well as roadway improvements at four intersections: Central Avenue at Gould Street, Gould Street at the Project Site driveway / Wingate driveway, Highland Avenue at Gould Street / Hunting Street, and Gould Street at TV Place. The mitigation proposed is based on the proposed mitigation from the traffic study completed by GPI in 2020 to assist in the rezoning of the Project Site. Details of the proposed pedestrian and bicycle improvements as well as the mitigation proposed at each intersection are provided below.

Proposed Pedestrian and Bicycle Improvements

Gould Street Bicycle Accommodations

The Proponent is proposing to add on-road bicycle accommodations along Gould Street to create a new north-south bicycle network within this area of Needham and connect Mills Field and the commercial and residential uses on Gould Street with the under-construction bicycle accommodations along Highland Avenue and the existing bicycle lanes in each direction on Hunting Road. The bicycle accommodations will consist of on-road bicycle lanes in each direction for approximately 900 feet between Highland Avenue and the former MBTA railroad ROW just north of TV Place. Between the former MBTA railroad ROW and Central Avenue, a distance of approximately ½ mile, the Proponent will fund the installation of shared lane pavement markings and signage in each direction. The design of the on-road bicycle accommodations will be coordinated with the Town of Needham.

Shared-Use Path Planning Study

North of the Project Site and the Channel 5 property is a former MBTA railroad ROW. There are long-term plans to convert this right-of-way into a shared-use path that would connect to the regional pedestrian and bicycle network of Eastern Massachusetts. To the north, the path would cross I-95/Route 128 and the Charles River and connect to the existing Upper Falls Greenway in Newton. To the south, the path would connect to the existing Bay Colony Rail Trail via Needham Heights and Needham Center. This would create a continuous off-road pedestrian and bicycle facility that would one day extend between Newton, Needham, Dover, and Medfield.

While there are long-term plans to create this shared-use path network, there is currently no funding for the part of the project between the Charles River and Needham Heights. The Proponent is proposing to coordinate with the Town of Needham to fund a study evaluating the feasibility of converting the former railroad ROW into a shared-use path between the Charles River and the commuter rail at Needham Heights. As part of the proposed improvements along Gould Street, the Proponent will include a crosswalk at the location of the future shared-use path.

Proposed Intersection Improvements

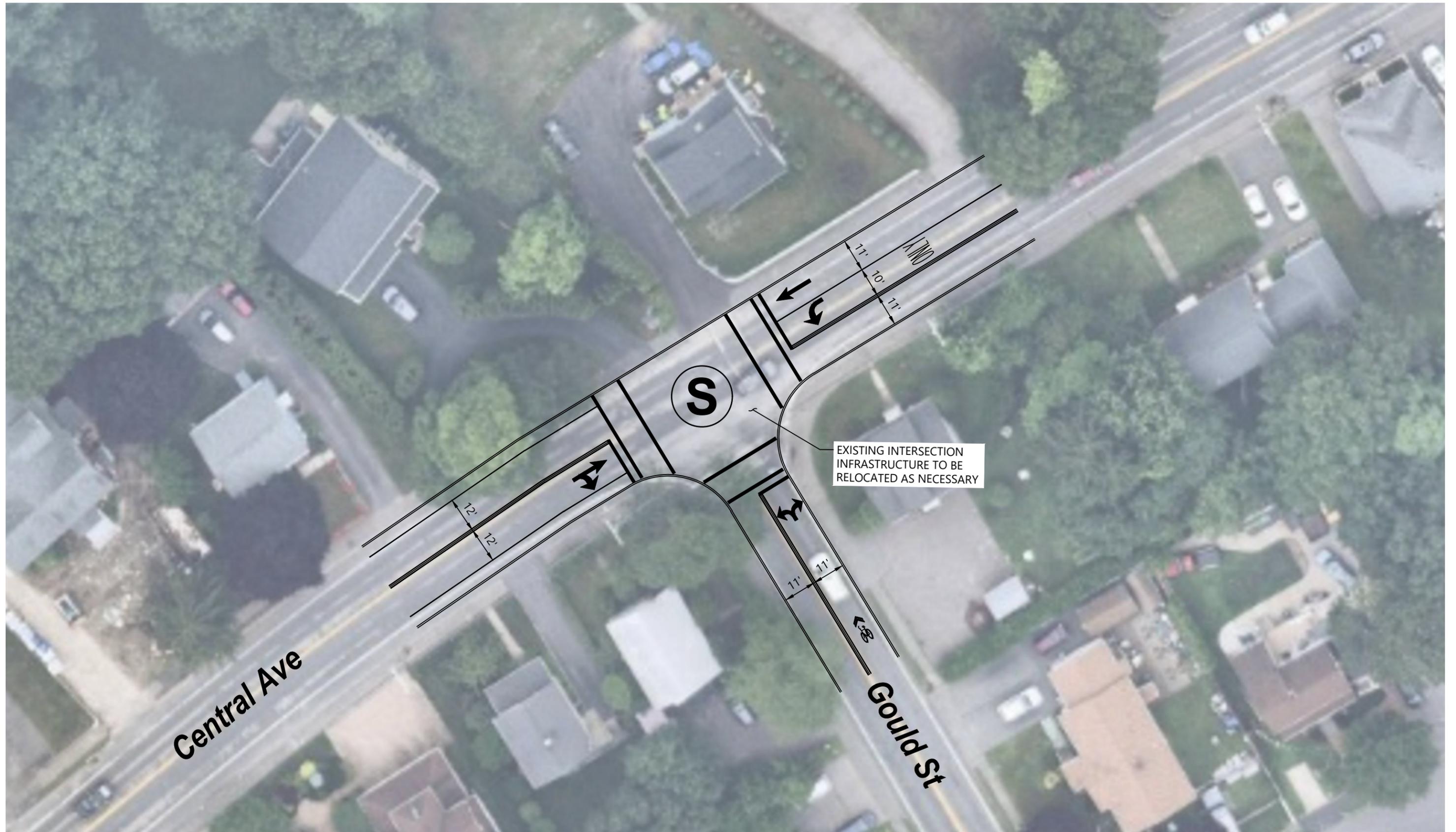
Central Avenue at Gould Street

Based on the analyses presented previously, without mitigation, the Gould Street approach is expected to operate at LOS F during the weekday morning and weekday evening peak hours under all scenarios, with v/c ratios greater than 1.00. The addition of Site traffic in the 2029 Build Condition will increase the delay on the Gould Street approach, as approximately 15-percent of Site-generated traffic is expected to travel through this intersection. Also as reported previously, this location meets the volume-based traffic signal warrants under the 2022 Existing, 2029 No Build, and 2029 Build Conditions. With mitigation, Gould Street is proposed to operate at LOS D or E with a v/c ratio under 1.00.

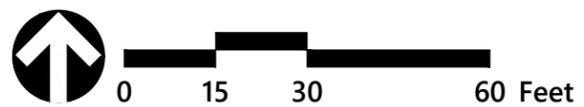
As recommended in the 2020 GPI Traffic Impact Study for the rezoning of the Project Site, the Proponent is proposing to fund the installation of a traffic signal at the intersection of Central Avenue at Gould Street. The traffic signal is proposed to be actuated-uncoordinated and include an exclusive pedestrian phase. The geometry of the intersection is proposed to be maintained on the Central Avenue eastbound and Gould Street northbound approaches with one general purpose lane in each direction while the geometry of the Central Avenue westbound approach is proposed to consist of a dedicated left-turn lane and a dedicated through lane. The westbound approach is anticipated to be restriped to provide a dedicated left-turn lane by narrowing the existing travel lanes and without changing the curb lines. Crosswalks will be provided across all approaches.

Although the installation of a traffic signal at this location will not require altering the curb line of the roadway, some minor right-of-way impacts may be necessary to locate signal equipment and to provide ADA-compliant sidewalk ramps at each crosswalk.

Figure 15 provides an illustration of the proposed intersection improvement concept. A summary of the traffic operations with the proposed mitigation in place is provided in the following section.



NOT FOR CONSTRUCTION



Proposed Intersection Improvements
Central Avenue at Gould Street
Highland Science Center
Needham, Massachusetts

Figure 15

03.30.22

Gould Street at Site Driveway / Wingate Driveway

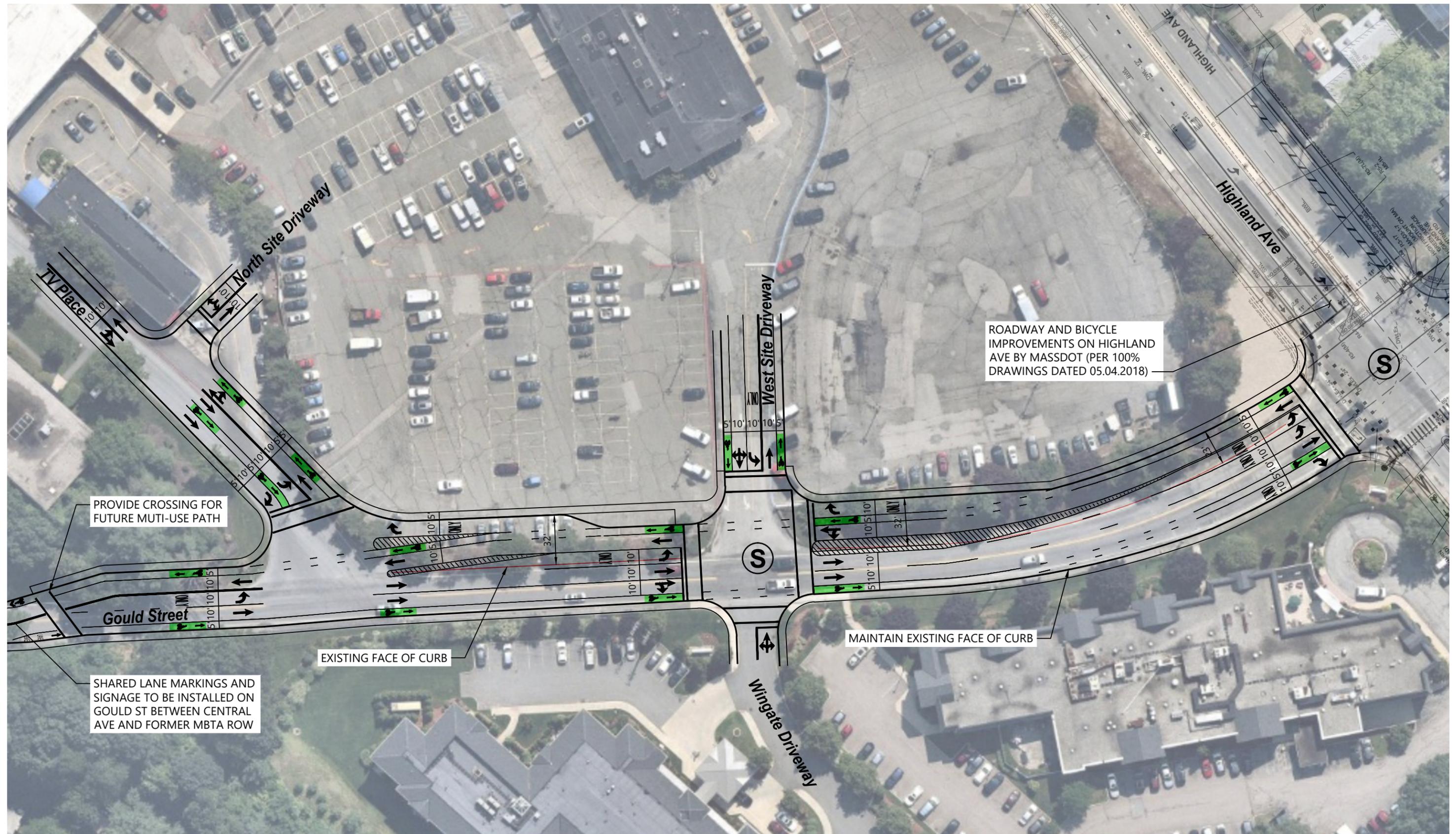
Based on the analyses presented previously, without mitigation, the Project Site driveway approach is expected to operate at LOS F during the weekday morning and weekday evening peak hours under the 2029 Build Condition, with v/c ratios greater than 1.00. Also as reported previously, this location meets all three volume-based traffic signal warrants under 2029 Build Conditions. In addition, there are no pedestrian facilities at this intersection, except for the sidewalk on the west side of Gould Street. With mitigation, the Project Site driveway during the weekday evening hour is proposed to operate at LOS D with a v/c ratio of 0.75 or lower and dedicated pedestrian and bicycle facilities will be provided.

As recommended in the 2020 GPI Traffic Impact Study for the rezoning of the Project Site, the Proponent is proposing to fund the installation of a traffic signal at the intersection of Gould Street at the Project Site Driveway / Wingate driveway. A traffic signal at this location will help employees and visitors access the Project Site via vehicle and will also improve pedestrian and bicycle connectivity to the Project Site by providing a protected crossing across Gould Street. The traffic signal is proposed to be actuated and coordinated with the signal at the intersection of Highland Avenue at Gould Street / Hunting Road, as the two traffic signals will be less than 400 feet apart.

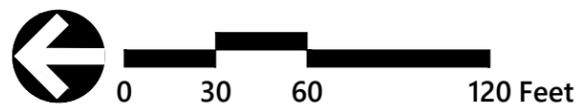
As outlined in the GPI Traffic Impact Study, Gould Street is proposed to be expanded to a five-lane cross section. The northbound approach will consist of a shared left-turn/through lane and a dedicated right-turn lane and the southbound approach will consist of a dedicated left-turn lane, a dedicated through lane, and a shared through/right-turn lane. The geometry of the Wingate driveway eastbound approach is proposed to be maintained with one general purpose lane. The Project Site driveway approach is proposed to consist of a dedicated left-turn lane and a shared left-turn/through/right-turn lane. One inbound lane into the Project Site is proposed. Crosswalks will be provided across all approaches and bicycle lanes will be provided in each direction on Gould Street and on the Project Site driveway.

To accommodate the expanded cross-section on Gould Street, the roadway will need to be expanded by up to 32 feet. Any expansion of the roadway is expected to occur to the east into the Project Site and the western curb line along the Wingate frontage will be maintained.

Figure 16 provides an illustration of the proposed improvements along Gould Street and at this intersection. A summary of the traffic operations with the proposed mitigation in place is provided in the following section.



NOT FOR CONSTRUCTION



Highland Avenue at Gould Street / Hunting Road

Based on the analyses presented previously, without mitigation, the intersection of Highland Avenue at Gould Street / Hunting Road is expected to operate at overall LOS F during the weekday morning and weekday evening peak hours under the 2029 Build Condition. The Gould Street southbound and Highland Avenue westbound approaches are expected to be impacted the greatest by the additional Site-generated traffic under the 2029 Build Conditions, with both approaches operating at LOS F with v/c ratios greater than 1.00. With mitigation, the intersection is expected to improve to overall LOS D during both peak hours.

As recommended in the 2020 GPI Traffic Impact Study for the rezoning of the Project Site, the Proponent is proposing to fund geometric improvements at this location that include the addition of a second dedicated southbound left turn lane as well as a dedicated southbound right-turn lane. Without mitigation, the southbound approach consists of a dedicated left-turn lane and a shared left/through/right-turn lane. Under the proposed mitigation, the southbound approach will consist of two dedicated left-turn lanes, a dedicated through lane, and a dedicated right-turn lane. This will provide additional capacity for the Project Site-generated traffic accessing I-95 and Needham Heights while minimizing the impacts for other drivers on the roadway. Bicycle lanes in each direction are also proposed on Gould Street.

In addition, the signal timings at this intersection are proposed to be modified to provide adequate green time for each approach. As part of the improvements, the signal is proposed to be coordinated with the signal at the intersection of Gould Street at the Project Site driveway / Wingate driveway, as the two traffic signals will be less than 400 feet apart.

Highland Avenue is currently being reconstructed as part of the Needham-Newton Corridor Project and will include improved pedestrian and bicycle accommodations. The proposed bicycle lanes on Gould Street will connect to the Highland Avenue bicycle accommodations at this intersection providing access toward Newton to the east and toward Needham Heights to the west. The Proponent will work with MassDOT to coordinate how the proposed improvements on Gould Street will tie into the roadway improvements on Highland Avenue as well as any changes needed to the signal equipment.

Figure 16 provides an illustration of the proposed improvements along Gould Street and at this intersection. A summary of the traffic operations with the proposed mitigation in place is provided in the following section.

Gould Street at TV Place

Based on the analyses presented previously, without mitigation, the TV Place single-lane approach to Gould Street is expected to operate at LOS D during the weekday morning and LOS F during the weekday evening peak hours under the 2029 Build Condition, with queues up to 185 feet. There are also no pedestrian or bicycle accommodations at this intersection, except for the sidewalk on the west side of Gould Street.

As recommended in the 2020 GPI Traffic Impact Study for the rezoning of the Project Site, the Proponent is proposing to provide turn lanes on TV Place and on Gould Street. TV Place is proposed to consist of a dedicated left-turn lane and a dedicated right-turn lane. Gould Street northbound is proposed to consist of a through lane and a dedicated right-turn lane and Gould Street southbound is proposed to consist of a through lane and a dedicated left-turn lane. This will help traffic entering and exiting the Project Site and other businesses on TV Place by providing additional storage space

for vehicles turning into and out of TV Place. In addition, a new crosswalk is proposed across TV Place and bicycle lanes are proposed in both directions on Gould Street and TV Place. The crosswalk will be ADA compliant and will connect with the proposed pedestrian facility along the Project Site frontage on the east side of Gould Street and the south side of TV Place.

To accommodate the expanded cross-sections on TV Place and Gould Street, the curb-to-curb width on each roadway will need to be widened. It is expected that roadway widening will take place into the Project Site east of Gould Street and south of TV Place. The Proponent also owns a small parcel of land north of TV Place that can accommodate the expanded cross-section of Gould Street north of the intersection.

As noted previously, the proposed improvements at this intersection match what was proposed in the 2020 GPI Traffic Impact Study for the rezoning of the Project Site. While the rezoning study looked at the potential redevelopment of the Project Site as well as the Channel 5 site and the small office building north of TV Place, the current Project only includes redevelopment of the former car dealership and car wash sites. However, the Proponent is proposing to construct all improvements at this intersection at this time to prepare for any potential redevelopment of the Channel 5 and office building sites in the future.

Figure 16 provides an illustration of the proposed improvements along Gould Street and at this intersection. A summary of the traffic operations with the proposed mitigation in place is provided in the following section.

Traffic Operations Analysis with Roadway Mitigation

To understand how traffic will operate with the proposed mitigation at each intersection, additional intersection capacity analyses have been conducted for the 2029 Build Conditions with the proposed improvements in place. Tables 15 and 16 summarize the intersection capacity analyses for the signalized and unsignalized mitigated study area intersections, respectively, and the capacity analysis worksheets are included in the Appendix to this report.

Table 15 Signalized Intersection Capacity Analysis Summary - with Proposed Mitigation

Location / Movement	2029 No-Build Conditions					2029 Build Without Mitigation					2029 Build With Mitigation				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Central Avenue at Gould Street															
<i>Weekday Morning</i>															
Central Ave EB T/R											1.05	59.3	E	368	#960
Central Ave WB T											0.72	28.7	C	18	#151
Central Ave WB L											0.27	5.1	A	36	141
Gould St NB L/R											0.85	55.7	E	82	#199
Overall	<i>Intersection unsignalized under 2029 No Build Conditions</i>					<i>Intersection unsignalized under 2029 Build without Mitigation Conditions</i>					0.93	46.0	D	-	-
<i>Weekday Evening</i>															
Central Ave EB T/R											0.81	30.0	C	228	#554
Central Ave WB T											0.67	20.0	C	41	#130
Central Ave WB L											0.86	24.4	C	287	#661
Gould St NB L/R											0.91	48.8	D	206	242
Overall	<i>Intersection unsignalized under 2029 No Build Conditions</i>					<i>Intersection unsignalized under 2029 Build without Mitigation Conditions</i>					0.89	31.1	C	-	-
Gould Street at Wingate Driveway and the Project Site Driveway															
<i>Weekday Morning</i>															
Wingate Dwy EB L/T/R											0.01	54.4	D	0	0
Site Dwy WB L											0.46	57.1	E	40	82
Site Dwy WB L/T/R											0.27	54.6	D	22	63
Gould St NB L/T											0.59	2.9	A	172	m202
Gould St NB R											0.29	1.4	A	19	m17
Gould St SB L											0.09	3.4	A	3	25
Gould St SB T/R											0.15	3.2	A	19	89
Overall	<i>Intersection unsignalized under 2029 No Build Conditions</i>					<i>Intersection unsignalized under 2029 Build without Mitigation Conditions</i>					0.55	5.8	A	-	-
<i>Weekday Evening</i>															
Wingate Dwy EB L/T/R											0.03	43.4	D	0	12
Site Dwy WB L											0.75	44.2	D	174	187
Site Dwy WB L/T/R											0.70	41.6	D	163	176
Gould St NB L/T											0.31	10.2	B	48	m245
Gould St NB R											0.06	14.7	B	0	m25
Gould St SB L											0.03	8.8	A	4	21
Gould St SB T/R											0.37	11.4	B	124	270
Overall	<i>Intersection unsignalized under 2029 No Build Conditions</i>					<i>Intersection unsignalized under 2029 Build without Mitigation Conditions</i>					0.44	21.7	C	-	-

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- # 95th percentile volume exceeds capacity, queue may be longer.
- m Volume for 95th percentile queue is metered by upstream signal.

Table 15 Signalized Intersection Capacity Analysis Summary - with Proposed Mitigation (cont.)

Location / Movement	2029 No-Build Conditions					2029 Build Without Mitigation					2029 Build With Mitigation				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Highland Avenue at Gould Street and Hunting Road															
<i>Weekday Morning</i>															
Highland Ave EB L	1.04	>120	F	~93	#234	>1.20	>120	F	~190	#353	0.97	110.4	F	~148	#277
Highland Ave EB T/R	0.86	40.2	D	364	#512	0.79	36.6	D	364	#512	0.68	28.4	C	336	433
Highland Ave WB L	0.58	58.6	E	36	83	0.61	65.3	E	38	83	0.38	53.8	D	37	76
Highland Ave WB T/R	0.94	52.1	D	362	#545	1.15	117.8	F	~616	#841	0.97	51.4	D	510	#718
Hunting Rd NB L/T	0.96	89.0	F	206	#434	1.13	>120	F	~263	#480	1.02	107.2	F	~241	#409
Hunting Rd NB R	0.48	39.8	D	48	102	0.51	44.0	D	52	102	0.55	41.8	D	81	130
Gould St SB L	0.82	64.8	E	145	#281	0.91	84.5	F	182	#347	0.72	62.3	E	105	180
Gould St SB L/T/R	0.78	59.4	E	137	#264	0.88	77.3	E	175	#335	-	-	-	-	-
Gould St SB T	-	-	-	-	-	-	-	-	-	-	0.41	56.1	E	64	136
Gould St SB R	-	-	-	-	-	-	-	-	-	-	0.03	46.2	D	0	10
Overall	0.98	55.1	E	-	-	1.20	100.2	F	-	-	0.98	52.5	D	-	-
<i>Weekday Evening</i>															
Highland Ave EB L	>1.20	>120	F	19	57	>1.20	>120	F	27	72	0.60	58.2	E	24	57
Highland Ave EB T/R	0.81	42.3	D	287	440	0.81	42.4	D	290	442	0.71	31.4	C	248	#360
Highland Ave WB L	0.86	83.3	F	100	194	0.87	84.5	F	101	196	0.78	61.6	E	89	#182
Highland Ave WB T/R	1.00	61.7	E	~535	#774	1.07	84.0	F	~599	#861	0.99	53.0	D	~515	#689
Hunting Rd NB L/T	0.56	51.4	D	66	127	0.58	52.2	D	70	134	0.93	108.6	F	66	#150
Hunting Rd NB R	0.10	35.7	D	4	24	0.10	35.7	D	4	24	0.07	35.5	D	0	6
Gould St SB L	0.91	61.1	E	295	#574	>1.20	>120	F	~681	#1051	0.95	56.5	E	307	#364
Gould St SB L/T/R	0.88	56.9	E	284	#554	>1.20	>120	F	~653	#1022	-	-	-	-	-
Gould St SB T	-	-	-	-	-	-	-	-	-	-	0.44	32.5	C	134	134
Gould St SB R	-	-	-	-	-	-	-	-	-	-	0.10	81.4	F	12	22
Overall	1.03	59.5	E	-	-	>1.20	>120	F	-	-	1.05	50.6	D	-	-

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- # 95th percentile volume exceeds capacity, queue may be longer.
- m Volume for 95th percentile queue is metered by upstream signal.

Table 16 Unsignalized Intersection Capacity Analysis Summary - with Proposed Mitigation

Location / Movement	2029 No-Build Conditions				2029 Build Without Mitigation				2029 Build With Mitigation			
	v/c ^a	Del ^b	LOS ^c	95 Q ^d	v/c	Del	LOS	95 Q	v/c	Del	LOS	95 Q
Gould Street at TV Place												
<i>Weekday Morning</i>												
TV Place WB L/R	0.15	20.5	C	13	0.36	32.0	D	39	-	-	-	-
TV Place WB L	-	-	-	-	-	-	-	-	0.28	26.7	D	27
TV Place WB R	-	-	-	-	-	-	-	-	0.39	0.0	A	0
Gould Street SB L	0.03	0.8	A	2	0.12	3.2	A	10	0.12	10.3	B	10
<i>Weekday Evening</i>												
TV Place WB L/R	0.19	21.7	C	17	0.88	72.7	F	183	-	-	-	-
TV Place WB L	-	-	-	-	-	-	-	-	0.78	50.2	F	148
TV Place WB R	-	-	-	-	-	-	-	-	0.24	0.0	A	0
Gould Street SB L	0.01	0.2	A	0	0.02	0.5	A	1	0.02	8.2	A	1

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 95th percentile queue, in feet.

As shown in Table 15, the intersection of Central Avenue at Gould Street with the proposed mitigation is expected to operate at overall LOS D during the weekday morning peak hour and LOS C during the weekday evening peak hour. While the eastbound and northbound approaches are expected to operate at LOS E during the weekday morning peak hour, this is because each approach is proposed to consist of a single lane in order to limit right-of-way impacts.

The intersection of Gould Street at the Project Site driveway / Wingate Driveway with the proposed mitigation is expected to operate at overall LOS A during the weekday morning peak hour and LOS C during the weekday evening peak hour. While the westbound site driveway approach is expected to operate at LOS E during the weekday morning peak hour, the volume to capacity ratio is less than 0.50. The intersection is proposed to be coordinated with the intersection of Highland Avenue at Gould Street / Hunting Road and the northbound queues at this intersection are not expected to extend back to the upstream intersection. The inclusion of two southbound through lanes will provide adequate queueing storage that is not expected to extend more than 300 feet.

The intersection of Highland Avenue at Gould Street / Hunting Road with the proposed mitigation is expected to operate at overall LOS D during the both the weekday morning and weekday evening peak hours, which is an improvement over the 2029 No Build Conditions. The intersection is proposed to be coordinated with the intersection of Gould Street at the Project Site driveway / Wingate driveway and the southbound queues at this intersection are not expected to extend back to the upstream intersection. In addition, in the 2020 GPI traffic study to support the rezoning of the Project Site, additional mitigation at this intersection included the construction of a dedicated westbound right-turn lane. Without the dedicated right-turn lane, the westbound approach is expected to operate at LOS E with v/c below 1.00. While adding a dedicated right-turn lane would improve right-turning operations, it would add a new weaving conflict between drivers coming off the I-95 Southbound off-ramp and drivers turning right onto Gould Street, which could cause a safety issue. To not add a new weaving conflict, no dedicated westbound right-turn lane is proposed as mitigation.

As shown in Table 16, while the unsignalized TV Place approach to Gould Street is still expected to operate at LOS F with the mitigation in place under the 2029 Build Conditions during the weekday evening peak hour, creating dedicated left-turn and right-turn lanes is expected to reduce the average delay by over 20 seconds for left-turning vehicles, from 73 seconds to 50 seconds. With a v/c ratio of 0.78, the intersection is expected to be able to handle the additional Site-generated traffic. The additional northbound and southbound turn lanes into TV Place will provide vehicles space to turn without blocking through traffic and will also be able to accommodate any potential future development along TV Place.

Transportation Demand Management

The Proponent is exploring a wide array of TDM measures to offer as a means to reduce single occupant driving and increase use of alternative forms of transportation to access the workplace.

- › Providing an Employee Transportation Advisor who will coordinate with the 128 Business Council;
- › Provide covered and secure bicycle parking spaces on-site;
- › Exploring the feasibility of providing shuttle service connectivity to nearby public transportation nodes (commuter rail and Green Line);

- › Requiring tenants to provide a 50 percent transit pass subsidy for their employees;
- › Carpool assistance and incentives;
- › Emergency ride home;
- › Bicycling/walking incentives and amenities;
- › Provide on-site locker rooms and showers for employees;
- › Offer on-site amenities for employees to reduce mid day trip making;
- › Telecommuting and compressed workweeks, when feasible;
- › Display in the Main Lobby transportation-related information for tenants' employees and visitors;
and
- › Promotional efforts.

Transportation Management Association

The Transportation Management Association serving businesses in Needham is the 128 Business Council. The Proponent will join and become an active member of the 128 Business Council.

Transportation Monitoring

The Proponent is committed to a robust transportation monitoring program to evaluate the effectiveness of its TDM program and to measure the Project's impacts on the transportation network. As detailed next, the monitoring program will include the annual collection of traffic counts and parking garage activity by tenants' employees and visitors to the Project Site. The transportation monitoring program will begin six months after full occupancy of the proposed development and continue for a period of five years. The results of each transportation monitoring program will be summarized in a report and provided to MassDOT and to the Town of Needham.

Traffic Monitoring: Vehicle Volumes and Parking Activity

Annual traffic counts will be conducted both on-Site and off-Site to evaluate the impact of the Project as compared to the estimated impact as outlined in this report.

On-Site Traffic Monitoring: Parking Activity

The actual number of weekday morning peak hour, weekday evening peak hour, and weekday daily vehicle trips generated by the Project will be measured using simultaneous automatic traffic recorder (ATR) counts or via a parking revenue control system at each parking entrance/exit for a continuous 24-hour period on a typical weekday.

These volumes entering and exiting each parking facility will be compared against the estimated Project-generated vehicle trips presented in this report to determine if the Project Site is generating trips at a rate higher or lower than what was projected.

Off-Site Traffic Monitoring

The traffic monitoring program will include collecting weekday morning and weekday evening peak period turning movement counts at the following study area intersections:

- › Central Avenue at Gould Street
- › Gould Street at TV Place
- › Gould Street at the Project Site driveway
- › Highland Avenue at Gould Street / Hunting Road

These area intersections represent the key vehicular gateways to the Project Site and are the focus of the proposed roadway mitigation.

In addition to peak period turning movement counts at the identified intersections above, the traffic monitoring program will include collecting continuous 48-hour ATR counts along Gould Street north of Highland Avenue.

These counts will be collected on a non-holiday week, during midweek days.

REF.: NEX-2200133.00

May 27, 2022

Ms. Lee Newman
Director of Planning and Community Development
Needham Department of Public Works
500 Dedham Avenue
Needham, MA 02492

**SUBJECT: Highland Science Center, Gould Street, Needham, MA
Traffic Peer Review**

Dear Ms. Newman:

On behalf of the Town of Needham, **Greenman-Pedersen Inc.** (GPI) performed a review of the *Transportation Impact and Access Study*¹ (TIAS) prepared by Vanasse Hangen Brustlin, Inc. (VHB) for review by the Town of Needham for the proposed Highland Science Center in Needham, Massachusetts. The site is located on the northeast corner of the intersection of Highland Avenue and Gould Street, and currently contains a Muzi Ford car dealership, Charles River Media Group and WCVB Channel 5. The site was recently part of a rezoning effort by the Town to allow for the development of up to ±880,000 square feet (SF) of office, research and development, and ancillary retail and service space. GPI has reviewed the TIAS and supporting traffic analysis for consistency with the goals and studies prepared as part of the Town's rezoning, as well as for compliance with the Massachusetts Department of Transportation (MassDOT) guidelines for traffic impact analysis and general engineering practice. The following summarizes GPI's comments related to the TIAS.

General Comments

1. As the project directly abuts the state highway layout (SHLO) on Interstate 95 / Route 128 and is anticipated to generate more than 3,000 vehicle trips per day (vpd), the project will require review by the Massachusetts Environmental Policy Act (MEPA) office in the form of a Environmental Notification Form (ENF) and a mandatory Environmental Impact Report (EIR). An ENF was prepared by the Applicant and noticed in the Environmental Monitor on April 8, 2022. The TIAS was included as a chapter within the ENF. A Certificate on the ENF was issued by MEPA on May 9, 2022. GPI previously provided comments to the MEPA office on behalf of the Town of Needham regarding the ENF, and a copy of these comments is included as an Attachment for reference. Many of GPI's comments were incorporated into the recommendations of the ENF Certificate, which include:
 - a) Table 2-9 of the ENF indicates that the traffic operations at the intersections of Highland Avenue / West Street will drop from LOS C to D and the operations of Highland Avenue / Gould Street / Hunting Road will degrade from LOS E to F as a result of the additional traffic generated by the project. The Applicant is requested to explore the feasibility of implementing additional measures to improve operations at these locations, including an additional northbound lane on Hunting Road.
 - b) Collision diagrams should be prepared for any study area intersections experiencing an average of more than 3.0 collisions per year and a crash rate higher than the statewide or district-wide average. The Applicant should investigate measures to improve safety and mitigate collision occurrence at any locations where five or more collisions of a similar type have occurred over the analysis period.

¹ *Transportation Impact and Access Study, Highland Science Center, Needham, Massachusetts*; prepared by Vanasse Hangen Brustlin, Inc. (VHB); March 2022.

- c) The Applicant should perform an estimate of the potential bicycle parking demand generated by the project to ensure adequate bicycle parking is provided for an effective Transportation Demand Management (TDM) program.
2. The project will also require a Vehicular Access Permit from MassDOT for the proposed change-in-use of the property, as well as for the construction of off-site roadway improvements within the SHLO. As such, the ENF was reviewed by the MassDOT District 6 office, as well as the Public-Private Development Unit (PPDU). The following comments from MassDOT were incorporated into the ENF Certificate issued by MEPA:
- a) The Applicant should evaluate queuing at the study area intersections to ensure that lengthier queues do not impact the operation of roadways and railways within the study area.
 - b) The Applicant should perform an analysis of the existing and proposed weave conditions on Highland Avenue to ensure that the increased traffic volumes will not lead to degraded safety conditions in the area of the I-95 / Highland Avenue interchange.
 - c) The Applicant should coordinate with the Massachusetts Bay Transit Authority (MBTA) to determine the feasibility of additional MBTA Bus Route 59 service closer to the project site and include feasible options in the Draft EIR.
 - d) MassDOT requests that the Applicant consider installing bicycle and pedestrian improvements on Highland Avenue at the I-95 Interchange to connect with the proposed Complete Streets improvements being installed as part of MassDOT Project #606635 along Highland Avenue.
 - e) The Applicant should provide a description of the methodology to be used to estimate the effectiveness of the proposed Transportation Demand Management (TDM) measures and discuss what remedial measures will be taken if the monitoring program indicates that the TDM program is less effective than anticipated in reducing single-occupant vehicle (SOV) trips and encouraging alternative means of travel to/from the site.
 - f) The proposed Transportation Monitoring Program should include a travel survey of employees and patrons of the site. Although MassDOT did not provide any further details on this request, it is assumed that the travel survey will be designed to verify the distribution of site-generated trips and mode share in order to assess the efficacy of the proposed TDM program.

Study Area

3. The TIAS includes an evaluation of the impact to traffic operations associated with the project at a total of twenty (20) intersections, which include all nine of the study intersections included as part of the *Traffic Impact Study*² prepared for the original rezoning. GPI concurs that the study area is appropriate for the size and scale of the development and includes those intersections which are likely to experience a measurable impact from the proposed redevelopment.

Existing Conditions

4. The TIAS included an evaluation of the operations of the study area intersections during the weekday AM and PM peak periods, which are consistent with typical commuter peaks on the adjacent roadway networks. GPI concurs that these time periods represent the critical time periods for analysis as they represent the peak hours of both adjacent street traffic and site-generated vehicle trips.

² *Traffic Impact Study, Muzi Motors Rezoning, Gould Street & Highland Avenue – Needham, Massachusetts*; prepared by Greenman-Pedersen, Inc. (GPI); October 2020.
2200133_2022-05-27_LTR_TIAS_Review

5. The Existing Conditions Vehicle Volumes were derived from traffic counts obtained from a number of sources, many of which were collected prior to the COVID-19 pandemic. New traffic counts were collected in July 2021 at the following intersections:
 - Central Avenue at Cedar Street
 - Central Avenue at Webster Street
 - Highland Avenue at Hunnewell StreetAll other traffic counts contained within the traffic study were collected pre-pandemic and adjusted to existing conditions utilizing MassDOT's approved Yearly Growth Factors and balancing between intersections. Regardless of which traffic count was collected more recently, the traffic volumes between intersections were always balanced upward to the higher traffic count. GPI concurs that this methodology is acceptable and will result in the most conservative (highest) estimate of existing traffic conditions through the study area intersections.
6. Traffic counts at many of the study area intersections were obtained from previously seasonally-adjusted traffic volumes from other traffic studies. However, raw traffic counts collected in April 2017 were obtained from the *Highland Avenue Reconstruction Functional Design Report*³ for the Highland Avenue / Webster Street intersection. Similarly, raw traffic counts collected in January 2018 were obtained from the *Northland Newton Development DEIR*⁴ for the Highland Avenue intersections with the I-95 Northbound and Southbound ramps. MassDOT Weekday Seasonal Factors data was provided in the TIAS Appendix for the 2019 year only. Since the traffic counts were collected in 2017 and 2018, it would be expected that seasonal adjustment factors for those years would have been used to seasonally adjust the raw traffic volumes. MassDOT's Weekday Seasonal Factors data for 2017 and 2019 both indicate that traffic volumes in April represent above-average conditions for Group Factors U3-U7. Therefore, no seasonal adjustment would be required for the Highland Avenue / Webster Street intersection. It is unclear what, if any, seasonal adjustment factor was applied to the volumes at the Highland Avenue intersections with the I-95 ramps. However, the MassDOT Weekday Seasonal Factors data for 2018 indicates that January traffic volumes for Factor Group U3 represent above-average month conditions. Therefore, no seasonal adjustment factor would be required for the Highland Avenue intersections with the I-95 ramps.
7. No adjustment was applied to the traffic volumes collected in July 2021 to account for any variations due to COVID-19. However, these traffic counts were balanced upward with traffic counts collected at adjacent intersections under pre-COVID conditions. GPI concurs that this methodology for adjustment is acceptable.

Collision History

8. Per MassDOT guidelines, collision diagrams should be prepared for any locations that experience an average of more than 3 crashes per year or a crash rate higher than the state or district-wide average. The intersection of Highland Avenue / West Street experienced an average of 4.4 crashes per year and a crash rate higher than the state and district-wide averages. Similarly, the Highland Avenue / Second Avenue intersection experiences an average of 6.6 collisions per year and a crash rate above the state and district-wide averages. Therefore, the Applicant should obtain detailed collision reports for these intersections and prepare collision diagrams to identify any collision patterns occurring at these locations, as well as potential measures to reduce the occurrence of such collisions.
9. The following additional intersections also experienced an average of more than three (3) collisions per year, and collision diagrams should be prepared to identify any collision patterns or potential mitigating measures at these intersections:
 - Highland Avenue / First Avenue
 - Hunting Road / Kendrick Street

³ *Highland Avenue Reconstruction Functional Design Report*; Prepared by Stantec, Inc.; August 2017.

⁴ *The Northland Newton Draft Environmental Impact Report*; Prepared by Vanasse Hangen Brustlin, Inc. (VHB); August 2020.
2200133_2022-05-27_LTR_TIAS Review

10. Although the intersection of Highland Avenue / Gould Street / Hunting Road also experienced more than three collisions per year, the crash rate was well below the state and district-wide averages. In addition, significant improvements were recently constructed by MassDOT that may reduce collisions at this location. Further, additional improvements are proposed at this intersection as mitigation for the proposed development, which may also impact collision occurrence. Therefore, preparation of a collision diagram for this location is not required. However, GPI recommends that the proposed Post-Occupancy Monitoring Program include a review of collisions occurring at this location following construction of the proposed mitigation measures to ensure that a new safety issue is not introduced.

2029 No-Build Conditions

11. The Applicant has projected traffic volumes to a seven-year design horizon consistent with MassDOT guidelines utilizing a background growth rate of 1.0 percent per year and adding traffic to be generated by other proposed or approved developments in the surrounding area. GPI concurs with this methodology.

Trip Generation

12. Table 3 of the TIAS notes that the existing site-generated trips were estimated based on empirical traffic counts collected at the site driveways, which show only 887 daily trips are currently generated by the site. It is important to note that these empirical counts were collected in the fall of 2021, during COVID, and as a result, may under-estimate the trips generated by the site pre-COVID when it was fully operational. The use of the lower existing site-generated trips will result in a more conservative (higher) estimate of the net increase in trips generated by the proposed redevelopment.
13. The Applicant has estimated the site-generated vehicle trips based on Institute of Transportation Engineers (ITE) trip generation rates for Land Use Codes (LUC) 710 (General Office Building), 760 (Research and Development Center) and 822 (Strip Retail Plaza (<40,000 sf)) and applied a modest credit for internal capture of trips shared between uses on the site. In addition, the Applicant has assumed that 25 to 40 percent of the retail trips will be from pass-by trips (vehicles already on the adjacent roadway network passing by the site while traveling to another destination). GPI concurs with this methodology.
14. Although the Applicant has proposed a significant Transportation Demand Management (TDM) program, the Applicant has not applied any reduction in vehicle trips generated by the project for the implementation of the TDM program. While GPI agrees that this methodology will result in the most conservative (worst case) estimate of project's impacts on traffic operations through the study area, it should not excuse the Applicant from developing an effective TDM program or identify target mode share goals for the proposed TDM program. The Applicant should estimate the potential mode share and vehicle trip reduction anticipated from implementing the proposed TDM program and identify mode share goals to be monitored and evaluated as part of the Post-Occupancy Monitoring Program.

Transportation Demand Management (TDM) Measures

15. The Applicant has proposed the following transit-related measures as part of the TDM program:
 - Explore the feasibility of providing shuttle service connectivity to nearby public transportation nodes (commuter rail and Green Line);
 - Require tenants to provide a 50 percent transit pass subsidy for their employees;
 - Carpool assistance and incentives;
 - Emergency ride home;
 - Display in the Main Lobby transportation-related information for tenants' employees and visitors; and

- Promotional efforts.

The Applicant should provide additional information on how carpool assistance and emergency ride home services will be provided, as well as what incentive program may be implemented. In addition to providing shuttle service to nearby commuter rail and Green Line services, the Applicant should explore the possibility of extending bus service to the site.

Bicycle Accommodations

16. Section 2.3.4.1 of the ENF notes that a total of 89 bicycle parking spaces will be provided indoors and outdoors, while the TIAS describes a total of only 70 bicycle parking spaces proposed on the site. The Applicant should clarify this discrepancy.
17. No description has been provided within the ENF or TIAS on how many bicycle parking spaces will be indoors and how many will be outdoors. The studies also do not contain any assessment of the potential bicycle parking demand that could be generated and the adequacy of the number of bicycle parking spaces provided to accommodate this demand. The Applicant should provide an evaluation of the potential bicycle parking demand to ensure that adequate bicycle parking is provided to encourage use of bicycle as a means of traveling to/from the site.

Proposed Mitigation

18. The TIAS describes geometric improvements that are proposed at the intersection of Highland Avenue / Gould Street / Hunting Road as mitigation for the project, which are shown graphically in Figure 16. The widening of the roadway that will be required to accommodate the additional lanes at this location will also likely require reconstruction of the traffic signal at this intersection to accommodate new signal indications and mast arms, as well as vehicle detection and pedestrian signal equipment. No mention of the signal upgrades was provided in the TIAS and no signal improvements are shown in Figure 16.
19. Figure 16 of the TIAS provides a graphic depiction of the roadway geometry proposed at the intersection of Highland Avenue / Gould Street / Hunting Road and along Gould Street fronting the site. The Figure does not include the Highland Avenue eastbound or Hunting Road northbound approaches to the intersection, so it is difficult to identify what, if any, improvements are proposed on those approaches. However, Figure 1.4 of the ENF also provides a similar graphic that includes all approaches to the intersection. While the geometry on the majority of the approaches appears consistent with the conceptual improvement sketches prepared as part of the former rezoning effort, the Hunting Road northbound approach to Highland Avenue and the receiving approach on Gould Street are inconsistent with the rezoning plans. The analysis and plans prepared as part of the rezone indicated that two through lanes would be required on Hunting Road with two receiving lanes on Gould Street to accommodate the traffic generated by the project. The capacity and queue analysis summarized in Table 15 of the TIAS indicates that even with the mitigation measures proposed by the Applicant, the Hunting Road northbound movement will operate over capacity at level-of-service (LOS) F during the weekday AM and PM peak hours under 2029 Build with Mitigation conditions. The Highland Avenue eastbound left-turn movement will also operate at LOS F during the weekday AM peak hour. Therefore, the Applicant should consider the feasibility of providing an additional northbound lane on Hunting Road to improve the capacity and operations of this intersection.
20. Figure 15 of the TIAS depicts improvements to be constructed at the Central Avenue / Gould Street intersection as mitigation for the project, which include restriping of Central Avenue to provide a westbound left-turn lane and installation of a fully-actuated traffic signal. The proposed signal equipment is not depicted on the plans. The Applicant should obtain survey information at this location to verify whether the proposed improvements can be constructed within the publicly-available right-of-way and whether any easements will

be required for the proposed signal equipment. In addition, the Applicant should perform vehicle turning movement analysis to verify that the proposed curb radii and STOP line locations will allow emergency vehicles and trucks to safely navigate the intersection without encroaching on opposing traffic flows.

Transportation Operations Analysis

21. According to Table 9, the Highland Avenue southbound approach to West Street will operate over capacity with long delays during the weekday PM peak hour under 2029 Build conditions, with an increase in delay of 22 seconds per vehicle generated by the project. The Applicant has not proposed any measures to mitigate this impact. The Applicant should investigate measures to mitigate this significant impact to operations.
22. The Highland Avenue eastbound through/right-turn movement at the intersection with Webster Street will operate over capacity during the weekday AM peak hour under 2029 Build conditions, with an increase in delay of 26 seconds per vehicle generated by the project. The Applicant has not proposed any measures to mitigate this impact. The Applicant should investigate measures to mitigate this significant impact to operations.
23. Although not heavily impacted by project-generated traffic, the Highland Avenue westbound left/through movement at the intersection with 1st Avenue will be well over capacity during the weekday PM peak hour under both 2029 No-Build and Build conditions. GPI recommends the Applicant consider measures to reduce delay and improve operations at this location.
24. Similarly, the Hunting Road northbound approach to Kendrick Street will be well over capacity during the weekday AM peak hour under 2029 No-Build and Build conditions. GPI recommends the Applicant consider options for reducing delay and improving operations at this location.
25. The Webster Street and Cedar Street approaches to Central Avenue are expected to operate well over capacity with long delays and queues under 2029 No-Build and Build conditions, particularly during the weekday AM peak hour. The Applicant should investigate options for improving the operations of these intersections, including conducting a signal warrant analysis to assess whether a warrant for installation of traffic signal will be met at either of these locations.
26. As noted in Comment 19, even with the proposed mitigation at the Highland Avenue / Gould Street / Hunting Road intersection, some movements will continue operating at LOS F under 2029 Build with Mitigation conditions. Therefore, the Applicant should investigate the feasibility of providing additional capacity at this location to accommodate 2029 Build traffic volumes.

Traffic Monitoring Program

27. The TIAS describes a transportation monitoring program that will be conducted post-occupancy to monitor parking occupancy and traffic operations at four of the study area intersections, including the site driveway. The Applicant should also provide monitoring of the effectiveness of the proposed TDM program in encouraging walking/biking, carpooling, and public transportation travel to/from the site.
28. The proposed traffic monitoring program will include the collection of vehicle turning movement counts during the weekday AM and PM peak periods at the following study area intersections:
 - Central Avenue / Gould Street
 - Gould Street / TV Place
 - Gould Street / Project Site Driveway
 - Highland Avenue / Gould Street / Hunting Road

GPI agrees that these represent the critical locations that would experience the greatest increase in traffic due to the project. However, should the result of the monitoring study indicate that the actual traffic increase generated by the project exceeds the traffic projections contained within the ENF by ten percent or more, the study area for the monitoring program should be expanded to include additional locations to verify that the project's impacts does not create any operation deficiencies at nearby locations. In addition, the monitoring programs should include a capacity and queue analysis to verify the operations of each of the study area intersections under post-occupancy conditions. The monitoring program should also include the collection of daily traffic volumes on TV Place and the Project Site driveway to verify the daily traffic generated by the project.

Site Access and Circulation

29. Figure 2 of the TIAS provides a site plan depicting the proposed layout and traffic circulation on the site. The plan appears to indicate that a loading/unloading area will be provided at the front of the site between Buildings A and B. This loading area is located in close proximity of the signalized intersection of the main site driveway and Gould Street. Vehicles, particularly trucks, stopped in this area could cause a back up of traffic into Gould Street. The Applicant should consider modifications to the site plan that provide a clear separation of loading/unloading areas and through traffic access to the parking fields to ensure traffic does not back up onto Gould Street. In addition, the Applicant should consider limiting hours of deliveries to the site, as a condition of approval, to avoid deliveries occurring between 7:00 AM and 9:00 AM when a high volume of traffic may be entering the site from Gould Street to access the parking garage.
30. A large parking garage is proposed at the northerly end of the site, as well as a small surface parking lot near Gould Street. The Applicant should clearly define who will utilize the surface parking lot. In order to avoid congestion along the main drive aisle through the site, the surface parking lot should be restricted to use by accessible parking spaces, visitors, and brewery patrons (if a brewery is provided) only. All employees of both buildings, including brewery employees, should be directed to park in the parking garage.
31. The site plan included in Figure 2 does not depict any pedestrian connections between the proposed surface parking lot and the buildings. The Applicant should modify the site plan to provide fully accessible pedestrian routes between the surface parking lot and both buildings, as well as to the pedestrian loops around the site.
32. The entering travel lane on TV Place is aligned with the sidewalk as it passes by the proposed site driveway. In addition, the exiting lane west of the site driveway is aligned with the entering lane east of the driveway. This has the potential to create a head-on collision between drivers entering and exiting the site as they cross between lanes through the site driveway intersection with TV Place. It also has the potential for entering vehicles on TV Place to drive onto the sidewalk. The Applicant should modify the layout of TV Place to provide better alignment of entering and exiting travel lanes, which may involve additional widening of TV Place to the east of the site driveway and introduction of a raised or striped median island.
33. The Applicant should perform a vehicle turning movement analysis to verify that emergency vehicles and trucks can safely access and navigate the site. This includes delivery, postal, and trash removal vehicles. The Applicant should provide this turning analysis to the Needham Police and Fire Departments for verification that safe and adequate access is provided.
34. Table 15 of the TIAS indicates that queues of nearly 200 feet (eight vehicles) could occur in each lane exiting the site driveway during the weekday PM peak hour. Although the provided plan on Figure 2 is not scaled to be able to accurately measure the available stacking distance, it appears that only 60 feet of stacking distance is proposed in each lane on the site driveway approaching Gould Street before reaching the loading area. Therefore, the queues exiting the site will regularly back up into the loading area and around the corner beyond the driveway to the surface parking lot during the weekday PM peak hour. The Applicant should consider

Ms. Lee Newman
May 27, 2022
Page 8 of 8

modifications to the site plan to provide additional vehicle stacking exiting the site without interference with the loading area, parking areas, or on-site circulation.

Should you have any questions regarding these comments, please contact me directly at 603-766-5223.

Sincerely,

GREENMAN-PEDERSEN, INC.

A handwritten signature in blue ink, appearing to read 'Rebecca L. Brown', is positioned above the printed name.

Rebecca L. Brown, P.E.
Senior Project Manager

Attachments:

- MEPA ENF – Traffic Peer Review Comment Letter
- MassDOT Weekly Seasonal Factors

REF.: NEX-2200133.00

April 25, 2022

Ms. Lee Newman
Director of Planning and Community Development
Needham Department of Public Works
500 Dedham Avenue
Needham, MA 02492

**SUBJECT: Highland Science Center, Gould Street, Needham, MA
MEPA ENF – Traffic Peer Review**

Dear Ms. Newman:

On behalf of the Town of Needham, **Greenman-Pedersen Inc.** (GPI) performed a review of the *Environmental Notification Form*¹ (ENF) prepared by Vanasse Hangen Brustlin, Inc. (VHB) for review by the Massachusetts Environmental Policy Act (MEPA) office for the proposed Highland Science Center in Needham, Massachusetts. The site is located on the northeast corner of the intersection of Highland Avenue and Gould Street, and currently contains a Muzi Ford car dealership, Charles River Media Group and WCVB Channel 5. The site was recently part of a rezoning effort by the Town to allow for the development of up to ±880,000 square feet (SF) of office, research and development, and ancillary retail and service space. GPI has reviewed the ENF and supporting traffic analysis for consistency with the goals and studies prepared as part of the Town's rezoning, as well as for compliance with the Massachusetts Department of Transportation (MassDOT) guidelines for traffic impact analysis and general engineering practice. The following summarizes GPI's comments related to the ENF.

Transportation Section (Traffic Generation)

1. In Section 1.B on page 18 of the ENF, the Applicant notes that a MassDOT Vehicular Access Permit will be required for the potential need to modify roadway geometry within the state highway layout (SHLO). It should be noted that MassDOT will require a minimum of two permits for this development. One permit will be for the change-in-use of the property as the property directly abuts land owned by the Commonwealth of Massachusetts (Interstate 95 / Route 128) and the project will generate more than 2,000 daily vehicle trips. A separate MassDOT access permit will be required for the construction of any off-site roadway improvements within the SHLO.
2. The table in Section 11.A on page 19 of the ENF Form notes that the existing site-generated trips were estimated based on empirical traffic counts collected at the site driveways, which show only 887 daily trips are currently generated by the site. It is important to note that these empirical counts were collected in the fall of 2021, during COVID, and as a result, may under estimate the trips generated by the site pre-COVID when it was fully operational. The use of the lower existing site-generated trips will result in a more conservative (higher) estimate of the net increase in trips generated by the proposed redevelopment.
3. In Section III on page 19 of the ENF Form, the Applicant is requested to describe any transportation demand management measures (TDM) to be implemented to reduce single-occupant vehicle trips to the site, including any transit-related measures. The Applicant has not described any TDM measures related to transit services in this section. However, these measures are described in Section 2.7.2 if the *Transportation* chapter, which notes that the Applicant will:

¹ *Environmental Notification Form, Highland Science Center, Needham Heights, Massachusetts*; prepared by Vanasse Hangen Brustlin, Inc. (VHB); March 2022.

- Explore the feasibility of providing shuttle service connectivity to nearby public transportation nodes (commuter rail and Green Line);
- Require tenants to provide a 50 percent transit pass subsidy for their employees;
- Carpool assistance and incentives;
- Emergency ride home;
- Display in the Main Lobby transportation-related information for tenants' employees and visitors; and
- Promotional efforts.

The Applicant should provide additional information on how carpool assistance and emergency ride home services will be provided, as well as what incentive program may be implemented. In addition to providing shuttle service to nearby commuter rail and Green Line services, the Applicant should explore the possibility of extending bus service to the site.

Transportation Section (Roadways and Other Transportation Facilities)

4. In Section 1.B on page 21 of the ENF Form, the Applicant has stated that no permits will be required related to roadways or other transportation facilities. However, a MassDOT access permit will be required for the construction of off-site roadway improvements within the SHLO. Therefore, the Applicant should complete the *Transportation Facility Impacts* section of the ENF Form.

Air Quality Section

5. In Section 1.A on page 23 of the ENF Form, the Applicant notes that the project does not exceed any of the thresholds related to air quality. However, MEPA requires that an *Air Quality and Greenhouse Gas Emissions* study be conducted for all projects that require a mandatory Environmental Impact Report (EIR). As the project is anticipated to generate more than 3,000 daily vehicle trips and provide more than 300 parking spaces, a mandatory EIR will be required. Therefore, the project will exceed the thresholds for an Air Quality analysis, which will include an evaluation of impacts from both stationary and mobile sources of emissions.

Project Description

6. Section 1.3 of the ENF notes that geometric improvements are proposed at the intersection of Highland Avenue / Gould Street / Hunting Road. The widening of the roadway that will be required to accommodate the additional lanes at this location will also likely require reconstruction of the traffic signal at this intersection to accommodate new signal indications and mast arms, as well as vehicle detection and pedestrian signal equipment. No mention of the signal upgrades were provided in this section.
7. Figure 1.4 provides a graphic depiction of the roadway geometry proposed at the intersection of Highland Avenue / Gould Street / Hunting Road and along Gould Street fronting the site. While the geometry on the majority of the approaches appears consistent with the conceptual improvement sketches prepared as part of the former rezoning effort, the Hunting Road northbound approach to Highland Avenue and the receiving approach on Gould Street are inconsistent with the rezoning plans. The analysis and plans prepared as part of the rezone indicated that two through lanes would be required on Hunting Road with two receiving lanes on Gould Street to accommodate the traffic generated by the project. The capacity and queue analysis summarized in Table 2-15 of the ENF indicates that even with the mitigation measures proposed by the Applicant, the Hunting Road northbound movement will operate over capacity at level-of-service (LOS) F during the weekday AM and PM peak hours under 2029 Build with Mitigation conditions. The Highland Avenue eastbound left-turn movement will also operate at LOS F during the weekday AM peak hour. Therefore, the Applicant should consider the feasibility of providing an additional northbound lane on Hunting Road to improve the capacity and operations of this intersection.

Bicycle Accommodations

8. Section 2.3.4.1 of the ENF notes that a total of 89 bicycle parking spaces will be provided indoors and outdoors, but no description is given on how many spaces will be indoors and how many will be outdoors. The study also does not contain any assessment of the potential bicycle parking demand that could be generated and the adequacy of the number of bicycle parking spaces provided to accommodate this demand.

Collision History

9. Table 2-2 of the ENF does not provide a calculation of the crash rates (in crashes per million entering vehicles) experienced at any of the study area intersections. The crash rate is utilized to assess the significance of the crash occurrence at a study intersection by comparing the crash rate experienced to the statewide and district-wide averages for similar intersections and/or roadway segments. In addition, per MassDOT guidelines, collision diagrams should be prepared for any locations that experience an average of more than 3 crashes per year or a crash rate higher than the state or district-wide average. The Applicant should calculate the crash rates for all study area intersections and prepare collision diagrams, as necessary, to identify collision patterns at the study area intersections. For any location where 5 or more crashes of a similar type occurred over the analysis period, the Applicant should investigate measures to improve safety and mitigate collision occurrence.

Transportation Operations Analysis

10. According to Table 2-9, the Highland Avenue southbound approach to West Street will operate over capacity with long delays during the weekday PM peak hour under 2029 Build conditions, with an increase in delay of 22 seconds per vehicle generated by the project. The Applicant has not proposed any measures to mitigate this impact. The Applicant should investigate measures to mitigate this significant impact to operations.
11. The Highland Avenue eastbound through/right-turn movement at the intersection with Webster Street will operate over capacity during the weekday AM peak hour under 2029 Build conditions, with an increase in delay of 26 seconds per vehicle generated by the project. The Applicant has not proposed any measures to mitigate this impact. The Applicant should investigate measures to mitigate this significant impact to operations.
12. Although not heavily impacted by project-generated traffic, the Highland Avenue westbound left/through movement at the intersection with 1st Avenue will be well over capacity during the weekday PM peak hour under both 2029 No-Build and Build conditions. GPI recommends the Applicant consider measures to reduce delay and improve operations at this location.
13. Similarly, the Hunting Road northbound approach to Kendrick Street will be well over capacity during the weekday AM peak hour under 2029 No-Build and Build conditions. GPI recommends the Applicant consider options for reducing delay and improving operations at this location.
14. The Webster Street and Cedar Street approaches to Central Avenue are expected to operate well over capacity with long delays and queues under 2029 No-Build and Build conditions, particularly during the weekday AM peak hour. The Applicant should investigate options for improving the operations of these intersections, including conducting a signal warrant analysis to assess whether a warrant for installation of traffic signal will be met at either of these locations.
15. As noted in Comment 7, even with the proposed mitigation at the Highland Avenue / Gould Street / Hunting Road intersection, some movements will continue operating at LOS F under 2029 Build with Mitigation conditions. Therefore, the Applicant should investigate the feasibility of providing additional capacity at this location to accommodate 2029 Build traffic volumes.

Traffic Monitoring Program

16. Section 2.7.3 of the ENF describes a transportation monitoring program that will be conducted post-occupancy to monitor parking occupancy and traffic operations at four of the study area intersections, including the site driveway. The Applicant should also provide monitoring of the effectiveness of the proposed TDM program in encouraging walking/biking, carpooling, and public transportation travel to/from the site.
17. The proposed traffic monitoring program will include the collection of vehicle turning movement counts during the weekday AM and PM peak periods at the following study area intersections:
- Central Avenue / Gould Street
 - Gould Street / TV Place
 - Gould Street / Project Site Driveway
 - Highland Avenue / Gould Street / Hunting Road

GPI agrees that these represent the critical locations that would experience the greatest increase in traffic due to the project. However, should the result of the monitoring study indicate that the actual traffic increase generated by the project exceeds the traffic projections contained within the ENF by ten percent or more, the study area for the monitoring program should be expanded to include additional locations to verify that the project's impacts does not create any operation deficiencies at nearby locations. In addition, the monitoring programs should include a capacity and queue analysis to verify the operations of each of the study area intersections under post-occupancy conditions. The monitoring program should also include the collection of daily traffic volumes on TV Place and the Project Site driveway to verify the daily traffic generated by the project.

Should you have any questions regarding these comments, please contact me directly at 603-766-5223.

Sincerely,

GREENMAN-PEDERSEN, INC.



Rebecca L. Brown, P.E.
Senior Project Manager

Massachusetts Highway Department
Statewide Traffic Data Collection
2017 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.30	1.23	1.21	1.04	0.98	0.92	0.86	0.81	0.95	0.99	1.03	1.10	0.80
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.05	1.01	1.04	0.99	0.94	0.93	0.91	0.92	0.96	0.94	1.01	1.03	0.97
R4-R7	1.10	1.07	1.09	1.00	0.95	0.89	0.88	0.87	0.92	0.95	1.04	1.09	0.93
U1-Boston	1.01	1.04	0.99	0.94	0.93	0.92	0.96	0.93	0.94	0.93	0.95	0.98	0.95
U1-Essex	1.04	1.05	1.00	0.96	0.93	0.89	0.90	0.90	0.93	0.93	0.98	1.03	0.90
U1-Southeast	1.07	1.05	1.02	0.97	0.95	0.90	0.89	0.88	0.92	0.94	0.98	1.01	0.97
U1-West	1.00	0.96	0.94	0.92	0.93	0.92	0.95	0.93	0.92	0.92	0.97	0.97	0.89
U1-Worcester	1.10	1.10	1.04	0.97	0.95	0.94	0.93	0.91	0.95	0.96	0.98	1.04	0.89
U2	1.01	1.03	0.98	0.95	0.93	0.91	0.94	0.92	0.95	0.95	0.95	0.97	0.98
U3	1.03	1.05	1.01	0.95	0.92	0.90	0.94	0.93	0.93	0.92	0.96	0.99	0.96
U4-U7	1.06	1.05	1.02	0.96	0.92	0.89	0.95	0.95	0.92	0.92	0.98	1.03	0.98
Rec - East	1.18	1.17	1.08	1.03	0.95	0.87	0.83	0.83	0.97	0.98	1.19	1.19	0.98
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.95

Round off:

0-999 = 10

>1000 = 100

U = Urban

R = Rural

1 - Interstate

2 - Freeway and Expressway

3 - Other Principal Arterial

4 - Minor Arterial

5 - Major Collector

6 - Minor Collector

7 - Local Road and Street

Recreational - East Group - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.

Recreational - West Group - Continuous Stations 2 and 189 including stations

1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114,1116,2196,2197 and 2198.

Massachusetts Highway Department
Statewide Traffic Data Collection
2018 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.37	1.26	1.30	1.08	0.97	0.93	0.87	0.83	0.96	0.98	1.05	1.13	0.78
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.15	1.06	1.07	1.00	0.89	0.88	0.89	0.89	0.95	0.92	1.02	1.01	0.98
R4-R7	1.10	1.07	1.03	1.00	0.90	0.92	0.94	0.94	0.96	0.94	1.03	1.02	0.93
U1-Boston	1.05	0.98	1.01	0.93	0.92	0.91	0.95	0.93	0.94	0.92	0.96	0.99	0.96
U1-Essex	1.05	1.01	1.04	0.93	0.92	0.89	0.90	0.90	0.94	0.93	0.98	1.01	0.91
U1-Southeast	1.11	1.05	1.07	0.99	0.93	0.89	0.88	0.87	0.93	0.95	1.01	1.05	0.98
U1-West	1.15	1.08	1.07	0.98	0.94	0.92	0.92	0.88	0.92	0.91	1.00	1.06	0.83
U1-Worcester	1.18	1.11	1.09	0.99	0.95	0.94	0.95	0.91	0.97	0.97	1.01	1.05	0.87
U2	1.04	0.99	0.99	0.94	0.92	0.90	0.93	0.91	0.94	0.92	0.96	0.98	0.99
U3	0.99	1.00	1.02	0.96	0.91	0.89	0.92	0.90	0.95	0.92	1.01	0.97	0.97
U4-U7	1.03	1.02	0.97	0.95	0.88	0.89	0.96	0.93	0.94	0.93	1.00	1.00	0.99
Rec - East	1.22	1.15	1.09	1.12	0.90	0.89	0.82	0.83	0.92	0.98	1.06	1.08	0.99
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.97

Round off:

0-999 = 10

>1000 = 100

U = Urban

R = Rural

1 - Interstate

2 - Freeway and Expressway

3 - Other Principal Arterial

4 - Minor Arterial

5 - Major Collector

6 - Minor Collector

7 - Local Road and Street

Recreational - East Group - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.

Recreational - West Group - Continuous Stations 2 and 189 including stations

1066,1067,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1113,1114,1116,2196,2197 and 2198.

Massachusetts Highway Department
 Statewide Traffic Data Collection
 2019 Weekday Seasonal Factors

Factor Group	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Axle Factor
R1	1.22	1.14	1.12	1.06	1.00	0.96	0.87	0.85	0.96	0.99	1.04	1.12	0.85
R2	0.95	0.96	0.98	0.97	0.97	0.93	0.97	0.94	0.96	0.90	0.92	0.93	0.96
R3	1.15	1.06	1.07	1.00	0.89	0.88	0.89	0.89	0.95	0.92	1.02	1.01	0.97
R4-R7	1.09	1.09	1.11	1.02	0.96	0.92	0.89	0.89	0.99	0.98	1.09	1.13	0.98
U1-Boston	1.03	1.01	0.98	0.94	0.94	0.92	0.95	0.93	0.94	0.94	0.97	1.04	0.96
U1-Essex	1.09	1.06	1.03	0.99	0.94	0.90	0.88	0.86	0.93	0.94	0.99	1.06	0.93
U1-Southeast	1.06	1.05	1.01	0.97	0.95	0.93	0.93	0.90	0.94	0.94	0.98	1.04	0.98
U1-West	1.19	1.14	1.09	0.95	0.92	0.89	0.89	0.86	0.91	0.95	0.97	1.07	0.84
U1-Worcester	1.02	1.04	0.97	0.94	0.93	0.91	0.95	0.91	0.93	0.92	0.95	1.10	0.88
U2	1.01	1.00	0.94	0.93	0.91	0.89	0.93	0.90	0.90	0.91	0.94	1.02	0.99
U3	1.06	1.03	0.98	0.94	0.93	0.91	0.95	0.91	0.92	0.93	0.97	1.00	0.98
U4-U7	1.01	1.00	0.95	0.92	0.88	0.86	0.92	0.91	0.92	0.94	0.99	1.04	0.99
Rec - East	1.04	1.16	1.12	0.98	0.92	0.88	0.77	0.81	0.94	1.02	1.08	1.12	0.99
Rec - West	1.30	1.23	1.32	1.18	0.95	0.82	0.70	0.69	0.97	0.96	1.16	1.15	0.98

Round off:

0-999 = 10

>1000 = 100

U = Urban

R = Rural

1 - Interstate

2 - Freeway and Expressway

3 - Other Principal Arterial

4 - Minor Arterial

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Recreational - East Group - Cape Cod (all towns) including the town of Plymouth south of Route 3A (stations 7014,7079,7080,7090,7091,7092,7093,7094,7095,7096,7097,7108 and 7178), Martha's Vineyard and Nantucket.

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TOWN OF NEEDHAM

TOWN HALL
1471 Highland Avenue
Needham, MA 02492-2669

Design Review Board

Memo: Project review, 557 Highland Avenue

May 16, 2022

The Board reviewed the design drawings for the development at 557 Highland Avenue, the former Muzi Motors site.

The DRB reviewed the project from the perspectives of overall site organization, general landscape concepts and amenities; building massing, materials, fenestration; Parking garage design, and site and building lighting.

The Board approved of the general site organization and building locations. The organization allowed for landscaping amenities at various locations that will be accessible to the public. The Board discussed the main entrance location off of Gould Street. There was some question about the closeness of the site entrance to Highland Ave intersection. The applicant noted the proposed installation of turning lanes, signalization of the entrance intersection and the alignment with the Wingate entrance as key reasons for that entry location. The Board agreed with the decision.

The DRB believed the paved plaza related to the proposed retail area was a good design element. The Board expressed some concern with the required setbacks on Gould and Highland not being utilized well, and the development of the plaza adjacent to the proposed retail area will be a good use of the setback area. The applicant proposes a walking path with fitness stops around the entire site. The path material is not yet determined but is expected to be some sort of pervious surface. Other amenities include using a retention pond in the rear of the site to create a water feature. They also propose a small water feature at the corner of Highland and Gould, a remake of a feature the previous site had at that location. The buffer zone area next to the surface parking area is also planned to have an area for use by the public. The applicant is having discussions with the neighborhood about what exactly it may be. The DRB considers all these elements helpful to integrate the development into the town.

The DRB reviewed the general landscaping concepts illustrated in the presentation. While they did review the plant list with the applicant, there was not a lot of detail shown on the plan. The applicant explained that they are working with the neighborhood on landscaping issues and will have more detail once that work is complete. The development will strive to have plant varieties that will provide seasonal color, not just summer vegetation. The Board asked that they return to the DRB once a more detailed plan is developed. The DRB asked that native species be used as much as possible.

The applicant stated the trees will be 3.5-4" caliper. The Board agrees this will provide more of an impact right from the beginning rather than planting saplings. The exact species and locations are being discussed with the neighborhood at this time.

The plan at this time illustrates large areas of lawn, and the Board recommends more of a mix of different grasses and planting beds rather than simply grass lawn areas.

The Board suggested that plant screening on areas along the walking path would be beneficial. Especially along Highland Avenue where the walk is close to the street. It is a very busy street, and some screening would make pedestrians more comfortable. Screening could also be useful along the plaza space.

Site lighting will be a mix of pedestrian and parking area lighting. Fixtures will be dark sky compliant. The Board asked that information on the final fixture selection be submitted to the DRB. The applicant did not expect much lighting on the building itself. The Board did not review any information on lighting on the building.

The building design and massing was approved by the Board. The design has a mix of precast GFRC finish, which can be colored and textured in a variety of ways, and metal / glass curtain wall. The applicant will supply a sample of the material to the Community Development office and DRB members can see the sample there.

The design does well breaking up long facades with changes in materials and with the insertion of small outdoor spaces on the upper floors. One suggestion was to consider using a lighter colored mechanical screen. A lighter color could help moderate the mass of the building as a transition to the lighter sky.

There was a discussion of the garage doors on the ground level walls each side of the main entrance. They appear to be a large single panel. The Board suggested the applicant could consider something with more detail to break it up.

The Parking Garage is a precast concrete structure. The design proposes a finish look with similar colors to those on the buildings. The columns will not be flush with the panels to break up the horizontal lines. Decorative fabric panels will be added to create visual interest and screen the garage. The elevator/stair tower would be finished in a different color, with a perforated metal panel accent.

The DRB discussed some of the issues they had with a similar structure in the N2 district. They suggested that the screens not simply be rectangles on frames attached to the façade. The frame could be designed as more of an architectural feature, possibly extending beyond the banners, or above the height of the garage. Screening could be more than one layer, of different heights, or of varied shapes. The applicant should pay special attention to the Gould Street side of the building and consider where the banners are placed, not simply the centers of each side of the garage structure.

Garage lighting needs to be carefully considered. The installation should be done in a way that minimizes the lighting being viewed from outside the site. The applicant stated the lights will be installed in the recessed portions of the precast structure, limiting their visibility. The fixtures themselves will have stages of brightness related to the activity level; low for pedestrian, medium for few cars, brightest for the most activity. The Board believes the proposed lighting and installation should help mitigate the amount of visibility the garage lighting will have off the site.

Overall the Board approved of the project design. They asked the applicant to provide an update on the landscape plan at some point during the Planning Board review process, to provide information on site lighting fixtures, and to provide a sample of the exterior finishes.

End of comments



Town of Needham
Building Department
500 Dedham Ave.
Needham, MA 02492

Tel. 781-455-7550 x 308

May 25, 2022

Town of Needham
Planning Board
500 Dedham Avenue
Needham, MA. 02492

Re: 557 Highland Ave./ Highland Innovation Center

Dear Board Members,

Please be advised that The Building Department has been part of several meetings between the applicant The Bulfinch Companies and town staff and consultants. Many of the questions that we had during this process have been addressed as far as the site is concerned. The project is still under design and in the early stages for Building, Fire and Mechanical questions currently.

As stated, before site access for pedestrian and vehicle traffic were addressed, fire access around the site was addressed, surface and garage parking were addressed. Water supply and flow for fire protection, and hydrants are under design, locations of hydrants were discussed with the Needham fire consultant.

The site as presented appears to meet the zoning regulations for the site, Special Permits are required for some dimensional requirements based on the design of the structures. The Building Department has no additional questions or comments currently and will continue to work with the applicant on the technical designs of the project.

David A Roche
Building Commissioner
Town of Needham

From: [Tara Gurge](#)
To: [Alexandra Clee](#)
Cc: [Timothy McDonald](#)
Subject: RE: Public Health Division's comments RE: #577 Highland Ave. proposal
Date: Friday, May 27, 2022 5:45:09 PM
Attachments: [image002.png](#)
[image003.png](#)

Hello Alex –

Here are the Public Health Division comments for the proposal located at #557 Highland Avenue. See below:

- Any retail/food establishments proposed in the buildings located on this property would need an online Food Permit Plan Review application completed, along with proposed food establishment design plans, which will need to be submitted and reviewed and approved by the Public Health Division prior to start of construction. Here is the direct link to the online Food Establishment Permit Plan Review application - <https://needhamma.viewpointcloud.com/categories/1073/record-types/1006516> .
- Please keep in mind, if a food establishment plan review is approved, sufficient space must be made available in the parking lot for both a solid waste (trash) dumpster and a separate recycling dumpster, for each food establishment, along with waste oil/grease containment (if applicable.) These dumpsters must be placed in an easily accessible area outside the facility, close to each food establishment. An exterior grease interceptor may also need to be installed.
- The following info. was previously provided to Robert Schlager, Bulfinch President, back on 4/26/22, re: his inquiry on his wastewater reuse proposal for this project - Here is the Massachusetts Dept. of Environmental Protection's (MassDEP) direct website link to their wastewater reuse program - <https://www.mass.gov/service-details/wastewater-reclaimed-water>. This proposal would need to meet MassDEP's approval for reclaiming water, specifically for - Cooling tower water, toilet and urinal flushing, boiler feed, industrial process water and irrigation for landscaped areas, etc. All these uses are allowed under 314 CMR 20.00., if approved.
- If a Biotech laboratory is proposed for this site, please ensure that the following online permit application is submitted to the Public Health Division for our review and approval - <https://needhamma.viewpointcloud.com/categories/1073/record-types/1006513> . Proper Biohazardous waste containment will need to be provided on site.
- Due to the environmental soil contamination that was discovered on the property during your environmental assessment that was conducted that you informed us about, we advise you to continue working with William Burns, Licensed Site Professional (LSP), LEP with McPHAIL ASSOCIATES, LLC on your ongoing clean-up protocols, and copies of these clean-up reports must continue to be submitted to the Public Health Division for our review for our files. Any updates or changes to your current LSP that is overseeing this clean-up, must be provided for our records.

Please let us know if you need additional information or have any follow-up questions on those requirements.

Thanks,



TARA E. GURGE, R.S., C.E.H.T., M.S. (she/her/hers)
ASSISTANT PUBLIC HEALTH DIRECTOR
Needham Public Health Division
Health and Human Services Department
178 Rosemary Street
Needham, MA 02494
Ph- (781) 455-7940; Ext. 211/Fax- (781) 455-7922
Mobile- (781) 883-0127
Email - tgurge@needhamma.gov
Web- www.needhamma.gov/health



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[Follow Needham Public Health on Twitter!](#)

From: Alexandra Clee <aclee@needhamma.gov>
Sent: Wednesday, May 25, 2022 1:49 PM
To: Carys Lustig <clustig@needhamma.gov>; Thomas Ryder <tryder@needhamma.gov>; John Schlittler <JSchlittler@needhamma.gov>; Dennis Condon <DCondon@needhamma.gov>; Timothy McDonald <tmcdonald@needhamma.gov>; Tara Gurge <TGurge@needhamma.gov>; Deb Anderson <andersond@needhamma.gov>; David Roche <droche@needhamma.gov>
Cc: Lee Newman <LNewman@needhamma.gov>; Elisa Litchman <elitchman@needhamma.gov>
Subject: RE: request for comment - 577 Highland Ave

Dear all,

As a reminder, we would appreciate your comments on this application as soon as you are able.

Thanks, alex.

Alexandra Clee
Assistant Town Planner
Needham, MA
781-455-7550 ext. 271

www.needhamma.gov

From: Alexandra Clee

Sent: Tuesday, April 19, 2022 4:17 PM

To: Carys Lustig <clustig@needhamma.gov>; Thomas Ryder <tryder@needhamma.gov>; John Schlittler <JSchlittler@needhamma.gov>; Dennis Condon <DCondon@needhamma.gov>; Timothy McDonald <tmcdonald@needhamma.gov>; Tara Gurge <TGurge@needhamma.gov>; Deb Anderson <andersond@needhamma.gov>; 'David Roche (droche@needhamma.gov)' <droche@needhamma.gov>

Cc: Lee Newman <LNewman@needhamma.gov>; Elisa Litchman <elitchman@needhamma.gov>

Subject: RE: request for comment - 577 Highland Ave

Apologies, one additional application item:

6. Fiscal Impact Analysis, prepared for rezoning, prepared by Barrett Planning Group, Inc., dated March 20, 2021.

Thanks, alex.

Alexandra Clee
Assistant Town Planner
Needham, MA
www.needhamma.gov

From: Alexandra Clee

Sent: Tuesday, April 19, 2022 4:08 PM

To: Carys Lustig <clustig@needhamma.gov>; Thomas Ryder <tryder@needhamma.gov>; John Schlittler <JSchlittler@needhamma.gov>; Dennis Condon <DCondon@needhamma.gov>; Timothy McDonald <tmcdonald@needhamma.gov>; Tara Gurge <TGurge@needhamma.gov>; Deb Anderson <andersond@needhamma.gov>; David Roche (droche@needhamma.gov) <droche@needhamma.gov>

Cc: Lee Newman <LNewman@needhamma.gov>; Elisa Litchman <elitchman@needhamma.gov>

Subject: request for comment - 577 Highland Ave

Dear all,

We have received the application materials for the proposal to redevelop 557 Highland Avenue. the information can be found on the website: <https://www.needhamma.gov/Archive.aspx?ADID=9611>

Although we operate electronically much of the time lately, I am sending hard copies for this project.

The Planning Board has scheduled this matter for June 7, 2022. Please send your comments by Wednesday May 25, 2022 at the latest.

Please note: These are the same materials that we distributed (electronically) for the Development Review Team meeting to be held April 26. We are also seeking staff comment, which can arrive after the DRT meeting.

The documents attached for your review are as follows:

1. Application for the Major Project Special Permit No. 2022-02, Applicant 557 Highland, LLC, dated April 7, 2022.
2. Letter directed to Planning Board Members, from Timothy Sullivan, dated April 5, 2022.
3. Plan set consisting of 44 pages, dated March 30, 2022.
4. Transportation Impact and Access Study, prepared by VHB, 101 Walnut Street, PO Box 9151, Watertown, MA, dated March 2022. (Appendices only sent to Engineering)
5. Stormwater Report, prepared by VHB, 101 Walnut Street, PO Box 9151, Watertown, MA, dated March 2022.

Thank you, alex.

Alexandra Clee
Assistant Town Planner
Needham, MA
781-455-7550 ext. 271
www.needhamma.gov

From: [Dennis Condon](#)
To: [Alexandra Clee](#)
Cc: [Lee Newman](#)
Subject: RE: request for comment - 577 Highland Ave
Date: Wednesday, June 1, 2022 2:39:14 PM
Attachments: [image001.png](#)
[image002.png](#)

Hi Alex,

The Fire dept. has met with the development team for this site to express our concerns and made a number of recommendations, which are to be addressed. Of prime concern was circulation for fire apparatus and the ability of fire crews to be able to access various locations of each building from the exterior. This is especially true of the South and North buildings along Highland Avenue and the Rte 128 ramp areas. Initial plans had the fire responding units to stage remotely from the building on Highland Avenue or the off ramp this would create a safety issue for both responding personnel and building occupants and was considered to be inadequate. Since these are State roads MA DOT might have also had objections with this staging plan. A solution was arrived at by incorporating the proposed fitness path to be dual purposed to accommodate fire apparatus. This would include paving wide enough for ladder truck operations. By revising the plan this way will allow responding units sufficient circulation to reach at least three side of each building. While full access around each building is ideal, it is not always practical. We feel the solution arrived at will remedy what might be a significant public safety issue in the event of a major response to this large site. We further requested that this pathway be kept free of snow throughout the winter, so that responding apparatus be able to gain sufficient access regardless of time of year. We will continue to work with the developer throughout the project construction to ensure all code and safety regulations are met.

Thanks,
Dennis

Dennis Condon
Chief of Department
Needham Fire Department
Town of Needham
(W) 781-455-7580
(C) 508-813-5107
Dcondon@needhamma.gov



Follow on Twitter: Chief Condon@NeedhamFire



Watch Needham Fire Related Videos on YouTube @ Chief Condon



From: Alexandra Clee <aclee@needhamma.gov>

Sent: Wednesday, May 25, 2022 1:49 PM

To: Carys Lustig <clustig@needhamma.gov>; Thomas Ryder <tryder@needhamma.gov>; John Schlittler <JSchlittler@needhamma.gov>; Dennis Condon <DCondon@needhamma.gov>; Timothy McDonald <tmcdonald@needhamma.gov>; Tara Gurge <TGurge@needhamma.gov>; Deb Anderson <andersond@needhamma.gov>; David Roche <droche@needhamma.gov>

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Alexandra Clee
Assistant Town Planner
Needham, MA
781-455-7550 ext. 271
www.needhamma.gov

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Sent: Tuesday, April 19, 2022 4:17 PM

To: Carys Lustig <clustig@needhamma.gov>; Thomas Ryder <tryder@needhamma.gov>; John Schlittler <JSchlittler@needhamma.gov>; Dennis Condon <DCondon@needhamma.gov>; Timothy McDonald <tmcdonald@needhamma.gov>; Tara Gurge <TGurge@needhamma.gov>; Deb Anderson <andersond@needhamma.gov>; 'David Roche (droche@needhamma.gov)' <droche@needhamma.gov>

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Needham, MA
www.needhamma.gov

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Cc: Lee Newman <LNewman@needhamma.gov>; Elisa Litchman <elitchman@needhamma.gov>

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5. Stormwater Report, prepared by VHB, 101 Walnut Street, PO Box 9151, Watertown, MA, dated March 2022.

Thank you, alex.

Alexandra Clee
Assistant Town Planner
Needham, MA
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**TOWN OF NEEDHAM, MASSACHUSETTS
PUBLIC WORKS DEPARTMENT
500 Dedham Avenue, Needham, MA 02492
Telephone (781) 455-7550 FAX (781) 449-9023**

June 2, 2022

Needham Planning Board
Needham Public Service Administration Building
Needham, MA 02492

RE: Major Project Special Permit No. 2022-02
557 Highland Avenue- Bullfinch Companies

Dear Members of the Board,

The Department of Public Works has completed its review of the above referenced request for a Special Permit. The applicant requests to redevelop the former Muzi Ford and Chevrolet automotive dealerships and service centers and Muzi car wash.

The proposed project will consist of 2-buildings of a 497,694 sf office, laboratory, research and development, as well as 10,000 sf for retail uses. A proposed one level parking garage for each building as well as a separate stand alone garage to accommodate the parking needs.

The review was conducted in accordance with the Planning Board's regulations and standard engineering practice. The documents submitted for review are as follows:

1. Application for the Major Project Special Permit No. 2022-02, Applicant 557 Highland, LLC, dated April 7, 2022.
2. Letter directed to Planning Board Members, from Timothy Sullivan, dated April 5, 2022.
3. Plan set consisting of 44 pages, dated March 30, 2022.
4. Transportation Impact and Access Study, prepared by VHB, 101 Walnut Street, PO Box 9151, Watertown, MA, dated March 2022. (Appendices only sent to Engineering)
5. Stormwater Report, prepared by VHB, 101 Walnut Street, PO Box 9151, Watertown, MA, dated March 2022.

Our comments and recommendations are as follows:

Water Supply:

- We are seeking clarification for the facility's proposed water use of 129,172 GPD while the wastewater design flow generation is 54,554 GPD.
- We expect to work with the developer on determining the optimum water loop design. The current proposal shows a 10-inch water connection to the site off a 12-inch main on Gould Street and a connection to an existing 8-inch water main on TV place. The additional loop connection may be more optimum if connected from Highland Avenue in front of the development instead of, or an addition to the 8-inch on TV Place connection.

Traffic at the Intersection of Highland and Gould

- We concur with traffic comments/recommendations prepared by GPI in their April 25, 2022 letter to the Planning and Community Development Office.
- The proposed development revises the currently under construction traffic pattern from the MassDOT's Highland Avenue Corridor project. The newly proposed layout for this project shows sidewalks on both sides of the road and consists of one bike lane with 4-vehicle traffic lanes exiting Gould Street onto Highland Avenue, and one bike lane with one vehicle lane entering Gould Street from Highland Avenue.
- This new road design increases the traveled width by approximately 32-feet from intersection of Highland Avenue at Gould to just beyond TV Place. A portion of the design shows the travel lanes located on private property owned by the Development. We expect the Developer to work with the town in providing an alteration/taking plan and recordings for a new Road Right of Way layout on Gould Street and to optimize of the traffic signals at Highland at Gould.

Wastewater:

- According to the ENF filed by the applicant, the proposed project will generate a total of design wastewater flow of 54,554 GPD; this is an increase of 31,501 GPD from the existing facility to the town's sewer system. The applicant has been in contact with Town of Needham representatives and understands the requirements to have a rate of four gallons for every one gallon of sewage added to the system removed through an I/I program (attached regulations).
- For the new facility, four times the increased flow equates to a total of 126,004 GPD I/I removal anticipated from the development. This may be satisfied by either undertaking a construction project or paying a fee to the Town's I&I program at a rate of \$8.00 per gallon required to be removed. We are in the process of analyzing the target areas for the inflow/infiltration to be removed and expect to work with the developer through the site plan approval process.

Stormwater Report:

- As part of the NPDES requirements, the applicant must comply with the Public Outreach & Education and Public Participation & Involvement control measures. The applicant shall submit a letter to the town identifying the measures selected and dates by which the measures will be completed in order to incorporate it into the Planning Board's decision.

Other:

- If emergency generators are proposed, they should indicate on the plans with proper screening and noise reduction according to a sound study for the proposed generators.

If you have any questions regarding the above, please contact our office at 781-455-7550.

Truly yours,

Thomas Ryder
Town Engineer

From: [John Schlittler](#)
To: [Alexandra Clee](#)
Cc: [Lee Newman](#)
Subject: RE: request for comment - 577 Highland Ave
Date: Friday, June 3, 2022 3:37:20 PM

I have a couple of concerns regarding traffic.

Gould at Central, looks like one lane getting out to Central. I am concerned that traffic will back up and create a scenario where vehicles will use cut through streets that are off Gould.

I am also concerned that vehicles will use Noanett, Ellis, Kearney, Beech, and Arnold St daily to beat the light at Gould and Central. I think the first step would be to place signage at these locations restricting traffic between commuting hours in the morning and afternoon.

I am also concerned about the impact that this project will have on Hunting/Greendale Ave. Although the RT 128 on/off ramps are very close this stretch of RT 128 tends to be stop and go during peak hours. I often see vehicles getting off RT 128 to use surface streets Hunting/Greendale to bypass traffic delays. What can be done to address impact to those neighborhoods?

If there are going to be walking paths, bike access around the building then there should be enough space for emergency vehicle access around the entire project.

From: Alexandra Clee <aclee@needhamma.gov>
Sent: Tuesday, April 19, 2022 4:17 PM
To: Carys Lustig <clustig@needhamma.gov>; Thomas Ryder <tryder@needhamma.gov>; John Schlittler <JSchlittler@needhamma.gov>; Dennis Condon <DCondon@needhamma.gov>; Timothy McDonald <tmcdonald@needhamma.gov>; Tara Gurge <TGurge@needhamma.gov>; Deb Anderson <andersond@needhamma.gov>; David Roche <droche@needhamma.gov>
Cc: Lee Newman <LNewman@needhamma.gov>; Elisa Litchman <elitchman@needhamma.gov>
Subject: RE: request for comment - 577 Highland Ave

Apologies, one additional application item:

6. Fiscal Impact Analysis, prepared for rezoning, prepared by Barrett Planning Group, Inc., dated March 20, 2021.

Thanks, alex.

Alexandra Clee
Assistant Town Planner
Needham, MA
www.needhamma.gov

From: Alexandra Clee
Sent: Tuesday, April 19, 2022 4:08 PM

To: Carys Lustig <clustig@needhamma.gov>; Thomas Ryder <tryder@needhamma.gov>; John Schlittler <JSchlittler@needhamma.gov>; Dennis Condon <DCondon@needhamma.gov>; Timothy McDonald <tmcdonald@needhamma.gov>; Tara Gurge <TGurge@needhamma.gov>; Deb Anderson <andersond@needhamma.gov>; David Roche (droche@needhamma.gov) <droche@needhamma.gov>

Cc: Lee Newman <LNewman@needhamma.gov>; Elisa Litchman <elitchman@needhamma.gov>

Subject: request for comment - 577 Highland Ave

Dear all,

We have received the application materials for the proposal to redevelop 557 Highland Avenue. the information can be found on the website: <https://www.needhamma.gov/Archive.aspx?ADID=9611>

Although we operate electronically much of the time lately, I am sending hard copies for this project.

The Planning Board has scheduled this matter for June 7, 2022. Please send your comments by Wednesday May 25, 2022 at the latest.

Please note: These are the same materials that we distributed (electronically) for the Development Review Team meeting to be held April 26. We are also seeking staff comment, which can arrive after the DRT meeting.

The documents attached for your review are as follows:

1. Application for the Major Project Special Permit No. 2022-02, Applicant 557 Highland, LLC, dated April 7, 2022.
2. Letter directed to Planning Board Members, from Timothy Sullivan, dated April 5, 2022.
3. Plan set consisting of 44 pages, dated March 30, 2022.
4. Transportation Impact and Access Study, prepared by VHB, 101 Walnut Street, PO Box 9151, Watertown, MA, dated March 2022. (Appendices only sent to Engineering)
5. Stormwater Report, prepared by VHB, 101 Walnut Street, PO Box 9151, Watertown, MA, dated March 2022.

Thank you, alex.

Alexandra Clee
Assistant Town Planner
Needham, MA

781-455-7550 ext. 271

www.needhamma.gov

The following information regarding

557 Highland Avenue

Is being provided for the

first time in this packet

June 30, 2022

**BY HAND DELIVERY, OVERNIGHT DELIVERY
& ELECTRONIC MAIL**

Town of Needham Planning Board Members
Public Service Administration Building
500 Dedham Avenue
Needham, MA 02492
Attn: Lee Newman, Planning Director

Re: 557 Highland Avenue, Needham Heights, Massachusetts (the "Property")

Dear Planning Board Members:

As you know, we are counsel to 557 Highland, LLC, an affiliate of The Bulfinch Companies, Inc. (the "Applicant"), in connection with the redevelopment of the Property with a new, mixed-use development of office, laboratory, research and development uses, and retail/restaurant uses (the "Project"), all as described in our prior cover letter dated April 5, 2022 (the "Prior Letter") submitting the Application for Site Plan Review and issuance of Special Permits in connection with development of the Project (the "Application").

Since submission of our Prior Letter, the Applicant has engaged in seven (7) community meetings with the general public and multiple productive discussions with interested neighbors, members of the community at large, and representatives of various Town of Needham departments. At the first public hearing with the Planning Board on June 7, 2022 the Applicant discussed the following aspects of the Project:

- Project Architecture and Site Overview
- Landscape Architecture
- Sustainability
- Environmental Lab Safety
- Transportation
- Zoning Compliance

Based on feedback from the Planning Board, Town departments, and members of the community, and in anticipation of the next public hearing for the Project on July 7, 2022, enclosed as **Exhibit F** is a presentation that illustrates further refinements to the Project design based on input we have received to date, and outlines the transportation improvements proposed in connection with the Project.

Planning Board Members
June 30, 2022

Additionally, attached hereto as **Exhibit A** are the Applicant's responses to aggregated comments from the Planning Board Members at the June 7th hearing and attached hereto as **Exhibit B** are the Applicant's responses to comments received from other Town departments.

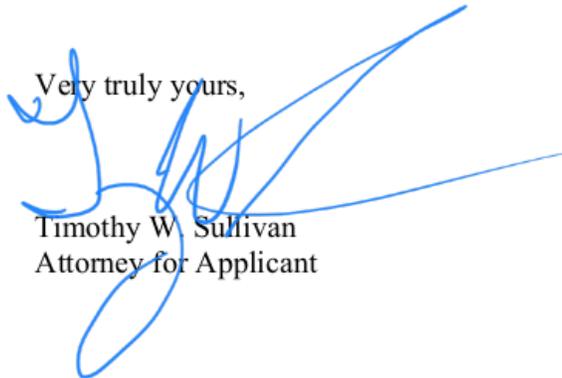
Furthermore, attached hereto as **Exhibit C**, is a response from VHB, Inc. to GPI's peer-review comments on the Project's Transportation Impact and Access Study and attached hereto as **Exhibit D** is a separate response from VHB, Inc. to Nitsch Engineering's peer-review comments on the Transportation Impact and Access Study.

Finally, attached hereto as **Exhibit E** is a copy of the Preliminary Exterior/Community Noise Evaluation/Narrative prepared by Acentech Incorporated examining compliance with MassDEP noise limits.

As detailed in the Prior Letter and affected by the supplemental materials submitted herewith, the Project continues to satisfy each of the applicable criteria for the relief requested in the Prior Letter.

We appreciate your attention to this matter. The Applicant and the entire Project team look forward to meeting with you and discussing the transportation aspects of the Project at the next public hearing on July 7, 2022.

Very truly yours,



Timothy W. Sullivan
Attorney for Applicant

Enclosures

EXHIBIT A

**RESPONSES TO TOWN OF NEEDHAM PLANNING BOARD COMMENTS AT
 JUNE 7, 2022 PUBLIC HEARING (557 HIGHLAND AVENUE)**

Question/Topic	Response
PLANNING BOARD	
<p><i>Whether the current setback on Gould Street is measured from the current layout of the street.</i></p>	<p>The plan filed with the Special Permit application contemplates that all of the Gould Street improvements will be subject to an easement in favor of the Town of Needham for public travel. Accordingly, the plan measures all setbacks and dimensional requirements based on the existing lot. The Applicant is working with Town Counsel regarding the application of setbacks in the context of the proposed roadway improvements.</p>
<p><i>Provide an itemized list of strategies to address climate change as referenced in the applicant's cover letter.</i></p>	<p>Impacts from climate change on the Project may include urban flooding and extreme heat events.</p> <p>With respect to urban flooding, the Property is located in Zone X (area of minimal flood hazard) according to FEMA Flood Insurance Rate Mapping. The existing site consists almost completely of impervious buildings and paved parking lots. The proposed Project represents a 1.8-acre decrease in impervious coverage compared to the existing condition. This reduction in impervious coverage, and the addition of a surface stormwater detention basin, will result in decreased stormwater peak runoff rates and volumes from the Site overall. The project represents a significant decrease in peak rates to the offsite MassDOT and municipal drainage systems to which the site is tributary, reducing downstream flooding potential should those systems become surcharged in extreme precipitation events.</p> <p>Extreme heat event mitigation strategies include: improved envelope insulation and infiltration to minimize cooling demand and better maintain indoor temperature conditions; high efficiency chilled water plant to minimize cooling demand and energy usage; laboratory exhaust monitoring controls to minimize outside air cooling load.</p>

Question/Topic	Response
<p><i>Whether the planned solar array will violate any height restrictions in zoning.</i></p>	<p>Pursuant to Section 4.11.2 of the Zoning By-Law, the parking garage may be allowed a maximum height of 55 ft. by special permit. Pursuant to Section 4.11.1(1)(e) “Structures erected on a building and not used for human occupancy, such as . . . solar or photovoltaic panels . . . and the like may exceed the maximum building height provided that no part of such structure shall project more than 15 feet above the maximum allowable building height, the total horizontal coverage of all of such structures on the building does not exceed 25 percent, and all of such structures are set back from the roof edge by a distance no less than their height.”</p> <p>The parking structure is proposed at 55 ft. in height and the Applicant has requested a special permit for this increased height.</p> <p>The proposed solar photovoltaic canopies on the parking structure may not exceed the 15 ft. limit imposed by Section 4.1.1(1)(e), which we assume is applicable to parking structures, depending upon final design. However, the proposed solar photovoltaic canopies would likely exceed the maximum horizontal coverage limitation of 25%.</p>
<p><i>Is there an opportunity to further reduce parking and what the impacts on the project might result?</i></p>	<p>The Project is requesting a reduction in proposed parking based upon documented employment densities of other peer research and development centers in eastern Massachusetts. With approximately 1,408 parking spaces proposed on-site, there will be adequate parking provided for the Project.</p>
<p><i>Can additional green space be incorporated into the design?</i></p>	<p>The site design has been revised to address prior community comments with an aim to include less grass and to maximize diverse and native plantings.</p>
<p><i>Will all amenities be accessible by the community?</i></p>	<p>All outdoor amenities for the Project are intended to be available to the public, as will the retail/restaurant tenant spaces.</p>
<p><i>Can the bike lanes/infrastructure be designed to favor families instead of commuters?</i></p>	<p>In close consultation with our neighbors, we are working to develop transportation improvements, including separated bike lanes/infrastructure that</p>

Question/Topic	Response
	address neighborhood concerns along Gould Street on or adjacent to the Property.
<i>Can the scale of the structures along Gould Street be further offset or reduced?</i>	As we further studied moving the North Loading Dock from the Gould Street elevation to the north side of the building, we have studied different fenestration options which may help the building read at a smaller scale on this elevation, but will still provide the areas needed to best serve the building tenants and community. Additional trees/planting are being considered in order to help further screen the building from view along Gould Street.
<i>Can the planned greenbelt be connected to the park/trail across from TV Place on neighboring property?</i>	This is currently part of a separate property at 0 Gould Street and no changes to this property are anticipated at this time.
<i>What will acoustic levels be from rooftop mechanicals?</i>	The Applicant has engaged Acentech as an acoustical consultant to provide a qualitative report on this topic and the results of the report are included as Exhibit E to this letter.
<i>Provide additional clarity on loading dock operations and whether loading dock access can be provided off of TV Place rather than facing Gould Street.</i>	Due to the location of the garage structure, as required by the recent rezoning, locating the North Building's loading dock off of TV Place was not achievable. However, the team has reviewed moving the loading dock to the north side of the North Building so the loading dock no longer faces Gould Street, which adds additional window area and a park along the west face of the North Building.
<i>Has the Fire Department approved of the driveway/roadway widths and can a permeable paving material be used for emergency lanes?</i>	In our meeting with the Fire Department on March 24, 2022, the Fire Department requested fire access lanes around the building which are being provided. These lanes are to be 18' minimum width, but 20' preferred due to snow clearing. The landscape architect is planning to provide the fitness path as bituminous concrete or gravel, then flank the sides with permeable structured grass or permeable pavers if allowed by the Fire Department.

Question/Topic	Response
<i>Can additional public transportation be provided through relocating or adding an MBTA bus route?</i>	<p>The Applicant will reach out to MBTA to evaluate the feasibility of providing additional MBTA service. However, in light of the MBTA’s Bus Network Redesign plan, released in May 2022, which proposes to maintain Route 59’s existing alignment in Needham while eliminating route variations in Newton, the Applicant thinks it unlikely that the MBTA will agree to shift a segment of Route 59 from serving residential neighborhoods to serving the Project site.</p> <p>The Applicant will be providing a direct shuttle service (via use of an electric shuttle) that will connect the site with nearby transit nodes.</p>

EXHIBIT B

**RESPONSES TO TOWN OF NEEDHAM DEPARTMENT COMMENTS
(557 HIGHLAND AVENUE)**

Question/Topic	Response
FIRE DEPARTMENT	
<i>Confirm with the Fire Department to ensure public safety vehicle access during the winter.</i>	Final plans will be resubmitted for Fire Department approval including all truck turn requirements, etc., to confirm acceptable access as is required by applicable codes and regulations.
POLICE DEPARTMENT	
<i>Address potential for use of cut-through streets off of Gould Street and address potential use of Noanett, Ellis, Kearney, Beech and Arnold Streets as cut-through streets to avoid light at Gould and Central intersection. Place signage at these locations restricting traffic during commuting hours.</i>	<p>The Applicant will work with the Town to design and install signage at Noanett Road to deter unwanted cut-through turning movements during the weekday peak commuting hours. In addition, the installation of a traffic signal at Central Avenue and Gould Street will improve operations on Gould Street and reduce the desire for vehicles to use side streets as a cut-through by providing gaps for vehicles to turn efficiently at that intersection.</p> <p>The Applicant will supplement these actions with information dissemination and enforcement funding in connection with close collaboration with the Needham Police Department.</p>
<i>Address potential impacts on Hunting and Greendale from drivers utilizing these streets during hours of heavy traffic on Route 128.</i>	<p>Traffic volumes on Hunting and Greendale have decreased in the last several years due to the completion of the Route 128 add-a-lane project in the area, and most notably, due to the implementation of the new interchange connection at Kendrick Street. The Project is expected to add only a very small number of new trips to Hunting and Greendale, as the additional southbound left-turn lane on Gould Street will make it easier for drivers from the site to directly access Route 128 via Highland Ave. In addition, the Applicant will fund the installation of radar embedded speed limit signs along Hunting Road as a measure to deter speeding during off-peak hours.</p>

Question/Topic	Response
<i>Confirm that walking paths, bike paths, and similar spaces running around perimeter of project site have adequate emergency vehicle access.</i>	The perimeter paths along Highland Avenue / Route 128 have been designed with stabilized gravel shoulders that will provide 20' wide emergency access. A 20' wide gravel access drive has also been provided around the proposed garage.
BUILDING DEPARTMENT	
<i>The site as presented appears to meet the zoning regulations for the site, Special Permits are required for some dimensional requirements based on the design of the structures.</i>	The Applicant has requested such special permit relief in its Application.
PUBLIC WORKS DEPARTMENT	
<i>We are seeking clarification for the facility's proposed water use of 129,172 GPD while the wastewater design flow generation is 54,554 GPD.</i>	Water demand and sewer generation for lab uses can vary and are highly dependent on the specific processes involved. These numbers have been estimated by the Project's MEP Engineer. The difference between the water demand and sewer generation represents water that will be consumed or otherwise used up by lab processes and mechanical equipment (such as evaporative cooling).
<i>We expect to work with the developer on determining the optimum water loop design. The current proposal shows a 10-inch water connection to the site off a 12-inch main on Gould Street and a connection to an existing 8-inch water main on TV place. The additional loop connection may be more optimum if connected from Highland Avenue in front of the development instead of, or an addition to the 8-inch on TV Place connection.</i>	The Applicant will work with the Town to coordinate the water loop connection points. Connections to the 12-inch mains in Highland and Gould as described can be incorporated into a future revised utility plan.
<i>We concur with traffic comments/ recommendations prepared by GPI in their April 25, 2022 letter to the Planning and Community Development Office.</i>	Responses to the peer review comments by GPI are included as Exhibit C .
<i>We expect the Developer to work with the town in providing an alteration/taking plan and recordings for a new Road Right of Way layout on Gould Street and to optimize the traffic signals at Highland at Gould.</i>	The Applicant will work with the Town to develop and finalize the necessary alteration/taking plan and recordings for a new Road Right of Way layout on Gould Street and to optimize the traffic signals at Highland at Gould.

Question/Topic	Response
<p><i>For the new facility, four times the increased flow equates to a total of 126,004 GPD I/I removal anticipated from the development. This may be satisfied by either undertaking a construction project or paying a fee to the Town's I&I program at a rate of \$8.00 per gallon required to be removed. We are in the process of analyzing the target areas for the inflow/infiltration to be removed and expect to work with the developer through the site plan approval process</i></p>	<p>The Applicant will work with the Town to satisfy the I/I removal requirements.</p>
<p><i>As part of the NPDES requirements, the applicant must comply with the Public Outreach & Education and Public Participation & Involvement control measures. The applicant shall submit a letter to the town identifying the measures selected and dates by which the measures will be completed in order to incorporate it into the Planning Board's decision</i></p>	<p>The Applicant understands that the Town's Stormwater Management Program, prepared in accordance with NPDES MS4 General Permit, requires the Town to perform public education and outreach / public involvement and participation. The Applicant will work with the Town to satisfy any of these requirements applicable to the Project.</p>
<p><i>If emergency generators are proposed, they should indicate on the plans with proper screening and noise reduction according to a sound study for the proposed generators</i></p>	<p>Emergency Generators will be provided as required by code for life safety and emergency uses. Separate tenant backup generators may also be provided to support the lab and office uses of the building. All emergency generators are currently planned to be located on the roofs behind the mechanical screen walls with final number and locations being determined. The generators will be designed to meet all sound and noise reduction requirements of the Town and state.</p>
<p>PUBLIC HEALTH DIVISION</p>	
<p><i>Food Establishments will require approval through Food Permit Plan Review, including evaluation of adequacy of dumpsters, grease traps, etc.</i></p>	<p>Upon selection of final tenants for the restaurant space, all Food Establishment tenants will undergo the necessary permitting and approval process, including review by Needham's Public Health Division. Adequate grease traps are planned for the retail and restaurant space with final design to be determined as the Project advances and tenants are chosen. There will be interior waste/recycling rooms.</p>
<p><i>Continue working on environmental remediation of the site and provide continual updates to Public Health on remediation efforts.</i></p>	<p>The Applicant will comply with applicable environmental laws and will provided updates to the Needham Public Health Department as appropriate.</p>

Question/Topic	Response
<i>Obtain MassDEP approval for reclaiming water, specifically for - cooling tower water, toilet and urinal flushing, boiler feed, industrial process water and irrigation for landscaped areas, etc. All these uses are allowed under 314 CMR 20.00., if approved.</i>	No wastewater re-use is planned for the Project. The Project will capture and reuse stormwater and will file for necessary MassDEP permitting.
<i>Any biolaboratory proposed as part of the Project must complete the Public Health Division's online permitting application including provision of proper biohazardous waste containment.</i>	The Applicant will require any life sciences tenants to comply with all applicable rules and regulations.
DESIGN REVIEW BOARD	
<i>Provide Design Review Board with updates to project landscaping, lighting, and screening in connection with the Design Review Board's comments.</i>	The Applicant intends to submit the information requested by the Design Review Board's comments for the Board's consideration.

Planning Board Members
June 30, 2022

EXHIBIT C

**RESPONSE TO GPI COMMENTS ON
TRANSPORTATION IMPACT AND ACCESS STUDY
(557 HIGHLAND AVENUE)**

[see attached]



Memorandum

To: Lee Newman
Director of Community Planning and Development
Town of Needham, MA

Date: June 29, 2022

Project #: 15306.00

From: Sean Manning, PE, PTOE
Matthew Duranleau, PE

Re: Response to Transportation Impact and Access Study
Traffic Peer Review Comments dated May 27, 2022
By Greenman-Pedersen Inc. (GPI)
557 Highland Avenue
Needham, Massachusetts

Overview

VHB has received and reviewed the Transportation Impact and Access Study (TIAS) Transportation Engineering Peer Review submitted to the Town of Needham by the Town's traffic review firm, Greenman-Pederson, Inc (GPI), dated May 27, 2022, for the proposed 557 Highland Avenue redevelopment in Needham, Massachusetts. This memorandum summarizes VHB's responses to the comments. Each comment raised by the reviewer is listed below followed by the response by VHB. The comments follow the format and structure outlined in the Transportation Engineering Peer Review.

Since the submittal of the Transportation Engineering Peer Review, the Proponent has received feedback from the community and the Town of Needham on the proposed Gould Street off-site improvements, including the desire for more family-friendly bicycle accommodations and the wish to reduce the amount of new pavement added on Gould Street. Based on this feedback, the following roadway improvement concepts have been developed:

- › Option 1: Previously Proposed Concept
- › Option 2: Two-Way Separated Bicycle Lanes on East Side with Reduced Gould Street Cross-Section
- › Option 3: Two-Way Separated Bicycle Lanes on West Side with Reduced Gould Street Cross-Section

Concept plans for the three improvement alternatives along Gould Street as well as for the intersection of Central Avenue at Gould Street are included in the Attachments to this memorandum.

The two additional improvement concept plans include dedicated sidewalk-level bicycle facilities in each direction along Gould Street between Highland Avenue and just north of TV Place. In addition, the two additional concepts eliminate the Gould Street dedicated northbound right-turn lane into TV Place and the dedicated southbound right-turn lane onto Highland Avenue based on feedback from the Town of Needham to reduce the amount of pavement. While these turn lanes were included in the initial concept design, the lanes are not required to provide an adequate level of operations for vehicles. Intersection traffic analyses for the new concepts are included in the Attachments to this memorandum.

Peer Review Comments

General Comments

1. As the project directly abuts the state highway layout (SHLO) on Interstate 95 / Route 128 and is anticipated to generate more than 3,000 vehicle trips per day (vpd), the project will require review by the Massachusetts Environmental Policy Act (MEPA) office in the form of an Environmental Notification Form (ENF) and a

mandatory Environmental Impact Report (EIR). An ENF was prepared by the Applicant and noticed in the Environmental Monitor on April 8, 2022. The TIAS was included as a chapter within the ENF. A Certificate on the ENF was issued by MEPA on May 9, 2022. GPI previously provided comments to the MEPA office on behalf of the Town of Needham regarding the ENF, and a copy of these comments is included as an Attachment for reference. Many of GPI's comments were incorporated into the recommendations of the ENF Certificate, which include:

- a. Table 2-9 of the ENF indicates that the traffic operations at the intersections of Highland Avenue / West Street will drop from LOS C to D and the operations of Highland Avenue / Gould Street / Hunting Road will degrade from LOS E to F as a result of the additional traffic generated by the project. The Applicant is requested to explore the feasibility of implementing additional measures to improve operations at these locations, including an additional northbound lane on Hunting Road.
- b. Collision diagrams should be prepared for any study area intersections experiencing an average of more than 3.0 collisions per year and a crash rate higher than the statewide or district-wide average. The Applicant should investigate measures to improve safety and mitigate collision occurrence at any locations where five or more collisions of a similar type have occurred over the analysis period.
- c. The Applicant should perform an estimate of the potential bicycle parking demand generated by the project to ensure adequate bicycle parking is provided for an effective Transportation Demand Management (TDM) program.

Applicant Response: The Draft Environmental Impact Report (DEIR) will incorporate all comments received on the ENF and will include a response to comments chapter that will provide written responses to each respective comment. The DEIR is expected to be submitted on July 15, 2022.

2. The project will also require a Vehicular Access Permit from MassDOT for the proposed change-in-use of the property, as well as for the construction of off-site roadway improvements within the SHLO. As such, the ENF was reviewed by the MassDOT District 6 office, as well as the Public-Private Development Unit (PPDU). The following comments from MassDOT were incorporated into the ENF Certificate issued by MEPA:
 - a. The Applicant should evaluate queuing at the study area intersections to ensure that lengthier queues do not impact the operation of roadways and railways within the study area.

Applicant Response: To understand the queueing impacts of operations at each study area intersection under the 2022 Existing Conditions, 2029 No Build Conditions, and 2029 Build Conditions, queue diagrams have been developed for the weekday morning and weekday evening peak hours. The queue diagrams for each study area intersection are provided in the Attachments to this memorandum.

As shown in the queue diagrams, the addition of the Project-generated vehicle trips is expected to result in minimal changes in queue lengths at most of the study area intersections. For intersections where there is a noticeable impact in queue caused by the Project, mitigation has been proposed to try and offset those impacts.

While the maximum queues on the Highland Avenue westbound approach are expected to extend beyond the I-95 southbound off-ramp under the 2029 Build Conditions with mitigation during both

peak hours, this situation is expected to occur as well under the 2029 No Build Conditions without the Project. As the I-95 southbound off-ramp is over 1,500 feet in length, any queue on the I-95 southbound off-ramp is not expected to spill back onto the I-95 southbound mainline. In addition, the queues on Highland Avenue westbound are not expected to extend back far enough in the 2029 Build Condition to impact the weaving operations between the I-95 northbound off-ramp and the I-95 southbound on-ramp, which are expected to operate at LOS B or better.

- b. The Applicant should perform an analysis of the existing and proposed weave conditions on Highland Avenue to ensure that the increased traffic volumes will not lead to degraded safety conditions in the area of the I-95 / Highland Avenue interchange.

Applicant Response: Weaving analyses based on methodology from the Highway Capacity Manual (HCM) were conducted on Highland Avenue at the I-95 interchange and presented in the TIA. For informational purposes, the weaving analyses results are presented below as well.

Weaving segment analyses were conducted at the following ramp junction locations:

- › Highland Avenue Eastbound between the I-95 Southbound Off-Ramp and the I-95 Northbound On-Ramp
- › Highland Avenue Westbound between the I-95 Northbound Off-Ramp and the I-95 Southbound On-Ramp

Analyses were conducted during the weekday morning and weekday evening peak hours under the 2022 Existing, 2029 No Build, and 2029 Build Conditions. A summary of the weave segment analyses is presented in Table 1 and the detailed analysis worksheets are provided in the Attachments to this memorandum.

Table 1 Weave Segment Capacity Analysis Summary

Location/Period	2022 Existing Conditions			2029 No Build Conditions			2029 Build Conditions		
	v/c ^a	Density ^b	LOS ^c	Demand	Density	LOS	Demand	Density	LOS
Highland Avenue EB between I-95 SB Off-Ramp and I-95 NB On-Ramp									
Weekday Morning	0.53	18.5	B	0.66	24.3	C	0.66	24.7	C
Weekday Evening	0.30	10.2	A	0.38	13.0	B	0.44	15.2	B
Highland Avenue WB between I-95 NB Off-Ramp and I-95 SB On-Ramp									
Weekday Morning	0.22	6.5	A	0.26	7.9	A	0.34	10.1	A
Weekday Evening	0.31	10.9	A	0.38	13.9	B	0.40	14.3	B

a volume to capacity ratio
 b density, in passenger cars per mile per lane
 c level of service

As shown in Table 1, the weaving locations for the interchange of Highland Avenue at I-95 are expected to operate at LOS C or better during the weekday morning and weekday evening peak hours under the 2022 Existing, 2029 No Build, and 2029 Build Conditions. The addition of Site-

generated traffic is not expected to result in a degrade in level of service for either Highland Avenue weaving location.

- c. The Applicant should coordinate with the Massachusetts Bay Transit Authority (MBTA) to determine the feasibility of additional MBTA Bus Route 59 service closer to the project site and include feasible options in the Draft EIR.

Applicant Response: Prior to the submittal of the FEIR, the Proponent will reach out to the MBTA to understand if there are opportunities to modify bus access in the area to better support transit connectivity to the Project site. As noted in the TIA, the nearest MBTA bus stop to the Site for MBTA Route 59 is nearly a half-mile away on Webster Street. Since the publication of the ENF, the MBTA released a draft plan of the Bus Network Redesign in May 2022. The Bus Network Redesign is a full review and overhaul of all bus routes operated by the MBTA with the goal to create a better experience for current and future bus riders. The MBTA spent several years developing the draft Bus Network Redesign plan based on demographics, employment districts, traffic congestion, and travel patterns. As shown in the draft plan of the Bus Network Redesign, Route 59 is proposed to maintain its existing alignment through Needham while eliminating different variations of the route through Newton to simplify operations. Route 59 is expected to operate every 60 minutes or less between at least 6:00 AM and 7:00 PM, seven days a week.

The Proponent was requested in the ENF certificate to review the feasibility of providing additional MBTA Bus Route 59 service closer to the Site. As currently proposed, Route 59 will not travel closer to the Site than it does under existing conditions and will continue to operate along Webster Street and Central Avenue. As one of the goals of the Bus Network Redesign is to simplify operations, it is unlikely that a new variation of Route 59 would be supported that stops at the Site for some routes and continues to serve the residential areas along Webster Street and Central Avenue for other routes. If Route 59 was revised to directly serve the Site, it would no longer provide access to the residential areas along Webster Street and Central Avenue.

To maintain transit service to the residential areas along Webster Street and Central Avenue while also providing transit connection to the Site, the Proponent is committed to providing a dedicated shuttle service that will run between the Site and nearby public transportation stations, such as the commuter rail at Needham Heights and the Green Line D Branch at Newton Highlands. This will provide a direct connection between the Site and the public transportation network throughout greater Boston without negatively impacting transit service to the existing residential areas in Needham served by Route 59.

- d. MassDOT requests that the Applicant consider installing bicycle and pedestrian improvements on Highland Avenue at the I-95 Interchange to connect with the proposed Complete Streets improvements being installed as part of MassDOT Project #606635 along Highland Avenue.

Applicant Response: Portions of Highland Avenue within the study area are currently under construction as part of the MassDOT Needham-Newton Corridor Project (MassDOT Project No. 606635). As part of this project, new raised bicycle lanes will be constructed in each direction along

Highland Avenue between Webster Street and just east of Gould Street / Hunting Road and between Wexford Street and the Charles River.

The segment of Highland Avenue within the I-95 interchange (including the bridge over I-95) was recently rebuilt and reconstructed as part of the Route 128/I-95 add-a-lane project. Construction was completed in 2018 and included significant improvements to the pedestrian and bicycle accommodations, including new sidewalks and buffered bicycle lanes on each side of Highland Avenue. The buffered bicycle lanes in each direction are separated from the general-purpose travel lanes on Highland Avenue by a painted buffer 2-4 feet in width which provides greater separation between vehicles and bicyclists than provided by traditional bicycle lanes. In addition, pedestrian and bicycle crossings were provided across all the interstate on-ramps and off-ramps, with signage and pavement markings included to enhance the visibility of the crossing pedestrians and bicyclists, with green paint used for the bicycle crossings.

The Proponent will coordinate with MassDOT to ensure the proposed improvements along Gould Street will tie into the accommodations along Highland Avenue. As the design for Highland Avenue went through many years of review and coordination, the Proponent will respect the recent and ongoing work on Highland Avenue and enhance the connections between Highland Avenue, the Site, and the nearby residential areas.

- e. The Applicant should provide a description of the methodology to be used to estimate the effectiveness of the proposed Transportation Demand Management (TDM) measures and discuss what remedial measures will be taken if the monitoring program indicates that the TDM program is less effective than anticipated in reducing single-occupant vehicle (SOV) trips and encouraging alternative means of travel to/from the site.

Applicant Response: The success of the TDM plan will be measured based on the results of the transportation monitoring program. The transportation monitoring program will include annual 24-hour driveway and parking garage counts on-Site, peak hour turning movement counts and operational capacity analyses at four nearby intersections, and a travel survey for employees and customers on-Site. The transportation monitoring program will begin six months after full occupancy of the proposed development and continue for a period of five years. The results of each transportation monitoring program will be summarized in a report and provided to MassDOT and to the Town of Needham.

Based on the results of the transportation monitoring program, the Proponent will evaluate the TDM program to see if any modifications are necessary to further engage the employees and patrons of the Site to encourage the use of walking/biking, carpooling, and public transportation. If the transportation monitoring program indicates that the actual traffic increase generated by the Project exceeds the traffic projections contained within the TIA by ten percent or more, the Proponent will increase funding for the TDM program and add more measures to try and reduce the share of single occupancy vehicles accessing the Site. The Proponent will coordinate with the Town of Needham and MassDOT to determine potential additional TDM measures that could be implemented if the actual Site-generated volumes exceeds the projections in the TIA by 10-percent or more.

- f. The proposed Transportation Monitoring Program should include a travel survey of employees and patrons of the site. Although MassDOT did not provide any further details on this request, it is assumed that the travel survey will be designed to verify the distribution of site-generated trips and mode share in order to assess the efficacy of the proposed TDM program.

Applicant Response: The proposed transportation monitoring program will include an annual travel survey of employees and patrons of the Site. The survey will be conducted by the Proponent and will include details on the mode of transportation employees and patrons use to access the Site as well as the effectiveness of the proposed TDM programs. The survey will also ask about hybrid work schedules to determine how frequently employees commute to the Site versus working from home. The results of the survey will be used to review the current TDM program and decide if any tweaks are necessary to further engage the employees and patrons of the Site to encourage the use of walking/biking, carpooling, and public transportation.

Study Area

3. The TIAS includes an evaluation of the impact to traffic operations associated with the project at a total of twenty (20) intersections, which include all nine of the study intersections included as part of the Traffic Impact Study prepared for the original rezoning. GPI concurs that the study area is appropriate for the size and scale of the development and includes those intersections which are likely to experience a measurable impact from the proposed redevelopment.

Applicant Response: No response needed

Existing Conditions

4. The TIAS included an evaluation of the operations of the study area intersections during the weekday AM and PM peak periods, which are consistent with typical commuter peaks on the adjacent roadway networks. GPI concurs that these time periods represent the critical time periods for analysis as they represent the peak hours of both adjacent street traffic and site-generated vehicle trips.

Applicant Response: No response needed

5. The Existing Conditions Vehicle Volumes were derived from traffic counts obtained from a number of sources, many of which were collected prior to the COVID-19 pandemic. New traffic counts were collected in July 2021 at the following intersections:
 - Central Avenue at Cedar Street
 - Central Avenue at Webster Street
 - Highland Avenue at Hunnewell Street

All other traffic counts contained within the traffic study were collected pre-pandemic and adjusted to existing conditions utilizing MassDOT's approved Yearly Growth Factors and balancing between intersections. Regardless of which traffic count was collected more recently, the traffic volumes between intersections were always balanced upward to the higher traffic count. GPI concurs that this methodology is acceptable and will result in the most conservative (highest) estimate of existing traffic conditions through the study area intersections.

Applicant Response: No response needed

6. Traffic counts at many of the study area intersections were obtained from previously seasonally-adjusted traffic volumes from other traffic studies. However, raw traffic counts collected in April 2017 were obtained from the Highland Avenue Reconstruction Functional Design Report for the Highland Avenue / Webster Street intersection. Similarly, raw traffic counts collected in January 2018 were obtained from the Northland Newton Development DEIR for the Highland Avenue intersections with the I-95 Northbound and Southbound ramps. MassDOT Weekday Seasonal Factors data was provided in the TIAS Appendix for the 2019 year only. Since the traffic counts were collected in 2017 and 2018, it would be expected that seasonal adjustment factors for those years would have been used to seasonally adjust the raw traffic volumes. MassDOT's Weekday Seasonal Factors data for 2017 and 2019 both indicate that traffic volumes in April represent above-average conditions for Group Factors U3-U7. Therefore, no seasonal adjustment would be required for the Highland Avenue / Webster Street intersection. It is unclear what, if any, seasonal adjustment factor was applied to the volumes at the Highland Avenue intersections with the I-95 ramps. However, the MassDOT Weekday Seasonal Factors data for 2018 indicates that January traffic volumes for Factor Group U3 represent above-average month conditions. Therefore, no seasonal adjustment factor would be required for the Highland Avenue intersections with the I-95 ramps.

Applicant Response: No seasonal adjustments were applied to the intersection of Highland Avenue at Webster Street, as both the 2017 and 2019 MassDOT seasonal adjustment factors indicate that April represents a month with above-average traffic volumes. To provide a conservative analysis, the volumes at the Highland Avenue intersection with the I-95 ramps were seasonally adjusted by six percent based on the 2019 MassDOT seasonal adjustment factors, which indicate that traffic volumes in the month of January were approximately six-percent lower than average conditions for U3 roadways (principal arterials). While it would have been more accurate to use the 2018 MassDOT seasonal adjustment factors (since the counts were conducted in January 2018), using the 2019 MassDOT seasonal adjustment factors results in a more conservative analysis as the 2018 factors would have resulted in no seasonal adjustment.

7. No adjustment was applied to the traffic volumes collected in July 2021 to account for any variations due to COVID-19. However, these traffic counts were balanced upward with traffic counts collected at adjacent intersections under pre-COVID conditions. GPI concurs that this methodology for adjustment is acceptable.

Applicant Response: No response needed

Collision History

8. Per MassDOT guidelines, collision diagrams should be prepared for any locations that experience an average of more than 3 crashes per year or a crash rate higher than the state or district-wide average. The intersection of Highland Avenue / West Street experienced an average of 4.4 crashes per year and a crash rate higher than the state and district-wide averages. Similarly, the Highland Avenue / Second Avenue intersection experiences an average of 6.6 collisions per year and a crash rate above the state and district-wide averages. Therefore, the Applicant should obtain detailed collision reports for these intersections and prepare collision diagrams to identify any collision patterns occurring at these locations, as well as potential measures to reduce the occurrence of such collisions.

Applicant Response: Based on a review of the crash data, the following five intersections either have a crash rate above the district average or experienced an average of three or crashes per year:

- › Highland Avenue at West Street
- › Highland Avenue at Gould Street / Hunting Road
- › Highland Avenue at 1st Avenue
- › Highland Avenue at 2nd Avenue
- › Hunting Road at Kendrick Street

Of these five intersections signalized intersections, only the intersection of Highland Avenue at West Street has a crash rate higher than the state and district-wide averages. Table 2 summarizes the crash rate for each intersection as compared to the district and state averages:

Table 2 Intersection Crash Rate Comparison

Location	Highland Ave at West St	Highland Ave at Gould St / Hunting Rd	Highland Ave at 1 st Ave	Highland Ave at 2 nd Ave	Hunting Rd at Kendrick St
Intersection Crash Rate ^a	0.86	0.44	0.41	0.64	0.63
District Average Crash Rate ^b	0.71	0.71	0.71	0.71	0.71
Statewide Average Crash Rate ^c	0.78	0.78	0.78	0.78	0.78
Exceeds District/ State Averages?	Yes	No	No	No	No

a intersection crash rates as reported in Table 2 (Vehicular Crash Summary) in the TIA.
 b Average crash rate for signalized intersections in District 6 (the district in which Needham is located) based on MassDOT website.
 c Statewide crash rate for signalized intersections based on MassDOT website.

It should be noted that several of these intersections are currently being reconstructed or have recently been reconstructed in connection with ongoing roadway improvements being led by MassDOT. The intersections of Highland Avenue at Gould Street/Hunting Road and Highland Avenue at 2nd Avenue are both currently being reconstructed as part of the MassDOT roadway improvements, and the intersection of Highland Avenue at 1st Avenue was reconstructed in 2018. Since the crash data reviewed was between 2015 and 2019, these improvements are expected to address some of the safety concerns and are not reflected in the crash data.

Collision diagrams have been developed at the identified intersections above, except for the intersections of Highland Avenue at 1st Avenue and 2nd Avenue, as the crash data does not reflect roadway improvements

and the project-related impacts are smaller at those two intersections. The collision diagrams are included in the Attachments to this memorandum.

As shown in the collision diagrams, angle crashes were most prevalent at the three intersections studied. At Highland Avenue and West Street, 6 angle crashes and 3 side-swipe, same direction crashes occurred at the intersection and 2 crashes involved bicyclists. At Highland Avenue and Gould Street/Hunting Road, 6 angle and 4 side-swipe, same direction crashes occurred. At Hunting Road and Kendrick Street, 7 angle crashes occurred.

The high prevalence of angle crashes may indicate conflicts between turning vehicles and through vehicles. This could be caused by drivers becoming frustrated with congestion and trying to turn when there are insufficient gaps in opposing traffic. To improve operations and reduce congestion at the three intersections where collision diagrams were developed, signal timing modifications are proposed as mitigation.

9. The following additional intersections also experienced an average of more than three (3) collisions per year, and collision diagrams should be prepared to identify any collision patterns or potential mitigating measures at these intersections:
 - Highland Avenue / First Avenue
 - Hunting Road / Kendrick Street

Applicant Response: As noted in the response to Comment 8, a collision diagram was developed for the intersection of Hunting Road at Kendrick Street. A collision diagram was not developed for the intersection of Highland Avenue at 1st Avenue, as that location was recently reconstructed which is not fully reflected in the crash data.

10. Although the intersection of Highland Avenue / Gould Street / Hunting Road also experienced more than three collisions per year, the crash rate was well below the state and district-wide averages. In addition, significant improvements were recently constructed by MassDOT that may reduce collisions at this location. Further, additional improvements are proposed at this intersection as mitigation for the proposed development, which may also impact collision occurrence. Therefore, preparation of a collision diagram for this location is not required. However, GPI recommends that the proposed Post-Occupancy Monitoring Program include a review of collisions occurring at this location following construction of the proposed mitigation measures to ensure that a new safety issue is not introduced.

Applicant Response: Since the Project is expected to impact operations at the intersection of Highland Avenue at Gould Street/Hunting Road and the proposed mitigation will include geometric and signal changes at this location, a collision diagram was developed, as noted in the response to Comment 8. If requested by the Town of Needham and MassDOT, the Proponent will review crash data at the intersection as part of the proposed Post-Occupancy Monitoring Program to ensure that a new safety issue is not introduced.

2029 No-Build Conditions

11. The Applicant has projected traffic volumes to a seven-year design horizon consistent with MassDOT guidelines utilizing a background growth rate of 1.0 percent per year and adding traffic to be generated by other proposed or approved developments in the surrounding area. GPI concurs with this methodology.

Applicant Response: No response needed

Trip Generation

12. Table 3 of the TIAS notes that the existing site-generated trips were estimated based on empirical traffic counts collected at the site driveways, which show only 887 daily trips are currently generated by the site. It is important to note that these empirical counts were collected in the fall of 2021, during COVID, and as a result, may under-estimate the trips generated by the site pre-COVID when it was fully operational. The use of the lower existing site-generated trips will result in a more conservative (higher) estimate of the net increase in trips generated by the proposed redevelopment.

Applicant Response: Due to a lack of data for traffic volume entering and exiting the existing driveways on-Site prior to the beginning of the pandemic, the existing site-generated trips were counted on July 14, 2021. While this represents a condition during the COVID-19 pandemic, the counts were conducted after the Commonwealth was beginning to enter a "new normal" phase and after the emergency order was rescinded.

To see if the site-generated trips observed in July 2021 generally aligns with the trip generation levels of a car wash and a car dealership, the empirical counts have been compared against the expected rates from the Institute of Transportation Engineers (ITE). Table 3 provides a comparison of the empirical rates for the previous uses and the ITE-generated rates (based on data provided in the ITE Trip Generation Manual). The ITE worksheets for the previous uses on-Site are included in the Attachments to this memorandum.

Table 3 Comparison of Empirical and ITE Trips for Existing Site Uses

	<u>Empirical Counts (July 2021) ^a</u>			<u>ITE Trip Generation</u>		
	<u>Car Dealership</u>	<u>Car Wash</u>	<u>Total</u>	<u>Car Dealership ^b</u>	<u>Car Wash ^c</u>	<u>Total</u>
Weekday Daily						
Enter	233	177	410	489	n/a	n/a
Exit	<u>300</u>	<u>177</u>	<u>477</u>	<u>489</u>	<u>n/a</u>	<u>n/a</u>
Total	533	354	887	978	n/a	n/a
Weekday Morning						
Enter	27	10	37	40	n/a	n/a
Exit	<u>19</u>	<u>5</u>	<u>24</u>	<u>34</u>	<u>n/a</u>	<u>n/a</u>
Total	46	15	61	75	n/a	n/a
Weekday Evening						
Enter	8	21	29	42	27	69
Exit	<u>33</u>	<u>24</u>	<u>57</u>	<u>50</u>	<u>27</u>	<u>77</u>
Total	41	45	86	92	54	146

a Based on actual counts by VHB in July 2021.

b Based on ITE LUC 840 (Automobile Car Sales (New)), using regression equation for daily trips and peak hour of generator trips.

c Based on ITE LUC 948 (Automated Car Wash), using average rates for peak hour of generator trips. No data provided for daily or weekday morning peak hour trips.

As shown in the table above, the empirical counts conducted in July 2021 are measurably lower than what would be expected based on ITE rates. The summer is generally a slower time for the previous uses on Site, especially for a car wash that commonly is busiest in the Winter and early Spring. Since the ITE trip rates are based on data collected at sites across the country over several decades and most-likely from different times of the year, it is not surprising that the empirical volumes do not exactly match the ITE-projected volumes and variation between the two sets of data is generally to be expected.

While July 2021 empirical data may represent a slightly lower volume of existing Site-generated trips than the Site may have generated on an average non-summer weekday prior to the pandemic, no adjustments have been made to the trip generation or the analyses presented in the TIA. Since the Site-generated volumes presented in the TIA include a credit for the trips currently generated by the Site, using the lower empirical data provides a much more conservative analysis for the trip generation and intersection operational analyses. Therefore, no changes have been made to the analyses to take further credit for the higher volume of trips that the Site may have generated by the previous uses on-Site.

- The Applicant has estimated the site-generated vehicle trips based on Institute of Transportation Engineers (ITE) trip generation rates for Land Use Codes (LUC) 710 (General Office Building), 760 (Research and Development Center) and 822 (Strip Retail Plaza (<40,000 sf)) and applied a modest credit for internal capture of trips shared between uses on the site. In addition, the Applicant has assumed that 25 to 40 percent of the retail trips will be from pass-by trips (vehicles already on the adjacent roadway network passing by the site while traveling to another destination). GPI concurs with this methodology.

Applicant Response: No response needed

14. Although the Applicant has proposed a significant Transportation Demand Management (TDM) program, the Applicant has not applied any reduction in vehicle trips generated by the project for the implementation of the TDM program. While GPI agrees that this methodology will result in the most conservative (worst case) estimate of project's impacts on traffic operations through the study area, it should not excuse the Applicant from developing an effective TDM program or identify target mode share goals for the proposed TDM program. The Applicant should estimate the potential mode share and vehicle trip reduction anticipated from implementing the proposed TDM program and identify mode share goals to be monitored and evaluated as part of the Post-Occupancy Monitoring Program.

Applicant Response: The Proponent is strongly committed to implementing the TDM measures to the greatest extent feasible to reduce single-occupancy vehicle travel to and from the Site. The Proponent will use the 128 Business Council as a resource when implementing the TDM measures as the 128 Business Council has many years of experience with TDM plans as a Transportation Management Association.

As presented in the TIA, the trip generation estimates were developed assuming 100-percent of the Site-generated traffic would use private vehicles to access the Site. This was a conservative analysis used to identify the "worst-case" scenario of vehicular impacts that the Site could generate. With the proposed TDM program, the investment in pedestrian and bicycle infrastructure, and the dedicated shuttle between the Site and nearby transit stations, the Proponent is committed to ensuring that the percentage of Site-generated traffic using private vehicles is measurably less than 100-percent. With the future of hybrid work schedules and employees working from home, it is also likely that not all employees who work on-Site will commute to the workplace five days a week.

Data from the US Census Bureau was reviewed to determine the actual mode share characteristics for employees who commute to workplaces in the Town of Needham. Based on the data, approximately 95-percent of all employees who commute to workplaces in the Town of Needham do so via private automobile while two percent use public transit and three percent walk or bike. With the strong TDM program and mitigation measures, the percentage of employees that take alternative forms of transportation is anticipated to be higher than that generated by other workplaces within the Town of Needham. The existing mode share data is included in the Attachments to this memorandum.

The success of the TDM plan will be measured based on the results of the transportation monitoring program. The Proponent will use the results of the transportation monitoring program to review the current TDM program and decide if any tweaks are necessary to further engage the employees and patrons of the Site to encourage the use of walking/biking, carpooling, and public transportation.

Transportation Demand Management (TDM) Measures

15. The Applicant has proposed the following transit-related measures as part of the TDM program:
- Explore the feasibility of providing shuttle service connectivity to nearby public transportation nodes (commuter rail and Green Line);

- Require tenants to provide a 50 percent transit pass subsidy for their employees;
- Carpool assistance and incentives;
- Emergency ride home;
- Display in the Main Lobby transportation-related information for tenants' employees and visitors; and
- Promotional efforts.

The Applicant should provide additional information on how carpool assistance and emergency ride home services will be provided, as well as what incentive program may be implemented. In addition to providing shuttle service to nearby commuter rail and Green Line services, the Applicant should explore the possibility of extending bus service to the site.

Applicant Response: The Proponent is committed to having an on-Site Employee Transportation Coordinator. Part of the job of the Employee Transportation Coordinator may be to assist in helping employees coordinate carpools, such as by creating a database of employees interested in carpooling and linking them with other employees interested in carpooling who live in the same direction. The Employee Transportation Coordinator may also provide incentives such as raffles with small prizes and other events to promote carpooling and commuting via transit, walking, and biking.

In addition, the Proponent is committed to joining the 128 Business Council, which serves as the Transportation Management Association (TMA) for the local area. As members of the 128 Business Council, employees on-Site will be able to take advantage of their emergency ride home program. The program provides commuters who use alternative transportation with a guaranteed ride home in the event of an emergency. To use this program, employees can be reimbursed for a taxi or ride-share ride for trips within 10 miles of the Site or be reimbursed for the cost of a rental car for trips more than 10 miles away from the Site. Details of the 128 Business Council's emergency ride home program can be found at the link below:

<https://128bc.org/resources/emergency-ride-home/>

As noted in the traffic study, the nearest MBTA bus stop to the Site is nearly a half-mile away on Webster Street along MBTA Route 59. The MBTA in May 2022 released a draft plan of the Bus Network Redesign which proposes to keep Route 59 on its existing alignment through Needham while eliminating variations of Route 59 through Newton to simplify operations. If Route 59 was revised to directly serve the Site, it would no longer provide access to the residential areas along Webster Street and Central Avenue. To maintain transit service to the residential areas along Webster Street and Central Avenue while also providing transit connection to the Site, the Proponent is committed to providing a dedicated shuttle service that will run between the Site and nearby public transportation stations, such as the commuter rail at Needham Heights and the Green Line D Branch at Newton Highlands. This will provide a direct connection between the Site and the public transportation network throughout greater Boston without negatively impacting the existing MBTA bus service through Needham.

Bicycle Accommodations

16. Section 2.3.4.1 of the ENF notes that a total of 89 bicycle parking spaces will be provided indoors and outdoors, while the TIAS describes a total of only 70 bicycle parking spaces proposed on the site. The Applicant should clarify this discrepancy.

Applicant Response: The number of bicycle parking spaces to be provided on-Site has increased since the submittal of the TIA. As currently proposed, the Project will provide covered and secured bicycle parking spaces within its buildings and in outdoor spaces, where public bicycle racks will be installed near building entrances for Project visitors. Specifically, the Project will include up to 104 indoor and secure bicycle parking spaces on-Site for employees and up to 50 outdoor bicycle parking spaces on public bicycle racks for visitors and customers for a total of up to 154 bicycle parking spaces on-Site.

17. No description has been provided within the ENF or TIAS on how many bicycle parking spaces will be indoors and how many will be outdoors. The studies also do not contain any assessment of the potential bicycle parking demand that could be generated and the adequacy of the number of bicycle parking spaces provided to accommodate this demand. The Applicant should provide an evaluation of the potential bicycle parking demand to ensure that adequate bicycle parking is provided to encourage use of bicycle as a means of traveling to/from the site.

Applicant Response: The Project will include up to 104 indoor and secure bicycle parking spaces on-Site for employees and up to 50 outdoor bicycle parking spaces on public bicycle racks for visitors and customers to the Site.

As presented in the TIA, the trip generation estimates were developed assuming 100-percent of the Site-generated traffic would use private vehicles to access the Site. This was a conservative analysis used to identify the "worst-case" scenario of vehicular impacts that the Site could generate. The actual percentage of employees commuting by private vehicle will be less than 100-percent.

To determine if the proposed bicycle parking supply is sufficient for the anticipated bicycle demand, data from the US Census Bureau was reviewed to determine the existing mode share characteristics for employees who commute to workplaces in the Town of Needham. Based on the data, approximately one percent of all existing employees who commute to workplaces in the Town of Needham do so by bicycle (the existing mode share data is included in the Attachments). With the proposed TDM program and the investment in pedestrian and bicycle infrastructure, the percentage of employees arriving and departing by alternative modes of transportation, including by bicycle, is expected to exceed the rates for existing workplaces in the Town of Needham. For the purposes of determining if the proposed bicycle parking supply is sufficient for the anticipated bicycle demand, a conservative five-percent bicycle mode share has been assumed.

Table 4 summarizes the proposed bicycle parking demand for the Project Site based on the trip generation presented in the TIA.

Table 4 Proposed Bicycle Parking Spaces

Period	Vehicle Trips ^a	Bike Mode Share Estimate ^b	Bike Trip Estimate ^c	Proposed Bicycle Parking		
				Long-term Spaces	Short-term Spaces	Total Bike Spaces
Weekday Daily						
Enter	2,536	5% enter	127	104	50	154
Exit	2,469	5% exit	124			

a Total Net New Vehicle Trips expected to be generated by the Project, as presented in Table 2-5 of the TIA.
 b Conservative bicycle mode share of five percent based on area projects.
 c Estimated daily bike trips generated by the Project assuming a five-percent bike share.

Using a conservative estimated bicycle trip rate, a maximum of 127 entering bicycle trips would be expected to be generated by the Project over the course of an average weekday. As shown in Table 4, up to 154 bicycle parking spaces will be provided on-Site. Since the total number of bicycle parking spaces on-Site will exceed the maximum daily bicycle trips generated by the Site, the bicycle parking supply is expected to be sufficient for the anticipated bicycle parking demand. This is true without considering that not all bicyclists will be on-Site at the same time and thus not all bicyclists will need their own dedicated bicycle parking spaces.

In addition, the Proponent will monitor the actual level of bicycle demand on-Site once the Project opens. If it is determined that the bicycle mode share exceeds the five percent assumed in the bicycle parking demand and additional bicycle parking is required, the Proponent will install additional bicycle parking spaces on-Site.

Proposed Mitigation

- The TIAS describes geometric improvements that are proposed at the intersection of Highland Avenue / Gould Street / Hunting Road as mitigation for the project, which are shown graphically in Figure 16. The widening of the roadway that will be required to accommodate the additional lanes at this location will also likely require reconstruction of the traffic signal at this intersection to accommodate new signal indications and mast arms, as well as vehicle detection and pedestrian signal equipment. No mention of the signal upgrades was provided in the TIAS and no signal improvements are shown in Figure 16.

Applicant Response: The widening of Gould Street will likely require the reconstruction of the traffic signal at the intersection of Highland Avenue at Gould Street/Hunting Road to accommodate new signal indications, mast arms, vehicle detection, and pedestrian signal equipment. The Proponent will coordinate with MassDOT and the Town of Needham on this additional construction work as the off-Site mitigation design progresses.

- Figure 16 of the TIAS provides a graphic depiction of the roadway geometry proposed at the intersection of Highland Avenue / Gould Street / Hunting Road and along Gould Street fronting the site. The Figure does not include the Highland Avenue eastbound or Hunting Road northbound approaches to the intersection, so it is difficult to identify what, if any, improvements are proposed on those approaches. However, Figure 1.4 of the ENF also provides a similar graphic that includes all approaches to the intersection. While the geometry on the majority of the approaches appears consistent with the conceptual improvement sketches prepared as part of the former rezoning effort, the Hunting Road northbound approach to Highland Avenue and the

receiving approach on Gould Street are inconsistent with the rezoning plans. The analysis and plans prepared as part of the rezone indicated that two through lanes would be required on Hunting Road with two receiving lanes on Gould Street to accommodate the traffic generated by the project. The capacity and queue analysis summarized in Table 15 of the TIAS indicates that even with the mitigation measures proposed by the Applicant, the Hunting Road northbound movement will operate over capacity at level-of-service (LOS) F during the weekday AM and PM peak hours under 2029 Build with Mitigation conditions. The Highland Avenue eastbound left-turn movement will also operate at LOS F during the weekday AM peak hour. Therefore, the Applicant should consider the feasibility of providing an additional northbound lane on Hunting Road to improve the capacity and operations of this intersection.

Applicant Response: The conceptual improvements proposed as part of the rezoning of the Site were reviewed when developing the mitigation for the Project. The traffic study submitted by GPI for the rezoning of the Site included a conceptual improvement plan at the intersection of Highland Avenue at Gould Street/Hunting Road that included two lanes on the Hunting Road northbound approach, a shared left-turn/through lane and a right-turn lane, and one receiving lane on Gould Street north of the intersection. This geometry matches what is currently proposed by the Proponent. As noted in the ENF, the only difference between the previous concept plan and the plan proposed in the TIA is the exclusion of a dedicated right-turn lane on the Highland Avenue westbound approach, as adding a right-turn lane would introduce a weaving conflict between vehicles on Highland Avenue westbound and vehicles on the I-95 southbound off-ramp that would cause safety concerns. A figure of the concept plan from the GPI traffic study supporting the rezoning of the Site is included in the Attachments of this memorandum for reference.

While expanding the Hunting Road cross-section would provide additional capacity at the intersection, an additional northbound lane cannot be implemented without taking significant property outside of the right-of-way. This would have a major impact on the property at 580 Highland Avenue and could require the razing of the existing house on that property. Therefore, to limit the right-of-way impacts, no expansion of Hunting Road is proposed.

To improve operations on the Hunting Road approach, the proposed signal cycle lengths and/or phase splits during the weekday morning and weekday evening peak hours were further reviewed and adjusted from what was proposed in the previously submitted traffic study. Since the new signalized intersection of Gould Street at the Site driveway is proposed to be coordinated with the intersection of Highland Avenue at Gould Street/Hunting Road, timing adjustments and operation changes at one intersection will also impact operations at the second intersection.

As noted previously, based on feedback from the community and from the Town of Needham, the Proponent has revised the design for the proposed improvements on Gould Street and developed two additional concept plans. The new concept plans both includes sidewalk-level bicycle facilities to provide a family-friendly bicycle accommodation and eliminates the dedicated southbound right-turn lane from Gould Street to Highland Avenue and the dedicated northbound right-turn lane from Gould Street to TV Place to reduce the amount of pavement. The removal of the dedicated southbound right-turn lane also has the added benefit of shortening the pedestrian crossing. The wider Gould Street cross-section was proposed in the 2020 traffic study to support the rezoning of the site based on the "worst-case" scenario for the full buildout of the site and the adjacent Channel 5 property, which included up to 130,000 SF of retail space. As the actual

Project will generate fewer trips than what was evaluated when the cross-section was designed, Gould Street no longer needs to be as expansive to accommodate the Site-generated traffic.

Table 5 summarizes the intersection capacity analyses at the intersections of Highland Avenue at Gould Street/Hunting Road and Gould Street at Site driveway during the weekday morning and weekday evening peak hours with the revised southbound geometry and the revised signal timings in place. The intersection capacity worksheets are included in the Attachments to this memorandum. It should be noted that the elimination of the Gould Street northbound right-turn lane onto TV Place is not expected to impact operations as the northbound approach is under free-flow conditions.



Table 5 Intersection Capacity Analysis Summary – Highland Avenue at Gould Street/Hunting Road

Location / Movement	2029 No-Build Condition					2029 Build without Mitigation					2029 Build with Mitigation									
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q					
Highland Avenue at Gould Street and Hunting Road																				
<i>Weekday Morning</i>																				
Highland Ave EB L	1.04	>120	F	~93	#234	>1.20	>120	F	~190	#353	0.96	115.7	F	153	#330					
Highland Ave EB T/R	0.86	40.2	D	364	#512	0.79	36.6	D	364	#512	0.66	30.2	C	363	503					
Highland Ave WB L	0.58	58.6	E	36	83	0.61	65.3	E	38	83	0.42	61.4	E	42	83					
Highland Ave WB T/R	0.94	52.1	D	362	#545	1.15	117.8	F	~616	#841	0.97	54.3	D	587	#797					
Hunting Rd NB L/T	0.96	89.0	F	206	#434	1.13	>120	F	~263	#480	0.96	96.8	F	265	#433					
Hunting Rd NB R	0.48	39.8	D	48	102	0.51	44.0	D	52	102	0.53	46.1	D	93	136					
Gould St SB L	0.82	64.8	E	145	#281	0.91	84.5	F	182	#347	0.70	71.7	E	136	180					
Gould St SB L/T/R	0.78	59.4	E	137	#264	0.88	77.3	E	175	#335	0.57	72.7	E	107	166					
Overall	0.98	55.1	E	-	-	1.20	100.2	F	-	-	0.95	55.5	E	-	-					
<i>Weekday Evening</i>																				
Highland Ave EB L	>1.20	>120	F	19	57	>1.20	>120	F	27	72	0.60	58.2	E	24	57					
Highland Ave EB T/R	0.81	42.3	D	287	440	0.81	42.4	D	290	442	0.74	32.8	C	252	#373					
Highland Ave WB L	0.86	83.3	F	100	194	0.87	84.5	F	101	196	0.78	61.6	E	89	#182					
Highland Ave WB T/R	1.00	61.7	E	~535	#774	1.07	84.0	F	~599	#861	1.02	61.3	E	~527	#702					
Hunting Rd NB L/T	0.56	51.4	D	66	127	0.58	52.2	D	70	134	0.73	61.0	E	65	#126					
Hunting Rd NB R	0.10	35.7	D	4	24	0.10	35.7	D	4	24	0.07	34.2	C	0	5					
Gould St SB L	0.91	61.1	E	295	#574	>1.20	>120	F	~681	#1051	0.97	61.6	E	310	#376					
Gould St SB L/T/R	0.88	56.9	E	284	#554	>1.20	>120	F	~653	#1022	0.76	45.5	D	228	#239					
Overall	1.03	59.5	E	-	-	>1.20	>120	F	-	-	1.05	52.9	D	-	-					
Gould Street at Wingate Driveway / Project Site Driveway																				
<i>Weekday Morning</i>																				
Wingate Dwy EB L/T/R											0.01	61.9	E	0	0					
Site Dwy WB L											0.50	65.0	E	46	90					
Site Dwy WB L/T/R											0.29	62.1	E	25	68					
Gould St NB L/T	<i>Intersection unsignalized under 2029 No Build Conditions without Mitigation</i>					<i>Intersection unsignalized under 2029 Build Conditions without Mitigation</i>														
Gould St NB R																0.57	5.0	A	153	m273
Gould St SB L																0.31	4.0	A	22	m78
Gould St SB L																0.08	3.1	A	3	24
Gould St SB T/R																0.15	3.0	A	20	88
Overall											0.54	7.8	A							
<i>Weekday Evening</i>																				
Wingate Dwy EB L/T/R											0.03	43.4	D	0	12					
Site Dwy WB L											0.75	44.2	D	174	187					
Site Dwy WB L/T/R											0.70	41.6	D	163	176					
Gould St NB L/T	<i>Intersection unsignalized under 2029 No Build Conditions without Mitigation</i>					<i>Intersection unsignalized under 2029 Build Conditions without Mitigation</i>														
Gould St NB R																0.31	10.7	B	56	m252
Gould St SB L																0.07	13.2	B	1	m30
Gould St SB L																0.03	8.8	A	4	21
Gould St SB T/R																0.37	11.4	B	124	270
Overall											0.44	21.8	C							

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- # 95th percentile volume exceeds capacity, queue may be longer.
- m Volume for 95th percentile queue is metered by upstream signal.

As shown in the table above, the southbound shared through/right-turn lane is expected to operate at acceptable levels of service without providing dedicated through and right-turn lanes and queues are not expected to spill back to the upstream intersection at the Site driveway. The shared lane is expected to operate at LOS E during the weekday morning peak hour and LOS D during the weekday evening peak hour with volume-to-capacity ratios of less than 0.80 during both peak hours.

During the weekday morning peak hour, while the Hunting Road northbound left-turn/through movements and the Highland Avenue eastbound left-turn movements are still expected to operate at LOS F under the 2029 Build Conditions with the proposed mitigation, the amount of delay and volume-to-capacity ratios are expected to be better than or similar to operations under the 2029 No Build Conditions and the overall intersection delay is expected to be nearly the same as under the 2029 No Build Conditions. During the weekday evening peak hour, the Hunting Road northbound left-turn/through movement is expected to operate at LOS E with the proposed mitigation, which is similar to operations for movements on the other approaches. The intersection of Gould Street at the Site driveway is expected to operate at overall LOS C or better under the 2029 Build Conditions with mitigation.

As noted in the traffic study, construction is currently ongoing on the MassDOT Needham-Newton corridor project along Highland Avenue to improve safety and pedestrian/bicycle accommodations. The project includes geometric and signal improvements along the corridor and new sidewalks and separated bicycle lanes. The roadway redesign project has been in the works for many years and has gone through several rounds of public comments to reach the current construction plan. It should be noted that the MassDOT reconstruction project does not include a significant enhancement of capacity at the intersections along Highland Avenue, as the design prioritizes safety and active transportation enhancements over additional vehicle capacity and several movements are expected to operate at LOS F with the roadway project in place. Since the 2029 No Build Conditions reflect the completed MassDOT roadway design at the intersection of Highland Avenue at Gould Street/Hunting Road, the proposed mitigation at the intersection has been designed to accommodate the additional Site-generated traffic while operating similarly to the 2029 No Build Conditions, which reflects the MassDOT vision of the corridor.

20. Figure 15 of the TIAS depicts improvements to be constructed at the Central Avenue / Gould Street intersection as mitigation for the project, which include restriping of Central Avenue to provide a westbound left-turn lane and installation of a fully-actuated traffic signal. The proposed signal equipment is not depicted on the plans. The Applicant should obtain survey information at this location to verify whether the proposed improvements can be constructed within the publicly-available right-of-way and whether any easements will be required for the proposed signal equipment. In addition, the Applicant should perform vehicle turning movement analysis to verify that that the proposed curb radii and STOP line locations will allow emergency vehicles and trucks to safely navigate the intersection without encroaching on opposing traffic flows.

Applicant Response: An updated concept plan has been developed for the proposed improvements at the intersection of Central Avenue at Gould Street and is included in the Attachments to this memorandum. The updated concept plan is based on survey data and includes the proposed location of the signal equipment. As noted on the modified concept plan, a small easement is likely to be required for the installation of a mast arm on the north side of Central Avenue between the driveways for 153 Gould Street and 161 Gould Street. All other signal equipment is proposed to be located within the existing roadway right-of-way.

The intersection has been designed to accommodate the turning radii of a WB-40 turning from Central Avenue onto Gould Street without encroaching on opposing traffic flows. This is an improvement over existing conditions where the largest vehicles that can make the turning maneuver without encroaching on opposing traffic flow is a SU-30. Larger vehicles will be able to perform turning maneuvers at the intersection but may result in slight encroachment into the opposing travel lane, which is similar to existing turning movements at intersections along Central Avenue and Gould Street.

It should be noted that the proposed improvements at the intersection of Central Avenue at Gould Street are still in the early design phases and the Proponent will coordinate with the Town of Needham on the specific details of the final design.

Transportation Operations Analysis

21. According to Table 9, the Highland Avenue southbound approach to West Street will operate over capacity with long delays during the weekday PM peak hour under 2029 Build conditions, with an increase in delay of 22 seconds per vehicle generated by the project. The Applicant has not proposed any measures to mitigate this impact. The Applicant should investigate measures to mitigate this significant impact to operations.

Applicant Response: The Proponent has reviewed the signal timings at the intersection of Highland Avenue at West Street during the weekday evening peak hour and determined that if the following signal timing adjustments were made, operations would improve for the southbound approach without adversely impacting movements on the other approaches:

- › Increase cycle length to 125 seconds
- › Provide the following splits for each movement:
 - 51 seconds for the West Street eastbound/westbound approaches, with a 17 second leading eastbound left-turn phase
 - 54 seconds for the Highland Avenue northbound/southbound approaches
 - 20 seconds for exclusive pedestrian crossings

Table 6 summarizes the intersection capacity analyses at the intersection of Highland Avenue at West Street during the weekday evening peak hour with the revised signal timings in place and the intersection capacity worksheets are included in the Attachments to this memorandum.



Table 6 Intersection Capacity Analysis Summary – Highland Avenue at West Street

Location / Movement	2029 No-Build Condition					2029 Build without Mitigation					2029 Build with Mitigation				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Highland Avenue at West Street															
<i>Weekday Evening</i>															
West St EB L	0.60	26.2	C	70	154	0.61	26.7	C	73	159	0.64	31.4	C	87	178
West St EB T/R	0.46	20.9	C	123	251	0.46	20.9	C	123	251	0.48	24.9	C	148	281
West St WB L	0.36	30.7	C	35	88	0.36	30.7	C	35	88	0.39	36.2	D	42	98
West St WB T/R	0.66	36.3	D	117	229	0.66	36.3	D	117	229	0.71	44.3	D	140	256
Highland Ave NB L/T/R	0.82	28.1	C	225	#664	0.83	29.0	C	229	#675	0.78	26.2	C	254	#669
Highland Ave SB L/T/R	0.97	50.7	D	320	#889	1.05	72.0	E	369	#978	0.98	53.4	D	408	#994
Overall	0.81	35.3	D	-	-	0.85	43.3	D	-	-	0.84	38.4	D	-	-

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- # 95th percentile volume exceeds capacity, queue may be longer.

As shown in the table above, modifying the signal timings at this location would reduce the delay for the Highland Avenue southbound movements from 72 seconds to 53 seconds, which nearly offsets the increase in delay caused by the additional Site-generated traffic through the intersection. With the modified signal timings, the overall intersection delay of 38 seconds under the 2029 Build Conditions would be similar to the overall intersection delay of 35 seconds under the 2029 No Build Conditions without the Project in place. In addition, the signal timing adjustments results in volume-to-capacity ratios of less than 1.00 for all movements.

22. The Highland Avenue eastbound through/right-turn movement at the intersection with Webster Street will operate over capacity during the weekday AM peak hour under 2029 Build conditions, with an increase in delay of 26 seconds per vehicle generated by the project. The Applicant has not proposed any measures to mitigate this impact. The Applicant should investigate measures to mitigate this significant impact to operations.

Applicant Response: The Proponent has reviewed the signal timings at the intersection of Highland Avenue at Webster Street during the weekday morning peak hour and determined that if the following signal timing adjustments were made, operations would improve for the eastbound approach without adversely impacting movements on the other approaches:

- › Increase cycle length to 130 seconds
- › Provide the following splits for each movement:
 - 65 seconds for the Highland Avenue eastbound/westbound approaches, with a 16 second leading westbound left-turn phase
 - 28 seconds for exclusive pedestrian crossings
 - 37 seconds for the Webster Avenue northbound/southbound approaches



Table 7 summarizes the intersection capacity analyses at the intersection of Highland Avenue at Webster Street during the weekday morning peak hour with the revised signal timings in place and the intersection capacity worksheets are included in the Attachments to this memorandum.

Table 7 Intersection Capacity Analysis Summary – Highland Avenue at Webster Street

Location / Movement	2029 No-Build Condition					2029 Build without Mitigation					2029 Build with Mitigation				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Highland Ave at Webster Street															
<i>Weekday Morning</i>															
Highland Ave EB L	0.14	22.7	C	13	50	0.14	22.7	C	13	50	0.12	22.1	C	14	52
Highland Ave EB T/R	1.00	67.6	E	290	#745	1.08	93.4	F	330	#830	0.92	49.1	D	366	#861
Highland Ave WB L	0.55	20.9	C	32	109	0.55	21.5	C	32	109	0.63	27.0	C	39	#152
Highland Ave WB T/R	0.64	18.5	B	180	473	0.64	18.6	B	182	480	0.61	19.1	B	223	531
Webster St NB L/T	0.90	56.0	E	189	#471	0.90	56.0	E	189	#471	0.86	54.6	D	223	#474
Webster St NB R	0.40	24.4	C	25	122	0.40	24.4	C	25	122	0.47	30.2	C	51	177
Webster St SB L/T/R	>1.20	35.0	D	69	#160	>1.20	35.0	D	69	#160	>1.20	39.1	D	82	164
Overall	0.91	39.2	D	-	-	0.95	46.3	D	-	-	0.87	36.8	D	-	-

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- # 95th percentile volume exceeds capacity, queue may be longer.

As shown in the table above, modifying the signal timings at this location would reduce the delay for the Highland Avenue eastbound through/right movements from 93 seconds to 49 seconds, which more than offsets the increase in delay caused by the additional Site-generated traffic through the intersection. With the modified signal timings, the overall intersection delay of 37 seconds under the 2029 Build Conditions would be lower than the overall intersection delay of 39 seconds under the 2029 No Build Conditions without the Project in place.

23. Although not heavily impacted by project-generated traffic, the Highland Avenue westbound left/through movement at the intersection with 1st Avenue will be well over capacity during the weekday PM peak hour under both 2029 No-Build and Build conditions. GPI recommends the Applicant consider measures to reduce delay and improve operations at this location.

Applicant Response: The Proponent has reviewed the signal timings at the intersection of Highland Avenue at 1st Avenue during the weekday evening peak hour and determined that if the following signal timing adjustments were made, operations would improve for the westbound approach without adversely impacting movements on the other approaches:

- › Increase cycle length to 115 seconds
- › Provide the following splits for each movement:
 - 50 seconds for the Highland Avenue eastbound/westbound approaches, with 3 second leading pedestrian intervals
 - 29 seconds for the southbound driveway approach and the crosswalk across Highland Avenue
 - 36 seconds for the 1st Avenue northbound approach

Table 8 summarizes the intersection capacity analyses at the intersection of Highland Avenue at 1st Avenue during the weekday evening peak hour with the revised signal timings in place and the intersection capacity worksheets are included in the Attachments to this memorandum.

Table 8 Intersection Capacity Analysis Summary – Highland Avenue at 1st Avenue

Location / Movement	2029 No-Build Condition					2029 Build without Mitigation					2029 Build with Mitigation				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Highland Avenue at 1st Avenue															
<i>Weekday Evening</i>															
Highland Ave EB L/T	0.65	23.6	C	192	#418	0.68	24.2	C	203	#444	0.58	22.0	C	231	427
Highland Ave EB R	0.19	2.4	A	0	12	0.19	2.4	A	0	12	0.19	2.7	A	0	24
Highland Ave WB L/T	>1.20	>120	F	~626	#975	>1.20	>120	F	~630	#980	1.08	76.8	E	~651	#1090
1 st Ave NB L	0.69	27.3	C	222	296	0.69	27.3	C	222	296	0.82	46.4	D	291	#532
1 st Ave NB L/T/R	0.55	23.9	C	144	216	0.55	23.9	C	144	216	0.68	37.6	D	207	#396
Driveway SB L/T/R	0.10	44.5	D	2	15	0.10	44.5	D	2	15	0.06	52.1	D	3	13
Overall	0.99	81.5	F	-	-	0.99	82.0	F	-	-	0.95	50.1	D	-	-

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- ~ Volume exceeds capacity, queue is theoretically infinite.
- # 95th percentile volume exceeds capacity, queue may be longer.

As shown in the table above, modifying the signal timings at this location would reduce the delay for the Highland Avenue eastbound through/right movements from over 120 seconds to 77 seconds, which is better than the operations under the 2029 No Build Conditions without the Project in place. The overall intersection level of service would improve from LOS F to LOS D with the signal timing adjustments.

24. Similarly, the Hunting Road northbound approach to Kendrick Street will be well over capacity during the weekday AM peak hour under 2029 No-Build and Build conditions. GPI recommends the Applicant consider options for reducing delay and improving operations at this location.

Applicant Response: The Proponent has reviewed the signal timings at the intersection of Hunting Road at Kendrick Street during the weekday morning peak hour and determined that if the following signal timing adjustments were made, operations would improve for the northbound approach without adversely impacting movements on the other approaches:

- › Maintain cycle length of 90 seconds
- › Provide the following splits for each movement:
 - 29 seconds for the Kendrick Street eastbound/westbound approaches, with a 12 second leading westbound left-turn phase
 - 37 seconds for the Hunting Road northbound/southbound approaches, with an 11 second lagging southbound left-turn phase
 - 24 seconds for exclusive pedestrian crossings

Table 9 summarizes the intersection capacity analyses at the intersection of Hunting Road at Kendrick Street during the weekday morning peak hour with the revised signal timings in place and the intersection capacity worksheets are included in the Attachments to this memorandum.

Table 9 Intersection Capacity Analysis Summary – Hunting Road at Kendrick Street

Location / Movement	2029 No-Build Condition					2029 Build without Mitigation					2029 Build with Mitigation				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Hunting Road at Kendrick Street															
<i>Weekday Morning</i>															
Kendrick St EB L/T/R	0.43	19.5	B	109	#252	0.43	19.6	B	110	#253	0.49	23.5	C	124	#298
Kendrick St WB L	0.23	11.0	B	20	71	0.23	11.0	B	20	71	0.26	13.6	B	23	77
Kendrick St WB T/R	0.31	12.4	B	72	213	0.33	12.7	B	78	227	0.37	15.8	B	93	249
Hunting Rd NB T/R	>1.20	>120	F	~285	#461	>1.20	>120	F	~285	#461	0.93	60.3	E	219	#386
Hunting Rd NB R	0.39	0.7	A	0	0	0.39	0.7	A	0	0	0.39	0.7	A	0	0
Hunting Rd SB L	0.42	38.0	D	32	65	0.45	38.2	D	34	69	0.39	34.1	C	31	63
Hunting Rd SB T/R	0.14	24.3	C	28	60	0.14	24.3	C	27	60	0.11	20.8	C	24	54
Overall	0.68	41.7	D	-	-	0.68	42.1	D	-	-	0.67	22.3	C	-	-

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- ~ Volume exceeds capacity, queue is theoretically infinite.
- # 95th percentile volume exceeds capacity, queue may be longer.

As shown in the table above, modifying the signal timings at this location would reduce the delay for the Hunting Road northbound movements from over 120 seconds to 60 seconds, which is better than the operations under the 2029 No Build Conditions without the Project in place. The overall intersection level of service would improve from LOS D to LOS C with the signal timing adjustments.

It should be noted that the traffic signal at this intersection is coordinated with the intersection of Kendrick Street at the I-95 Southbound Ramps to the east, which was not included as a study area intersection in the TIA. It should be confirmed that modifying the splits at the Hunting Road at Kendrick Street intersection will not adversely impact operations at the adjacent signalized intersection before implementing the signal timing adjustments.

25. The Webster Street and Cedar Street approaches to Central Avenue are expected to operate well over capacity with long delays and queues under 2029 No-Build and Build conditions, particularly during the weekday AM peak hour. The Applicant should investigate options for improving the operations of these intersections,

including conducting a signal warrant analysis to assess whether a warrant for installation of traffic signal will be met at either of these locations.

Applicant Response: As requested, signal warrants have been conducted at the intersections of Central Avenue at Cedar Street and Central Avenue at Webster Street. The warrants have been conducted for the 2022 Existing Conditions, 2029 No Build Conditions, and 2029 Build Conditions. The warrants are based on peak hour data projected throughout the day based on the hourly distribution of traffic at a nearby MassDOT count station on Highland Avenue. Table 10 presents the results of the signal warrant analyses and the warrant analysis worksheets are included in the Attachments to this memorandum.

Table 10 Traffic Signal Warrants Analysis Summary

Location	Condition	Warrant 1 (8-Hour) Met	Warrant 2 (4-Hour) Met	Warrant 3 (Peak Hour) Met
Central Avenue at Cedar Street	2022 Existing	Yes	Yes	No
	2029 No Build	Yes	Yes	No
	2029 Build	Yes	Yes	Yes
Central Avenue at Webster Street	2022 Existing	Yes	No	No
	2029 No Build	Yes	Yes	No
	2029 Build	Yes	Yes	No

Note: Based on 85th-percentile speeds under 40 miles per hour, per posted speed limits on Central Avenue

As shown in the table above, both intersections are warranted by at least one warrant under the 2022 Existing, 2029 No Build, and 2029 Build Conditions. The addition of Site-generated traffic does not trigger an intersection from not having a traffic signal being warranted to warranting a traffic signal.

Since both intersections are warranted under Existing and No Build Conditions and since less than 10-percent of the Project-generated trips are expected to travel through these two intersections, the Proponent is not proposing to signalize either of these intersections. Mitigation for the proposed Project is focused on locations that are expected to carry a higher proportion of Site-generated traffic. However, the signal warrants conducted provide knowledge to the Town of Needham that a signal is warranted to be installed at each of these locations. In addition, the Proponent is proposing to fund the installation of a traffic signal at the intersection of Central Avenue at Gould Street, which is expected to also help operations at these two unsignalized intersections by creating additional gaps in the traffic flow along Central Avenue that will help create additional opportunities for vehicles turning from Cedar Street and Webster Street onto Central Avenue.

- As noted in Comment 19, even with the proposed mitigation at the Highland Avenue / Gould Street / Hunting Road intersection, some movements will continue operating at LOS F under 2029 Build with Mitigation conditions. Therefore, the Applicant should investigate the feasibility of providing additional capacity at this location to accommodate 2029 Build traffic volumes.

Applicant Response: As noted in the response to Comment 19, additional capacity cannot be provided on the Hunting Road northbound approach without impacting the existing property at 580 Highland Avenue and

potentially requiring the razing of the building. However, the signal timings were reviewed to try and improve operations expected to operate at LOS F.

With the proposed mitigation and signal timing adjustments, the intersection will operate similar to the 2029 No Build Conditions. The 2029 No Build Conditions include the completion of the MassDOT Needham-Newton corridor project along Highland Avenue, which does not include a significant enhancement of capacity at the intersections along Highland Avenue, as the design prioritizes safety and active transportation enhancements over additional vehicle capacity. As the roadway redesign project has been in the works for many years and has gone through several rounds of public comments to reach the current construction plan, the design reflects state and local vision of the Highland Avenue corridor, which allows for occasional movements operating at LOS F in the future.

In addition, the design of the Gould Street cross-section has been revised since receiving the Transportation Engineering Peer Review and two additional alternatives have been created. In response to The Town of Needham directing the Proponent to evaluate concepts that would result in less additional pavement, the revised concepts include a three-lane cross section on the Gould Street southbound approach to Highland Avenue; two left-turn lanes and one shared through/right-turn lane. These concepts result in less pavement and a shorter crossing distance for pedestrians while still providing adequate capacity for the existing and future traffic volumes on Gould Street.

Traffic Monitoring Program

27. The TIAS describes a transportation monitoring program that will be conducted post-occupancy to monitor parking occupancy and traffic operations at four of the study area intersections, including the site driveway. The Applicant should also provide monitoring of the effectiveness of the proposed TDM program in encouraging walking/biking, carpooling, and public transportation travel to/from the site.

Applicant Response: The proposed transportation monitoring program will be expanded to include a travel survey of employees and patrons of the Site. The survey will be conducted by the Proponent and will include details on the mode of transportation employees and patrons use to access the Site as well as the effectiveness of the proposed TDM programs. The survey will also ask about hybrid work schedules to determine how frequently employees commute to the Site versus working from home. The results of the survey will be used to review the current TDM program and decide if any tweaks are necessary to further engage the employees and patrons of the Site to encourage the use of walking/biking, carpooling, and public transportation.

28. The proposed traffic monitoring program will include the collection of vehicle turning movement counts during the weekday AM and PM peak periods at the following study area intersections:
 - Central Avenue / Gould Street
 - Gould Street / TV Place
 - Gould Street / Project Site Driveway
 - Highland Avenue / Gould Street / Hunting Road

GPI agrees that these represent the critical locations that would experience the greatest increase in traffic due to the project. However, should the result of the monitoring study indicate that the actual traffic increase generated by the project exceeds the traffic projections contained within the ENF by ten percent or more, the study area for the monitoring program should be expanded to include additional locations to verify that the project's impacts does not create any operation deficiencies at nearby locations. In addition, the monitoring programs should include a capacity and queue analysis to verify the operations of each of the study area intersections under post-occupancy conditions. The monitoring program should also include the collection of daily traffic volumes on TV Place and the Project Site driveway to verify the daily traffic generated by the project.

Applicant Response: The proposed transportation monitoring program will include simultaneous automatic traffic recorder (ATR) counts at each Site driveway for a continuous 48-hour period during a typical week as well as a capacity and queue analyses to verify the operations at the four intersections listed above under post-occupancy condition. If the results of the monitoring study indicate that the actual traffic increase generated by the Project exceeds the traffic projections contained within the ENF by ten percent or more, the Proponent will work with the Town of Needham and MassDOT to determine if the monitoring program should be expanded, and if so, which additional intersections should be included. The Proponent will also further evaluate the TDM program to see if any tweaks are necessary to further engage the employees and patrons of the Site to encourage the use of walking/biking, carpooling, and public transportation if the actual traffic increase generated by the Project exceeds the traffic projections contained within the ENF by ten percent or more.

Site Access and Circulation

29. Figure 2 of the TIAS provides a site plan depicting the proposed layout and traffic circulation on the site. The plan appears to indicate that a loading/unloading area will be provided at the front of the site between Buildings A and B. This loading area is located in close proximity of the signalized intersection of the main site driveway and Gould Street. Vehicles, particularly trucks, stopped in this area could cause a back up of traffic into Gould Street. The Applicant should consider modifications to the site plan that provide a clear separation of loading/unloading areas and through traffic access to the parking fields to ensure traffic does not back up onto Gould Street. In addition, the Applicant should consider limiting hours of deliveries to the site, as a condition of approval, to avoid deliveries occurring between 7:00 AM and 9:00 AM when a high volume of traffic may be entering the site from Gould Street to access the parking garage.

Applicant Response: The Project Site will include two dedicated loading docks, one in each building. The loading docks will allow trucks to load and unload safely within the loading dock area and will not impede traffic flow on the circulating Site roadway. The area in front of the atrium is intended to be used as a pick-up/drop-off area and will likely be used as well by small deliveries, such as food deliveries and UPS/FedEx. The pick-up/drop-off area will be wide enough so that vehicles idling along the curbside will not impede through movements on the circulating Site roadway. Signage and pavement markings will be provided on-Site indicating the use of this area as a pick-up/drop-off zone and directing employees and visitors to the parking fields.

30. A large parking garage is proposed at the northerly end of the site, as well as a small surface parking lot near Gould Street. The Applicant should clearly define who will utilize the surface parking lot. In order to avoid congestion along the main drive aisle through the site, the surface parking lot should be restricted to use by accessible parking spaces, visitors, and brewery patrons (if a brewery is provided) only. All employees of both buildings, including brewery employees, should be directed to park in the parking garage.

Applicant Response: The small surface parking lot is proposed to be used by accessible parking spaces, visitors, and patrons to the retail establishments on Site (the retail tenants for the Site are currently unknown). All employees on-Site (including those for the retail establishment) will be directed to the parking garage and the underground parking area.

31. The site plan included in Figure 2 does not depict any pedestrian connections between the proposed surface parking lot and the buildings. The Applicant should modify the site plan to provide fully accessible pedestrian routes between the surface parking lot and both buildings, as well as to the pedestrian loops around the site.

Applicant Response: The plan has been revised to include a crosswalk and accessible access from the parking lot to the buildings as well as access to the pedestrian loop.

32. The entering travel lane on TV Place is aligned with the sidewalk as it passes by the proposed site driveway. In addition, the exiting lane west of the site driveway is aligned with the entering lane east of the driveway. This has the potential to create a head-on collision between drivers entering and exiting the site as they cross between lanes through the site driveway intersection with TV Place. It also has the potential for entering vehicles on TV Place to drive onto the sidewalk. The Applicant should modify the layout of TV Place to provide better alignment of entering and exiting travel lanes, which may involve additional widening of TV Place to the east of the site driveway and introduction of a raised or striped median island.

Applicant Response: The geometry of TV Place has been modified to better align the entering and exiting travel lanes. In addition, a dashed lane line extension pavement marking will be installed for the through movements on TV Place at the Site driveway to better align eastbound and westbound traffic on TV Place. The modified TV Place geometry is included in the revised Gould Street concept plan included in the Attachments to this memorandum.

33. The Applicant should perform a vehicle turning movement analysis to verify that emergency vehicles and trucks can safely access and navigate the site. This includes delivery, postal, and trash removal vehicles. The Applicant should provide this turning analysis to the Needham Police and Fire Departments for verification that safe and adequate access is provided.

Applicant Response: Turning diagrams within the site have been studied and are provided in the Attachments to this memorandum. The emergency vehicles as well as delivery vehicles can safely access and navigate the site.

34. Table 15 of the TIAS indicates that queues of nearly 200 feet (eight vehicles) could occur in each lane exiting the site driveway during the weekday PM peak hour. Although the provided plan on Figure 2 is not scaled to be able to accurately measure the available stacking distance, it appears that only 60 feet of stacking distance is proposed in each lane on the site driveway approaching Gould Street before reaching the loading area. Therefore, the queues exiting the site will regularly back up into the loading area and around the corner beyond the driveway to the surface parking lot during the weekday PM peak hour. The Applicant should consider modifications to the site plan to provide additional vehicle stacking exiting the site without interference with the loading area, parking areas, or on-site circulation.

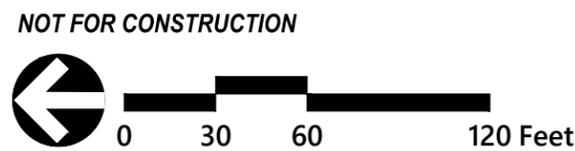
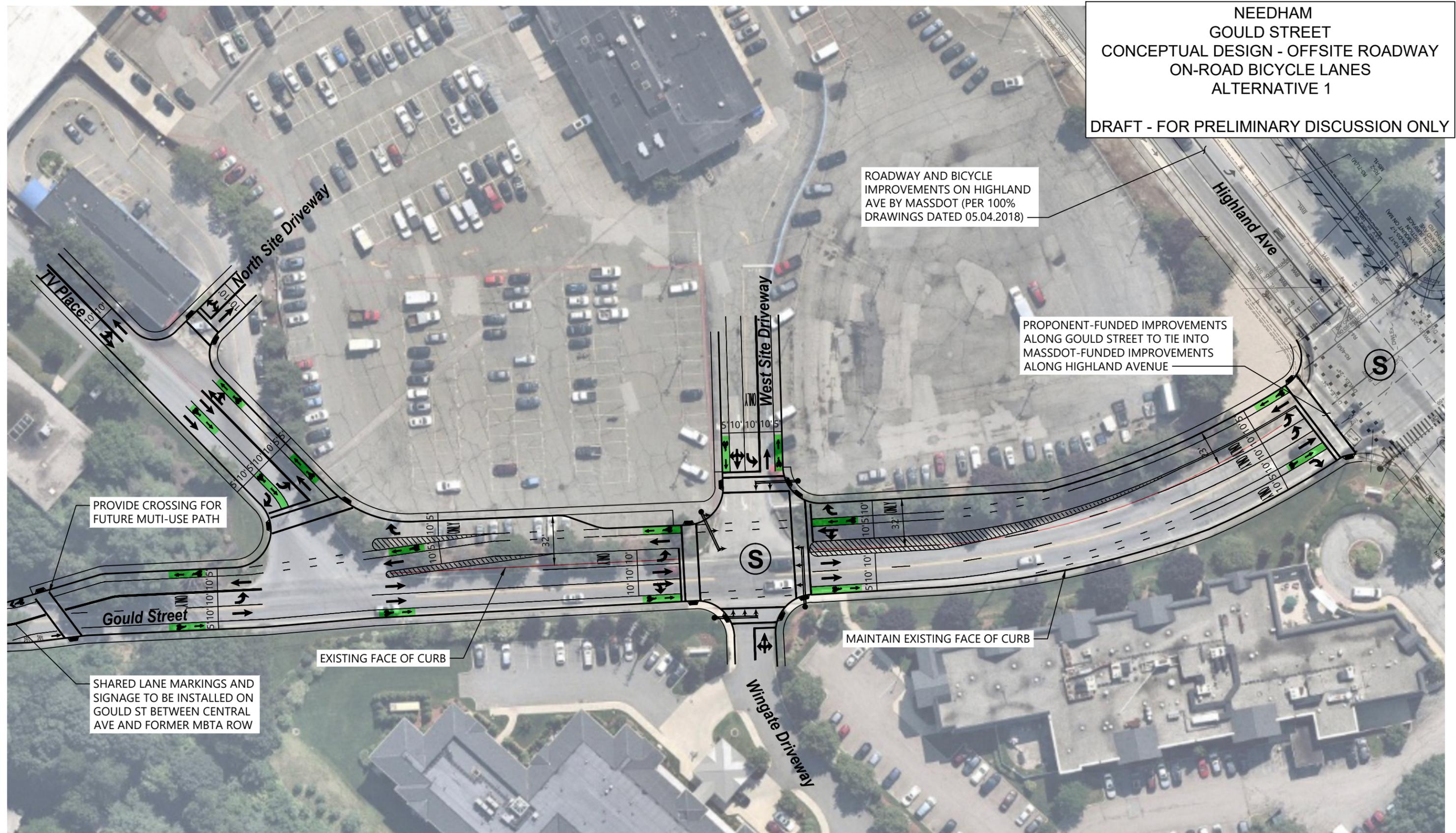
Applicant Response: The Site driveway will be designed to accommodate the queues waiting at the traffic signal at Gould Street. The garage entrance closest to the traffic signal will only provide access to the loading dock, which will be designed so that loading and unloading vehicles will not block the circulating Site roadway. The development is not expected to receive many deliveries during the weekday evening peak hour, but if a delivery truck needs to leave the loading dock and the queue at the signal extends past the loading dock, the delivery truck will be able to turn right onto the circulating Site roadway and exit the Site via TV Place. The entrances to the underground parking area and the free-standing parking garage are around the corner and more than 200 feet away from the signal, providing sufficient room for vehicles to queue without spilling back into the main parking areas. While a queue of 200 feet may extend past the pick-up/drop-off area, that should not be an operational issue as the pick-up/drop-off area will be located on the other side of the circulating Site roadway. Drivers using the pick-up/drop-off area are expected to enter the Site at the signalized driveway and exit the Site at TV Place, traveling in a counterclockwise direction.

Attachments

- Updated Off-Site Mitigation Roadway Concept Plans
- Queue Diagrams (*Comment 2a*)
- Weave Segment Capacity Analysis Worksheets (*Comment 2b*)
- Collision Diagrams (*Comment 8*)
- Existing Site Trip Generation Calculations (*Comment 12*)
- Existing Town of Needham Mode Share Data (*Comment 14*)
- GPI Gould Street Improvement Concept Plan (*Comment 19*)
- Intersection Capacity Analysis Worksheets (*Comments 19 and 21-24*)
- Traffic Signal Warrant Analysis Worksheets (*Comment 25*)
- Turning Movement Diagrams (*Comment 33*)

Updated Off-Site Mitigation Roadway Concept Plans

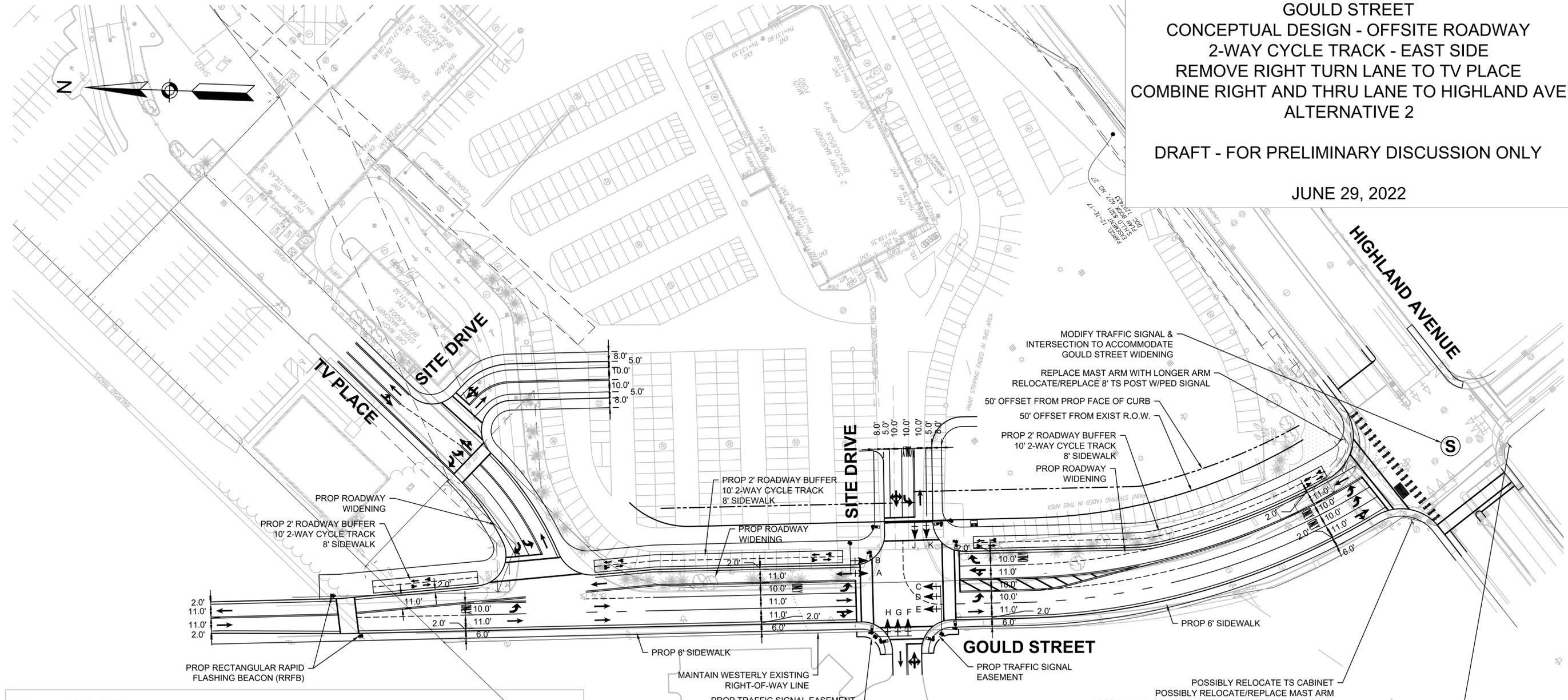
NEEDHAM
GOULD STREET
CONCEPTUAL DESIGN - OFFSITE ROADWAY
ON-ROAD BICYCLE LANES
ALTERNATIVE 1
DRAFT - FOR PRELIMINARY DISCUSSION ONLY



NEEDHAM
 GOULD STREET
 CONCEPTUAL DESIGN - OFFSITE ROADWAY
 2-WAY CYCLE TRACK - EAST SIDE
 REMOVE RIGHT TURN LANE TO TV PLACE
 COMBINE RIGHT AND THRU LANE TO HIGHLAND AVE
 ALTERNATIVE 2

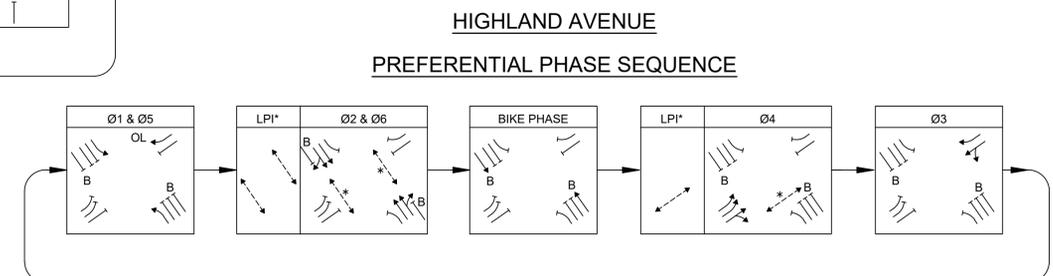
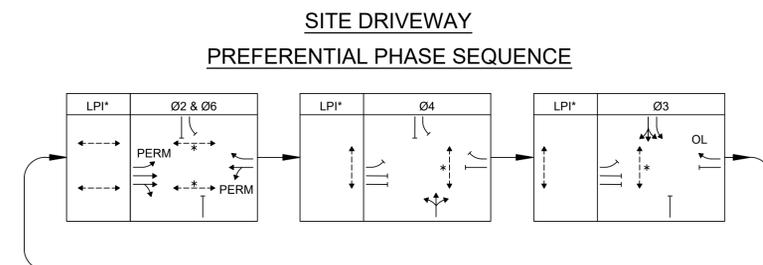
DRAFT - FOR PRELIMINARY DISCUSSION ONLY

JUNE 29, 2022

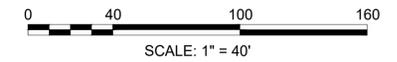


SIGNAL HEAD DATA

A,D,E,H,K	B	C	F	G,J	ALL
ALL 12" LENS					



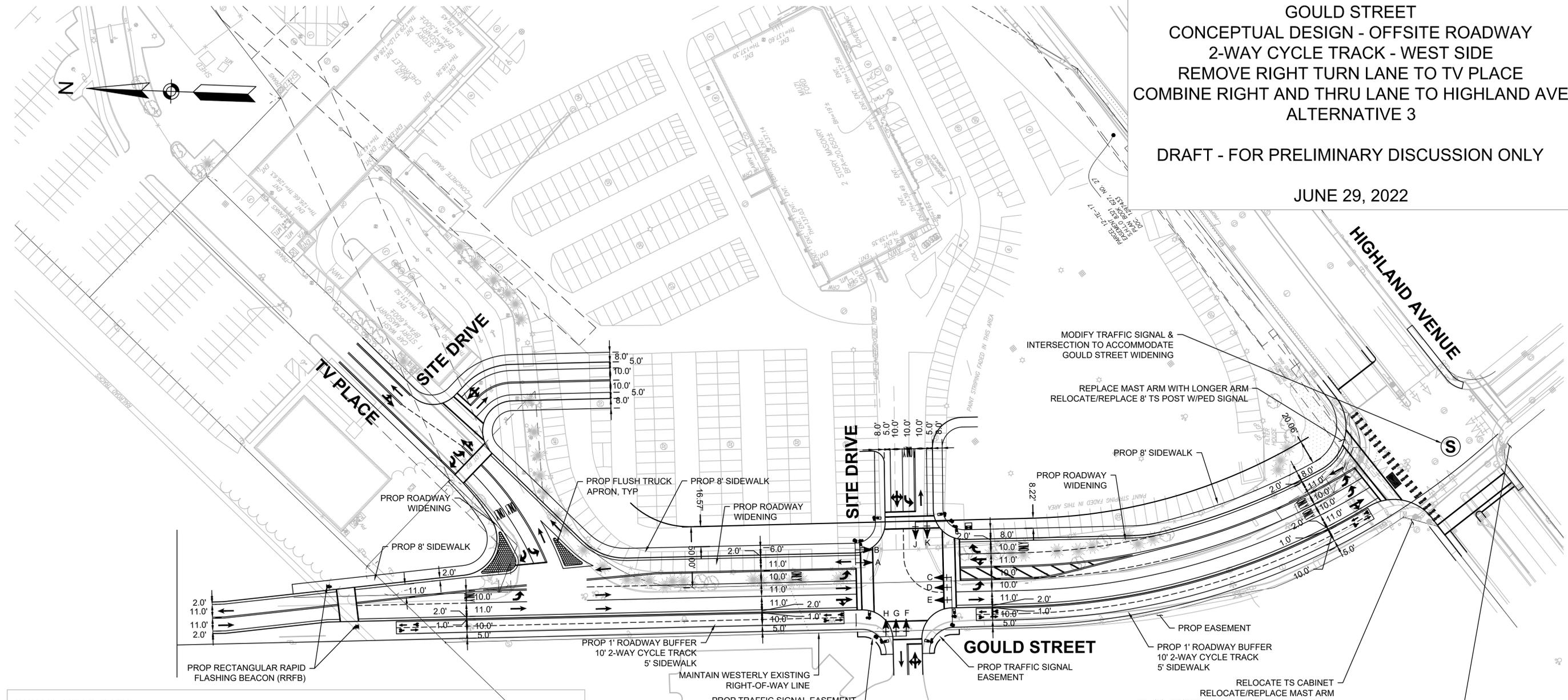
- NOTES:**
- ALL SIGNAL HEADS SHALL BE RIGID MOUNTED.
 - ALL SIGNAL HEADS SHALL BE EQUIPPED WITH 5"± NON- LOUVERED BACKPLATES. ALL BACKPLATES SHALL CONTAIN A 3" WIDE YELLOW REFLECTIVE BORDER.
 - ALL SIGNAL HEADS SHALL BE EQUIPPED WITH TUNNEL VISORS.
 - ALL SIGNAL DISPLAYS SHALL BE EQUIPPED WITH L.E.D. MODULES.



NEEDHAM
GOULD STREET
CONCEPTUAL DESIGN - OFFSITE ROADWAY
2-WAY CYCLE TRACK - WEST SIDE
REMOVE RIGHT TURN LANE TO TV PLACE
COMBINE RIGHT AND THRU LANE TO HIGHLAND AVE
ALTERNATIVE 3

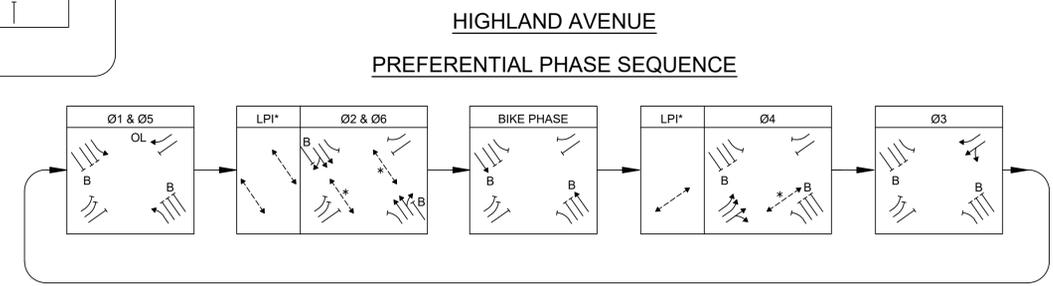
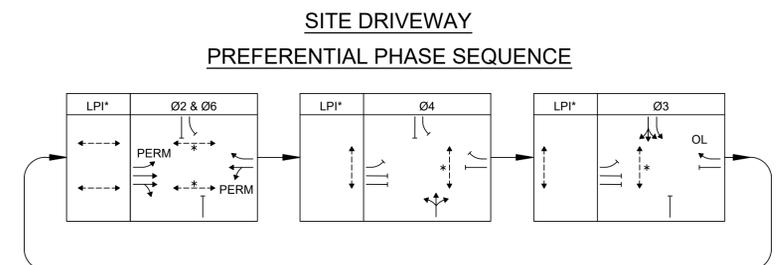
DRAFT - FOR PRELIMINARY DISCUSSION ONLY

JUNE 29, 2022



SIGNAL HEAD DATA

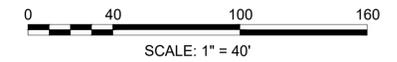
A,D,E,H,K	B	C	F	G,J	ALL
ALL 12" LENS					



- NOTES:**
- ALL SIGNAL HEADS SHALL BE RIGID MOUNTED.
 - ALL SIGNAL HEADS SHALL BE EQUIPPED WITH 5"± NON- LOUVERED BACKPLATES. ALL BACKPLATES SHALL CONTAIN A 3" WIDE YELLOW REFLECTIVE BORDER.
 - ALL SIGNAL HEADS SHALL BE EQUIPPED WITH TUNNEL VISORS.
 - ALL SIGNAL DISPLAYS SHALL BE EQUIPPED WITH L.E.D. MODULES.

* NORMALLY DW, W/FDW UPON PEDESTRIAN PUSH BUTTON ACTUATION
 PERM = PERMISSIVE
 LPI = LEADING PEDESTRIAN INTERVAL

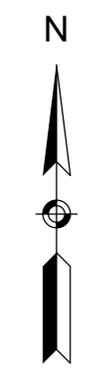
* NORMALLY DW, W/FDW UPON PEDESTRIAN PUSH BUTTON ACTUATION
 OL = OVERLAP
 LPI = LEADING PEDESTRIAN INTERVAL
 B = HIGHLAND AVENUE SEPARATED BIKE LANE



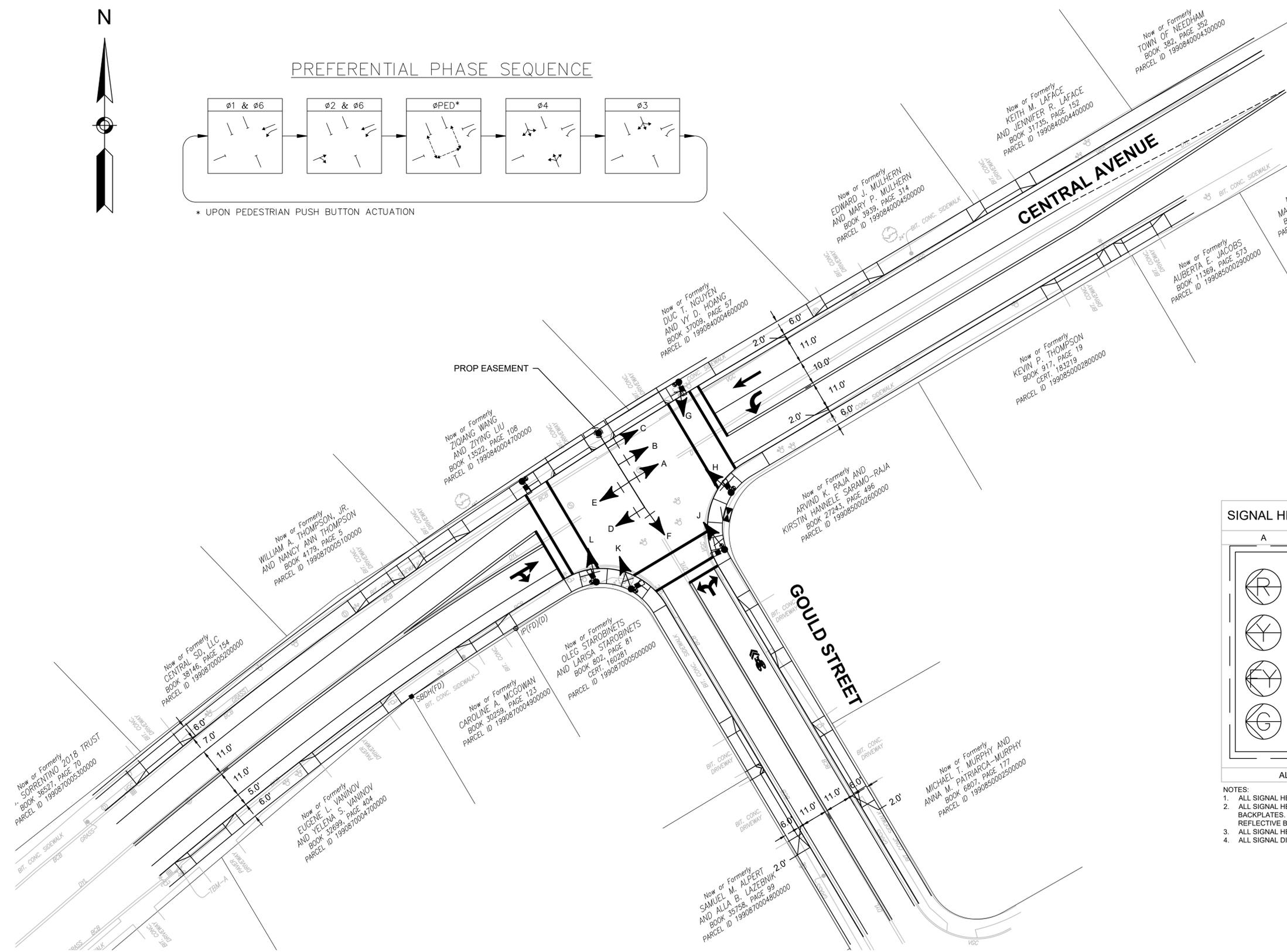
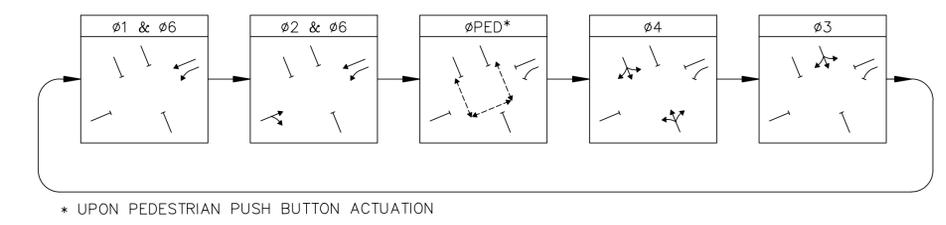
NEEDHAM
GOULD STREET @ CENTRAL AVENUE
CONCEPTUAL LAYOUT

DRAFT - FOR PRELIMINARY DISCUSSION ONLY

JUNE 27, 2022

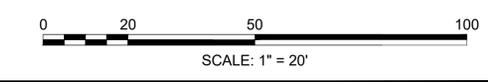


PREFERENTIAL PHASE SEQUENCE



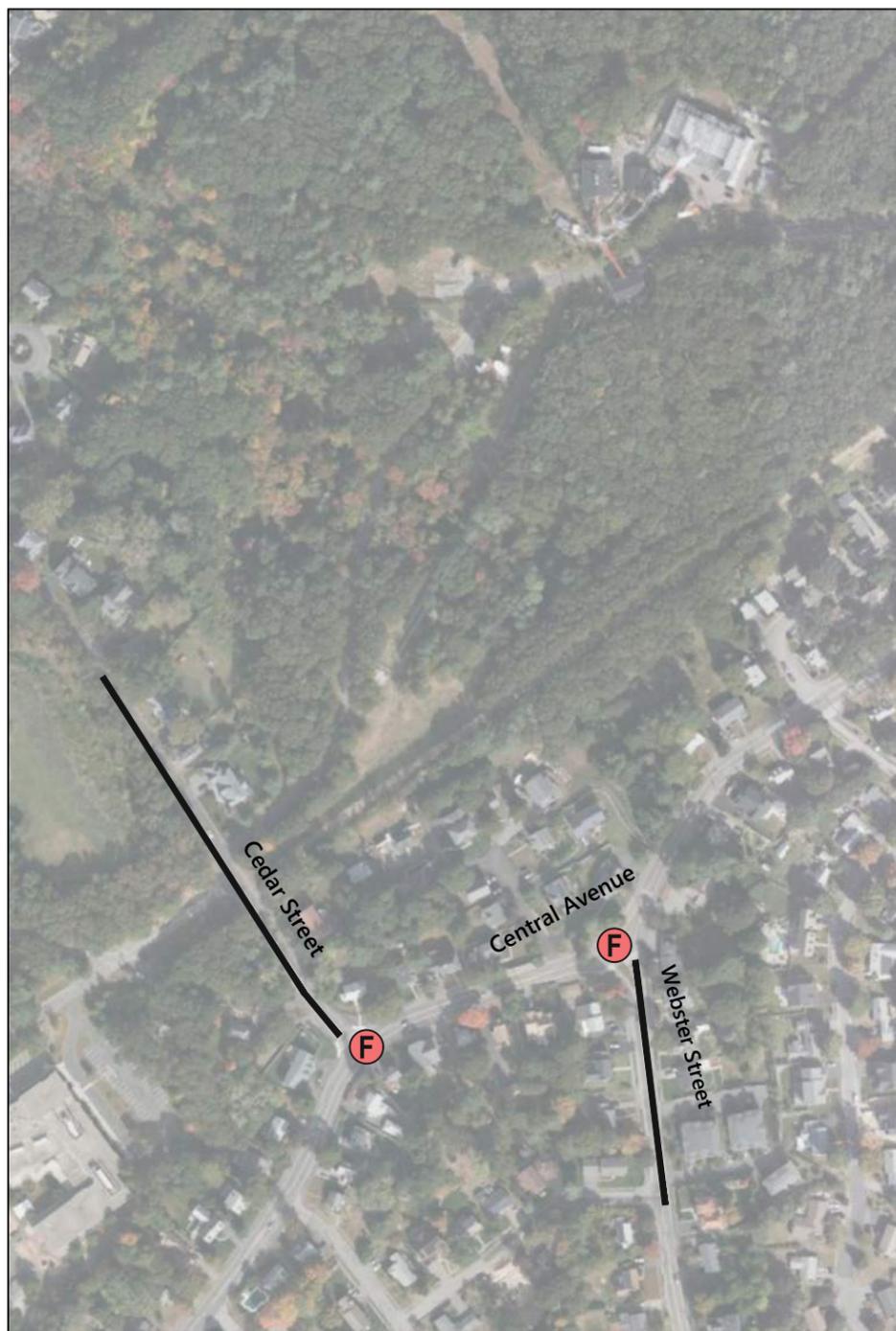
SIGNAL HEAD DATA		
A	B,C,D,E,F,G,H,J,K,L	ALL
		<p>W/COUNTDOWN TIMER</p>
ALL 12" LENS		

- NOTES:
1. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED.
 2. ALL SIGNAL HEADS SHALL BE EQUIPPED WITH 5"± NON- LOUVERED BACKPLATES. ALL BACKPLATES SHALL CONTAIN A 3" WIDE YELLOW REFLECTIVE BORDER.
 3. ALL SIGNAL HEADS SHALL BE EQUIPPED WITH TUNNEL VISORS.
 4. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED WITH L.E.D. MODULES.

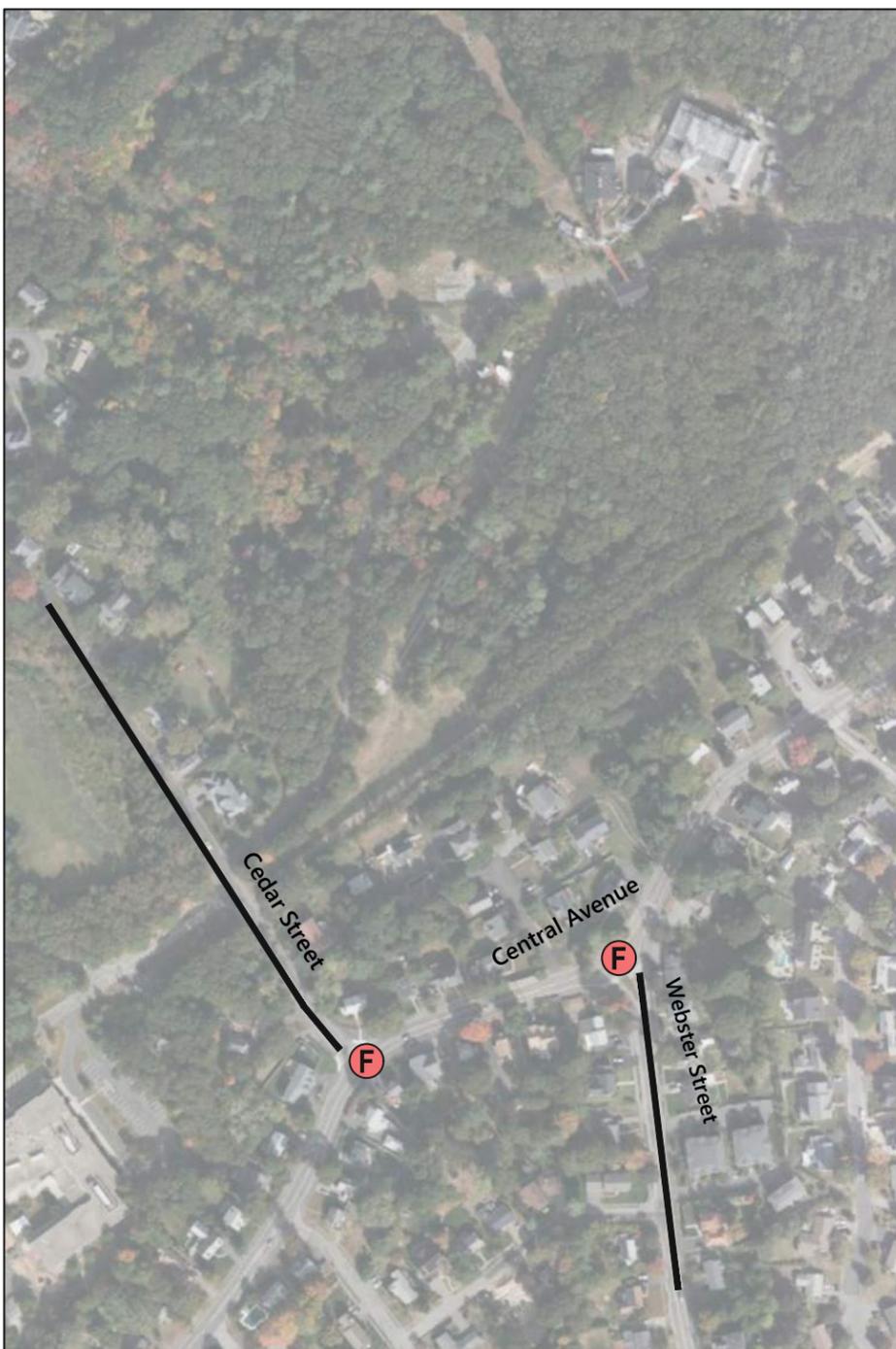


Central Avenue at Cedar Street and Webster Street (Unsignalized)

☒ Signalized Intersection Level of Service 50th Percentile Queue
☒ Unsignalized Intersection Level of Service 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build

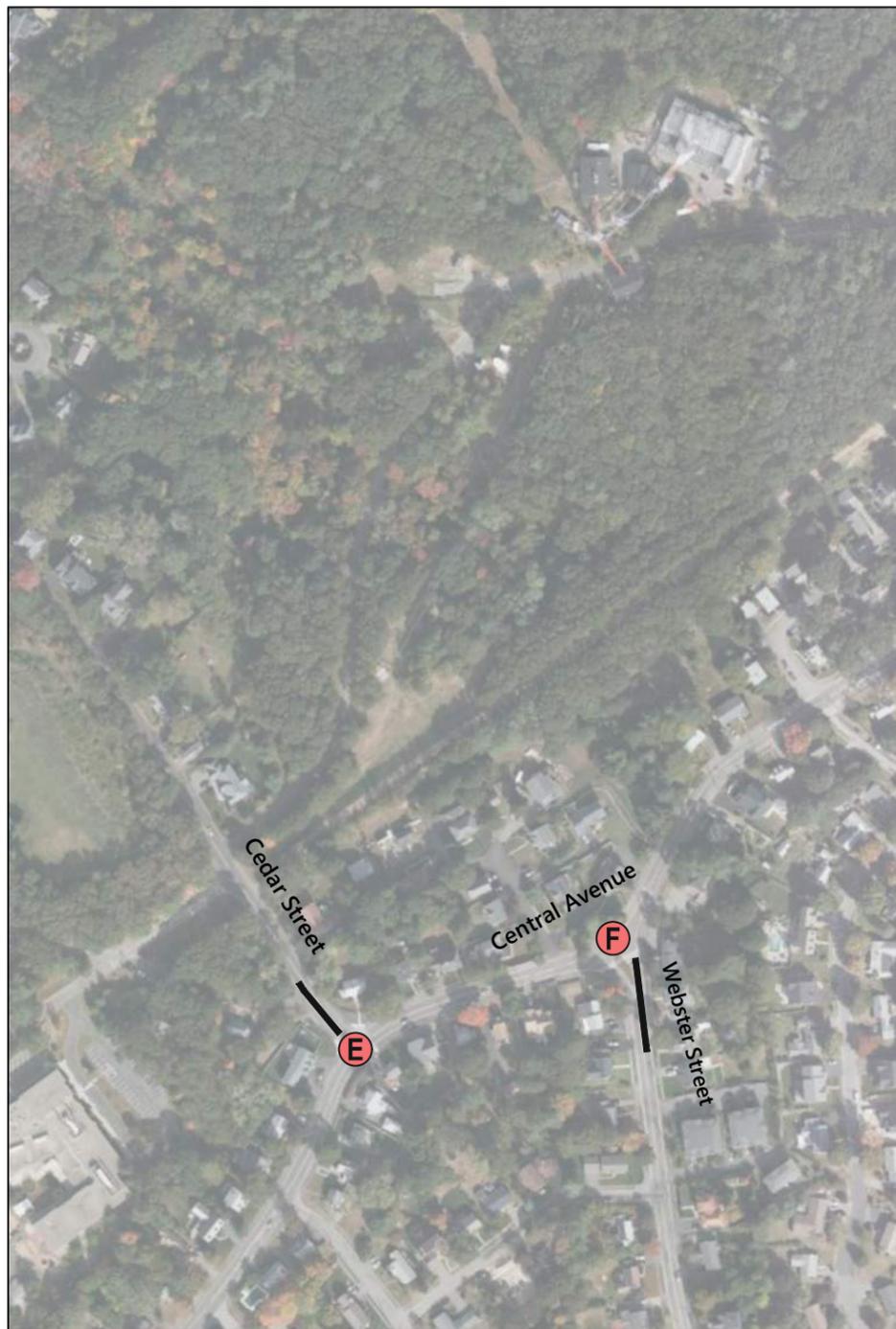


Queue Diagrams
Weekday Morning Peak Hour

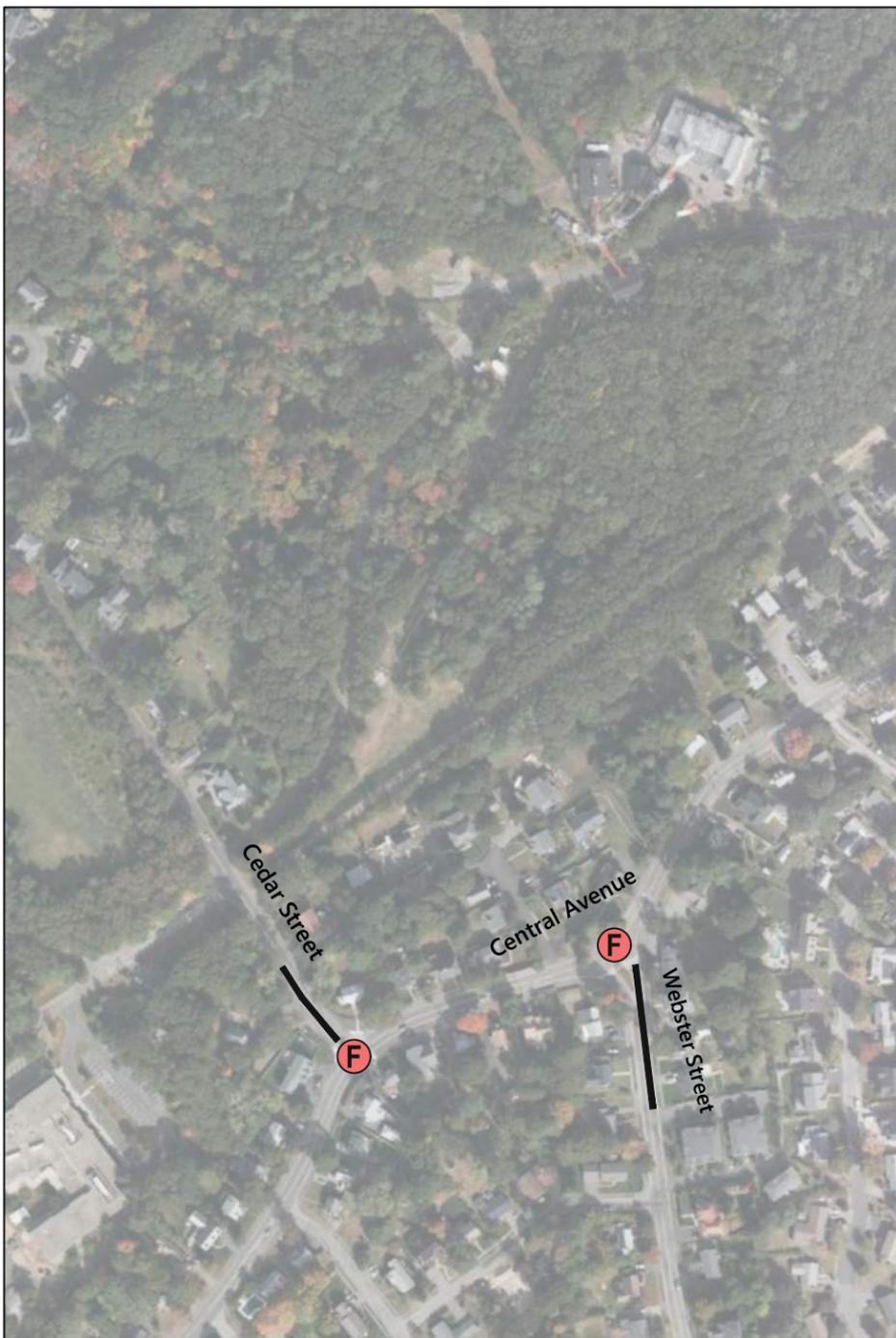
557 Highland Avenue
Needham, Massachusetts

Central Avenue at Cedar Street and Webster Street (Unsignalized)

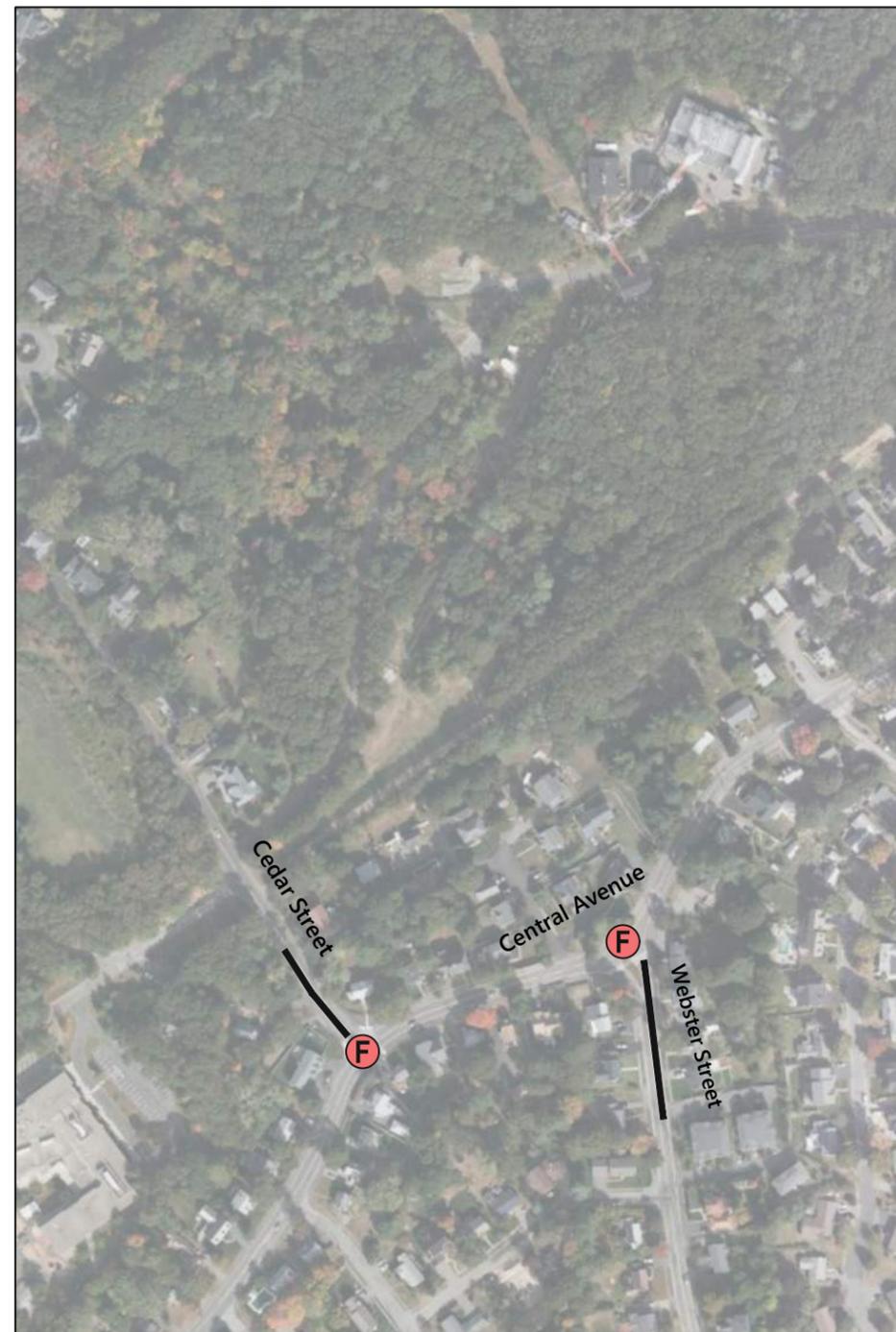
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☒ Unsignalized Intersection Level of Service 95th Percentile Queue



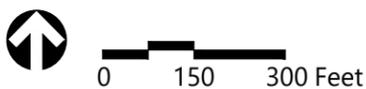
2022 Existing



2029 No-Build



2029 Build



vhb Queue Diagrams
Weekday Evening Peak Hour

**557 Highland Avenue
Needham, Massachusetts**

Central Avenue at Gould Street, Hampton Avenue, and River Park Street (Unsignalized)

ⓧ Signalized Intersection Level of Service 50th Percentile Queue
ⓧ Unsignalized Intersection Level of Service 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation



Queue Diagrams
Weekday Morning Peak Hour

557 Highland Avenue
Needham, Massachusetts



Central Avenue at Gould Street, Hampton Avenue, and River Park Street (Unsignalized)

- ⓧ Signalized Intersection Level of Service
- ⓧ Unsignalized Intersection Level of Service
- 50th Percentile Queue
- 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation

* Movement beyond capacity, no results reported.



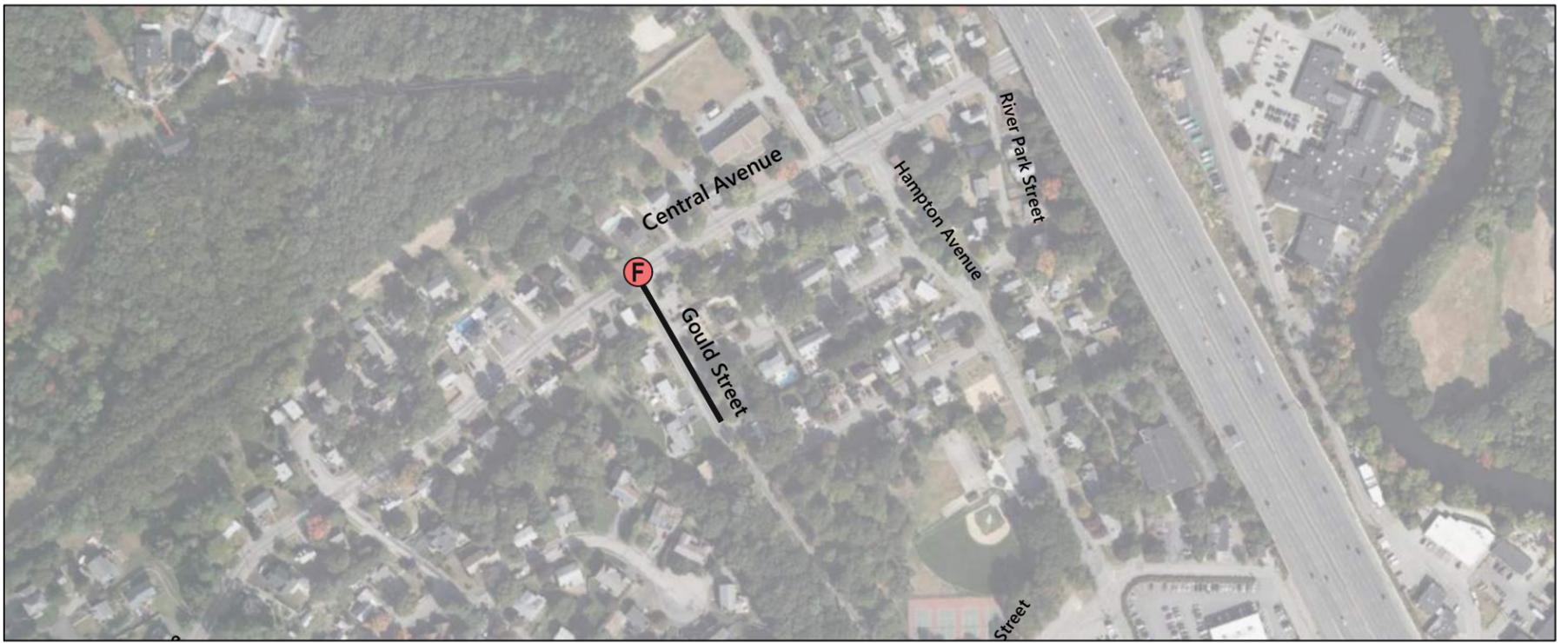
Queue Diagrams
Weekday Evening Peak Hour



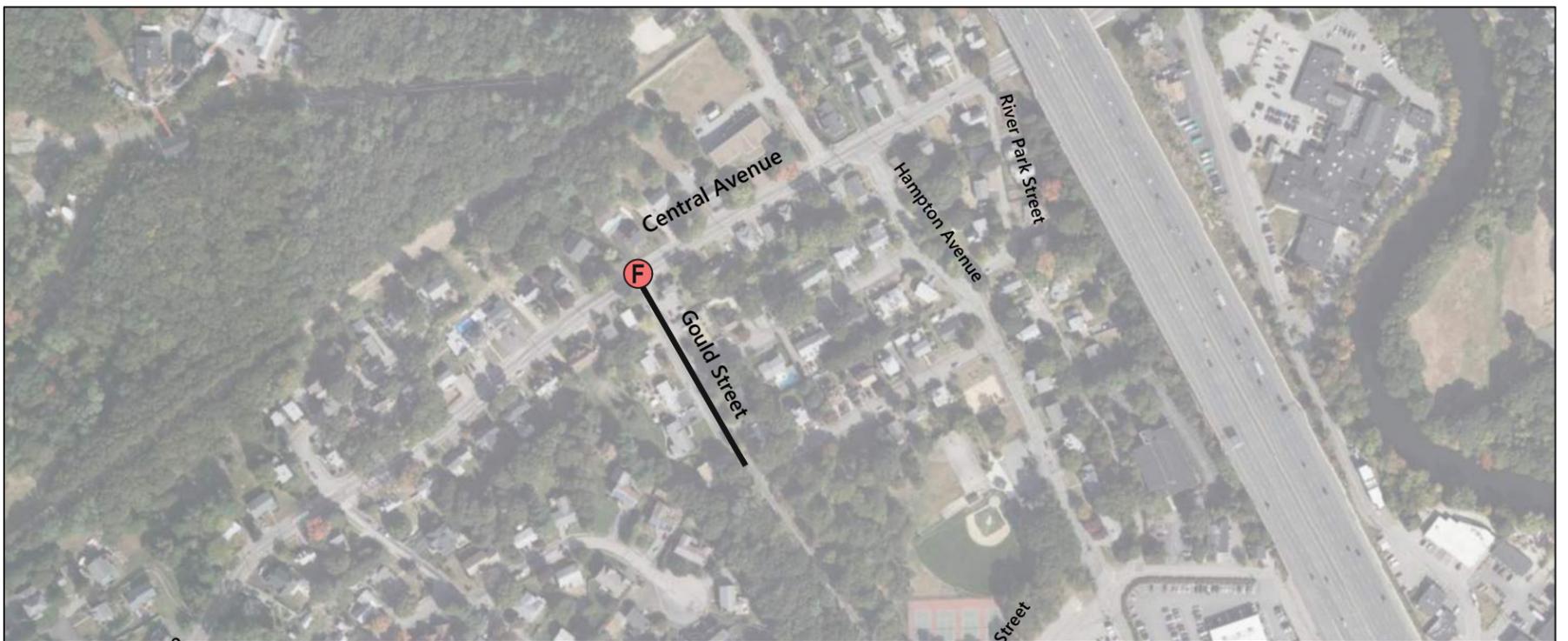
557 Highland Avenue
Needham, Massachusetts

Central Avenue at Gould Street (Unsignalized)

- ☒ Signalized Intersection Level of Service
- ☒ 50th Percentile Queue
- ☒ Unsignalized Intersection Level of Service
- ☒ 95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

Central Avenue at Gould Street signalized under mitigation conditions.



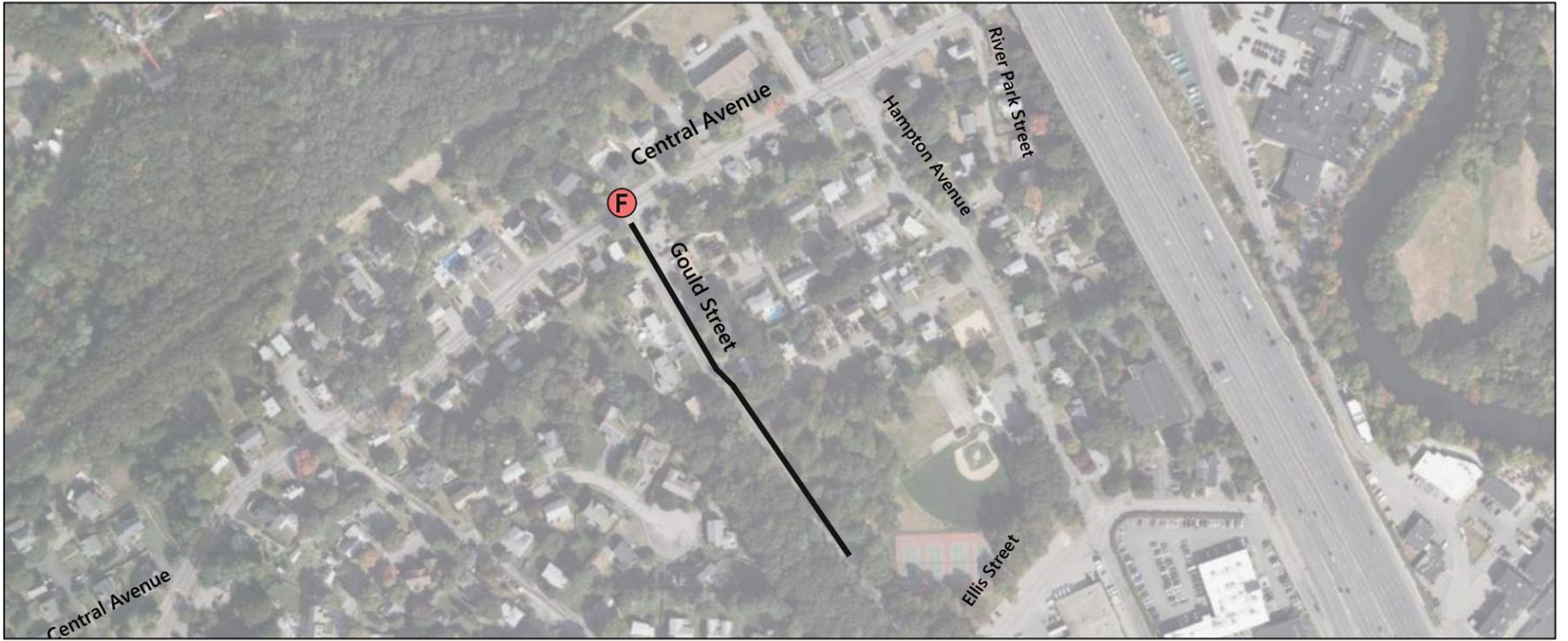
Queue Diagrams
Weekday Morning Peak Hour



557 Highland Avenue
Needham, Massachusetts

Central Avenue at Gould Street (Unsignalized)

- ☒ Signalized Intersection Level of Service
- ☒ 50th Percentile Queue
- ☒ Unsignalized Intersection Level of Service
- ☒ 95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

* Movement beyond capacity, no results reported.
Central Avenue at Gould Street signalized under mitigation conditions.



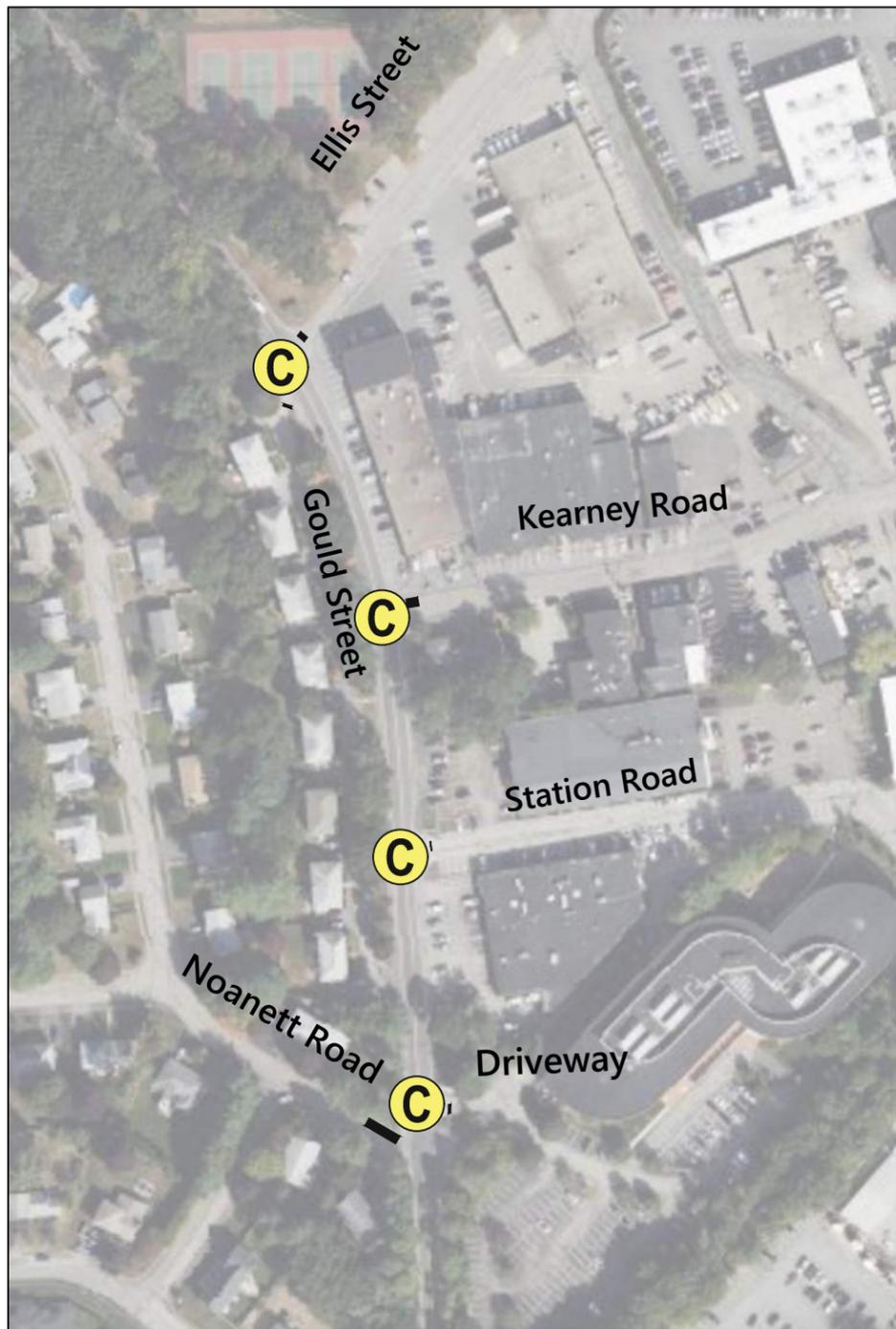
Queue Diagrams
Weekday Evening Peak Hour



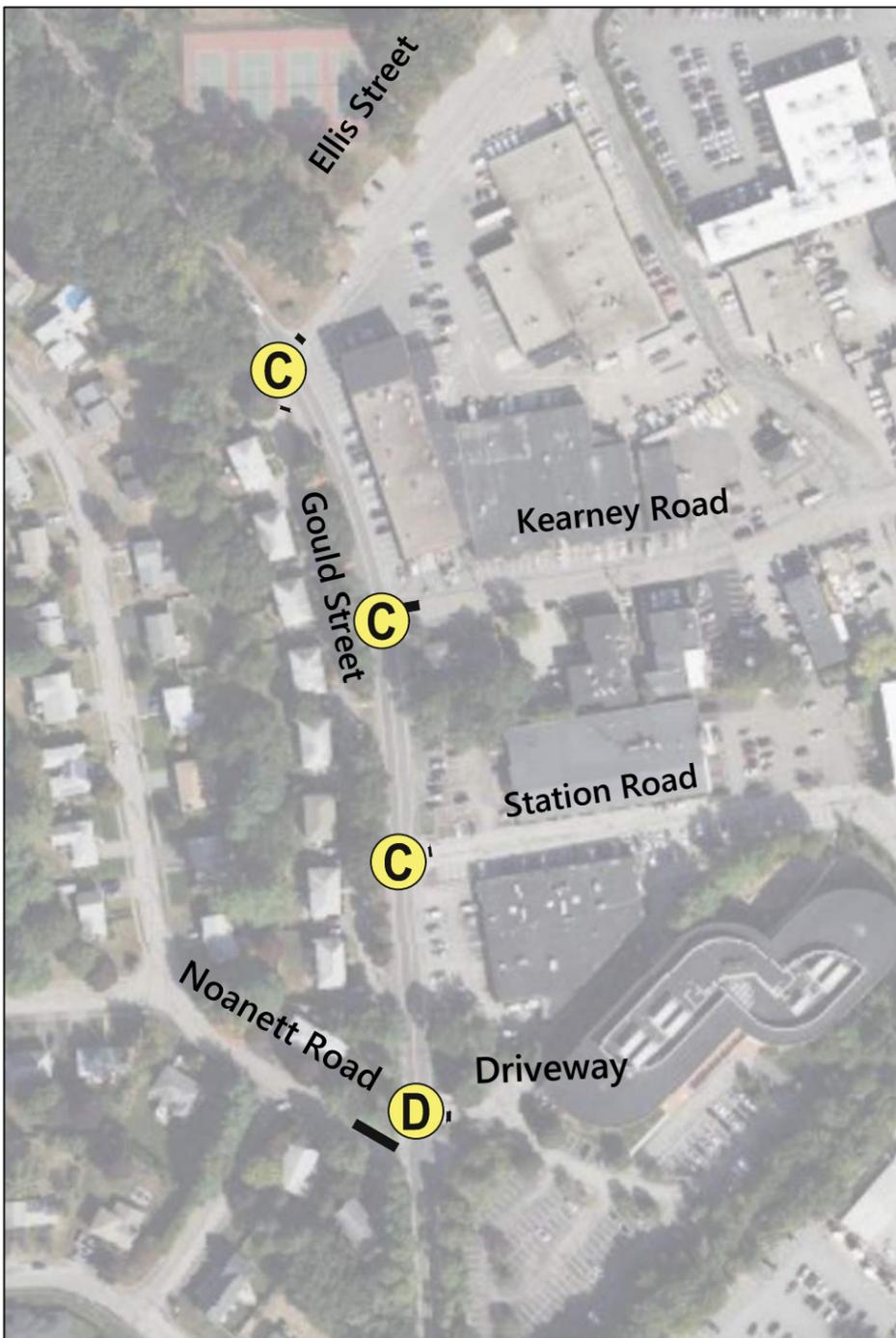
557 Highland Avenue
Needham, Massachusetts

Gould Street at Ellis Treet, Kearney Road, Station Road, and Noanett Road (Unsignalized)

ⓧ Signalized Intersection Level of Service 50th Percentile Queue
ⓧ Unsignalized Intersection Level of Service 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build

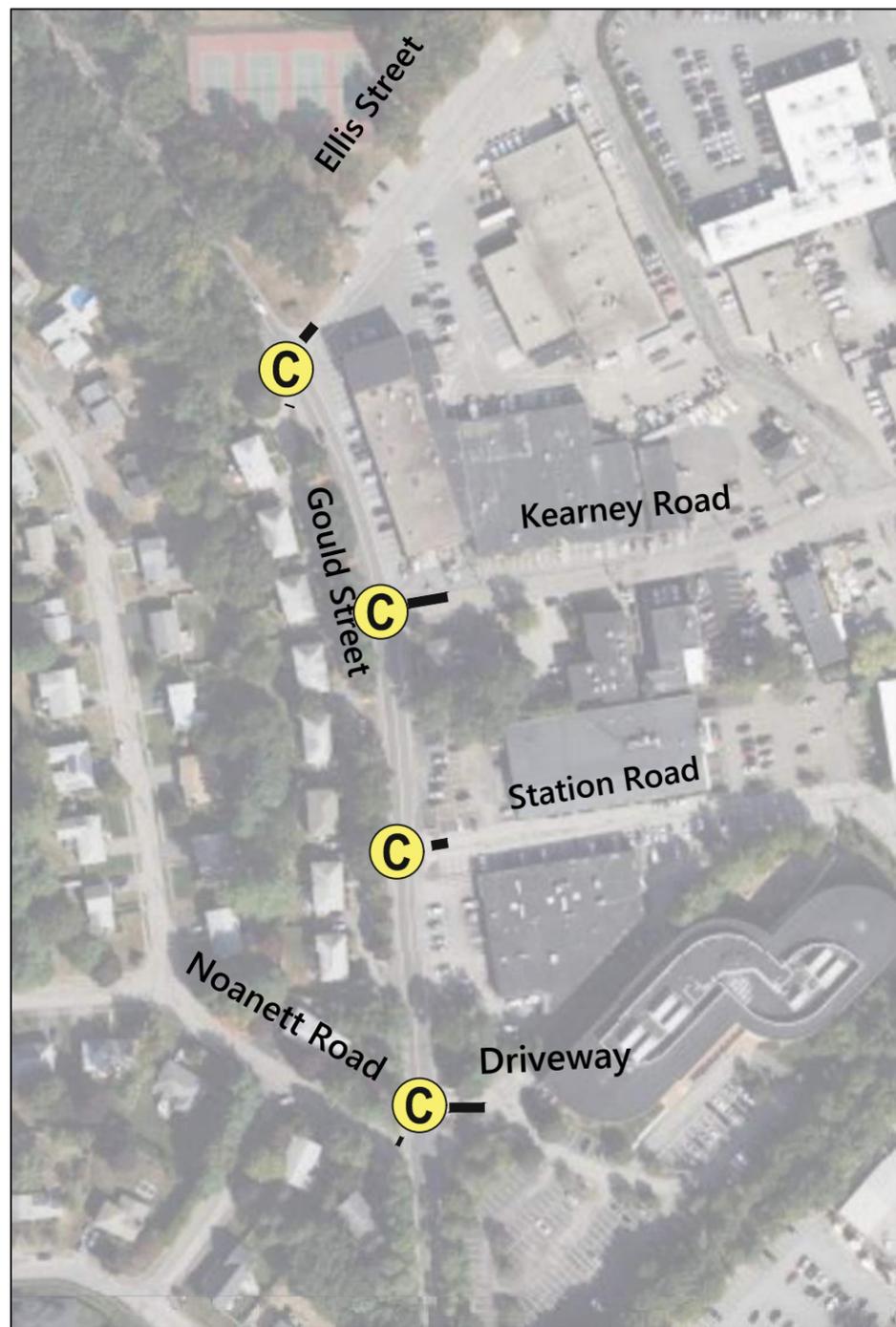


vhb Queue Diagrams
Weekday Morning Peak Hour

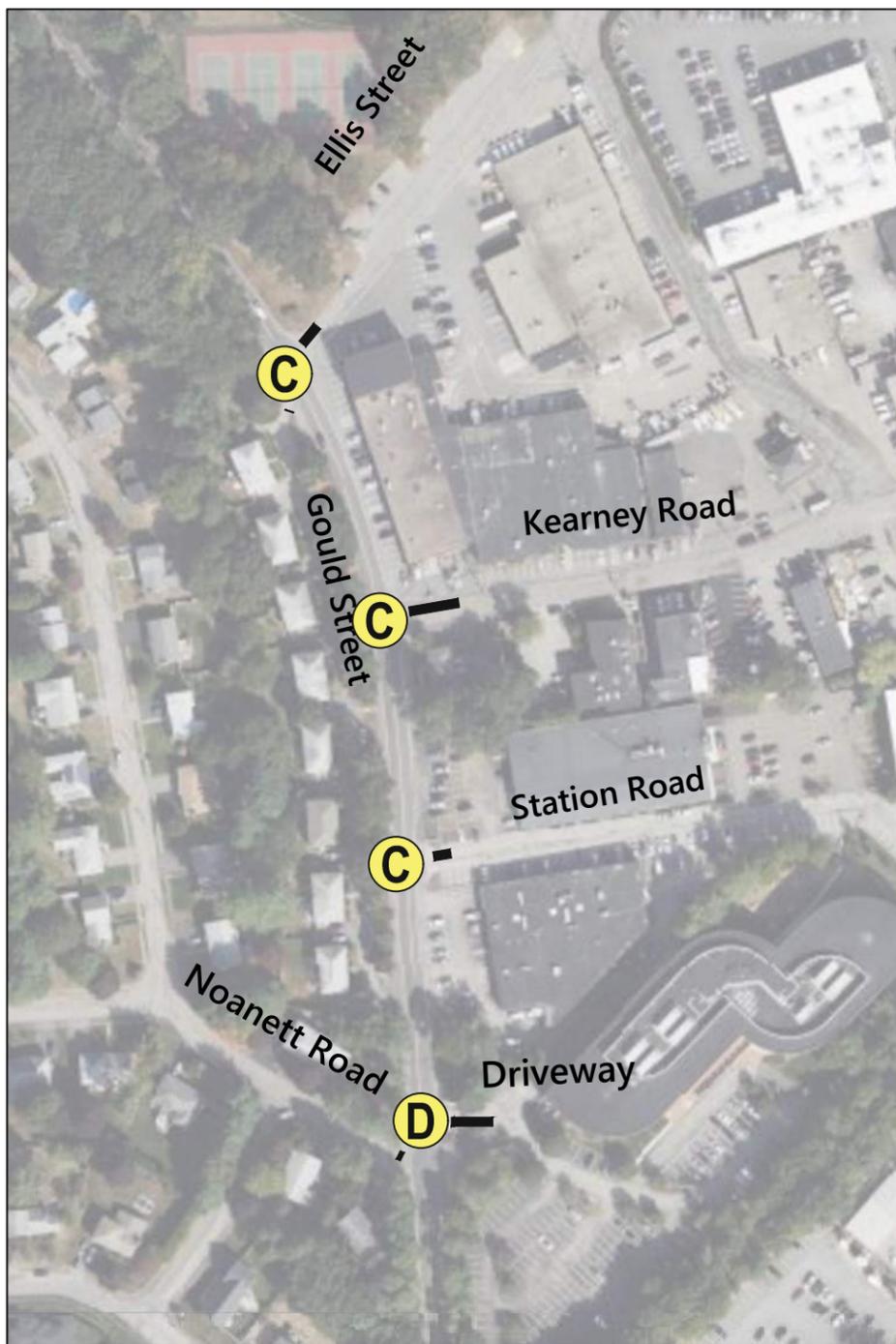
557 Highland Avenue
Needham, Massachusetts

Gould Street at Ellis Treet, Kearney Road, Station Road, and Noanett Road (Unsignalized)

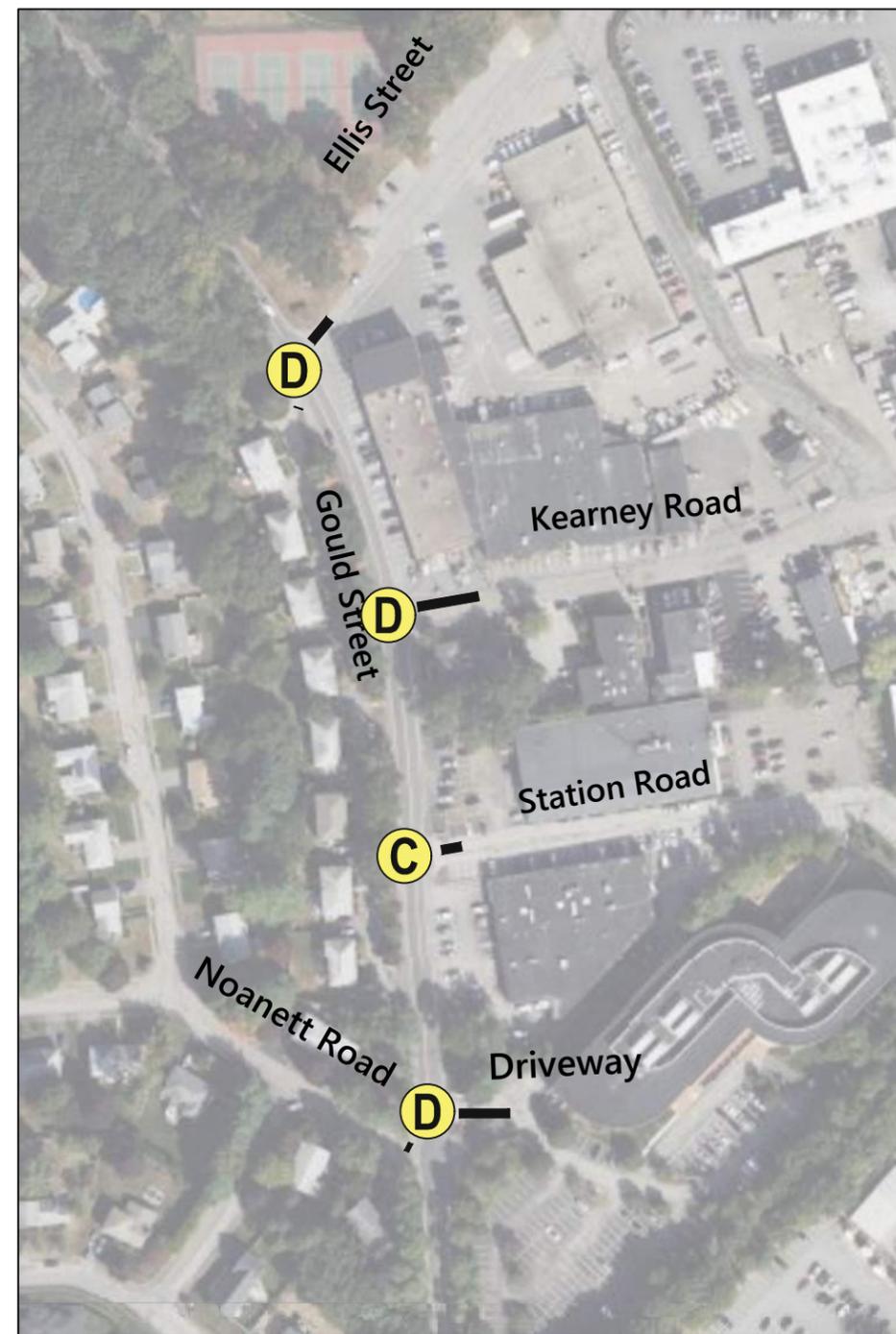
- ⓧ Signalized Intersection Level of Service
- ⓧ Unsignalized Intersection Level of Service
- 50th Percentile Queue
- 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build



Gould Street at Highland Avenue (Signalized), Site Driveway (Unsignalized), and TV Place (Unsignalized)

X Signalized Intersection Level of Service **—** 50th Percentile Queue
○ Unsignalized Intersection Level of Service **—** 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation



Queue Diagrams
Weekday Morning Peak Hour

557 Highland Avenue
Needham, Massachusetts



Gould Street at Highland Avenue (Signalized), Site Driveway (Unsignalized), and TV Place (Unsignalized)

X Signalized Intersection Level of Service 50th Percentile Queue
X Unsignalized Intersection Level of Service 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation

* Movement beyond capacity, no results reported.



Queue Diagrams
Weekday Evening Peak Hour

**557 Highland Avenue
Needham, Massachusetts**



Gould Street at Highland Avenue (Signalized), Site Driveway (Unsignalized), and TV Place (Unsignalized)

X Signalized Intersection Level of Service 50th Percentile Queue
X Unsignalized Intersection Level of Service 95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

Gould Street at Site Driveway signalized under Mitigation Condition



Queue Diagrams
Weekday Morning Peak Hour



**557 Highland Avenue
Needham, Massachusetts**

Gould Street at Highland Avenue (Signalized), Site Driveway (Unsignalized), and TV Place (Unsignalized)

X Signalized Intersection Level of Service
X Unsignalized Intersection Level of Service

50th Percentile Queue
 95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

* Movement beyond capacity, no results reported.

Gould Street at Site Driveway signalized under Mitigation Condition



Queue Diagrams
Weekday Evening Peak Hour

**557 Highland Avenue
Needham, Massachusetts**



Highland Avenue at West Street (Signalized) and Hunnewell Street (Unsignalized)

[X] Signalized Intersection Level of Service [Grey Line] 50th Percentile Queue
[X] Unsignalized Intersection Level of Service [Black Line] 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation

* Movement beyond capacity, no results reported.



vhb Queue Diagrams
Weekday Morning Peak Hour

**557 Highland Avenue
Needham, Massachusetts**

Highland Avenue at West Street (Signalized) and Hunnewell Street (Unsignalized)

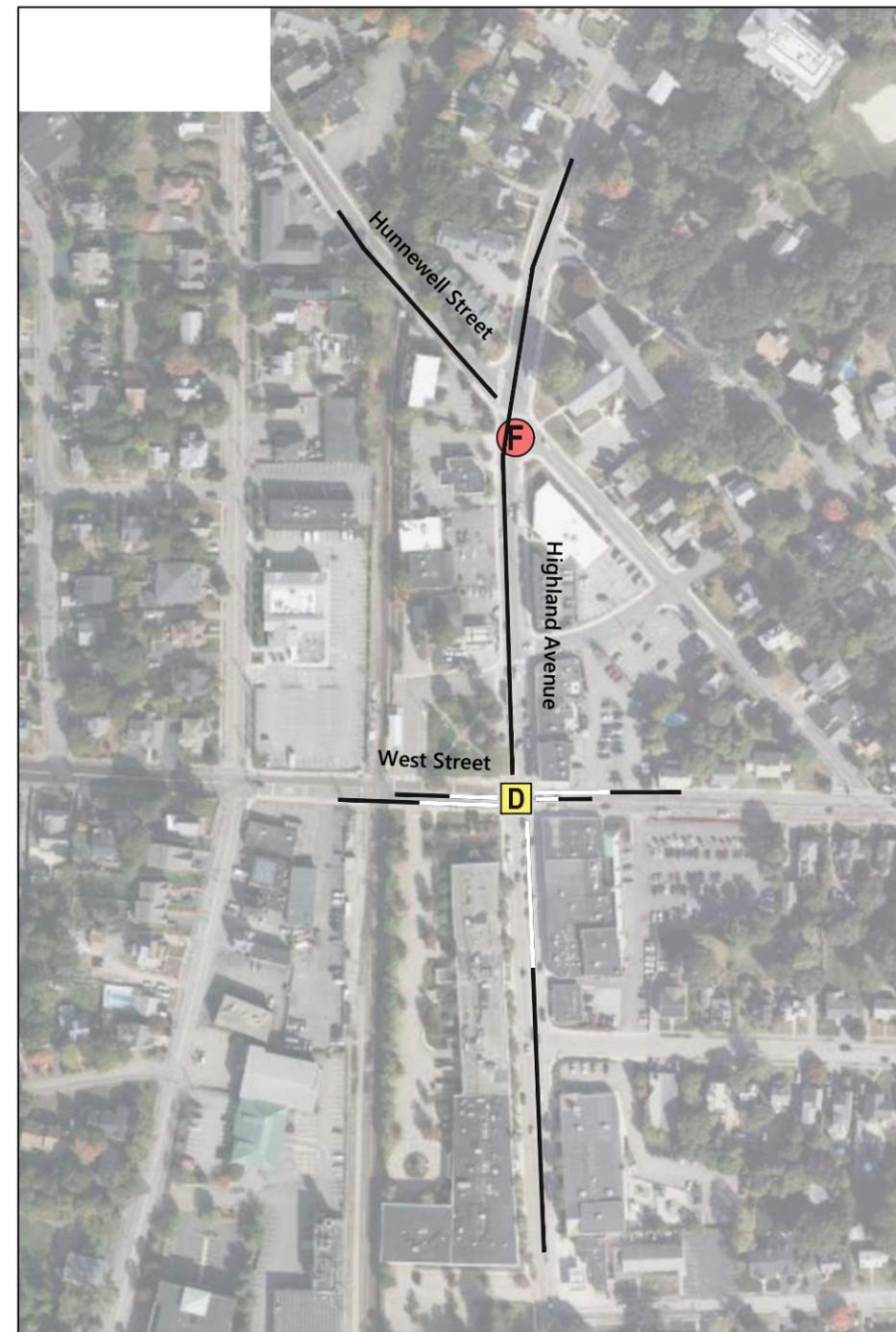
- ⓧ Signalized Intersection Level of Service
- ⓧ Unsignalized Intersection Level of Service
- 50th Percentile Queue
- 95th Percentile Queue



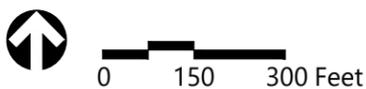
2022 Existing



2029 No-Build



2029 Build Without Mitigation



vhb Queue Diagrams
Weekday Evening Peak Hour

**557 Highland Avenue
Needham, Massachusetts**

Highland Avenue at West Street (Signalized)

☒ Signalized Intersection Level of Service 50th Percentile Queue
☒ Unsignalized Intersection Level of Service 95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

Signal timings modified under Mitigation Conditions



vhb Queue Diagrams
Weekday Morning Peak Hour

**557 Highland Avenue
Needham, Massachusetts**

Highland Avenue at West Street (Signalized)

- ☒ Signalized Intersection Level of Service
- ☒ 50th Percentile Queue
- ☒ Unsignalized Intersection Level of Service
- ☒ 95th Percentile Queue



2029 No-Build

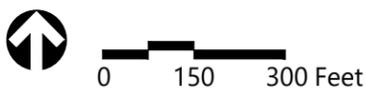


2029 Build Without Mitigation



2029 Build With Mitigation

Signal timings modified under Mitigation Conditions



vhb Queue Diagrams
Weekday Evening Peak Hour

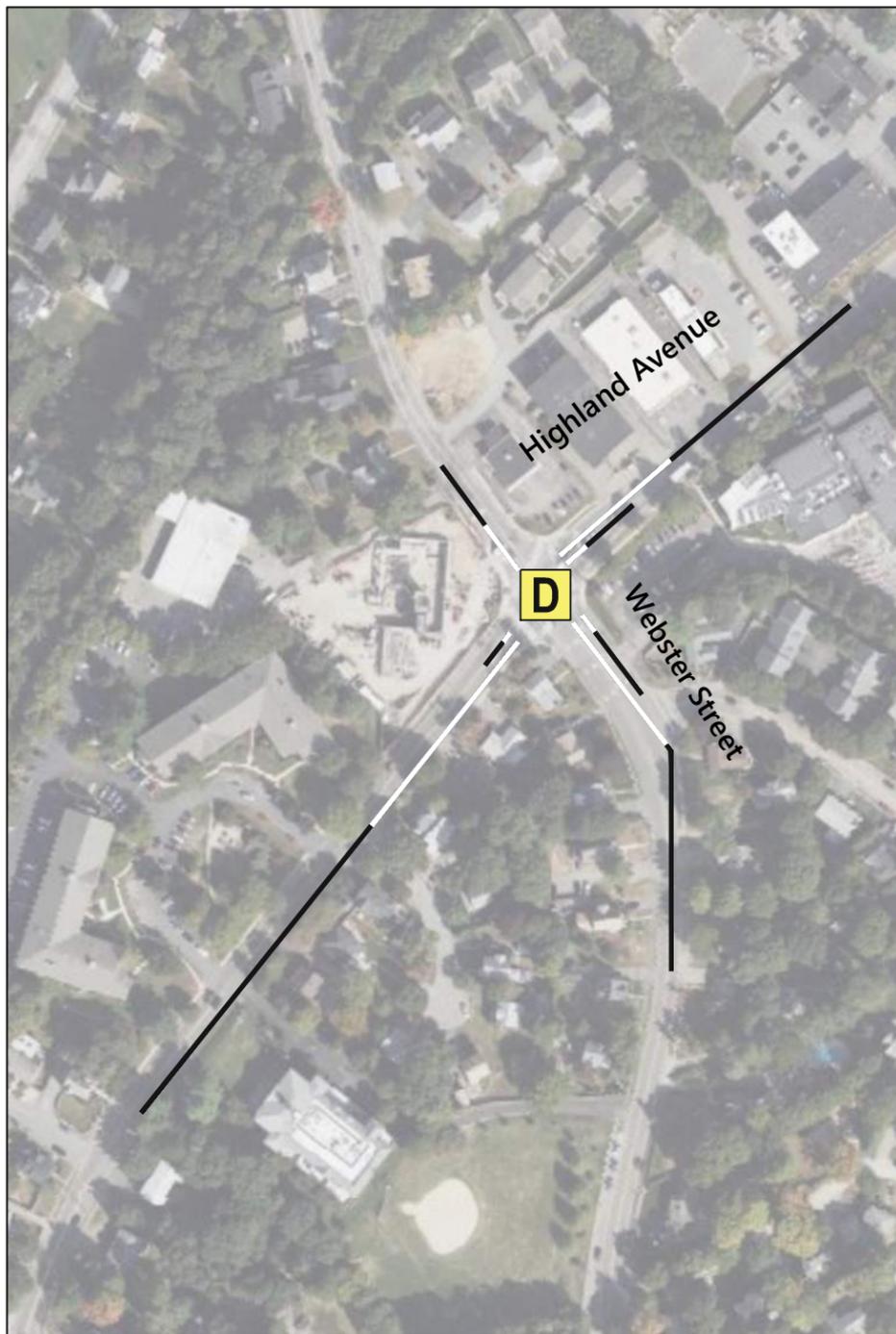
**557 Highland Avenue
Needham, Massachusetts**

Highland Avenue at Webster Street (Signalized)

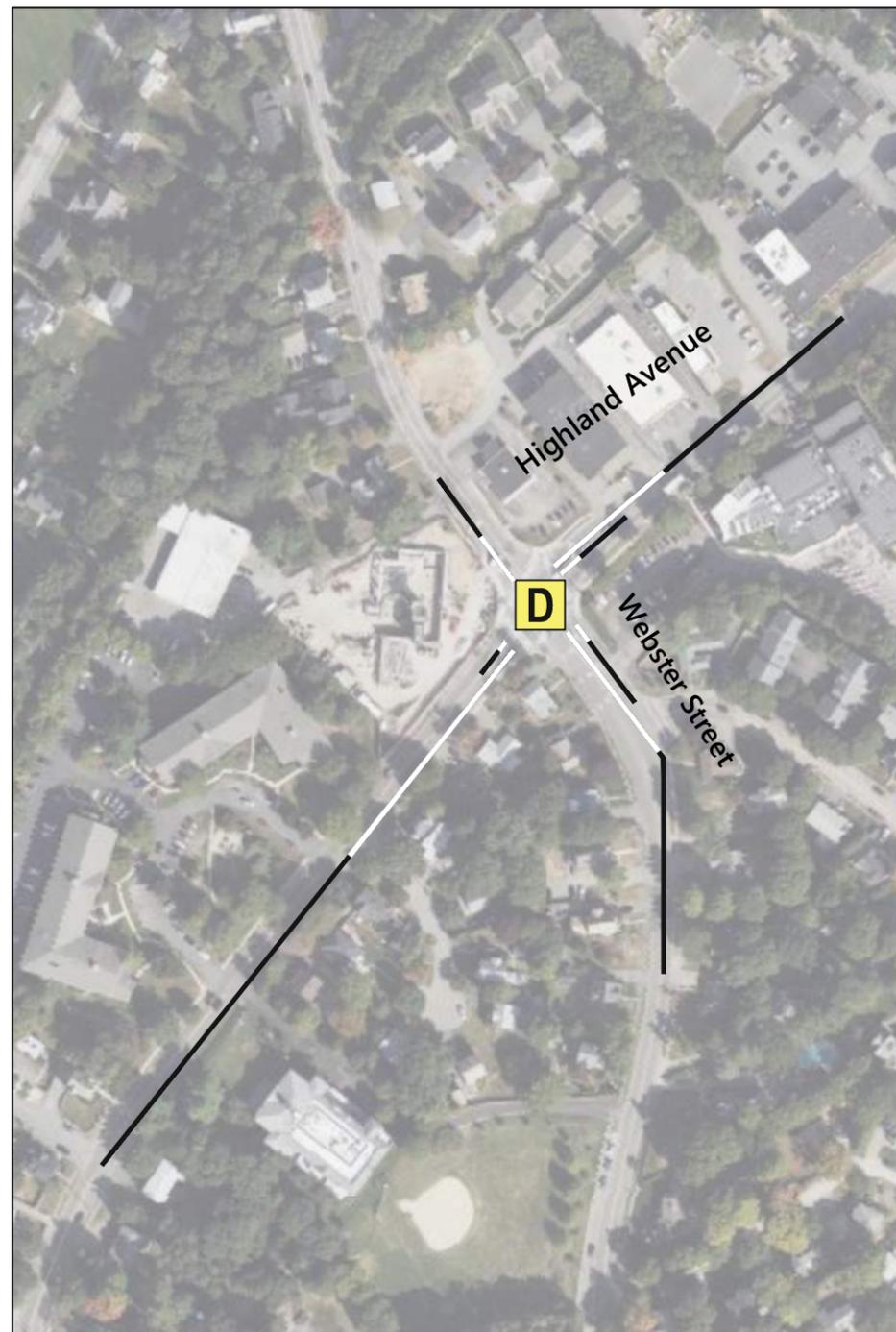
- ⓧ Signalized Intersection Level of Service
- ⓧ Unsignalized Intersection Level of Service
- 50th Percentile Queue
- 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation

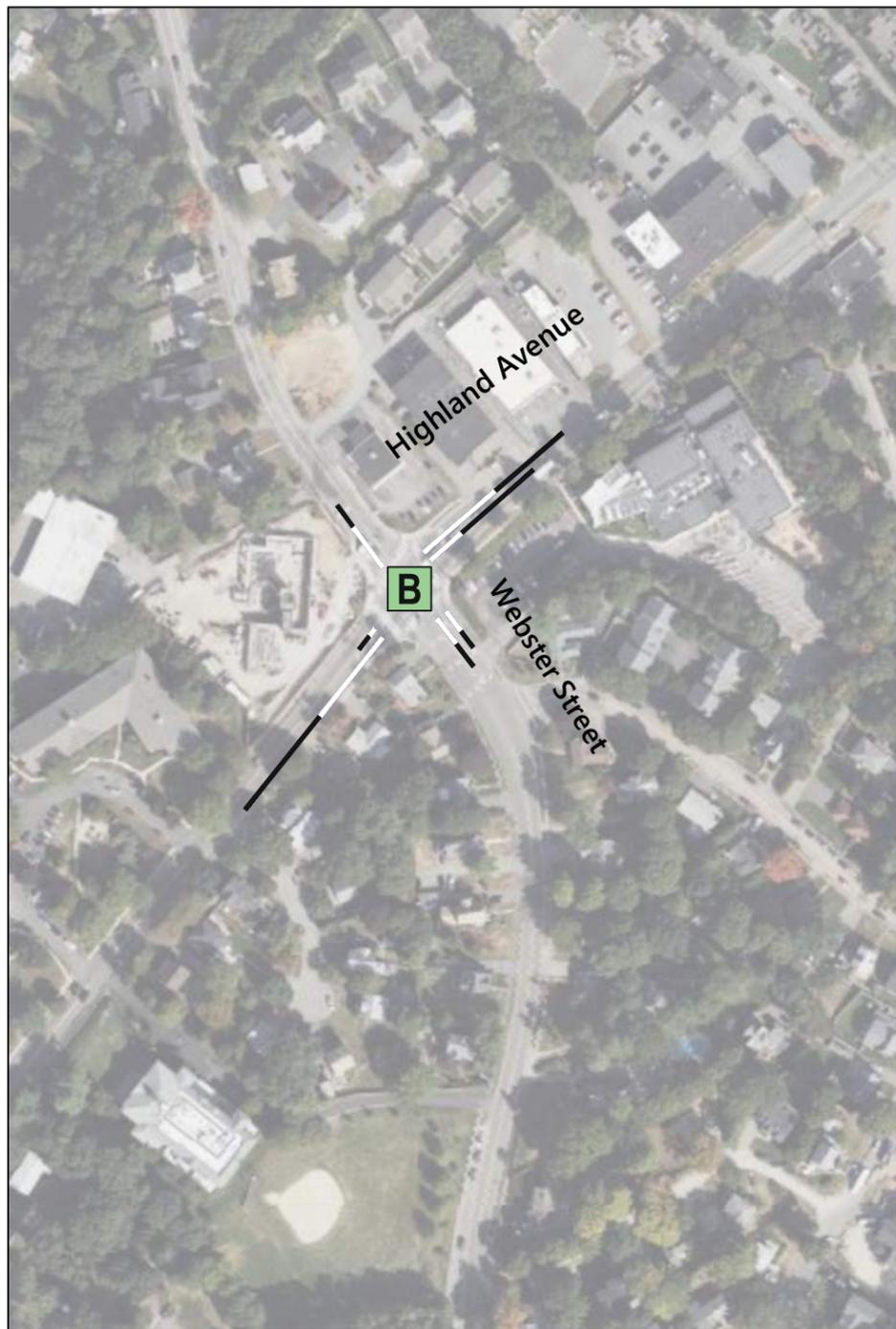


vhb Queue Diagrams
Weekday Morning Peak Hour

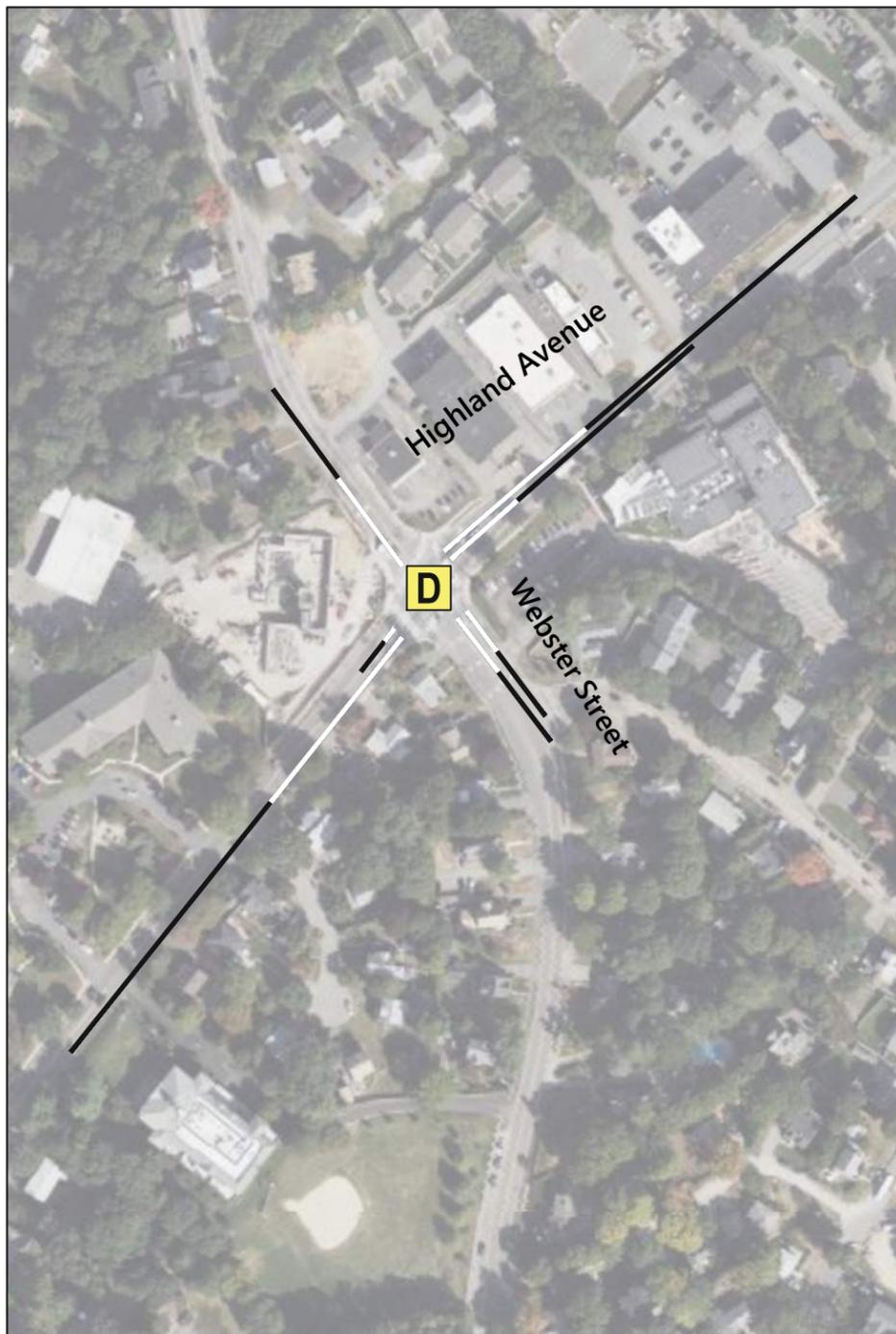
**557 Highland Avenue
Needham, Massachusetts**

Highland Avenue at Webster Street (Signalized)

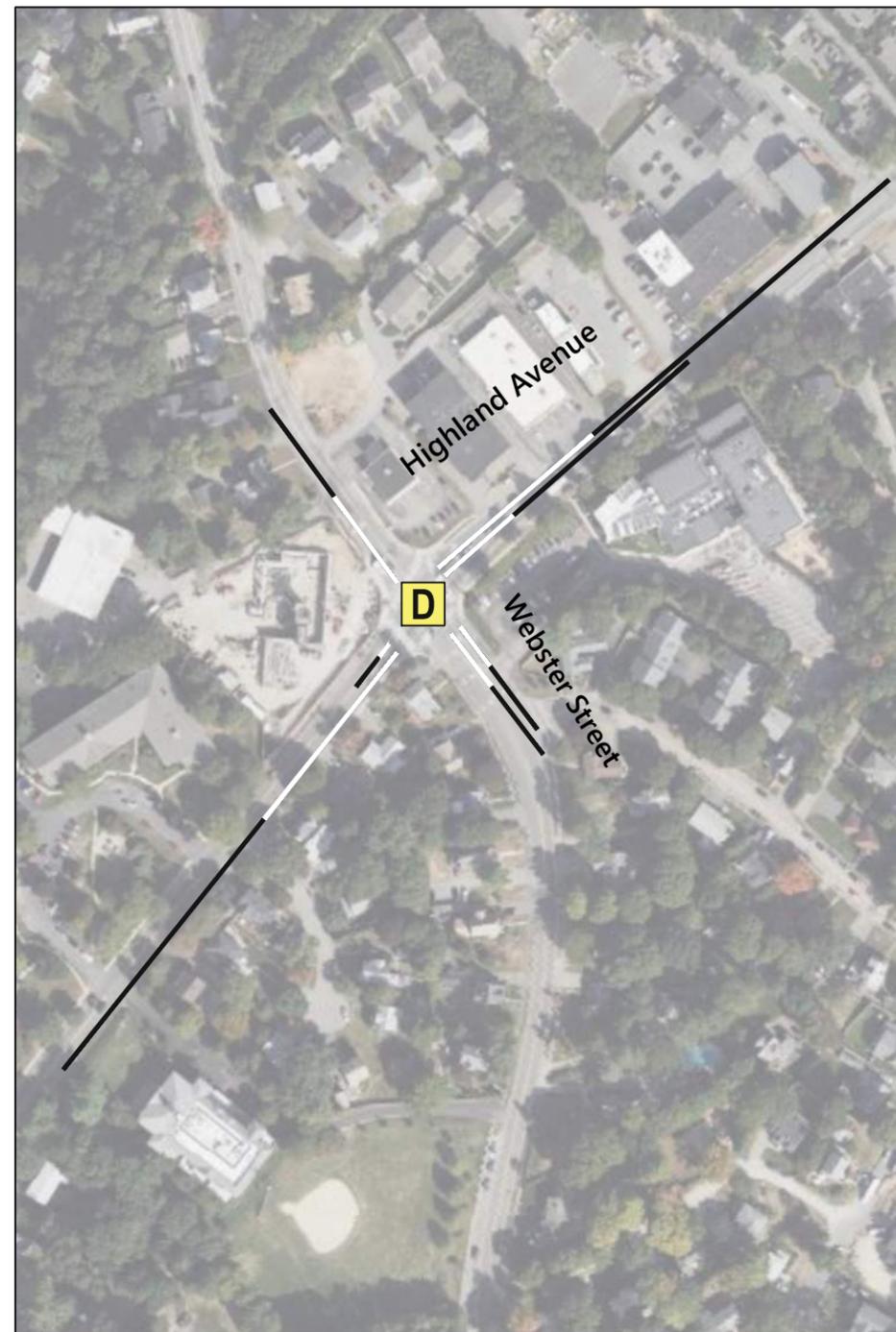
- ⓧ Signalized Intersection Level of Service
- ⓧ Unsignalized Intersection Level of Service
- 50th Percentile Queue
- 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation

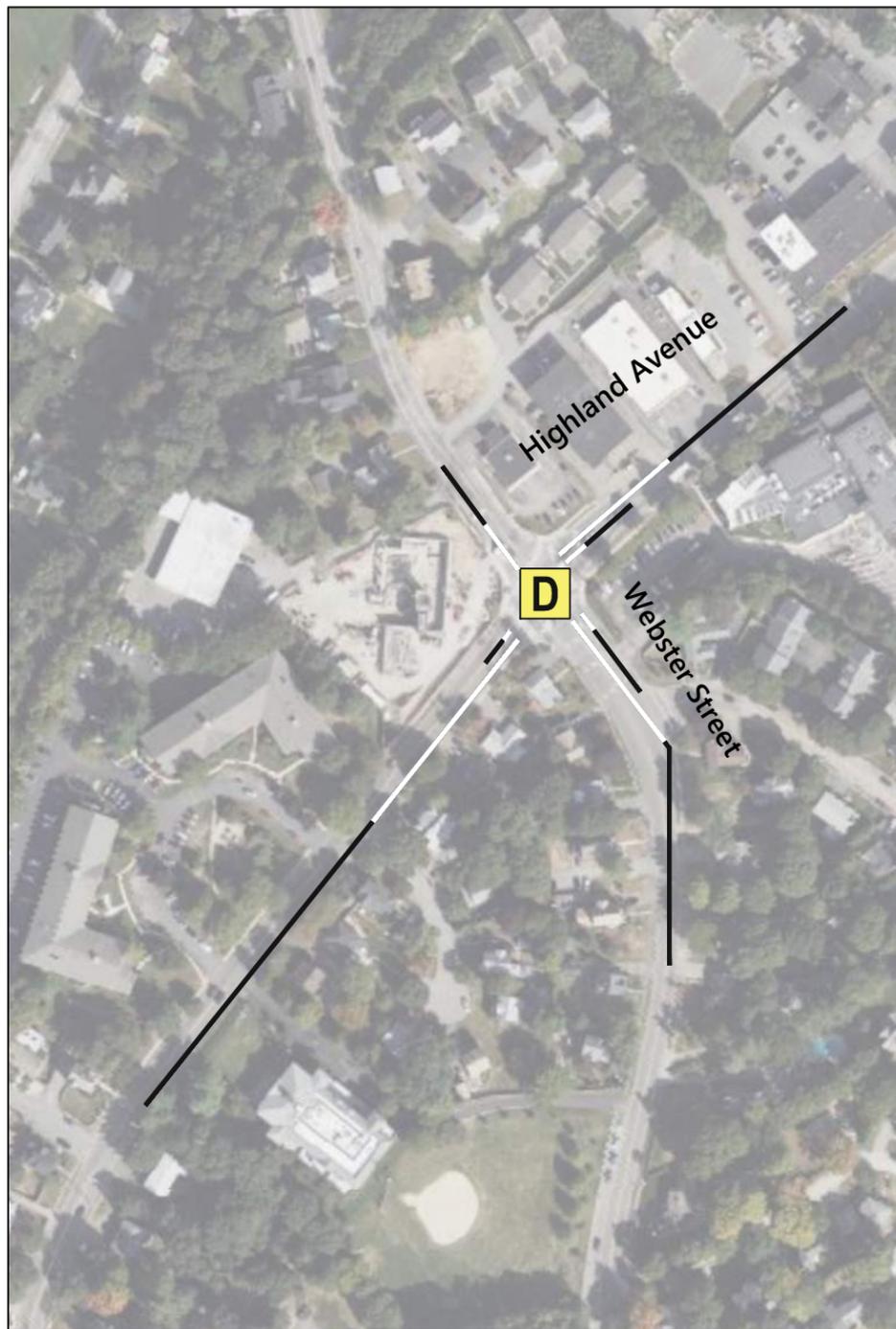


vhb Queue Diagrams
Weekday Evening Peak Hour

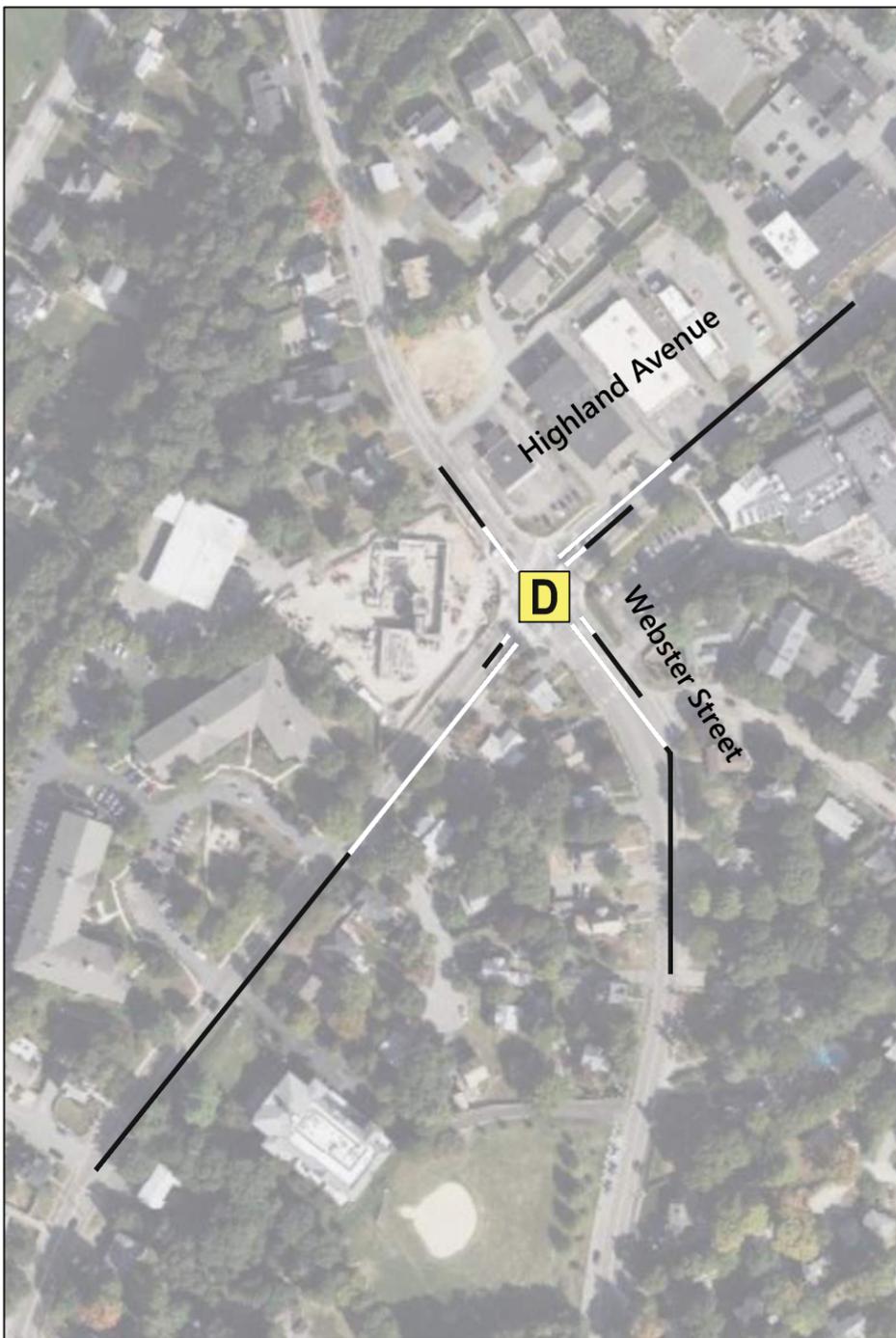
**557 Highland Avenue
Needham, Massachusetts**

Highland Avenue at Webster Street (Signalized)

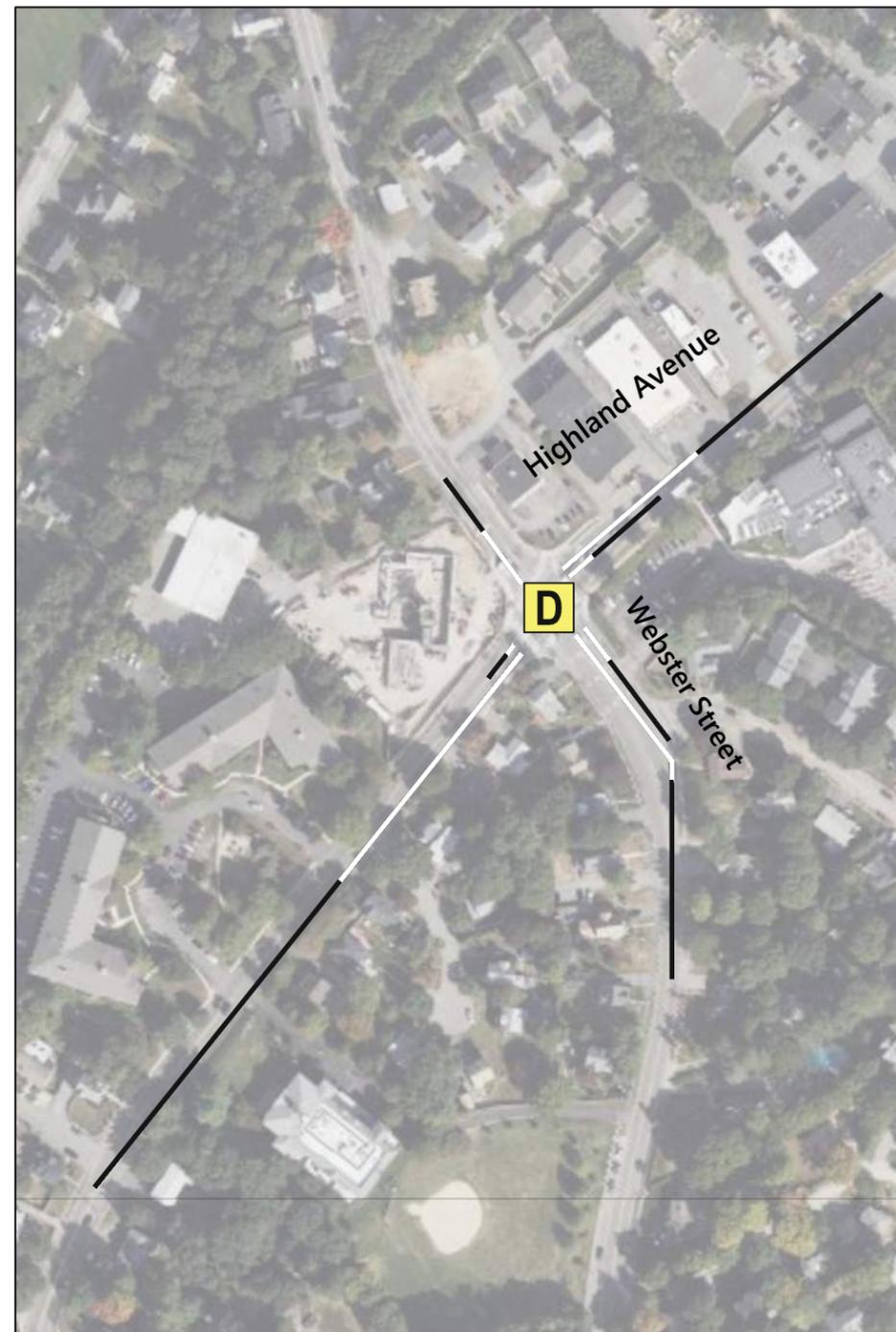
ⓧ Signalized Intersection Level of Service 50th Percentile Queue
ⓧ Unsignalized Intersection Level of Service 95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

Signal Timings modified under Mitigation Conditions



vhb Queue Diagrams
Weekday Morning Peak Hour

557 Highland Avenue
Needham, Massachusetts

Highland Avenue at Webster Street (Signalized)

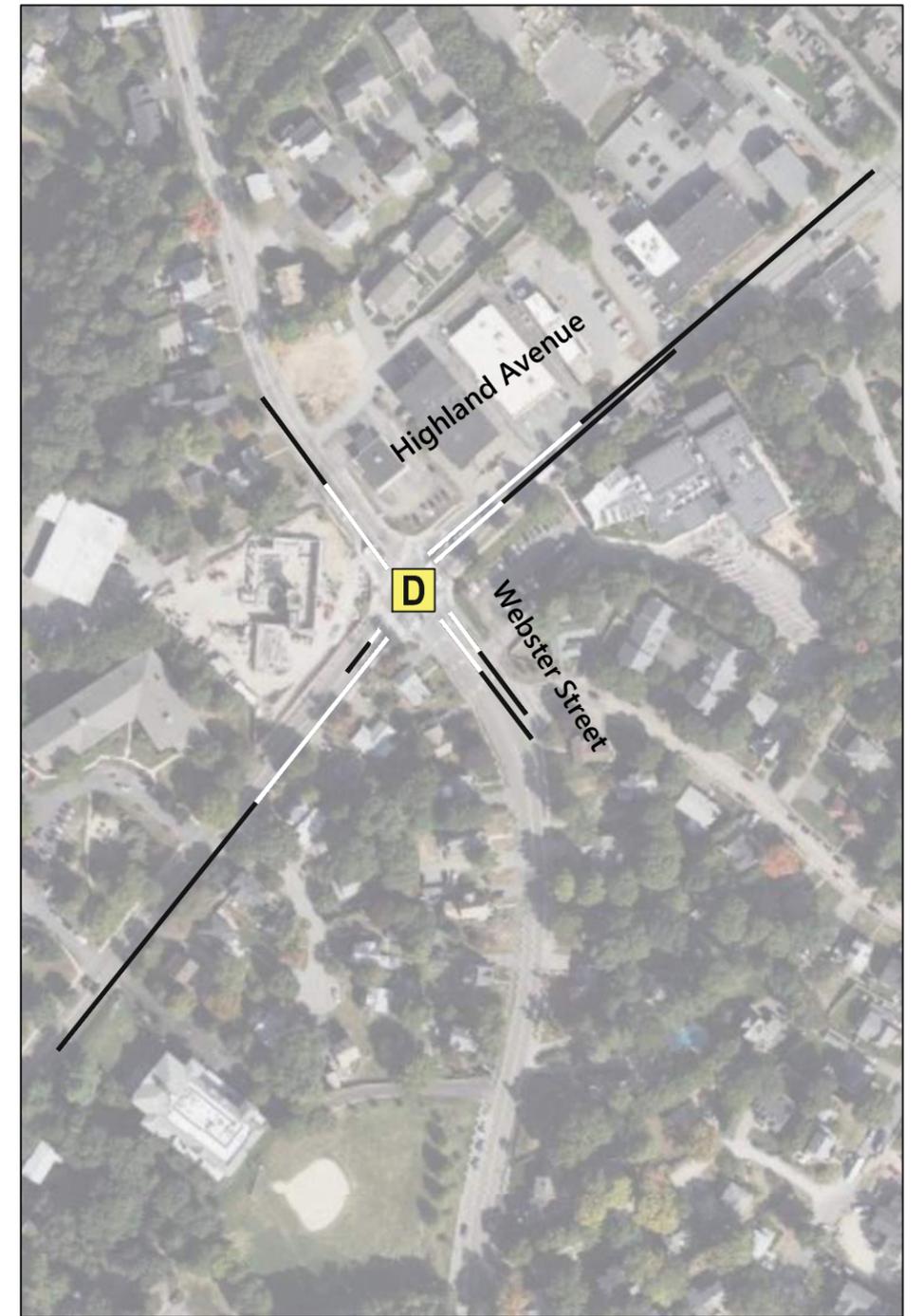
☒ Signalized Intersection Level of Service 50th Percentile Queue
☒ Unsignalized Intersection Level of Service 95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

Signal Timings modified under Mitigation Conditions

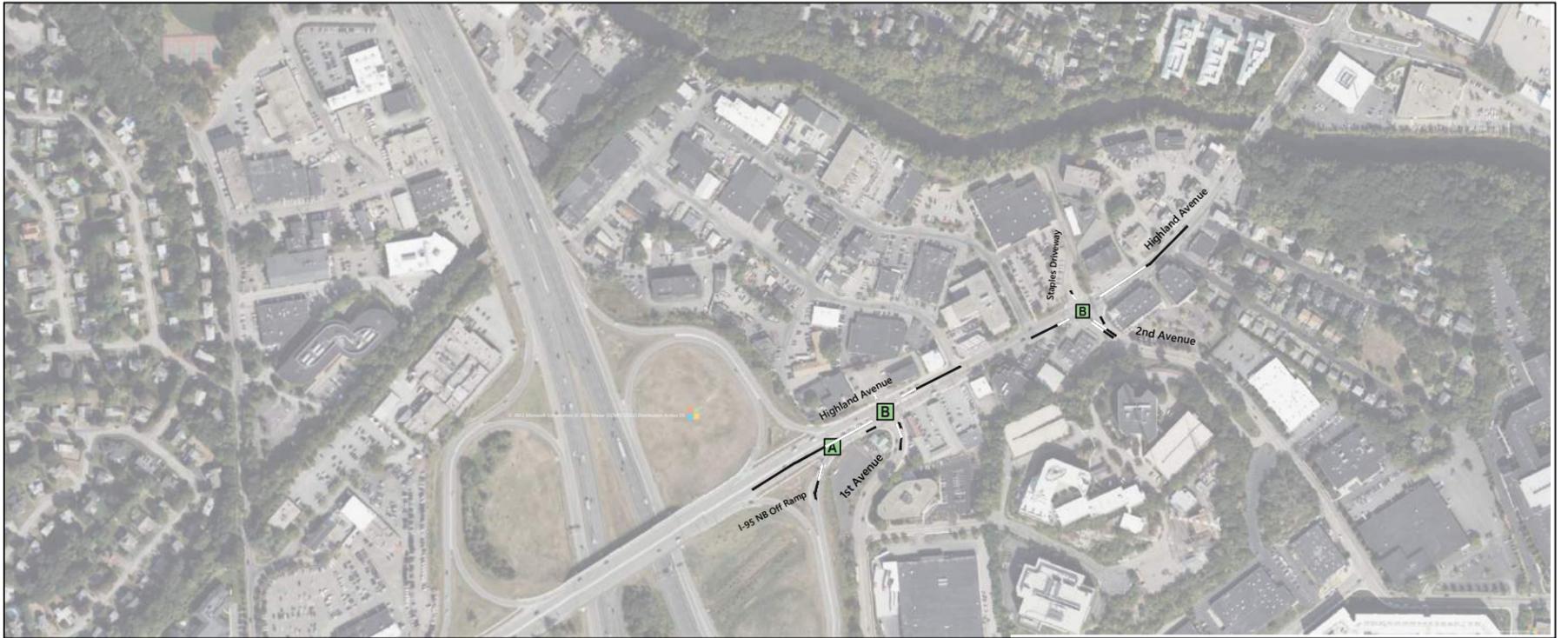


vhb Queue Diagrams
Weekday Evening Peak Hour

**557 Highland Avenue
Needham, Massachusetts**

Highland Avenue at I-95 Ramps, 1st Avenue, and 2nd Avenue (Signalized)

- ☒ Signalized Intersection Level of Service
- ☒ Unsignalized Intersection Level of Service
- 50th Percentile Queue
- 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation



Queue Diagrams
Weekday Morning Peak Hour

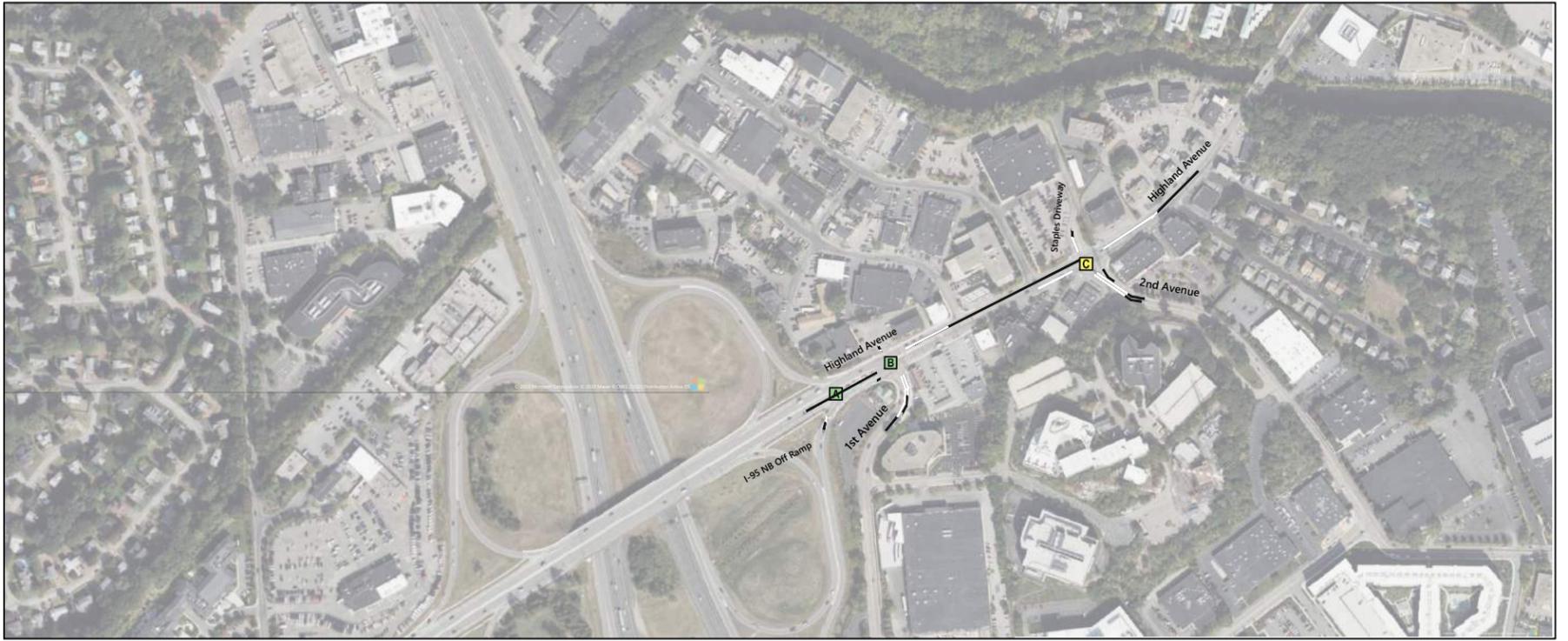
557 Highland Avenue
Needham, Massachusetts



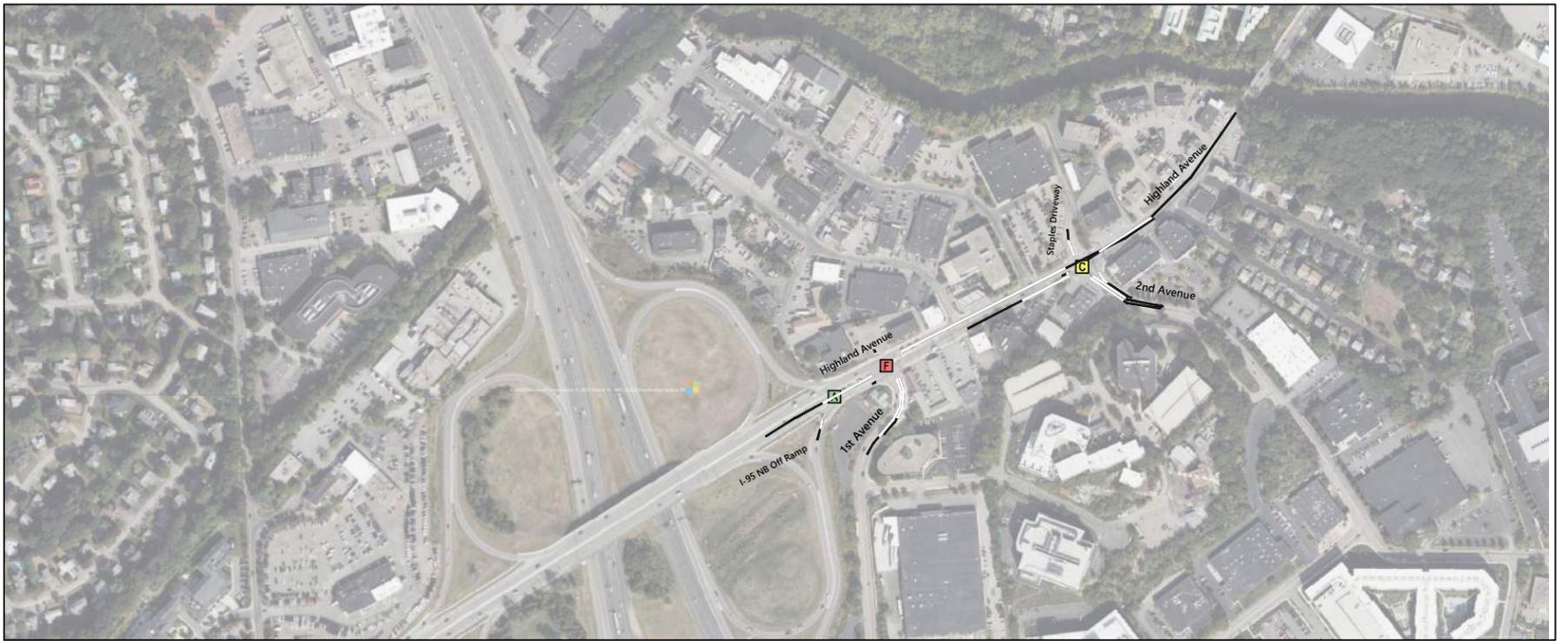
Highland Avenue at I-95 Ramps, 1st Avenue, and 2nd Avenue (Signalized)

- ☒ Signalized Intersection Level of Service
- ☒ Unsignalized Intersection Level of Service

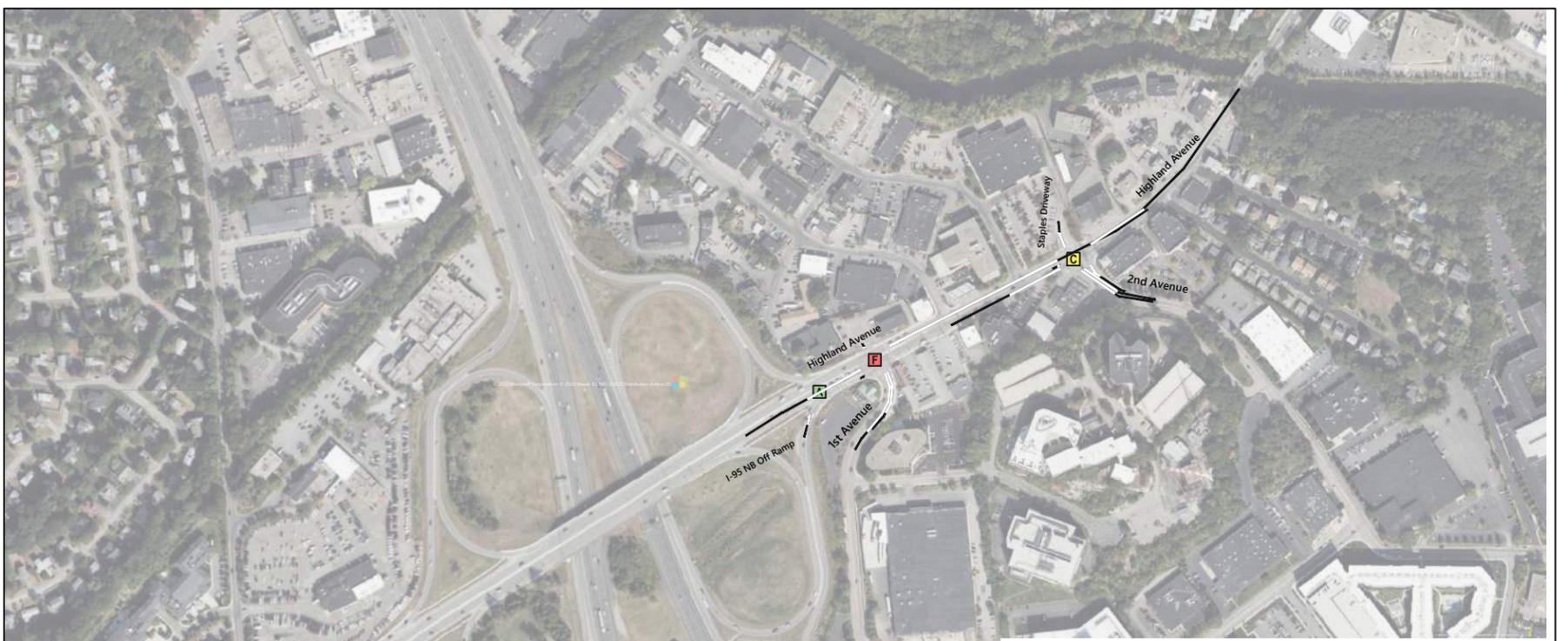
- 50th Percentile Queue
- 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation



Queue Diagrams
Weekday Evening Peak Hour

557 Highland Avenue
Needham, Massachusetts



Highland Avenue at 1st Avenue (Signalized)

-  Signalized Intersection Level of Service
-  Unsignalized Intersection Level of Service
-  50th Percentile Queue
-  95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

Signal Timings modified under Mitigation Conditions



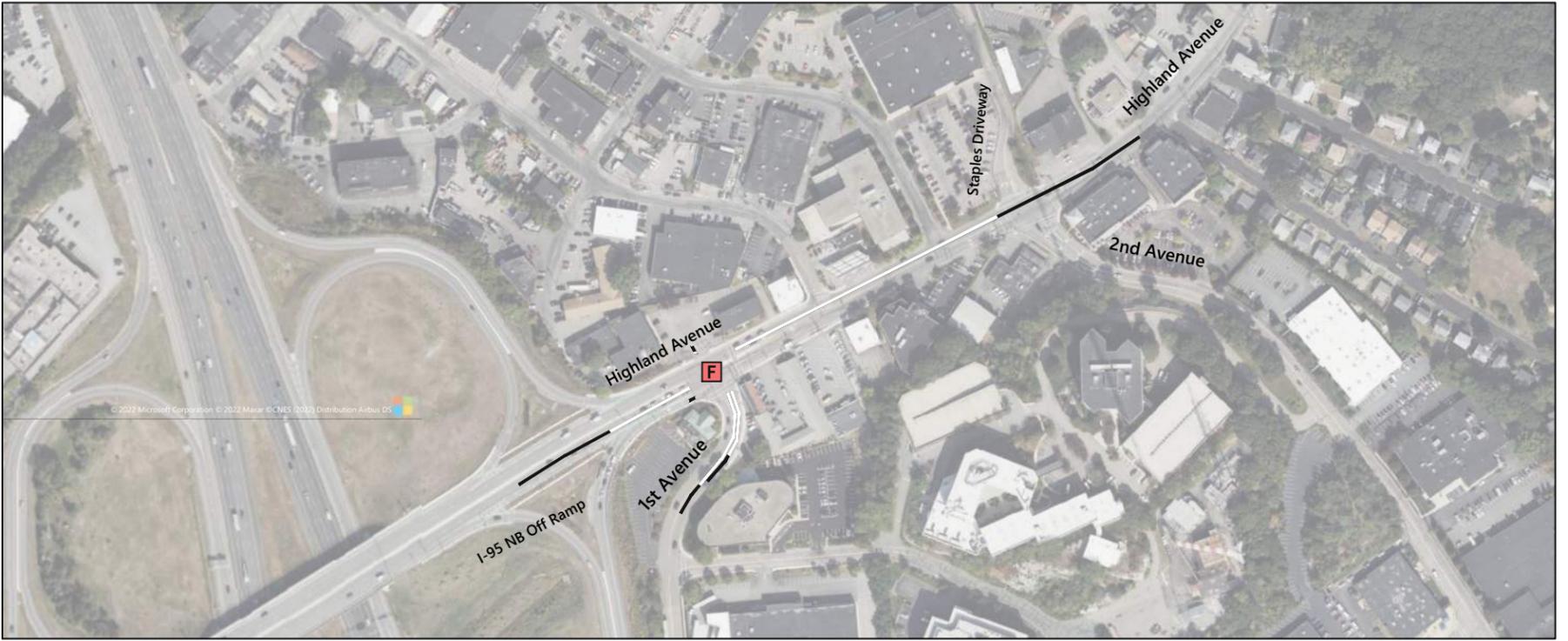
Queue Diagrams
Weekday Morning Peak Hour



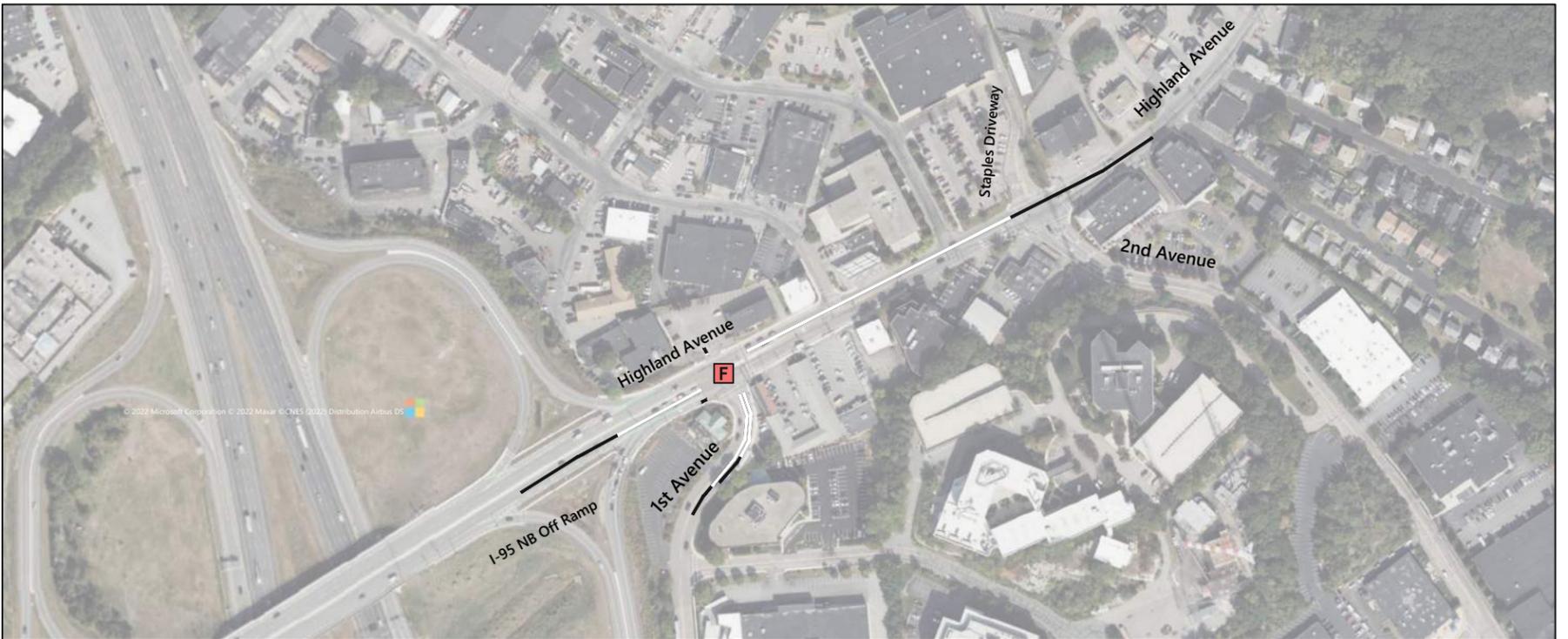
557 Highland Avenue
Needham, Massachusetts

Highland Avenue at 1st Avenue (Signalized)

-  Signalized Intersection Level of Service
-  Unsignalized Intersection Level of Service
-  50th Percentile Queue
-  95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

Signal Timings modified under Mitigation Conditions



Queue Diagrams
Weekday Evening Peak Hour



557 Highland Avenue
Needham, Massachusetts

Hunting Road at Kendrick Street (Signalized)

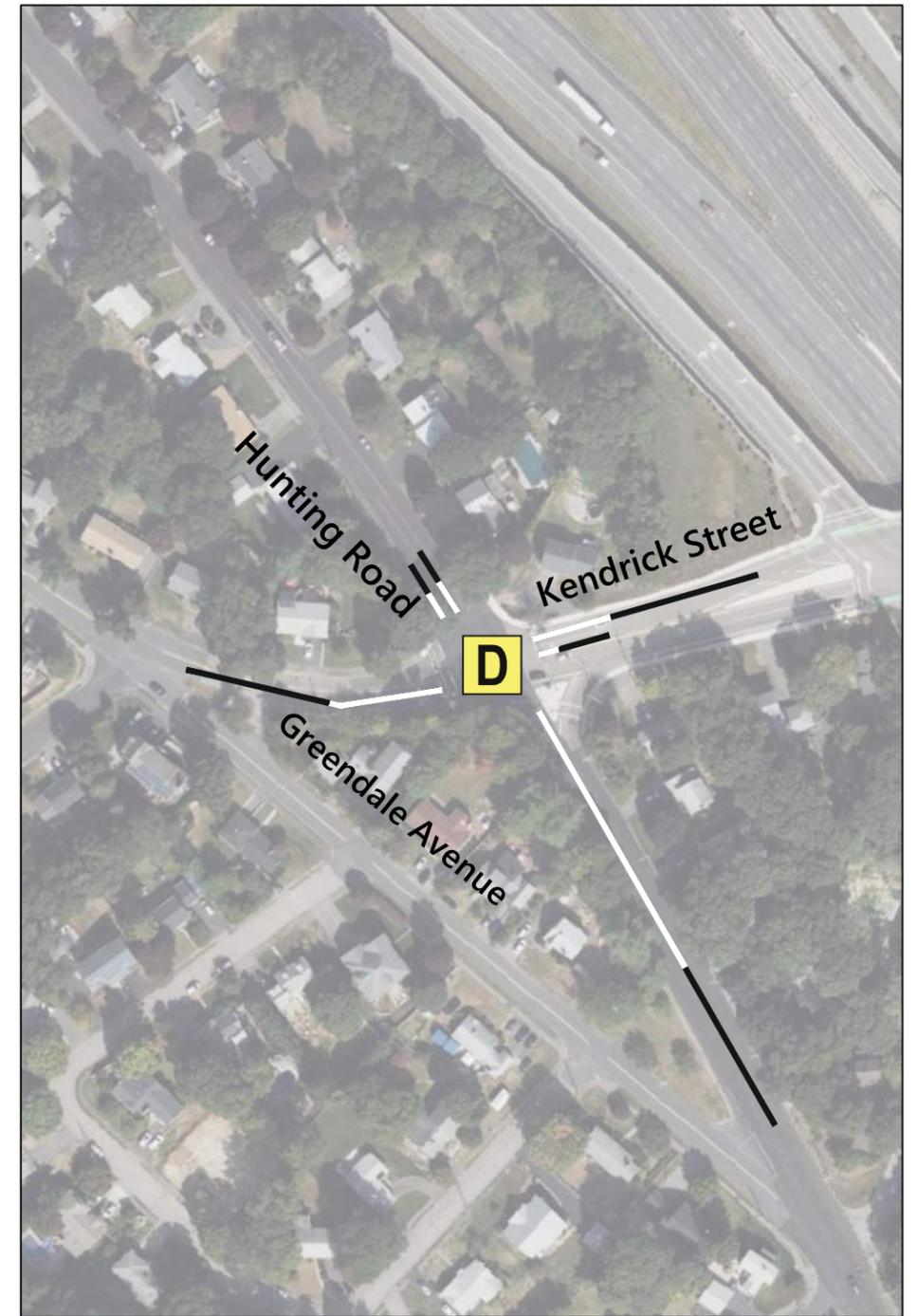
- ⓧ Signalized Intersection Level of Service
- ⓧ Unsignalized Intersection Level of Service
- 50th Percentile Queue
- 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation



Queue Diagrams
Weekday Morning Peak Hour

557 Highland Avenue
Needham, Massachusetts

Hunting Road at Kendrick Street (Signalized)

ⓧ Signalized Intersection Level of Service 50th Percentile Queue
ⓧ Unsignalized Intersection Level of Service 95th Percentile Queue



2022 Existing



2029 No-Build



2029 Build Without Mitigation



vhb Queue Diagrams
Weekday Evening Peak Hour

557 Highland Avenue
Needham, Massachusetts

Hunting Road at Kendrick Street (Signalized)

ⓧ Signalized Intersection Level of Service 50th Percentile Queue
ⓧ Unsignalized Intersection Level of Service 95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

Signal timings modified under Mitigation Conditions



vhb Queue Diagrams
Weekday Morning Peak Hour

557 Highland Avenue
Needham, Massachusetts

Hunting Road at Kendrick Street (Signalized)

☒ Signalized Intersection Level of Service 50th Percentile Queue
☒ Unsignalized Intersection Level of Service 95th Percentile Queue



2029 No-Build



2029 Build Without Mitigation



2029 Build With Mitigation

Signal timings modified under Mitigation Conditions



vhb Queue Diagrams
Weekday Evening Peak Hour

557 Highland Avenue
Needham, Massachusetts

Weave Segment Capacity Analysis Worksheets

Comment 2b

557 Highland Avenue TIS
Weaving Segment Analysis

Step 1: Input Data																												
Geometric Inputs															Volume Characteristics for Each Movement													
Scenario	Direction	Road	Start	End	Freeway or Highway/C-D Road	Number of lanes within the weaving segment, N	One-sided vs two-sided Weave	Short length of weaving segment, L _s	Number of lane changes, LC _{FF}	Number of lane changes, LC _{FR}	Number of lane changes, LC _{RR}	Number of weaving lanes	Interchanges within 3 miles up/downstream	Terrain type	Free-flow speed	Equivalent capacity of basic freeway segment	Hourly demand volume, V _{FF} (Freeway-to-Freeway)	PHF _{FF}	HV% _{FF}	Hourly demand volume, V _{FR} (Ramp-to-Freeway)	PHF _{FR}	HV% _{FR}	Hourly demand volume, V _{RR} (Freeway-to-Ramp)	PHF _{RR}	HV% _{RR}			
2022 EXISTING ANALYSIS																												
Existing AM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	Highway	3	One-sided	750	1	1	0	2	12	Level	45	1900	685	0.98	0.01	725	0.91	0.02	410	0.98	0.01	15	0.91	0.02
Existing AM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	Highway	3	One-sided	670	1	1	0	2	12	Level	45	1900	215	0.97	0.03	90	0.93	0.01	410	0.97	0.03	5	0.93	0.01
Existing PM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	Highway	3	One-sided	750	1	1	0	2	12	Level	45	1900	505	0.98	0.01	265	0.96	0.02	365	0.98	0.01	5	0.96	0.02
Existing PM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	Highway	3	One-sided	670	1	1	0	2	12	Level	45	1900	625	0.95	0.01	110	0.94	0.01	450	0.95	0.01	5	0.94	0.01
2029 NO BUILD ANALYSIS																												
Existing AM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	Highway	3	One-sided	750	1	1	0	2	12	Level	45	1900	810	0.92	0.01	945	0.92	0.02	440	0.92	0.01	20	0.92	0.02
Existing AM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	Highway	3	One-sided	670	1	1	0	2	12	Level	45	1900	250	0.92	0.03	100	0.92	0.01	470	0.92	0.03	5	0.92	0.01
Existing PM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	Highway	3	One-sided	750	1	1	0	2	12	Level	45	1900	575	0.92	0.01	360	0.92	0.02	395	0.92	0.01	5	0.92	0.02
Existing PM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	Highway	3	One-sided	670	1	1	0	2	12	Level	45	1900	730	0.92	0.01	120	0.92	0.01	575	0.92	0.01	5	0.92	0.01
2029 BUILD ANALYSIS																												
Existing AM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	Highway	3	One-sided	750	1	1	0	2	12	Level	45	1900	815	0.92	0.01	945	0.92	0.02	460	0.92	0.01	20	0.92	0.02
Existing AM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	Highway	3	One-sided	670	1	1	0	2	12	Level	45	1900	285	0.92	0.03	265	0.92	0.01	470	0.92	0.03	5	0.92	0.01
Existing PM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	Highway	3	One-sided	750	1	1	0	2	12	Level	45	1900	610	0.92	0.01	360	0.92	0.02	545	0.92	0.01	5	0.92	0.02
Existing PM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	Highway	3	One-sided	670	1	1	0	2	12	Level	45	1900	735	0.92	0.01	150	0.92	0.01	575	0.92	0.01	5	0.92	0.01

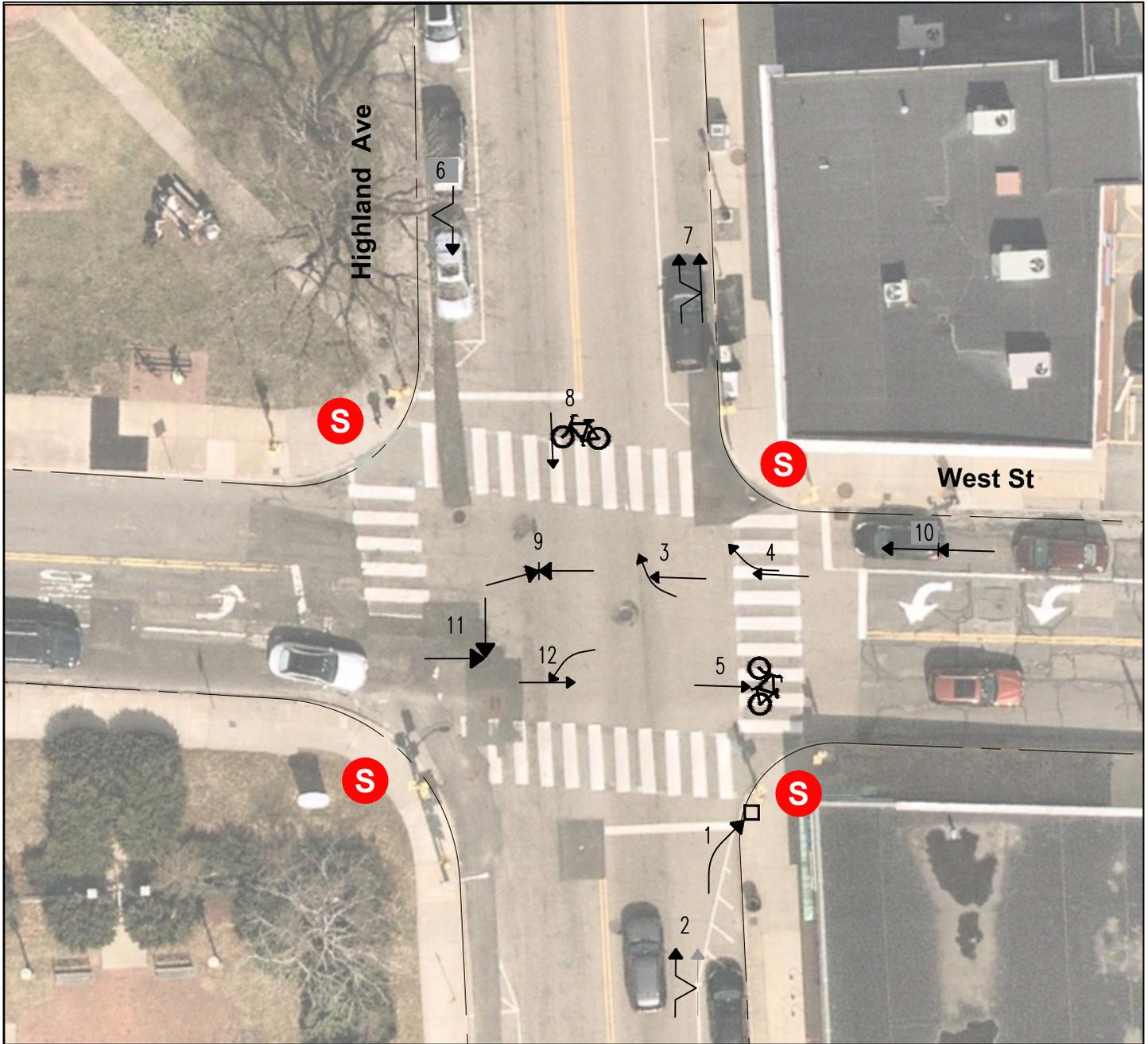
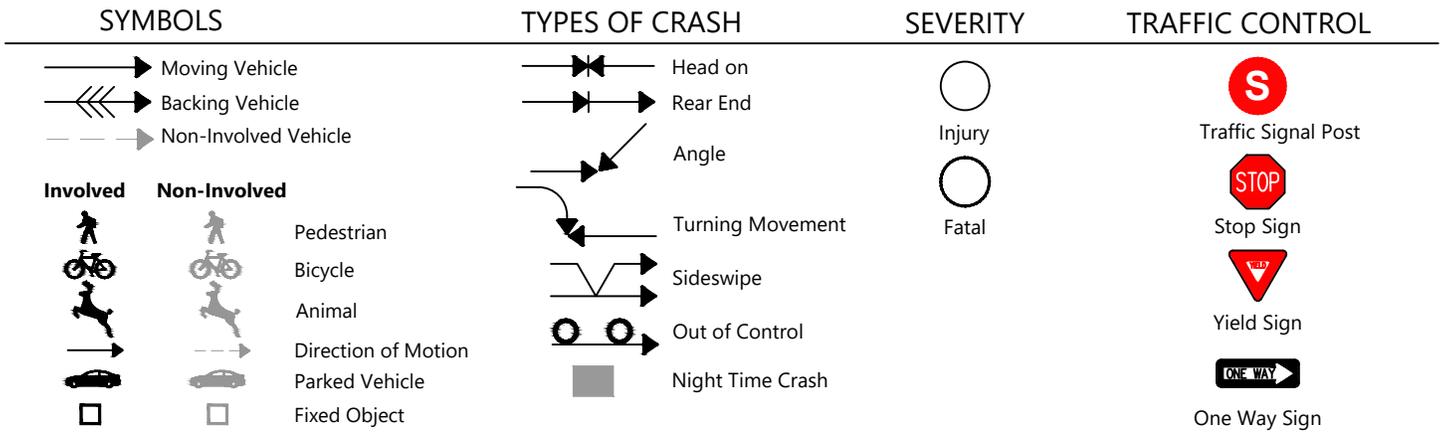
Source: Based on methodology presented in the Highway Capacity Manual: 6th Edition (HCM 6)

Step 2: Adjust Volume															Step 3: Determine Configuration Characteristics							Step 4: Determine Maximum Weaving Length				
Heavy Vehicle Volume Adjustment Factors					Equation 13-1					Combined Volumes					Geometrics				Equation 13-2 or 13-3		Geometrics		Equation 13-4	Check		
Scenario	Direction	Road	Start	End	Passenger Car Equivalent of Heavy Vehicle for Freeway, E _T	Heavy Vehicle Adjustment Factor, f _{HV,FF}	Heavy Vehicle Adjustment Factor, f _{HV,FR}	Heavy Vehicle Adjustment Factor, f _{HV,RR}	Heavy Vehicle Adjustment Factor, f _{HV,FR}	Heavy Vehicle Adjustment Factor, f _{HV,RR}	Freeway-to-freeway demand flow rate, v _{FF}	Ramp-to-freeway demand flow rate, v _{FR}	Freeway-to-ramp demand flow rate, v _{FR}	Ramp-to-ramp demand flow rate, v _{RR}	Weaving demand flow rate, v _W	Nonweaving demand flow rate, v _{NW}	Total demand flow rate, v	Volume ratio, VR	Number of lanes within the weaving segment, N	Number of lanes from which a weaving maneuver may be made with one or no lane changes, N _{WL}	Minimum number of lane changes from on-ramp to freeway, LC _{FR}	Minimum number of lane changes from freeway to off-ramp, LC _{RR}	Minimum rate of lane changing, LC _{MIN}	Length of weaving segment, L _s	Maximum weaving segment length, L _{MAX}	Check that Weave Analysis is Warranted
2022 EXISTING ANALYSIS																										
Existing AM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	2	0.99	0.98	0.99	0.98	706	813	423	17	1235	723	1958	0.63	3	2	1	1	1235	750	9396	OK	
Existing AM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	2	0.97	0.99	0.97	0.99	228	98	435	5	533	234	767	0.70	3	2	1	1	533	670	10196	OK	
Existing PM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	2	0.99	0.98	0.99	0.98	520	282	376	5	658	526	1184	0.56	3	2	1	1	658	750	8485	OK	
Existing PM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	2	0.99	0.99	0.99	0.99	664	118	478	5	597	670	1266	0.47	3	2	1	1	597	670	7490	OK	
2029 NO BUILD ANALYSIS																										
Existing AM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	2	0.99	0.98	0.99	0.98	889	1048	483	22	1531	911	2442	0.63	3	2	1	1	1531	750	9346	OK	
Existing AM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	2	0.97	0.99	0.97	0.99	280	110	526	5	636	285	921	0.69	3	2	1	1	636	670	10134	OK	
Existing PM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	2	0.99	0.98	0.99	0.98	631	399	434	6	833	637	1470	0.57	3	2	1	1	833	750	8616	OK	
Existing PM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	2	0.99	0.99	0.99	0.99	801	132	631	5	763	807	1570	0.49	3	2	1	1	763	670	7663	OK	
2029 BUILD ANALYSIS																										
Existing AM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	2	0.99	0.98	0.99	0.98	895	1048	505	22	1553	917	2470	0.63	3	2	1	1	1553	750	9369	OK	
Existing AM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	2	0.97	0.99	0.97	0.99	319	291	526	5	817	325	1142	0.72	3	2	1	1	817	670	10455	OK	
Existing PM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	2	0.99	0.98	0.99	0.98	670	399	598	6	997	675	1673	0.60	3	2	1	1	997	750	8974	OK	
Existing PM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	2	0.99	0.99	0.99	0.99	807	165	631	5	796	812	1608	0.49	3	2	1	1	796	670	7767	OK	

Source: Based on methodology presented in the Highway Capacity Manual: 6th Edition (HCM 6)

Step 5: Determine Weaving Segment Capacity										Step 6: Determine Lane-Changing Rates							Step 7: Determine Average Speeds of Weaving and				Step 8: Determine LOS					
Weaving Segment Capacity Determined by Density Equations 13-5 & 13-6					Weaving Segment Capacity Determined by Weaving Demand Flows (Equations 13-7 & 13-8)		Final Capacity	Volume-to-Capacity Ratio (Equation 13-10)	LOS F	Geometrics	Equation 13-11	Equation 13-12	Equation 13-13	Equation 13-14	Equation 13-15	Equation 13-16	Equation 13-17	Equation 13-18/13-19	Equation 13-20	Equation 13-21	Equation 13-22	Equation 13-23	Equation 13-Exhibit 13-6			
Scenario	Direction	Road	Start	End	Capacity per lane of the weaving segment under equivalent ideal conditions, c _{WL}	Capacity per lane of a basic freeway segment with the same prevailing conditions, c _{FL}	Total capacity under prevailing conditions, c _W	Capacity of all lanes, c _W	Capacity of all lanes under prevailing conditions, c _W	Final capacity, c _W	Volume-to-capacity ratio, v/c	LOS F Check	Interchange density, ID	Total rate of lane changing by weaving vehicles, LC _W	Total rate of lane changing by nonweaving vehicles, LC _{NW1}	Total rate of lane changing by nonweaving vehicles, LC _{NW2}	Total rate of lane changing by nonweaving vehicles, LC _{NW3}	Total rate of lane changing by all vehicles, LC _{ALL}	Average speed of weaving vehicles, S _W	Weaving intensity factor, W	Average speed of nonweaving vehicles, S _{NW}	Average speed of all vehicles, S	Average density of all vehicles, D	LOS		
2022 EXISTING ANALYSIS																										
Existing AM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	1239	1900	3679	3804	3767	3679	0.53	NOT F	2.00	1415	108	0	1850	-3392	0	1415	36.9	0.37	33.0	35.3	18.5	B
Existing AM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	1171	1900	3411	3452	3352	3352	0.22	NOT F	2.00	696	31	0	1741	-3398	0	696	39.3	0.23	39.9	39.5	6.5	A
Existing PM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	1308	1900	3886	4318	4276	3886	0.30	NOT F	2.00	837	79	0	1806	-3393	0	837	39.1	0.25	38.4	38.8	10.2	A
Existing PM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	1378	1900	4094	5095	5044	4094	0.31	NOT F	2.00	759	90	0	1838	-3423	0	759	39.0	0.25	38.7	38.8	10.9	A
2029 NO BUILD ANALYSIS																										
Existing AM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	1242	1900	3690	3829	3791	3690	0.66	NOT F	2.00	1710	137	16	1892	-3341	16	1727	35.9	0.44	30.1	33.5	24.3	C
Existing AM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	1176	1900	3425	3477	3376	3376	0.26	NOT F	2.00	799	38	0	1753	-3402	0	799	38.8	0.26	38.9	38.9	7.9	A
Existing PM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	1298	1900	3856	4235	4193	3856	0.38	NOT F	2.00	1012	96	0	1831	-3393	0	1012	38.3	0.29	36.7	37.6	13.0	B
Existing PM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	1365	1900	4054	4938	4889	4054	0.38	NOT F	2.00	926	108	0	1869	-3427	0	926	38.2	0.29	37.0	37.6	13.9	B
2029 BUILD ANALYSIS																										
Existing AM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	1241	1900	3685	3817	3779	3685	0.66	NOT F	2.00	1732	138	18	1893	-3337	18	1750	35.8	0.44	29.9	33.4	24.7	C
Existing AM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	1151	1900	3354	3353	3256	3256	0.34	NOT F	2.00	980	43	0	1761	-3405	0	980	38.0	0.31	37.3	37.8	10.1	A
Existing PM	EB	Highland Avenue EB	I-95 SB Off-Ramp	I-95 NB On-Ramp	1271	1900	3775	4025	3985	3775	0.44	NOT F	2.00	1177	101	0	1840	-3393	0	1177	37.7	0.32	35.1	36.6	15.2	B
Existing PM	WB	Highland Avenue WB	I-95 NB Off-Ramp	I-95 SB On-Ramp	1357	1900	4031	4850	4802	4031	0.40	NOT F	2.00	959	109	0	1870	-3427	0	959	38.1	0.30	36.7	37.4	14.3	B

Source: Based on methodology presented in the Highway Capacity Manual: 6th Edition (HCM 6)



TIME PERIOD ANALYZED: 2017-2019
 SOURCE OF CRASH REPORTS: Needham Police Dept.

Not to Scale



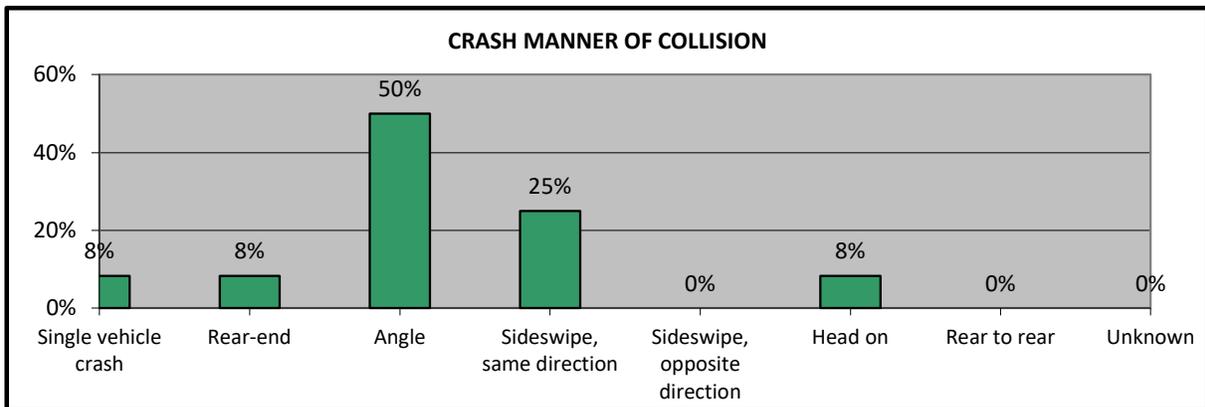
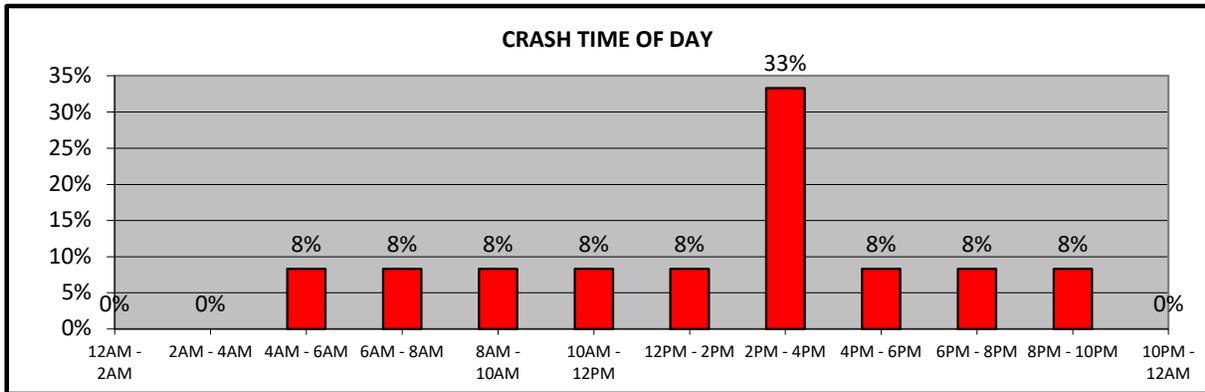
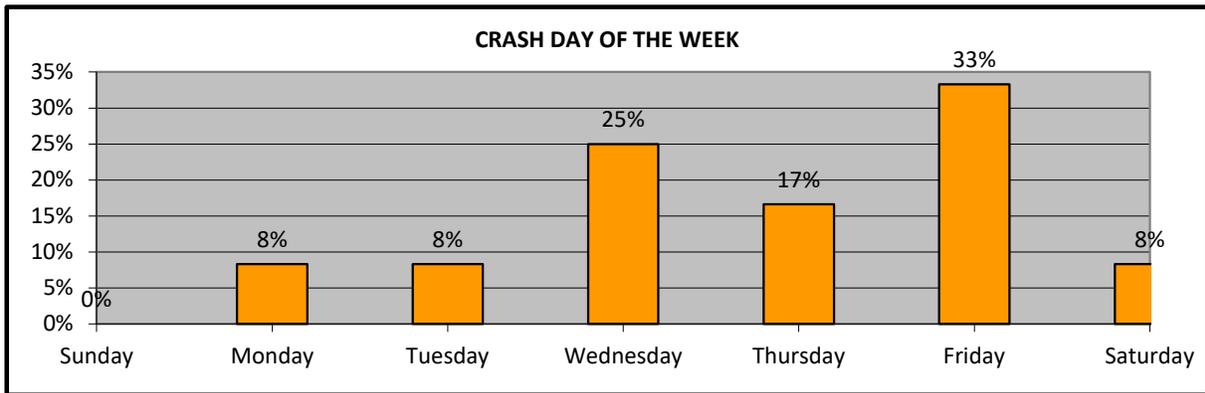
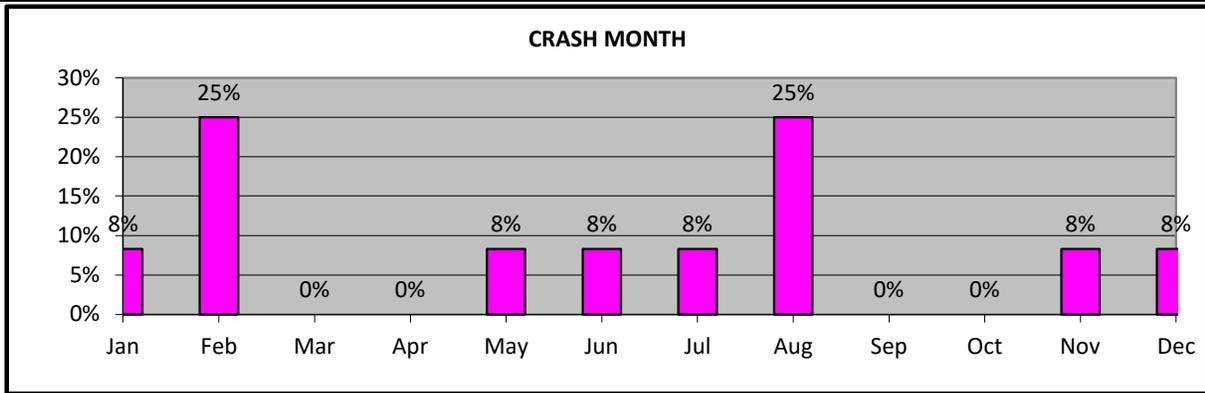
Collision Diagram
 Highland Avenue at
 West Street
 Needham, MA

Crash Data Summary Table

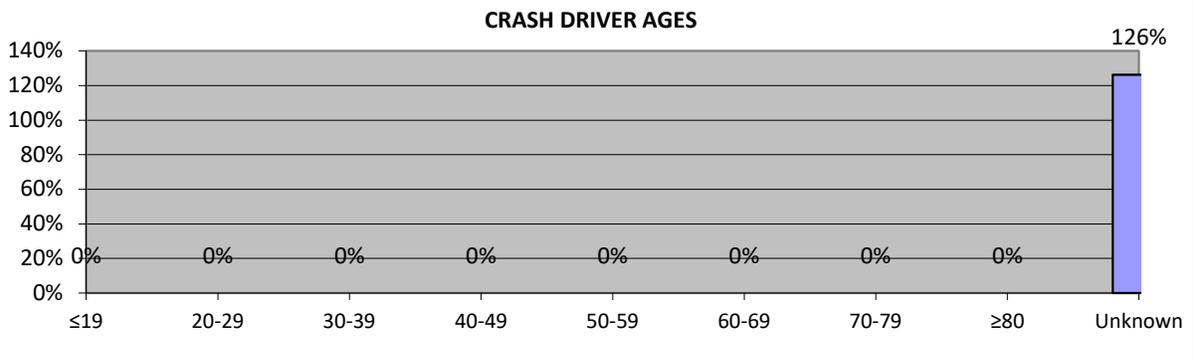
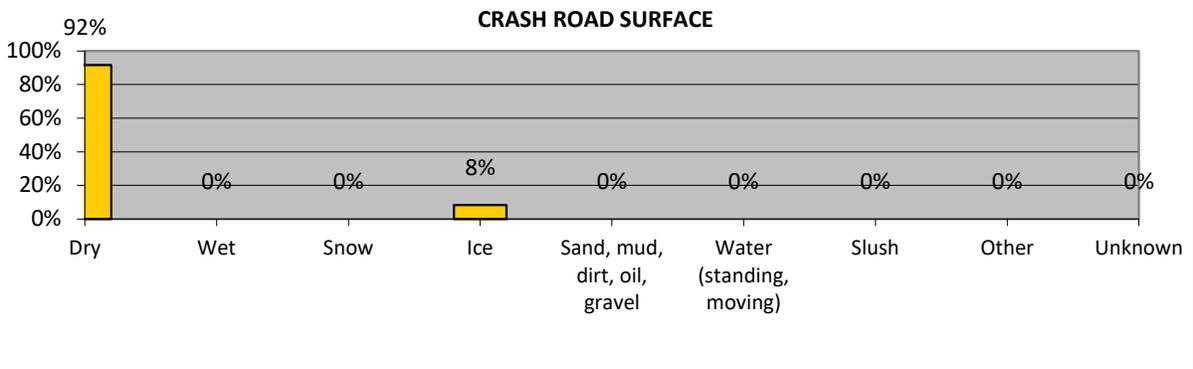
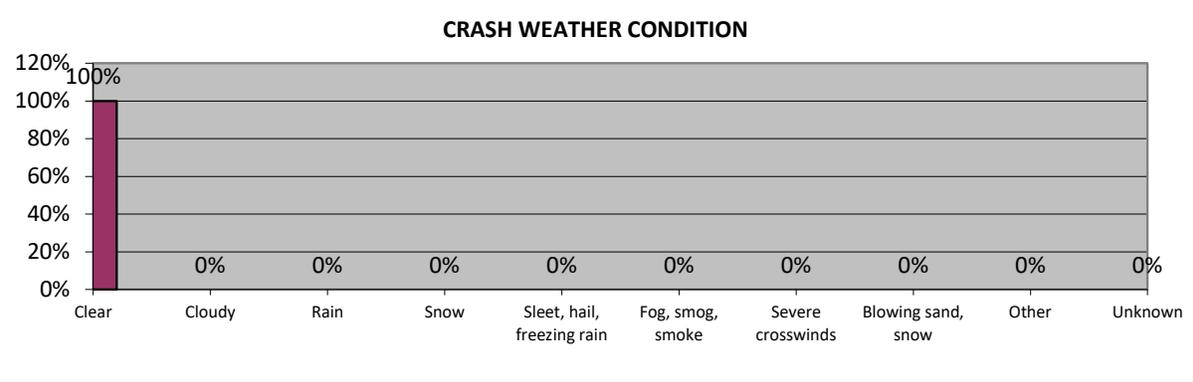
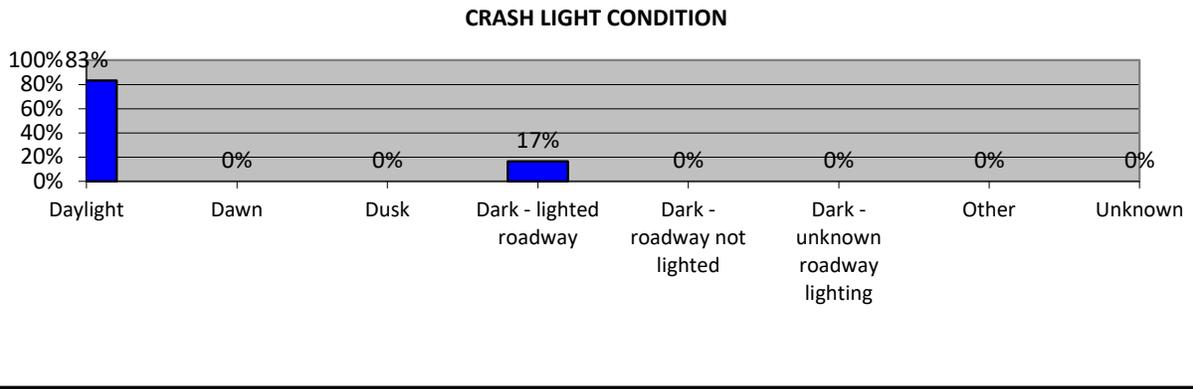
Highland Ave at West St
2017 - 2019

Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	D4 Age	Comments
#	mm/dd/yy	Day	hh:mm	Type	Type	Type	Type	Type	#	#	#	#	
1	02/03/17	Friday	4:11 PM	Single vehicle crash	Daylight	Clear	Dry	Inattention	Unknown	Unknown			Tractor trailer struck and knocked down a light post, then continued driving. Truck took a right from Highland Ave onto West St. Light portion of the traffic pole was knocked down and hanging on pole by 3 wires.
2	02/08/17	Wednesday	5:45 AM	Sideswipe, same direction	Daylight	Clear	Ice	No improper driving	Unknown	Unknown			Vehicle #2 was traveling north on Highland Ave. Flash freeze on the roads at the time. Vehicle #2 stopped for red light signal and its trailer slid sideways striking Vehicle #1 which was parked.
3	05/19/17	Friday	2:09 PM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	Unknown	Unknown			Vehicle #2 was stopped at red light at the intersection of Highland Ave and West St. Vehicle #2 was in a marked left turn only lane. To the right of Vehicle #2 is a separate lane for right turns and for traffic going straight. When the light turned green, Vehicle #2 took a right turn, failing to follow the marked lane, and caused a collision with Vehicle #1. Vehicle #1 was to the right of Vehicle #2 at the red light. Property damage, no injury.
4	07/19/17	Wednesday	3:59 PM	Sideswipe, same direction	Daylight	Clear	Dry	Unknown	Unknown	Unknown			Bus turning right from West St to Highland Ave. Rear of Bus struck the right side of Vehicle that was sitting to the left of it. No injuries.
5	08/28/17	Monday	10:45 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	Unknown	Unknown			Vehicle crash involving a cyclist. Vehicle #1 was moving eastbound on West St towards Highland Ave with a green light. Cyclist entered crosswalk to cross the intersection. Property damaged, no injury.
6	02/07/19	Thursday	8:41 PM	Angle	Dark - lighted roadway	Clear	Dry	Unknown	Unknown	Unknown			Hit and run crash to a parked vehicle. Vehicle parked on Corner of Highland Ave facing south, truck hit her vehicle while taking a left turn into Trader Joes.
7	08/15/19	Thursday	2:57 PM	Sideswipe, same direction	Daylight	Clear	Dry	Unknown	Unknown	Unknown			Hit and run. No injuries were reported. Vehicle #1 was attempting to park on Highland Ave, tractor trailer truck was turning onto Highland Ave from West St and clipped the driver's side of Vehicle #1.
8	08/23/19	Friday	12:09 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	Unknown	Unknown			Vehicle #1 was stopped at the red light on West St in the left turn only lane. The cyclist entered the crosswalk just before the walk signal ended and was proceeding thru the crosswalk. The light turned to green and Vehicle #1 started the left turn and was about half way through the crosswalk when the cyclist ran into the passenger side of vehicle #1. The cyclist fell off the bicycle on the ground. No injuries or damages.
9	12/07/19	Saturday	8:00 AM	Head on	Daylight	Clear	Dry	Other improper action	Unknown	Unknown			Vehicle #1 was turning left to go northbound onto Highland Ave from West St. Vehicle #2 was travelling westbound on West St crossing over Highland Ave. Vehicle #2 was struck vehicle #1 as it was making the turn. Both vehicles sustained moderate damage, but did not have to be towed from the scene. No injuries were reported.
10	01/25/17	Wednesday	6:11 PM	Rear-end	Dark - lighted roadway	Clear	Dry	Unknown	Unknown	Unknown			No injuries. Vehicle #1 was unable to stop when Vehicle #2 in front of her stopped. Vehicle #1 had heavy front end damage, there was damage to the rear of vehicle #2.
11	06/01/18	Friday	6:38 AM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	Unknown	Unknown			Vehicle #2 was traveling north on Highland Ave and was struck by Vehicle #1 that was traveling WB on West St.
12	11/13/18	Tuesday	3:49 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	Unknown	Unknown			No injuries. Vehicle #1 was traveling down West St and turning left. Vehicle #2 was on West St going towards Webster St when the operator of Vehicle #1 turned left and hit vehicle #2. Vehicle #1 was removed by tow.

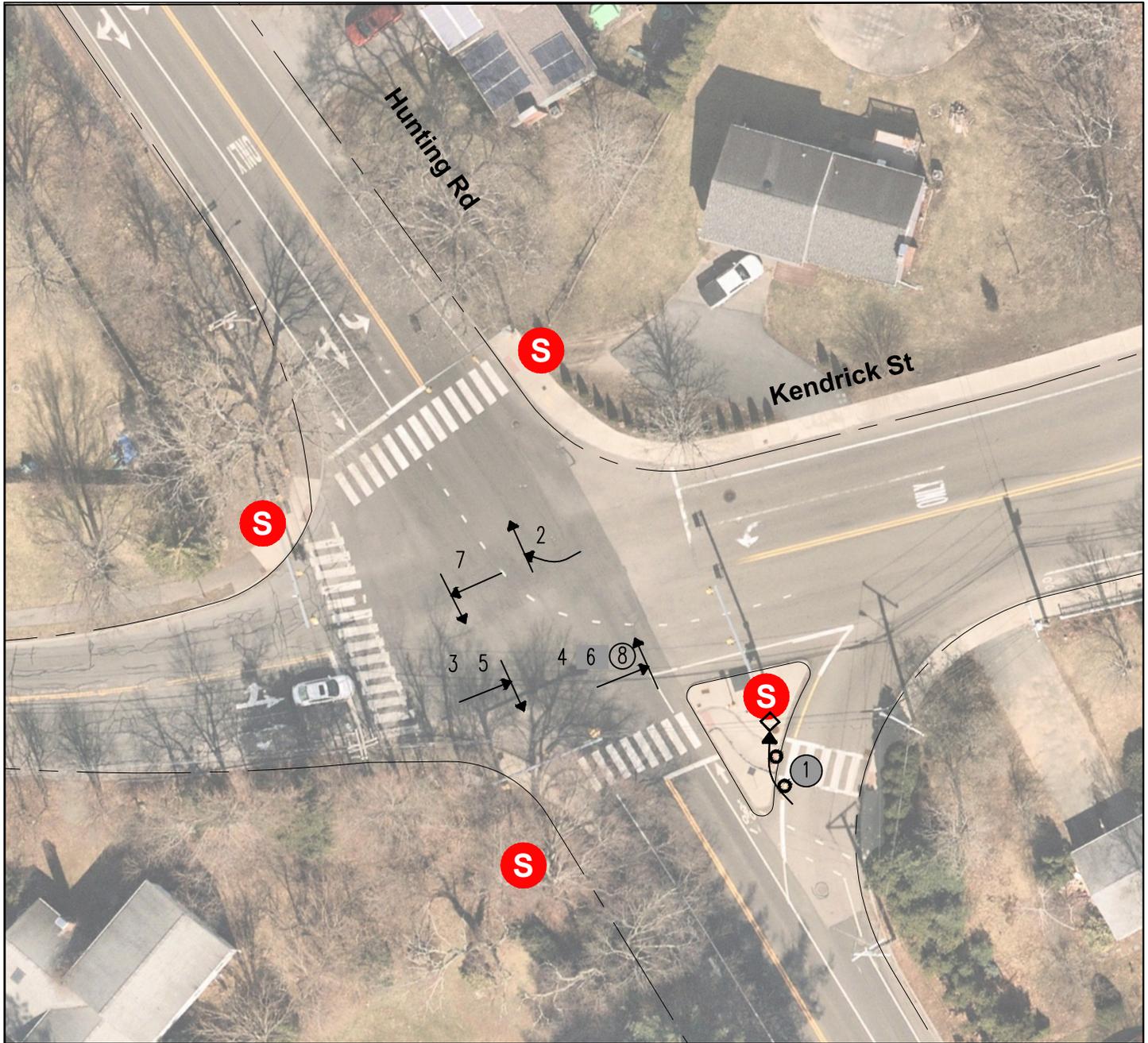
Crash Data Summary Charts Highland Ave at West St



Crash Data Summary Charts Highland Ave at West St



SYMBOLS		TYPES OF CRASH	SEVERITY	TRAFFIC CONTROL
	Moving Vehicle			
	Backing Vehicle			Injury
	Non-Involved Vehicle			Fatal
Involved	Non-Involved			
				Stop Sign
				Yield Sign
				One Way Sign
	Direction of Motion			
	Parked Vehicle			
	Fixed Object			



TIME PERIOD ANALYZED: 2017-2019
 SOURCE OF CRASH REPORTS: Needham Police Dept.

Not to Scale



Collision Diagram
 Hunting Road at
 Kendrick Street
 Needham, MA

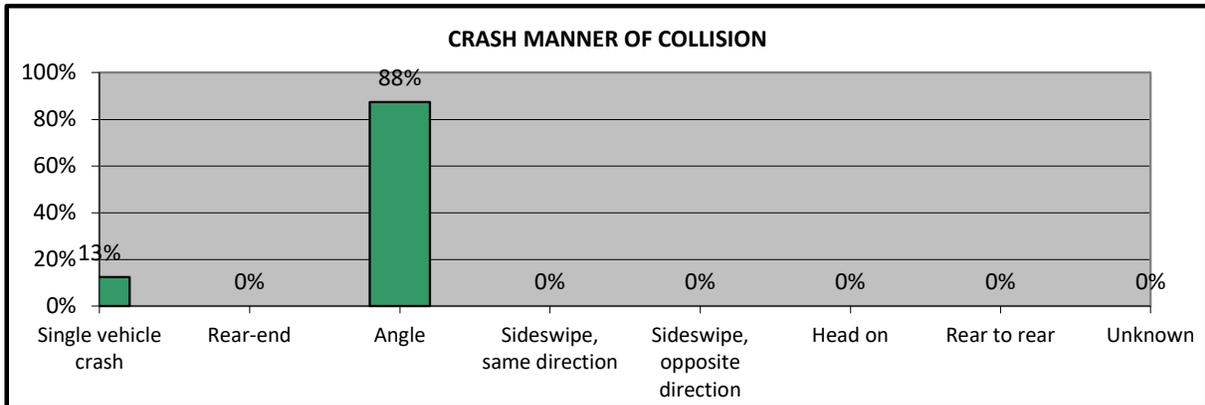
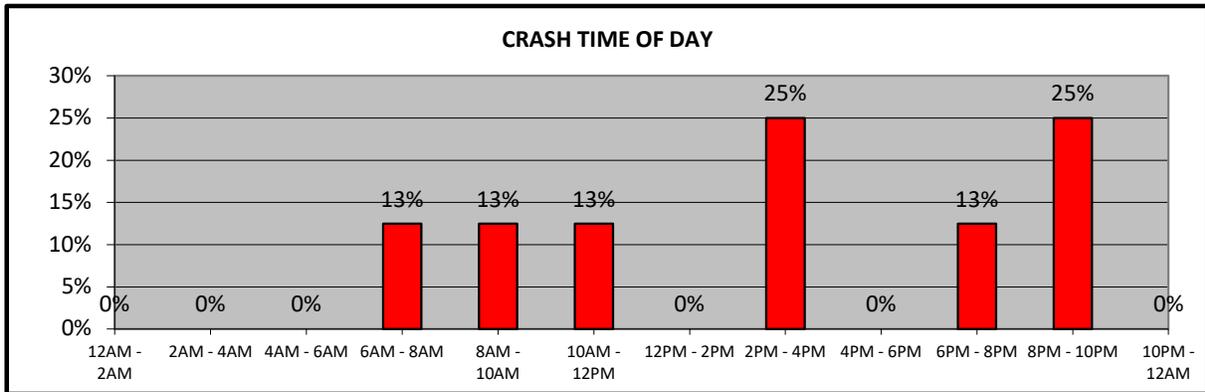
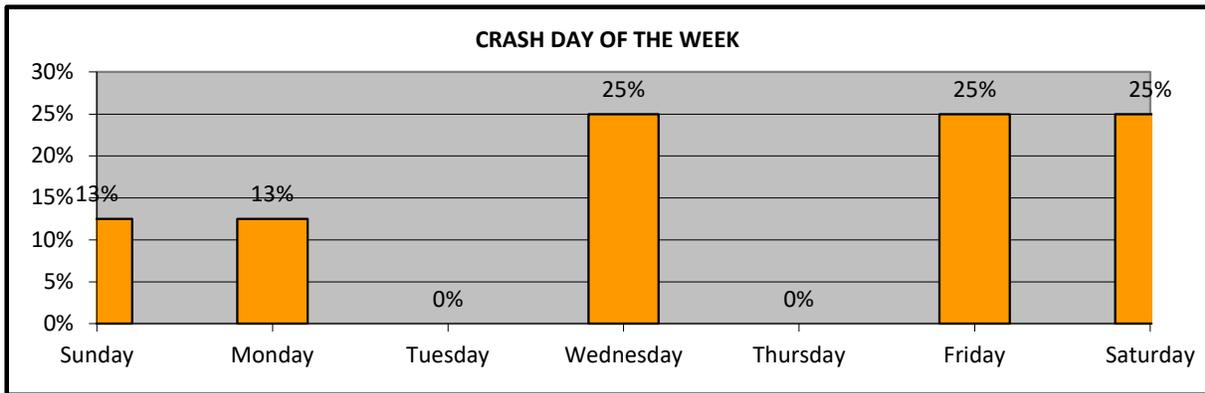
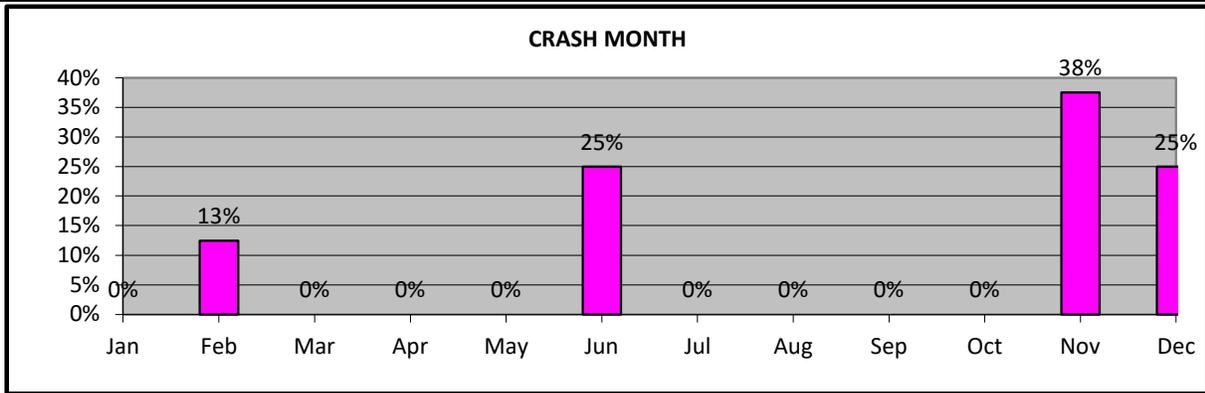
Crash Data Summary Table

Hunting Rd at Kendrick St
2017 - 2019

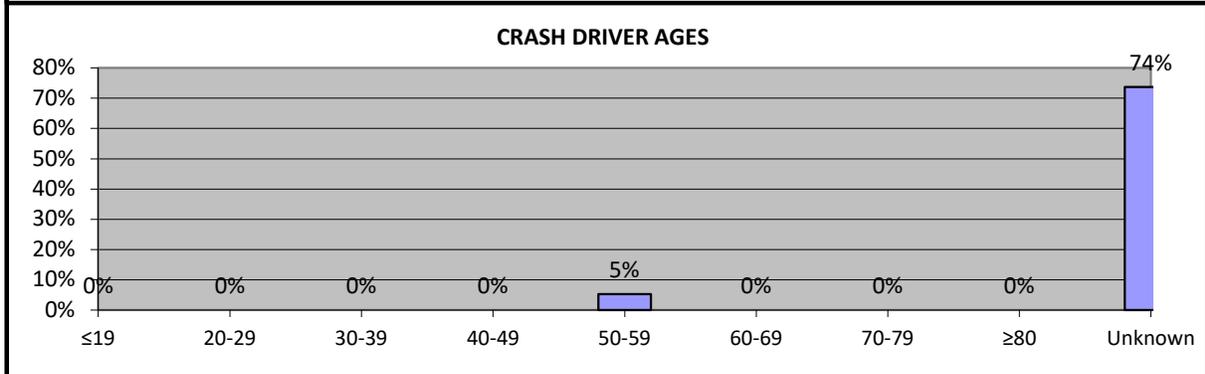
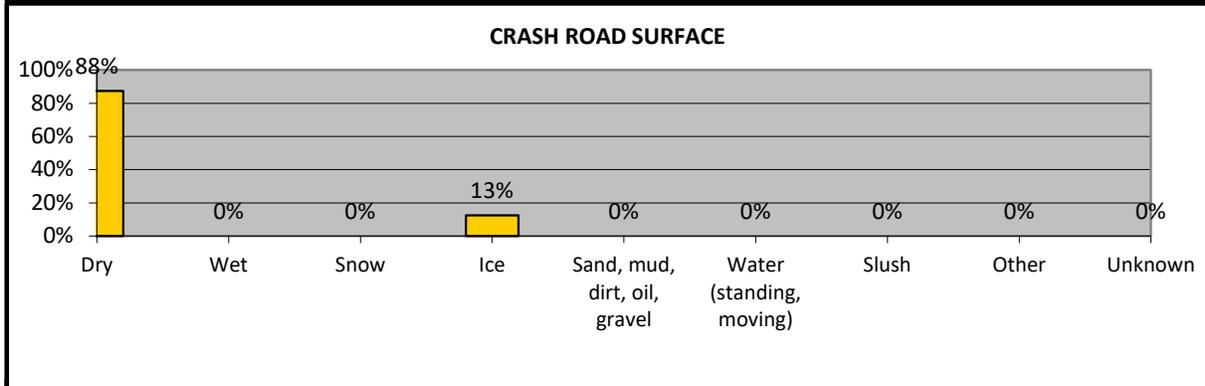
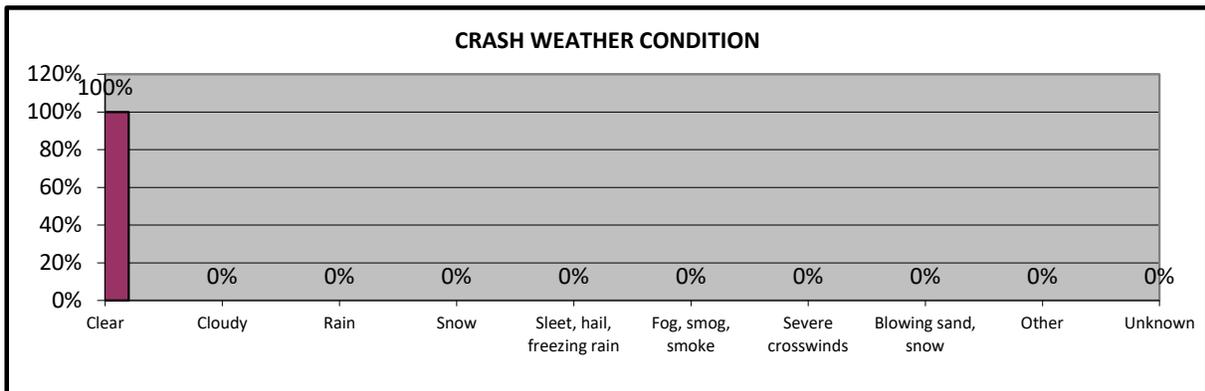
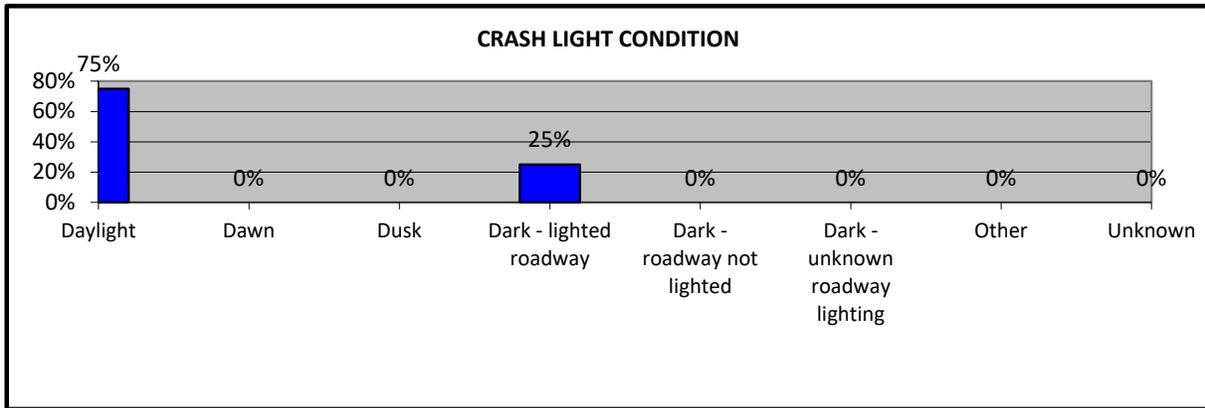
Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	D4 Age	Comments
#	mm/dd/yy	Day	hh:mm	Type	Type	Type	Type	Type	#	#	#	#	
1	02/08/17	Wednesday	6:30 AM	Single vehicle crash	Dark - lighted roadway	Clear	Ice	No improper driving	Unknown				Vehicle #1 was traveling northbound on Hunting Road when the extremely ice condition caused him to slide up onto a curb and struck the base of the a traffic light pole. Driver complained of dizziness and was evaluated. Flash freeze. Pole was not damaged.
2	11/10/17	Friday	10:57 AM	Angle	Daylight	Clear	Dry	Failed to yield right of way	Unknown	Unknown			Vehicle #1 was traveling on Hunting Rd and crossing through a green light over Kendrick St to continue on Hunting Rd. Vehicle #2 stated he was stopped at red light on Kendrick St when he tried to take a right turn on red onto Hunting Rd. Vehicle #2 struck Vehicle #1 as it attempted to turn onto Hunting Rd. Vehicle #1 suffered minor damage to the passenger side of front door. Vehicle #2 suffered minor damage to the driver's side front wheel well and front driver's side panel. No injuries were reported.
3	06/18/18	Monday	9:37 PM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	Unknown	Unknown			Vehicle #1 was traveling on Hunting Rd SB heading towards Cheney St. Vehicle #2 was on Kendrick St heading EB towards Newton. No injuries reported, Vehicle #1 had minor to moderate passenger side damage. Vehicle #2 had moderate front end damage.
4	11/03/18	Saturday	8:41 PM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	Unknown	Unknown			Vehicle #1 east on Hunting, Vehicle #2 north of Kendrick. No injury, minor to moderate damage.
5	11/21/18	Wednesday	2:44 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	Unknown	Unknown			Vehicle #1 traveling EB on Kendrick St heading towards Newton. Vehicle #2 traveling WB on Kendrick St, making a left turn onto Hunting Rd. No injuries reported, moderate damages to vehicles
6	06/28/19	Friday	7:50 PM	Angle	Dark - lighted roadway	Clear	Dry	Inattention	Unknown	54			Vehicle #2 was traveling west on Kendrick Street with the right of way when vehicle #1 entered the intersection on a red light. No reported injuries and both vehicles had to be towed from the scene.
7	12/28/19	Saturday	3:48 PM	Angle	Daylight	Clear	Dry	Failed to yield right of way	Unknown	Unknown			Vehicle #1 traveling south on Hunting Rd when vehicle #2 crashed into the left side of his car. No injuries, both vehicles were towed.
8	12/01/19	Sunday	8:48 AM	Angle	Daylight	Clear	Dry	Unknown	Unknown	Unknown			Vehicle #1 was travelling EB on Kendrick St. Vehicle #2 was travelling northbound on Hunting Road. Serious damage to both vehicles.

Crash Data Summary Charts

Hunting Rd at Kendrick St



Crash Data Summary Charts Hunting Rd at Kendrick St



Crash Data Summary Table

Highland Ave at Gould St / Hunting Rd
2017 - 2019

Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	D4 Age	Comments
#	mm/dd/yy	Day	hh:mm	Type	Type	Type	Type	Type	#	#	#	#	
1	08/03/19	Saturday	2:55 PM	Angle	Daylight	Clear	Dry	Unknown	Unknown	Unknown			Vehicle #1 was turning onto Highland Ave at green. Vehicle #2 took a right on red and crashed into the passenger side of Vehicle #1.
2	03/01/17	Wednesday	1:31 PM	Sideswipe, same direction	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	Unknown	Unknown			Vehicle #2 was turning right onto Highland Ave from Hunting Road. Vehicle #1 was behind Vehicle #2 and attempted to pass it on the right and turn right onto Highland Ave as well. Vehicle #2 sustained moderate damage to the left rear and side. Vehicle #1 sustained minor damage to the right front corner. There were no reported injuries and both vehicles were able to be driver from the scene.
3	06/27/18	Wednesday	7:23 AM	Angle	Daylight	Clear	Dry	Disregarded traffic signs, signals, road markings	Unknown	Unknown			Vehicle #2 stated he got a green arrow to turn right from his traffic signal, but accidentally continued straight and vehicle #1 drove into him. Air bag deployment in both vehicles. Witness stated that Vehicle #1's lane of traffic had a green light, all of a sudden vehicle #2 came across the intersection at a high rate of speed and vehicle 1 drove into vehicle 2.
4	12/09/19	Monday	11:10 AM	Sideswipe, same direction	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	Unknown	Unknown			Vehicle #1 and Vehicle #2 were turning eastbound from Gould Street onto Highland Ave when Vehicle #1 did not stay in the proper lane, striking Vehicle #2 on the driver's side closest to the driver side door. Vehicle #1 had minor damage to the front right side bumper. Vehicle #2 had substantial damage to the left side mirror. No injuries were reported.
5	03/22/18	Thursday	4:40 PM	Rear-end	Daylight	Clear	Dry	Failed to yield right of way	Unknown	Unknown			Vehicle #2 was in the left lane on Gould St when she realized she needed to be on the right. Vehicle #2 was changing lanes and her vehicle struck Vehicle #1. Vehicle #2 sustained minor rear end damage, and Vehicle #1 sustained minor damage to the front fender and bumper.
6	05/04/18	Friday	6:00 PM	Rear-end	Daylight	Clear	Dry	Distracted	Unknown	Unknown			No injuries. Vehicle #1 was stopped at the lights on Highland Ave waiting to travel westbound on Highland Ave, when he was rear ended by vehicle #2.
7	07/17/18	Tuesday	2:03 AM	Single vehicle crash	Dark - lighted roadway	Clear	Dry	Inattention	Unknown	Unknown			Report of flashing lights possibly caused by a passing construction vehicle. Truck operator struck two signs along Highland Ave as well. The traffic signal was struck.
8	07/26/18	Thursday	8:20 AM	Sideswipe, same direction	Daylight	Clear	Dry	Failure to keep in proper lane or running off road	Unknown	Unknown			Vehicle #2 was stopped in traffic on Highland Ave facing eastbound. According to Vehicle #2, vehicle #1 drove by his stopped vehicle and sideswiped it, knocking his mirror off and damaging it. Vehicle #1 then turned onto Gould St and never stopped. No injuries were reported. Vehicle #2 had very minor damage.
9	12/12/18	Wednesday	12:11 PM	Angle	Daylight	Clear	Dry	No improper driving	Unknown	Unknown			Vehicle #2 was in the left lane, which is a left turn only lane. Vehicle #1 was in the right lane which has no turning restrictions. The light was red and when it turned green vehicle #1 turned left and vehicle #2 went straight ahead. Vehicle #2 struck vehicle #1 in the left rear and then fled the area on Highland Ave towards Netwon.
10	02/05/19	Tuesday	7:21 PM	Sideswipe, same direction	Dark - lighted roadway	Clear	Dry	No improper driving	Unknown	Unknown			Hit and run accident. Vehicle #2 stated that she was traveling west on Highland Ave, approaching the Gould St intersection, when Vehicle #1 sideswiped the right side of her vehicle as unknown vehicle #1 passed her on the right side. No one reported injury. Vehicle #2 sustained right side damage. Unknown vehicle #1 did not pull over after the accident and there is no information available for the vehicle make or operator.
11	03/23/19	Saturday	11:04 AM	Angle	Daylight	Clear	Dry	Unknown	Unknown	Unknown			Vehicle #1 was facing southbound on Gould St attempting to make a left turn onto Highland Ave eastbound. Vehicle #1 started from inside travel lane of Gould Street. Vehicle #2 was facing on Gould St in the outside lane attempting to make a left turn onto Highland Ave eastbound. At some point during the turn the vehicles collided. The paint line delineating the traffic lanes at this intersection are faded. No injuries are reported. Vehicle #1 had minor right front bumper damage and vehicle #2 had minor left rear quarter panel damage (dents and scrape marks).

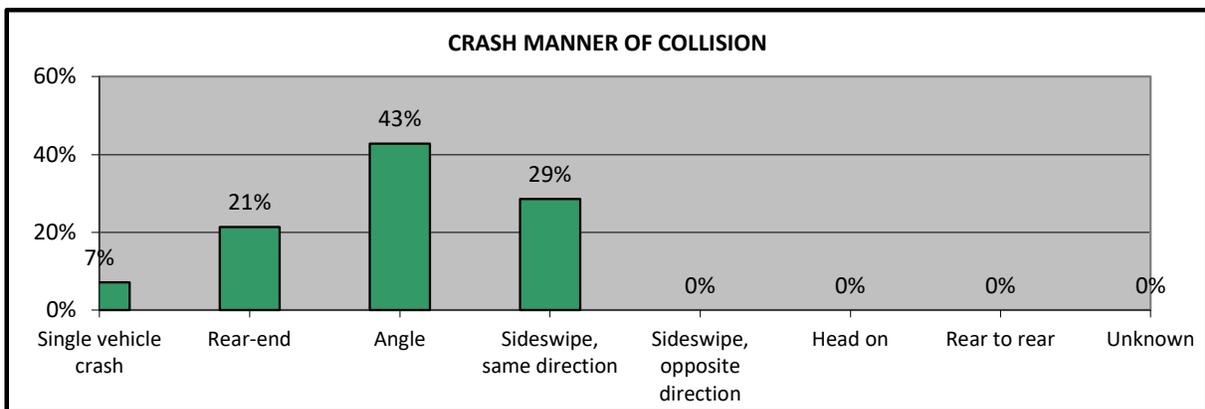
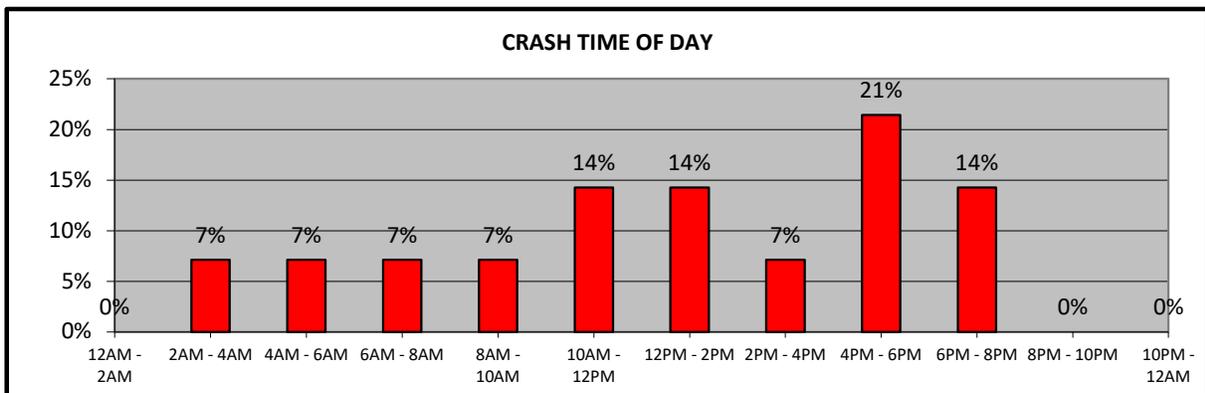
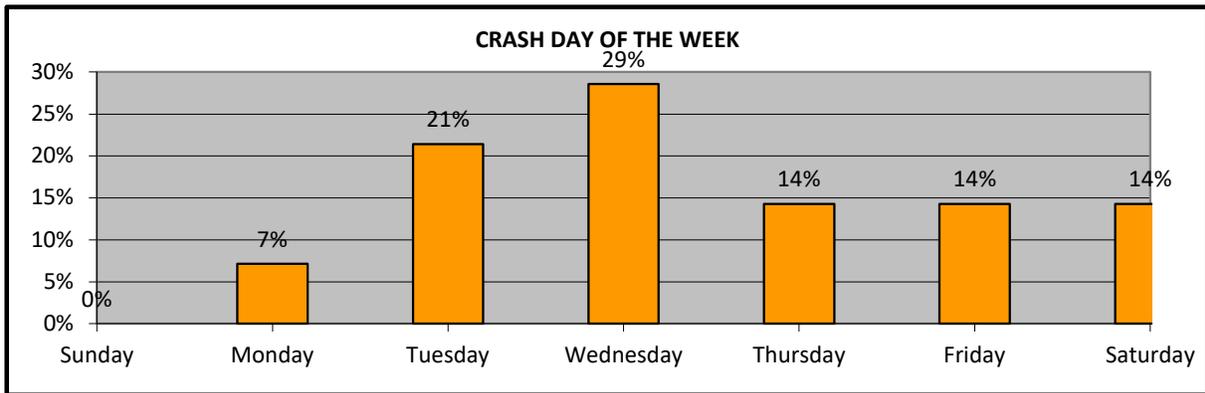
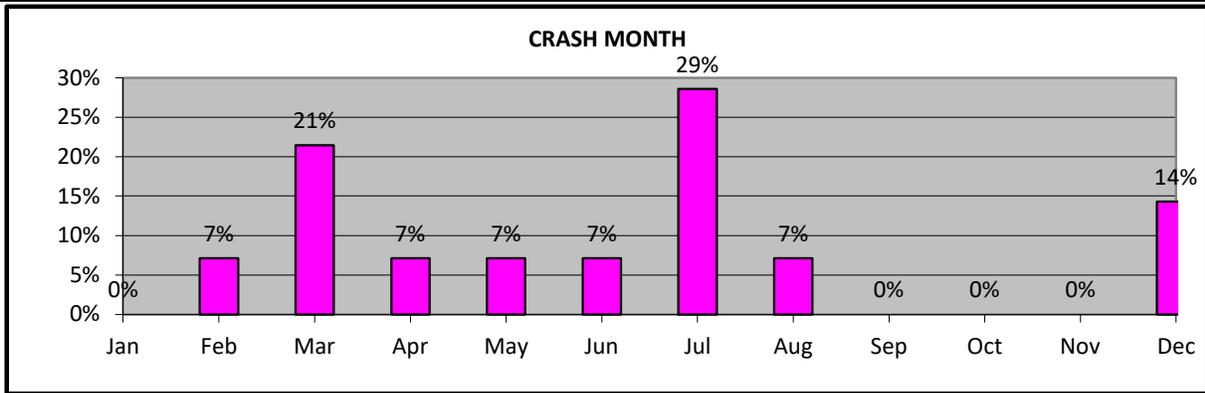
Crash Data Summary Table

Highland Ave at Gould St / Hunting Rd
2017 - 2019

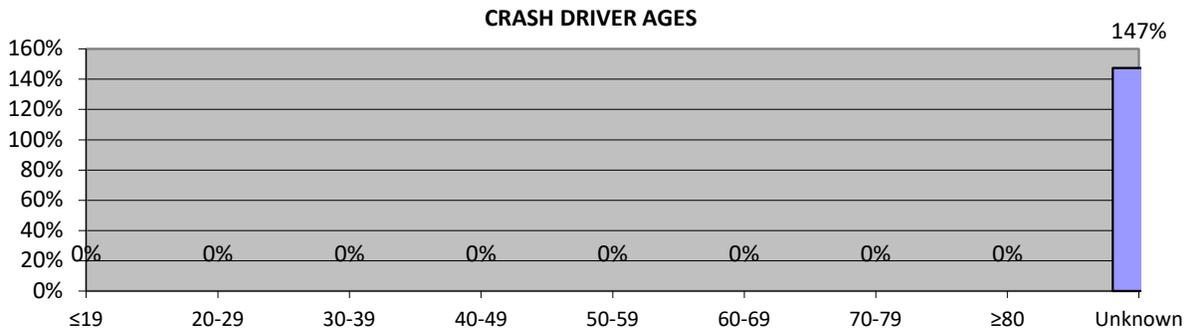
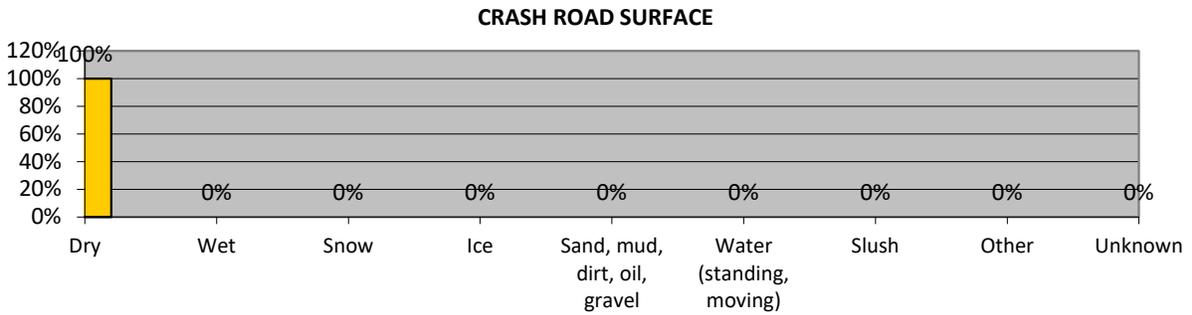
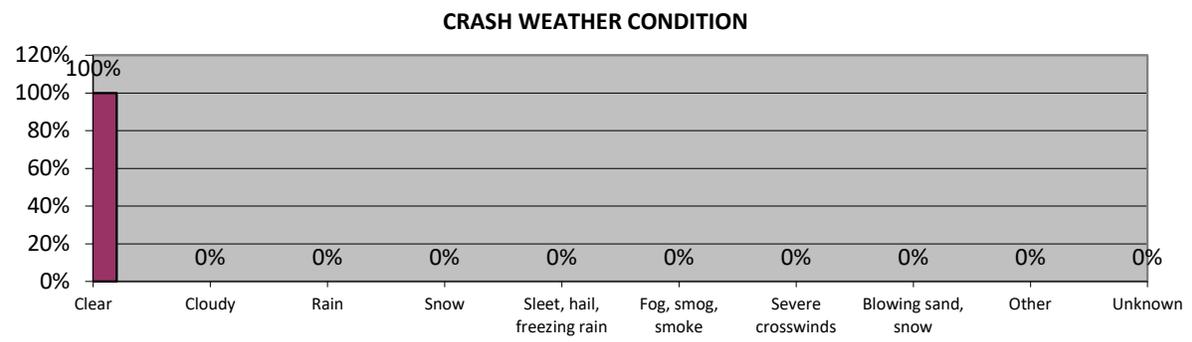
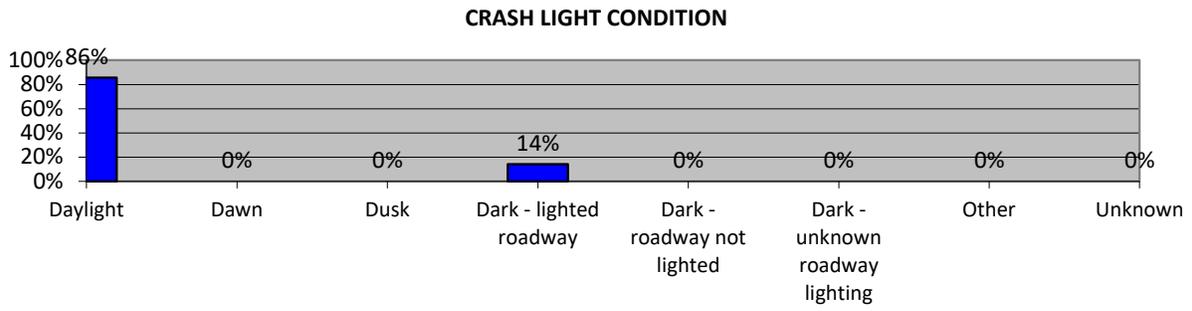
Crash Diagram Ref #	Crash Date	Crash Day	Time of Day	Manner of Collision	Light Condition	Weather Condition	Road Surface	Driver Contributing Code	D1 Age	D2 Age	D3 Age	D4 Age	Comments
#	mm/dd/yy	Day	hh:mm	Type	Type	Type	Type	Type	#	#	#	#	
12	04/30/19	Tuesday	4:49 AM	Angle	Daylight	Clear	Dry	Unknown	Unknown	Unknown			At 4:49 am, 2 car crash at intersection of Highland Ave and Gould St with no reported injuries. Vehicle #1 stated she was driving on Highland Ave (west) and turning right (north) onto Gould St when she struck vehicle #2. Some left shoulder pain of vehicle #2. Vehicle #2 was towed from the scene.
13	07/13/18	Friday	5:59 PM	Rear-end	Daylight	Clear	Dry	Unknown	Unknown	Unknown			Vehicle #2 at the intersection of Highland Ave at Hunting Rd. Vehicle #1 rear ends Vehicle #2 while it is stopped. No injuries reported at the scene. Vehicles had significant damage but neither had to be towed from the scene. No injuries.
14	07/31/19	Wednesday	4:35 PM	Angle	Daylight	Clear	Dry	Unknown	Unknown	Unknown			Vehicle #1 was going southwest on Highland Ave. Vehicle #2 was driving towards her. Minimal damage on Vehicle #1. No injury.

Crash Data Summary Charts

Highland Ave at Gould St / Hunting Rd



Crash Data Summary Charts Highland Ave at Gould St / Hunting Rd



Existing Site Trip Generation Calculations

Comment 12

ITE TRIP GENERATION WORKSHEET
(11th Edition, Updated 2021)

LANDUSE: Automated Car Wash
LANDUSE CODE: 948
SETTING/LOCATION:
JOB NAME: 557 Highland Avenue
JOB NUMBER:

Independent Variable --- 1,000 Sq. Feet Gross Floor Area

FLOOR AREA (KSF): 4.60

WEEKDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	--	--	--	--	--	--	--	--	--	--
AM PEAK OF GENERATOR	--	--	--	--	--	--	--	--	--	--
PM PEAK OF GENERATOR	2	--	11.66	8.35	16.63	5.00	4.39	6.59	50%	50%

TRIPS:	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	--	--	--	--	--	--
AM PEAK OF GENERATOR	--	--	--	--	--	--
PM PEAK OF GENERATOR	54	27	27	--	--	--

SATURDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	--	--	--	--	--	--	--	--	--	--
PEAK OF GENERATOR	3	--	30.40	14.20	37.75	3.00	1.69	5.00	50%	50%

TRIPS:	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	--	--	--	--	--	--
PEAK OF GENERATOR	140	70	70	--	--	--

SUNDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	--	--	--	--	--	--	--	--	--	--
PEAK OF GENERATOR	--	--	--	--	--	--	--	--	--	--

TRIPS:	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	--	--	--	--	--	--
PEAK OF GENERATOR	--	--	--	--	--	--

ITE TRIP GENERATION WORKSHEET
(11th Edition, Updated 2021)

LANDUSE: Automobile Sales (New)
LANDUSE CODE: 840
SETTING/LOCATION: General Urban/Suburban
JOB NAME: 557 Highland Avenue
JOB NUMBER:

Independent Variable --- 1,000 Sq. Feet Gross Floor Area

FLOOR AREA (KSF): 35.15

WEEKDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	18	0.80	27.84	14.98	41.78	36	15.00	77.00	50%	50%
AM PEAK OF GENERATOR	40	0.65	2.15	0.59	4.13	32	9.34	80.00	54%	46%
PM PEAK OF GENERATOR	39	0.61	2.65	0.89	5.64	33	9.34	80.00	46%	54%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	980	490	490	978	489	489
AM PEAK OF GENERATOR	76	41	35	75	40	34
PM PEAK OF GENERATOR	93	43	50	92	42	50

SATURDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	1	--	52.24	52.24	52.24	33	33	33	50%	50%
PEAK OF GENERATOR	4	0.92	4.02	1.41	5.64	21	16	33	50%	50%

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	1,838	919	919	--	--	--
PEAK OF GENERATOR	141	71	71	206	103	103

SUNDAY

RATES:	# Studies	R^2	Total Trip Ends			Independent Variable Range			Directional Distribution	
			Average	Low	High	Average	Low	High	Enter	Exit
DAILY	1	--	21.73	21.73	21.73	33	33	33	50%	50%
PEAK OF GENERATOR	--	--	--	--	--	--	--	--	--	--

TRIPS:

	BY AVERAGE			BY REGRESSION		
	Total	Enter	Exit	Total	Enter	Exit
DAILY	764	382	382	--	--	--
PEAK OF GENERATOR	--	--	--	--	--	--

Existing Town of Needham Mode Share Data

Comment 14

2012-2016 American Community Survey - Work in Needham

Mode Share - Aggregate

Mode	Total	Percent
Car, Truck, or Van - Drove Alone	16,089	82.5%
Carpool - In 2-Person Carpool	1,072	5.5%
Carpooled - In 3-Person Carpool	181	0.9%
Carpooled - In 4-Person Carpool	65	0.3%
Carpooled - In a 5 or 6 Person Carpool	20	0.1%
Carpooled - In a 7 or More Person Carpool	140	0.7%
Public Transportation	302	1.5%
Walked	287	1.5%
Bicycle	99	0.5%
Taxicab / Motorcycle / Other	71	0.4%
Worked at Home	1,185	6.1%
Total	19,511	100.0%

Note: Based on Journey to Work data from the US Census Bureau (2012-2016 5-Year American Community Survey) for those who work in Needham.

Mode Share - Combined

Mode	Total	Percent
Vehicle	17,638	90.4%
Transit	302	1.5%
Bicycle	99	0.5%
Walked	287	1.5%
Worked at home	1,185	6.1%
Total	19,511	100.0%

Mode Share - For Comparison

Mode	Total	Percent	% Rounded
Vehicle	17,638	96.2%	95%
Transit	302	1.6%	2%
Bike	99	0.5%	1%
Walk	287	1.6%	2%
Total	18,326	100.0%	100.0%

Note: Worked at home not included in dataset

Vehicle Occupancy Rate

Vehicle Occupancy	Total
1	16,160
2	1,072
3	181
4	65
5	10
6	10
7	140
VOR	1.15

Intersection Capacity Analysis Worksheets

Comments 19 and 21-24

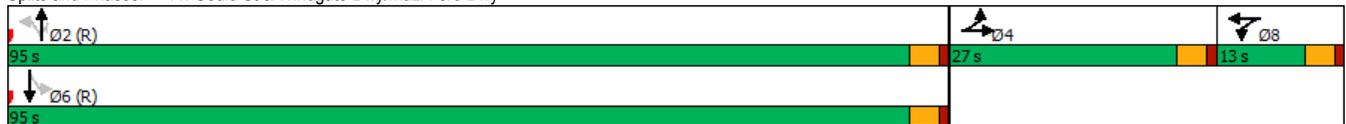
Intersection						
Int Delay, s/veh	2.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔		↔	↔
Traffic Vol, veh/h	25	20	635	135	85	355
Future Vol, veh/h	25	20	635	135	85	355
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	95	95	91	91
Heavy Vehicles, %	0	0	2	2	0	3
Mvmt Flow	42	33	668	142	93	390
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1315	739	0	0	810	0
Stage 1	739	-	-	-	-	-
Stage 2	576	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	176	421	-	-	825	-
Stage 1	476	-	-	-	-	-
Stage 2	566	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	156	421	-	-	825	-
Mov Cap-2 Maneuver	156	-	-	-	-	-
Stage 1	476	-	-	-	-	-
Stage 2	502	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	26.5	0	1.9			
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	156	421	825	-
HCM Lane V/C Ratio	-	-	0.267	0.079	0.113	-
HCM Control Delay (s)	-	-	36.3	14.3	9.9	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	1	0.3	0.4	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	5	70	1	20	15	750	385	30	350	2
Future Volume (vph)	1	0	5	70	1	20	15	750	385	30	350	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	13	13	12	12	12	12	12	12
Storage Length (ft)	0	0	0	0	0	0	0	100	150	0	0	0
Storage Lanes	0	0	1	0	0	0	0	1	1	0	0	0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		151			225			398			315	
Travel Time (s)		3.4			5.1			9.0			7.2	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.63	0.63	0.63	0.90	0.90	0.90	0.90	0.90	0.90	0.83	0.83	0.83
Shared Lane Traffic (%)				34%								
Lane Group Flow (vph)	0	10	0	51	50	0	0	850	428	36	424	0
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Detector Phase	4	4		8	8		2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.0	27.0		11.0	11.0		15.0	15.0	15.0	23.0	23.0	
Total Split (s)	27.0	27.0		13.0	13.0		95.0	95.0	95.0	95.0	95.0	
Total Split (%)	20.0%	20.0%		9.6%	9.6%		70.4%	70.4%	70.4%	70.4%	70.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min	C-Min	C-Min	C-Min	
v/c Ratio		0.07		0.43	0.36			0.55	0.32	0.08	0.14	
Control Delay		0.8		70.6	44.5			7.1	3.2	5.8	4.0	
Queue Delay		0.0		0.0	0.0			4.5	1.2	0.0	0.0	
Total Delay		0.8		70.6	44.5			11.6	4.5	5.8	4.0	
Queue Length 50th (ft)		0		46	25			153	22	3	20	
Queue Length 95th (ft)		0		90	68			m273	m78	24	88	
Internal Link Dist (ft)		71			145			318			235	
Turn Bay Length (ft)									100	150		
Base Capacity (vph)		313		128	147			1550	1339	447	2978	
Starvation Cap Reductn		0		0	0			611	669	0	0	
Spillback Cap Reductn		0		0	0			0	0	0	0	
Storage Cap Reductn		0		0	0			0	0	0	0	
Reduced v/c Ratio		0.03		0.40	0.34			0.91	0.64	0.08	0.14	

Intersection Summary

Area Type: Other
 Cycle Length: 135
 Actuated Cycle Length: 135
 Offset: 15 (11%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Gould St & Windgate Dwy/Muzi Ford Dwy





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕	↕	↕	↕	
Traffic Volume (vph)	1	0	5	70	1	20	15	750	385	30	350	2
Future Volume (vph)	1	0	5	70	1	20	15	750	385	30	350	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13	12	12	12	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95			1.00	1.00	1.00	0.95	
Frb, ped/bikes		1.00		1.00	1.00			1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt		0.89		1.00	0.93			1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	0.97			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1645		1681	1663			1861	1551	1770	3537	
Flt Permitted		0.99		0.95	0.97			0.99	1.00	0.29	1.00	
Satd. Flow (perm)		1645		1681	1663			1841	1551	531	3537	
Peak-hour factor, PHF	0.63	0.63	0.63	0.90	0.90	0.90	0.90	0.90	0.90	0.83	0.83	0.83
Adj. Flow (vph)	2	0	8	78	1	22	17	833	428	36	422	2
RTOR Reduction (vph)	0	10	0	0	21	0	0	0	40	0	0	0
Lane Group Flow (vph)	0	0	0	51	29	0	0	850	388	36	424	0
Conf. Bikes (#/hr)									1			
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		5.8		8.3	8.3			108.9	108.9	108.9	108.9	
Effective Green, g (s)		5.8		8.3	8.3			108.9	108.9	108.9	108.9	
Actuated g/C Ratio		0.04		0.06	0.06			0.81	0.81	0.81	0.81	
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		70		103	102			1485	1251	428	2853	
v/s Ratio Prot		c0.00		c0.03	0.02						0.12	
v/s Ratio Perm								c0.46	0.25	0.07		
v/c Ratio		0.01		0.50	0.29			0.57	0.31	0.08	0.15	
Uniform Delay, d1		61.8		61.3	60.5			4.7	3.4	2.7	2.9	
Progression Factor		1.00		1.00	1.00			0.98	1.14	1.00	1.00	
Incremental Delay, d2		0.0		3.7	1.6			0.4	0.2	0.4	0.1	
Delay (s)		61.9		65.0	62.1			5.0	4.0	3.1	3.0	
Level of Service		E		E	E			A	A	A	A	
Approach Delay (s)		61.9			63.6			4.7			3.0	
Approach LOS		E			E			A			A	
Intersection Summary												
HCM 2000 Control Delay			7.8			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			135.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			67.0%			ICU Level of Service				C		
Analysis Period (min)			15									

c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	225	220	30	40	190	60	30	555	60	25	305	105	
Future Volume (vph)	225	220	30	40	190	60	30	555	60	25	305	105	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	120		0	100		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Taper Length (ft)	25			25			25			25			
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		318			371			476			549		
Travel Time (s)		7.2			8.4			10.8			12.5		
Confl. Peds. (#/hr)	14		4	4		14	4		22	22		4	
Peak Hour Factor	0.94	0.94	0.94	0.87	0.87	0.87	0.87	0.87	0.87	0.96	0.96	0.96	
Heavy Vehicles (%)	4%	2%	4%	0%	2%	0%	4%	4%	0%	0%	7%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	2	2	2	0	0	0	
Parking (#/hr)							0	0	0	0	0	0	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	239	266	0	46	287	0	0	741	0	0	453	0	
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases	1	1 2			2			3			3		9
Permitted Phases	2	2		2			3			3			
Detector Phase	1	1 2		2	2		3	3		3	3		
Switch Phase													
Minimum Initial (s)	6.0			10.0	10.0		10.0	10.0		10.0	10.0		7.0
Minimum Split (s)	11.0			15.0	15.0		15.0	15.0		15.0	15.0		20.0
Total Split (s)	15.0			35.0	35.0		60.0	60.0		60.0	60.0		20.0
Total Split (%)	11.5%			26.9%	26.9%		46.2%	46.2%		46.2%	46.2%		15%
Yellow Time (s)	4.0			4.0	4.0		4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.0			5.0	5.0		5.0	5.0		5.0	5.0		
Lead/Lag	Lead			Lag	Lag								
Lead-Lag Optimize?													
Recall Mode	None			None	None		Min	Min		Min	Min		None
v/c Ratio	0.88	0.42		0.20	0.77			0.91			0.60		
Control Delay	60.4	29.2		38.0	55.1			42.6			24.5		
Queue Delay	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	60.4	29.2		38.0	55.1			42.6			24.5		
Queue Length 50th (ft)	114	128		25	176			407			189		
Queue Length 95th (ft)	#258	252		65	313			#913			453		
Internal Link Dist (ft)		238			291			396			469		
Turn Bay Length (ft)	120			100									
Base Capacity (vph)	273	778		320	508			811			761		
Starvation Cap Reductn	0	0		0	0			0			0		
Spillback Cap Reductn	0	0		0	0			0			0		
Storage Cap Reductn	0	0		0	0			0			0		
Reduced v/c Ratio	0.88	0.34		0.14	0.56			0.91			0.60		

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 106.5

Natural Cycle: 130

Control Type: Actuated-Uncoordinated

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 12: Highland Ave & West St





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	225	220	30	40	190	60	30	555	60	25	305	105	
Future Volume (vph)	225	220	30	40	190	60	30	555	60	25	305	105	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0			5.0		
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00		
Frb, ped/bikes	1.00	1.00		1.00	0.99			1.00			0.99		
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00		
Frt	1.00	0.98		1.00	0.96			0.99			0.97		
Fit Protected	0.95	1.00		0.95	1.00			1.00			1.00		
Satd. Flow (prot)	1730	1819		1793	1781			1606			1545		
Fit Permitted	0.29	1.00		0.60	1.00			0.97			0.94		
Satd. Flow (perm)	524	1819		1123	1781			1554			1456		
Peak-hour factor, PHF	0.94	0.94	0.94	0.87	0.87	0.87	0.87	0.87	0.87	0.96	0.96	0.96	
Adj. Flow (vph)	239	234	32	46	218	69	34	638	69	26	318	109	
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0	
Lane Group Flow (vph)	239	266	0	46	287	0	0	741	0	0	453	0	
Confl. Peds. (#/hr)	14		4	4		14	4		22	22		4	
Heavy Vehicles (%)	4%	2%	4%	0%	2%	0%	4%	4%	0%	0%	7%	5%	
Bus Blockages (#/hr)	0	0	0	0	0	0	2	2	2	0	0	0	
Parking (#/hr)							0	0	0	0	0	0	
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases	1	1 2			2			3				3	
Permitted Phases	2	2		2			3			3			
Actuated Green, G (s)	32.3	37.3		22.2	22.2			55.7			55.7		
Effective Green, g (s)	32.3	37.3		22.2	22.2			55.7			55.7		
Actuated g/C Ratio	0.30	0.35		0.21	0.21			0.52			0.52		
Clearance Time (s)	5.0			5.0	5.0			5.0			5.0		
Vehicle Extension (s)	3.0			3.0	3.0			3.0			3.0		
Lane Grp Cap (vph)	269	628		231	366			802			751		
v/s Ratio Prot	c0.08	0.15			0.16								
v/s Ratio Perm	c0.18			0.04				c0.48			0.31		
v/c Ratio	0.89	0.42		0.20	0.78			0.92			0.60		
Uniform Delay, d1	33.3	27.1		35.5	40.6			24.1			18.3		
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00		
Incremental Delay, d2	27.7	0.5		0.4	10.5			16.2			1.4		
Delay (s)	61.0	27.5		35.9	51.1			40.3			19.7		
Level of Service	E	C		D	D			D			B		
Approach Delay (s)		43.4			49.0			40.3			19.7		
Approach LOS		D			D			D			B		
Intersection Summary													
HCM 2000 Control Delay			37.9									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.88										
Actuated Cycle Length (s)			107.9									Sum of lost time (s)	17.0
Intersection Capacity Utilization			81.4%									ICU Level of Service	D
Analysis Period (min)			15										

c Critical Lane Group

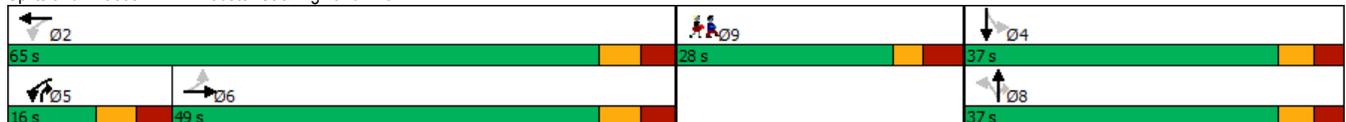


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	35	595	15	125	460	60	20	315	405	85	140	30	
Future Volume (vph)	35	595	15	125	460	60	20	315	405	85	140	30	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	150		0	150		0	0		150	0		200	
Storage Lanes	1		0	1		0	0		1	0		1	
Taper Length (ft)	25			25			25			25			
Right Turn on Red			Yes			No			Yes			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1325			691			391			2983		
Travel Time (s)		30.1			15.7			8.9			67.8		
Confl. Peds. (#/hr)	7					7	1		7	7			1
Confl. Bikes (#/hr)			1										
Peak Hour Factor	0.94	0.94	0.94	0.88	0.88	0.88	0.87	0.87	0.87	0.88	0.88	0.88	
Heavy Vehicles (%)	4%	3%	0%	0%	2%	4%	1%	1%	0%	0%	1%	0%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	37	649	0	142	591	0	0	385	466	0	290	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA		
Protected Phases		6		5	2			8	5		4		9
Permitted Phases	6			2			8		8	4			
Detector Phase	6	6		5	2		8	8	5	4	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0	6.0	6.0	6.0		7.0
Minimum Split (s)	17.5	17.5		13.5	17.5		12.5	12.5	13.5	12.5	12.5		28.0
Total Split (s)	49.0	49.0		16.0	65.0		37.0	37.0	16.0	37.0	37.0		28.0
Total Split (%)	37.7%	37.7%		12.3%	50.0%		28.5%	28.5%	12.3%	28.5%	28.5%		22%
Yellow Time (s)	4.0	4.0		4.0	4.0		3.5	3.5	4.0	3.5	3.5		3.0
All-Red Time (s)	3.5	3.5		3.5	3.5		3.0	3.0	3.5	3.0	3.0		4.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0			
Total Lost Time (s)	7.5	7.5		7.5	7.5		6.5	7.5		6.5			
Lead/Lag	Lag	Lag		Lead				Lead					
Lead-Lag Optimize?													
Recall Mode	Min	Min		None	Min		None	None	None	None	None		None
v/c Ratio	0.12	0.87		0.60	0.58		0.82	0.62		0.90dl			
Control Delay	25.4	44.6		26.6	20.6		52.2	11.5		40.4			
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0			
Total Delay	25.4	44.6		26.6	20.6		52.2	11.5		40.4			
Queue Length 50th (ft)	14	366		39	223		223	51		82			
Queue Length 95th (ft)	52	#861		#152	531		#474	177		164			
Internal Link Dist (ft)		1245			611			311			2903		
Turn Bay Length (ft)	150			150				150					
Base Capacity (vph)	311	743		237	1019		537	747		566			
Starvation Cap Reductn	0	0		0	0		0	0		0			
Spillback Cap Reductn	0	0		0	0		0	0		0			
Storage Cap Reductn	0	0		0	0		0	0		0			
Reduced v/c Ratio	0.12	0.87		0.60	0.58		0.72	0.62		0.51			

Intersection Summary

Area Type: Other
 Cycle Length: 130
 Actuated Cycle Length: 104.2
 Natural Cycle: 130
 Control Type: Actuated-Uncoordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.
 dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 14: Webster St & Highland Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	595	15	125	460	60	20	315	405	85	140	30
Future Volume (vph)	35	595	15	125	460	60	20	315	405	85	140	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.5	7.5		7.5	7.5			6.5	7.5		6.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		0.95	
Frb, ped/bikes	1.00	1.00		1.00	1.00			1.00	0.98		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.98			1.00	0.85		0.98	
Fit Protected	0.95	1.00		0.95	1.00			1.00	1.00		0.98	
Satd. Flow (prot)	1729	1839		1805	1821			1875	1578		3453	
Fit Permitted	0.42	1.00		0.10	1.00			0.96	1.00		0.54	
Satd. Flow (perm)	772	1839		184	1821			1811	1578		1907	
Peak-hour factor, PHF	0.94	0.94	0.94	0.88	0.88	0.88	0.87	0.87	0.87	0.88	0.88	0.88
Adj. Flow (vph)	37	633	16	142	523	68	23	362	466	97	159	34
RTOR Reduction (vph)	0	1	0	0	0	0	0	0	224	0	0	0
Lane Group Flow (vph)	37	648	0	142	591	0	0	385	242	0	290	0
Confl. Peds. (#/hr)	7					7	1		7	7		1
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	4%	3%	0%	0%	2%	4%	1%	1%	0%	0%	1%	0%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6			2			8		8	4		
Actuated Green, G (s)	42.2	42.2		58.3	58.3			27.2	35.8		27.2	
Effective Green, g (s)	42.2	42.2		58.3	58.3			27.2	35.8		27.2	
Actuated g/C Ratio	0.38	0.38		0.53	0.53			0.25	0.33		0.25	
Clearance Time (s)	7.5	7.5		7.5	7.5			6.5	7.5		6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	296	706		224	966			448	514		471	
v/s Ratio Prot		c0.35		0.05	c0.32				0.04			
v/s Ratio Perm	0.05			0.29				c0.21	0.12		0.15	
v/c Ratio	0.12	0.92		0.63	0.61			0.86	0.47		0.90dl	
Uniform Delay, d1	21.9	32.2		21.2	17.9			39.5	29.5		36.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.2	16.8		5.8	1.2			15.1	0.7		2.4	
Delay (s)	22.1	49.1		27.0	19.1			54.6	30.2		39.1	
Level of Service	C	D		C	B			D	C		D	
Approach Delay (s)		47.6			20.6			41.2			39.1	
Approach LOS		D			C			D			D	

Intersection Summary		
HCM 2000 Control Delay	36.8	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio	0.87	
Actuated Cycle Length (s)	109.9	Sum of lost time (s)
Intersection Capacity Utilization	87.5%	ICU Level of Service
Analysis Period (min)	15	

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

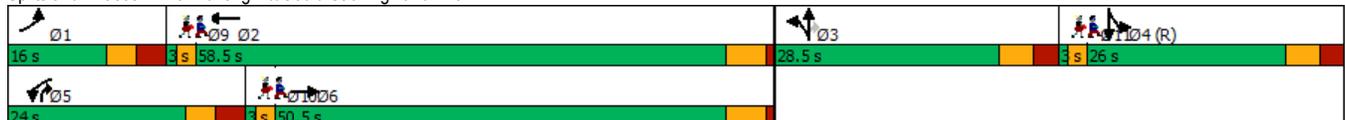


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9	Ø10	Ø11
Lane Configurations															
Traffic Volume (vph)	150	890	15	45	605	760	25	240	240	290	90	45			
Future Volume (vph)	150	890	15	45	605	760	25	240	240	290	90	45			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Storage Length (ft)	175		0	165		400	0		150	200		200			
Storage Lanes	1		0	1		0	0		1	1		0			
Taper Length (ft)	25			25			25			25					
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		345			745			3028			398				
Travel Time (s)		7.8			16.9			68.8			9.0				
Confl. Peds. (#/hr)	1		1	1		1									
Confl. Bikes (#/hr)									1						
Peak Hour Factor	0.87	0.87	0.87	0.92	0.92	0.92	0.88	0.88	0.88	0.94	0.94	0.94			
Heavy Vehicles (%)	3%	2%	0%	0%	5%	1%	0%	1%	0%	3%	2%	0%			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	172	1040	0	49	1484	0	0	301	273	309	144	0			
Turn Type	Prot	NA		Prot	NA		Split	NA	pm+ov	Split	NA				
Protected Phases	1	6		5	2		3	3	5	4	4		9	10	11
Permitted Phases									3						
Detector Phase	1	6		5	2		3	3	5	4	4				
Switch Phase															
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0	6.0	6.0	6.0		1.0	1.0	1.0
Minimum Split (s)	12.0	20.0		12.0	25.0		12.0	12.0	12.0	29.5	29.5		3.0	3.0	3.0
Total Split (s)	16.0	50.5		24.0	58.5		28.5	28.5	24.0	26.0	26.0		3.0	3.0	3.0
Total Split (%)	11.9%	37.4%		17.8%	43.3%		21.1%	21.1%	17.8%	19.3%	19.3%		2%	2%	2%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5		2.0	2.0	2.0
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5	3.0	2.5	2.5		0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0				
Total Lost Time (s)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0				
Lead/Lag	Lead			Lead			Lead	Lead	Lead				Lag	Lag	Lag
Lead-Lag Optimize?															
Recall Mode	None	Min		None	Min		Min	Min	None	C-Min	C-Min		None	None	None
v/c Ratio	0.96	0.66		0.42	1.00			0.96	0.61	0.66	0.56				
Control Delay	117.3	33.3		70.2	56.2			98.4	22.8	68.6	63.4				
Queue Delay	15.8	0.0		0.0	2.4			0.0	0.0	0.0	0.0				
Total Delay	133.2	33.3		70.2	58.6			98.4	22.8	68.6	63.4				
Queue Length 50th (ft)	153	363		42	587			265	93	136	107				
Queue Length 95th (ft)	#330	503		83	#797			#433	136	180	166				
Internal Link Dist (ft)		265			665			2948			318				
Turn Bay Length (ft)	175			165					150	200					
Base Capacity (vph)	179	1574		240	1479			312	548	509	280				
Starvation Cap Reductn	0	0		0	0			0	0	0	0				
Spillback Cap Reductn	11	0		0	13			0	0	0	0				
Storage Cap Reductn	0	0		0	0			0	0	0	0				
Reduced v/c Ratio	1.02	0.66		0.20	1.01			0.96	0.50	0.61	0.51				

Intersection Summary

Area Type: Other
 Cycle Length: 135
 Actuated Cycle Length: 135
 Offset: 0 (0%), Referenced to phase 4:SBTL, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 15: Hunting Rd/Gould St & Highland Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	150	890	15	45	605	760	25	240	240	290	90	45	
Future Volume (vph)	150	890	15	45	605	760	25	240	240	290	90	45	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0		
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00	0.97	1.00		
Frb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.99	1.00	1.00		
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00		
Fr	1.00	1.00		1.00	0.92			1.00	0.85	1.00	0.95		
Fit Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1752	3530		1805	3178			1874	1600	3400	1781		
Fit Permitted	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1752	3530		1805	3178			1874	1600	3400	1781		
Peak-hour factor, PHF	0.87	0.87	0.87	0.92	0.92	0.92	0.88	0.88	0.88	0.94	0.94	0.94	
Adj. Flow (vph)	172	1023	17	49	658	826	28	273	273	309	96	48	
RTOR Reduction (vph)	0	1	0	0	159	0	0	0	74	0	14	0	
Lane Group Flow (vph)	172	1039	0	49	1325	0	0	301	199	309	130	0	
Confl. Peds. (#/hr)	1		1	1		1							
Confl. Bikes (#/hr)									1				
Heavy Vehicles (%)	3%	2%	0%	0%	5%	1%	0%	1%	0%	3%	2%	0%	
Turn Type	Prot	NA		Prot	NA		Split	NA	pm+ov	Split	NA		
Protected Phases	1	6		5	2		3	3	5	4	4		
Permitted Phases									3				
Actuated Green, G (s)	13.8	60.2		8.9	58.2			22.5	31.4	17.5	17.5		
Effective Green, g (s)	13.8	60.2		8.9	58.2			22.5	31.4	17.5	17.5		
Actuated g/C Ratio	0.10	0.45		0.07	0.43			0.17	0.23	0.13	0.13		
Clearance Time (s)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0		
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0		
Lane Grp Cap (vph)	179	1574		118	1370			312	372	440	230		
v/s Ratio Prot	c0.10	0.29		0.03	c0.42			c0.16	0.04	c0.09	0.07		
v/s Ratio Perm									0.09				
v/c Ratio	0.96	0.66		0.42	0.97			0.96	0.53	0.70	0.57		
Uniform Delay, d1	60.3	29.4		60.6	37.5			55.9	45.4	56.3	55.2		
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.12	1.14		
Incremental Delay, d2	55.3	0.8		0.9	16.8			40.9	0.7	9.0	9.6		
Delay (s)	115.7	30.2		61.4	54.3			96.8	46.1	71.7	72.7		
Level of Service	F	C		E	D			F	D	E	E		
Approach Delay (s)		42.3			54.5			72.7			72.1		
Approach LOS		D			D			E			E		
Intersection Summary													
HCM 2000 Control Delay			55.5		HCM 2000 Level of Service						E		
HCM 2000 Volume to Capacity ratio			0.95										
Actuated Cycle Length (s)			135.0		Sum of lost time (s)						27.0		
Intersection Capacity Utilization			91.0%		ICU Level of Service						E		
Analysis Period (min)			15										
c Critical Lane Group													

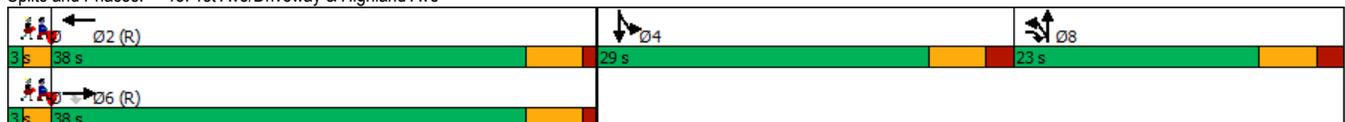


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø5
Lane Configurations		↑↑	↑		↑↑		↑	↑			↑			
Traffic Volume (vph)	5	1170	1005	0	965	15	175	0	70	5	5	10		
Future Volume (vph)	5	1170	1005	0	965	15	175	0	70	5	5	10		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0		0	0		0	75		0	0		0		
Storage Lanes	0		1	0		0	1		0	0		0		
Taper Length (ft)	25			25			25			25				
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30			30			
Link Distance (ft)		176			681			500			267			
Travel Time (s)		4.0			15.5			11.4			6.1			
Confl. Peds. (#/hr)			1	1					8	8				
Confl. Bikes (#/hr)			2											
Peak Hour Factor	0.88	0.88	0.88	0.95	0.95	0.95	0.91	0.91	0.91	0.39	0.39	0.39		
Heavy Vehicles (%)	0%	4%	2%	0%	5%	0%	11%	0%	6%	33%	0%	0%		
Shared Lane Traffic (%)							28%							
Lane Group Flow (vph)	0	1336	1142	0	1032	0	138	131	0	0	52	0		
Turn Type		NA	pm+ov		NA		Split	NA		Split	NA			
Protected Phases		6	8		2		8	8		4	4		1	5
Permitted Phases			6											
Detector Phase		6	8		2		8	8		4	4			
Switch Phase														
Minimum Initial (s)		10.0	6.0		10.0		6.0	6.0		6.0	6.0		1.0	1.0
Minimum Split (s)		25.0	20.0		20.0		20.0	20.0		29.0	29.0		3.0	3.0
Total Split (s)		38.0	23.0		38.0		23.0	23.0		29.0	29.0		3.0	3.0
Total Split (%)		40.9%	24.7%		40.9%		24.7%	24.7%		31.2%	31.2%		3%	3%
Yellow Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0		2.0	2.0
All-Red Time (s)		1.0	2.0		1.0		2.0	2.0		2.0	2.0		0.0	0.0
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0			
Total Lost Time (s)		5.0	6.0		5.0		6.0	6.0		6.0	6.0			
Lead/Lag		Lag		Lag									Lead	Lead
Lead-Lag Optimize?														
Recall Mode		C-Min	None		C-Min		None	None		None	None		None	None
v/c Ratio		1.68	0.81		0.56		0.44	0.33		0.27				
Control Delay		334.2	7.4		19.2		36.1	9.9		24.3				
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0				
Total Delay		334.2	7.4		19.2		36.1	9.9		24.3				
Queue Length 50th (ft)		~611	11		203		73	7		15				
Queue Length 95th (ft)		#806	#103		354		140	58		10				
Internal Link Dist (ft)		96			601			420		187				
Turn Bay Length (ft)							75							
Base Capacity (vph)		794	1419		1840		347	421		419				
Starvation Cap Reductn		0	0		0		0	0		0				
Spillback Cap Reductn		0	0		0		0	0		0				
Storage Cap Reductn		0	0		0		0	0		0				
Reduced v/c Ratio		1.68	0.80		0.56		0.40	0.31		0.12				

Intersection Summary

Area Type: Other
 Cycle Length: 93
 Actuated Cycle Length: 93
 Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 18: 1st Ave/Driveway & Highland Ave





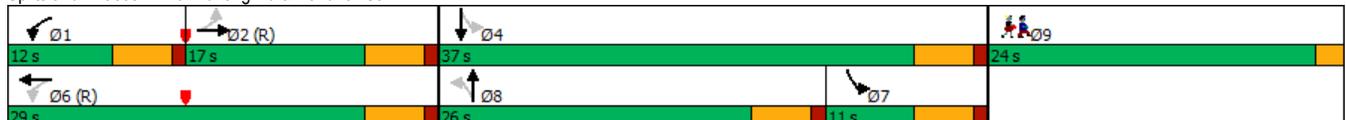
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↑↑	↑		↑↑		↑	↑↑			↑↓		
Traffic Volume (vph)	5	1170	1005	0	965	15	175	0	70	5	5	10	
Future Volume (vph)	5	1170	1005	0	965	15	175	0	70	5	5	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		5.0	6.0		5.0		6.0	6.0			6.0		
Lane Util. Factor		0.95	1.00		0.95		0.95	0.95			1.00		
Frbp, ped/bikes		1.00	0.98		1.00		1.00	0.99			1.00		
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00		
Frt		1.00	0.85		1.00		1.00	0.91			0.93		
Fit Protected		1.00	1.00		1.00		0.95	0.98			0.99		
Satd. Flow (prot)		3471	1557		3433		1545	1472			1617		
Fit Permitted		0.95	1.00		1.00		0.95	0.98			0.99		
Satd. Flow (perm)		3300	1557		3433		1545	1472			1617		
Peak-hour factor, PHF	0.88	0.88	0.88	0.95	0.95	0.95	0.91	0.91	0.91	0.39	0.39	0.39	
Adj. Flow (vph)	6	1330	1142	0	1016	16	192	0	77	13	13	26	
RTOR Reduction (vph)	0	0	281	0	1	0	0	93	0	0	24	0	
Lane Group Flow (vph)	0	1336	862	0	1031	0	138	38	0	0	28	0	
Confl. Peds. (#/hr)			1	1					8	8			
Confl. Bikes (#/hr)			2										
Heavy Vehicles (%)	0%	4%	2%	0%	5%	0%	11%	0%	6%	33%	0%	0%	
Turn Type		NA	pm+ov		NA		Split	NA		Split	NA		
Protected Phases		6	8		2		8	8		4	4		
Permitted Phases			6										
Actuated Green, G (s)		48.6	67.5		48.6		18.9	18.9			8.5		
Effective Green, g (s)		48.6	67.5		48.6		18.9	18.9			8.5		
Actuated g/C Ratio		0.52	0.73		0.52		0.20	0.20			0.09		
Clearance Time (s)		5.0	6.0		5.0		6.0	6.0			6.0		
Vehicle Extension (s)		2.0	2.0		2.0		2.0	2.0			2.0		
Lane Grp Cap (vph)		1724	1230		1794		313	299			147		
v/s Ratio Prot			c0.14		0.30		0.09	0.03			c0.02		
v/s Ratio Perm		c0.40	0.41										
v/c Ratio		0.77	0.70		0.57		0.44	0.13			0.19		
Uniform Delay, d1		17.8	7.1		15.1		32.4	30.3			39.1		
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00		
Incremental Delay, d2		3.5	1.5		1.3		0.4	0.1			0.2		
Delay (s)		21.3	8.6		16.5		32.8	30.4			39.3		
Level of Service		C	A		B		C	C			D		
Approach Delay (s)		15.4			16.5			31.6			39.3		
Approach LOS		B			B			C			D		
Intersection Summary													
HCM 2000 Control Delay			17.2		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.74										
Actuated Cycle Length (s)			93.0		Sum of lost time (s)					19.0			
Intersection Capacity Utilization			77.3%		ICU Level of Service					D			
Analysis Period (min)			15										
c Critical Lane Group													

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations		↔↔		↔	↔			↔	↔	↔	↔		
Traffic Volume (vph)	30	455	0	85	230	85	5	355	575	75	60	10	
Future Volume (vph)	30	455	0	85	230	85	5	355	575	75	60	10	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		100	190		0	0		400	125		0	
Storage Lanes	0		1	1		0	0		1	1		0	
Taper Length (ft)	25			25			25			25			
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		442			443			907			3028		
Travel Time (s)		10.0			10.1			20.6			68.8		
Confl. Peds. (#/hr)							2						2
Confl. Bikes (#/hr)			1										
Peak Hour Factor	0.83	0.83	0.83	0.97	0.97	0.97	0.91	0.91	0.91	0.92	0.92	0.92	
Heavy Vehicles (%)	0%	1%	0%	4%	4%	3%	0%	1%	0%	2%	2%	8%	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	584	0	88	325	0	0	395	632	82	76	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Free	pm+pt	NA		
Protected Phases		2		1	6			8		7	4		9
Permitted Phases	2			6			8		Free	4			
Detector Phase	2	2		1	6		8	8		7	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0		7.0	10.0		10.0	10.0		2.0	10.0		1.0
Minimum Split (s)	16.0	16.0		12.0	28.0		15.0	15.0		7.0	27.0		24.0
Total Split (s)	17.0	17.0		12.0	29.0		26.0	26.0		11.0	37.0		24.0
Total Split (%)	18.9%	18.9%		13.3%	32.2%		28.9%	28.9%		12.2%	41.1%		27%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0		0.0
Lost Time Adjust (s)		0.0		0.0	0.0			0.0		0.0	0.0		
Total Lost Time (s)		5.0		5.0	5.0			5.0		5.0	5.0		
Lead/Lag	Lag	Lag		Lead			Lead	Lead		Lag			
Lead-Lag Optimize?													
Recall Mode	C-Min	C-Min		None	C-Min		None	None		None	None		None
v/c Ratio		0.44		0.24	0.36			0.93	0.39	0.37	0.13		
Control Delay		26.4		17.7	17.3			65.0	0.7	30.5	17.8		
Queue Delay		0.0		0.0	0.0			0.0	0.0	0.0	0.0		
Total Delay		26.4		17.7	17.3			65.0	0.7	30.5	17.8		
Queue Length 50th (ft)		124		23	93			219	0	31	24		
Queue Length 95th (ft)		#298		77	249			#386	0	63	54		
Internal Link Dist (ft)		362			363			827			2948		
Turn Bay Length (ft)				190					400	125			
Base Capacity (vph)		1327		373	912			437	1615	231	647		
Starvation Cap Reductn		0		0	0			0	0	0	0		
Spillback Cap Reductn		0		0	0			0	0	0	0		
Storage Cap Reductn		0		0	0			0	0	0	0		
Reduced v/c Ratio		0.44		0.24	0.36			0.90	0.39	0.35	0.12		

Intersection Summary

Area Type: Other
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 11 (12%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 90
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 20: Hunting Rd & Kendrick St





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔↔		↔	↔			↔	↔	↔	↔	
Traffic Volume (vph)	30	455	0	85	230	85	5	355	575	75	60	10
Future Volume (vph)	30	455	0	85	230	85	5	355	575	75	60	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0			5.0	4.0	5.0	5.0	
Lane Util. Factor		0.95		1.00	1.00			1.00	1.00	1.00	1.00	
Frbp, ped/bikes		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt		1.00		1.00	0.96			1.00	0.85	1.00	0.98	
Fit Protected		1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		3565		1736	1757			1880	1615	1770	1801	
Fit Permitted		0.91		0.30	1.00			1.00	1.00	0.23	1.00	
Satd. Flow (perm)		3269		544	1757			1876	1615	420	1801	
Peak-hour factor, PHF	0.83	0.83	0.83	0.97	0.97	0.97	0.91	0.91	0.91	0.92	0.92	0.92
Adj. Flow (vph)	36	548	0	88	237	88	5	390	632	82	65	11
RTOR Reduction (vph)	0	0	0	0	10	0	0	0	0	0	7	0
Lane Group Flow (vph)	0	584	0	88	315	0	0	395	632	82	69	0
Confl. Peds. (#/hr)								2				2
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	1%	0%	4%	4%	3%	0%	1%	0%	2%	2%	8%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Free	pm+pt	NA	
Protected Phases		2		1	6			8		7	4	
Permitted Phases	2			6			8		Free	4		
Actuated Green, G (s)		32.9		43.6	43.6			20.4	90.0	30.0	30.0	
Effective Green, g (s)		32.9		43.6	43.6			20.4	90.0	30.0	30.0	
Actuated g/C Ratio		0.37		0.48	0.48			0.23	1.00	0.33	0.33	
Clearance Time (s)		5.0		5.0	5.0			5.0		5.0	5.0	
Vehicle Extension (s)		2.0		2.0	2.0			2.0		2.0	2.0	
Lane Grp Cap (vph)		1195		339	851			425	1615	209	600	
v/s Ratio Prot				0.02	0.18					0.02	0.04	
v/s Ratio Perm		c0.18		0.11				c0.21	c0.39	0.11		
v/c Ratio		0.49		0.26	0.37			0.93	0.39	0.39	0.11	
Uniform Delay, d1		22.1		13.5	14.6			34.1	0.0	33.7	20.8	
Progression Factor		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.4		0.1	1.2			26.2	0.7	0.4	0.0	
Delay (s)		23.5		13.6	15.8			60.3	0.7	34.1	20.8	
Level of Service		C		B	B			E	A	C	C	
Approach Delay (s)		23.5			15.3			23.6			27.7	
Approach LOS		C			B			C			C	
Intersection Summary												
HCM 2000 Control Delay			22.3			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.67									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)				22.0		
Intersection Capacity Utilization			74.7%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

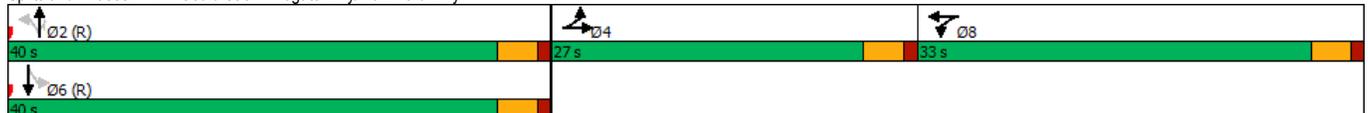


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕	↕	↕	↕	
Traffic Volume (vph)	1	0	30	360	1	40	5	285	80	15	700	5
Future Volume (vph)	1	0	30	360	1	40	5	285	80	15	700	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	13	13	12	12	12	12	12	12
Storage Length (ft)	0		0	0		0	0		100	150		0
Storage Lanes	0		0	1		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		151			225			398			315	
Travel Time (s)		3.4			5.1			9.0			7.2	
Peak Hour Factor	0.75	0.75	0.75	0.72	0.72	0.72	0.86	0.86	0.86	0.92	0.92	0.92
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	0	41	0	280	277	0	0	337	93	16	766	0
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Detector Phase	4	4		8	8		2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.0	27.0		11.0	11.0		15.0	15.0	15.0	23.0	23.0	
Total Split (s)	27.0	27.0		33.0	33.0		40.0	40.0	40.0	40.0	40.0	
Total Split (%)	27.0%	27.0%		33.0%	33.0%		40.0%	40.0%	40.0%	40.0%	40.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min	C-Min	C-Min	C-Min	
v/c Ratio		0.20		0.75	0.71		0.30	0.09	0.03	0.36		
Control Delay		8.5		48.3	43.8		14.0	8.2	15.4	13.9		
Queue Delay		0.0		0.0	0.0		0.6	0.0	0.0	0.1		
Total Delay		8.5		48.3	43.8		14.6	8.2	15.4	14.0		
Queue Length 50th (ft)		0		174	163		56	1	4	124		
Queue Length 95th (ft)		12		187	176		m252	m30	21	270		
Internal Link Dist (ft)		71			145			318		235		
Turn Bay Length (ft)								100	150			
Base Capacity (vph)		413		487	503		1112	986	568	2134		
Starvation Cap Reductn		0		0	0		437	0	0	0		
Spillback Cap Reductn		4		0	0		0	0	0	276		
Storage Cap Reductn		0		0	0		0	0	0	0		
Reduced v/c Ratio		0.10		0.57	0.55		0.50	0.09	0.03	0.41		

Intersection Summary

Area Type: Other
 Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Gould St & Windgate Dwy/Muzi Ford Dwy





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕	↕	↕	↕	↕
Traffic Volume (vph)	1	0	30	360	1	40	5	285	80	15	700	5
Future Volume (vph)	1	0	30	360	1	40	5	285	80	15	700	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13	12	12	12	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95			1.00	1.00	1.00	0.95	
Fr't		0.87		1.00	0.97			1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.96			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1615		1681	1705			1861	1583	1770	3536	
Flt Permitted		1.00		0.95	0.96			0.99	1.00	0.51	1.00	
Satd. Flow (perm)		1615		1681	1705			1842	1583	941	3536	
Peak-hour factor, PHF	0.75	0.75	0.75	0.72	0.72	0.72	0.86	0.86	0.86	0.92	0.92	0.92
Adj. Flow (vph)	1	0	40	500	1	56	6	331	93	16	761	5
RTOR Reduction (vph)	0	38	0	0	10	0	0	0	32	0	0	0
Lane Group Flow (vph)	0	3	0	280	267	0	0	337	61	16	766	0
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2	2	6	6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		7.0		22.3	22.3			58.7	58.7	58.7	58.7	
Effective Green, g (s)		7.0		22.3	22.3			58.7	58.7	58.7	58.7	
Actuated g/C Ratio		0.07		0.22	0.22			0.59	0.59	0.59	0.59	
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		113		374	380			1081	929	552	2075	
v/s Ratio Prot		c0.00		c0.17	0.16						c0.22	
v/s Ratio Perm								0.18	0.04	0.02		
v/c Ratio		0.03		0.75	0.70			0.31	0.07	0.03	0.37	
Uniform Delay, d1		43.3		36.2	35.8			10.4	8.9	8.7	10.9	
Progression Factor		1.00		1.00	1.00			0.99	1.48	1.00	1.00	
Incremental Delay, d2		0.1		8.0	5.8			0.4	0.1	0.1	0.5	
Delay (s)		43.4		44.2	41.6			10.7	13.2	8.8	11.4	
Level of Service		D		D	D			B	B	A	B	
Approach Delay (s)		43.4			42.9			11.2			11.3	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	180	235	50	70	155	60	25	420	55	30	570	100	
Future Volume (vph)	180	235	50	70	155	60	25	420	55	30	570	100	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	120		0	100		0	0		0	0		0	
Storage Lanes	1		0	1		0	0		0	0		0	
Taper Length (ft)	25			25			25			25			
Right Turn on Red			No			No			No			No	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		318			371			476			549		
Travel Time (s)		7.2			8.4			10.8			12.5		
Confl. Peds. (#/hr)	7		8	8		7	4		36	36		4	
Peak Hour Factor	0.87	0.87	0.87	0.86	0.86	0.86	0.89	0.89	0.89	0.93	0.93	0.93	
Heavy Vehicles (%)	3%	0%	0%	0%	2%	2%	1%	8%	0%	0%	3%	6%	
Bus Blockages (#/hr)	0	0	0	0	0	0	2	2	2	0	0	0	
Parking (#/hr)							0	0	0	0	0	0	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	207	327	0	81	250	0	0	562	0	0	753	0	
Turn Type	D.P+P	NA		Perm	NA		Perm	NA		Perm	NA		
Protected Phases	1	1 2			2			3			3		9
Permitted Phases	2	2		2			3			3			
Detector Phase	1	1 2		2	2		3	3		3	3		
Switch Phase													
Minimum Initial (s)	6.0			10.0	10.0		10.0	10.0		10.0	10.0		7.0
Minimum Split (s)	11.5			15.0	15.0		15.0	15.0		15.0	15.0		20.0
Total Split (s)	17.0			34.0	34.0		54.0	54.0		54.0	54.0		20.0
Total Split (%)	13.6%			27.2%	27.2%		43.2%	43.2%		43.2%	43.2%		16%
Yellow Time (s)	4.5			3.0	3.0		4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	1.0			1.0	1.0		1.0	1.0		1.0	1.0		0.0
Lost Time Adjust (s)	0.0			0.0	0.0		0.0	0.0		0.0	0.0		
Total Lost Time (s)	5.5			4.0	4.0		5.0	5.0		5.0	5.0		
Lead/Lag	Lead			Lag	Lag								
Lead-Lag Optimize?							Min	Min		Min	Min		None
Recall Mode	None			None	None		Min	Min		Min	Min		None
v/c Ratio	0.65	0.49		0.38	0.70		0.76	0.76		0.97	0.97		
Control Delay	35.2	28.2		40.5	48.3		31.4	31.4		52.7	52.7		
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0		
Total Delay	35.2	28.2		40.5	48.3		31.4	31.4		52.7	52.7		
Queue Length 50th (ft)	87	148		42	140		254	254		408	408		
Queue Length 95th (ft)	178	281		98	256		#669	#669		#994	#994		
Internal Link Dist (ft)		238			291		396	396		469	469		
Turn Bay Length (ft)	120			100									
Base Capacity (vph)	320	854		323	540		735	735		777	777		
Starvation Cap Reductn	0	0		0	0		0	0		0	0		
Spillback Cap Reductn	0	0		0	0		0	0		0	0		
Storage Cap Reductn	0	0		0	0		0	0		0	0		
Reduced v/c Ratio	0.65	0.38		0.25	0.46		0.76	0.76		0.97	0.97		

Intersection Summary

Area Type: Other

Cycle Length: 125

Actuated Cycle Length: 99.6

Natural Cycle: 120

Control Type: Actuated-Uncoordinated

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 12: Highland Ave & West St





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	235	50	70	155	60	25	420	55	30	570	100
Future Volume (vph)	180	235	50	70	155	60	25	420	55	30	570	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5		4.0	4.0			5.0			5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frb, ped/bikes	1.00	0.99		1.00	0.99			0.99			1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00			1.00			1.00	
Frt	1.00	0.97		1.00	0.96			0.99			0.98	
Fit Protected	0.95	1.00		0.95	1.00			1.00			1.00	
Satd. Flow (prot)	1749	1840		1782	1766			1552			1613	
Fit Permitted	0.33	1.00		0.56	1.00			0.95			0.96	
Satd. Flow (perm)	614	1840		1056	1766			1473			1556	
Peak-hour factor, PHF	0.87	0.87	0.87	0.86	0.86	0.86	0.89	0.89	0.89	0.93	0.93	0.93
Adj. Flow (vph)	207	270	57	81	180	70	28	472	62	32	613	108
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	207	327	0	81	250	0	0	562	0	0	753	0
Confl. Peds. (#/hr)	7		8	8		7	4		36	36		4
Heavy Vehicles (%)	3%	0%	0%	0%	2%	2%	1%	8%	0%	0%	3%	6%
Bus Blockages (#/hr)	0	0	0	0	0	0	2	2	2	0	0	0
Parking (#/hr)							0	0	0	0	0	0
Turn Type	D,P+P	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	1	12			2			3				3
Permitted Phases	2	2		2			3			3		
Actuated Green, G (s)	31.9	37.4		20.2	20.2			49.8			49.8	
Effective Green, g (s)	31.9	37.4		20.2	20.2			49.8			49.8	
Actuated g/C Ratio	0.32	0.37		0.20	0.20			0.49			0.49	
Clearance Time (s)	5.5			4.0	4.0			5.0			5.0	
Vehicle Extension (s)	3.0			3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	325	680		210	352			725			766	
v/s Ratio Prot	c0.07	0.18			c0.14							
v/s Ratio Perm	0.13			0.08				0.38			c0.48	
v/c Ratio	0.64	0.48		0.39	0.71			0.78			0.98	
Uniform Delay, d1	27.4	24.4		35.1	37.7			21.1			25.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	4.1	0.5		1.2	6.6			5.2			28.1	
Delay (s)	31.4	24.9		36.2	44.3			26.2			53.4	
Level of Service	C	C		D	D			C			D	
Approach Delay (s)		27.5			42.4			26.2			53.4	
Approach LOS		C			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	38.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	101.1	Sum of lost time (s)	16.5
Intersection Capacity Utilization	82.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

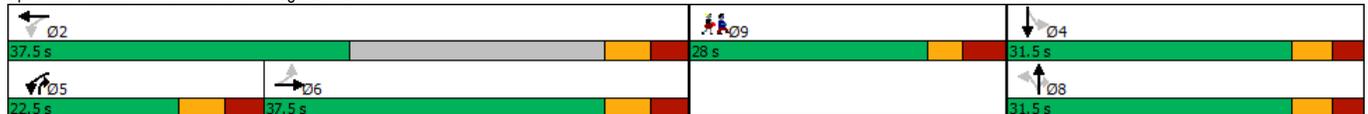


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations													
Traffic Volume (vph)	45	460	15	315	630	75	25	125	175	95	300	45	
Future Volume (vph)	45	460	15	315	630	75	25	125	175	95	300	45	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	150		0	150		0	0		150	0		200	
Storage Lanes	1		0	1		0	0		1	0		1	
Taper Length (ft)	25			25			25			25			
Right Turn on Red			Yes			Yes				No			No
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		1325			691			391			2983		
Travel Time (s)		30.1			15.7			8.9			67.8		
Confl. Peds. (#/hr)	2					2	2						2
Peak Hour Factor	0.91	0.91	0.91	0.97	0.97	0.97	0.87	0.87	0.87	0.88	0.88	0.88	
Heavy Vehicles (%)	0%	0%	0%	1%	2%	1%	0%	0%	0%	0%	0%	0%	0%
Shared Lane Traffic (%)													
Lane Group Flow (vph)	49	521	0	325	726	0	0	173	201	0	500	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA		
Protected Phases		6		5	2			8	5		4		9
Permitted Phases	6			2			8		8	4			
Detector Phase	6	6		5	2		8	8	5	4	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0		6.0	10.0		6.0	6.0	6.0	6.0	6.0		7.0
Minimum Split (s)	17.5	17.5		13.5	17.5		12.5	12.5	13.5	12.5	12.5		28.0
Total Split (s)	37.5	37.5		22.5	37.5		31.5	31.5	22.5	31.5	31.5		28.0
Total Split (%)	31.4%	31.4%		18.8%	31.4%		26.4%	26.4%	18.8%	26.4%	26.4%		23%
Yellow Time (s)	4.0	4.0		4.0	4.0		3.5	3.5	4.0	3.5	3.5		3.0
All-Red Time (s)	3.5	3.5		3.5	3.5		3.0	3.0	3.5	3.0	3.0		4.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	7.5	7.5		7.5	7.5		6.5	7.5	6.5	6.5	6.5		
Lead/Lag	Lag	Lag		Lead					Lead				
Lead-Lag Optimize?													
Recall Mode	Min	Min		None	Min		None	None	None	None	None		None
v/c Ratio	0.21	0.85		0.85	0.70		0.53	0.27		0.75			
Control Delay	30.6	46.0		42.4	21.9		39.9	18.2		42.8			
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0			
Total Delay	30.6	46.0		42.4	21.9		39.9	18.2		42.8			
Queue Length 50th (ft)	20	268		115	257		83	62		134			
Queue Length 95th (ft)	68	#673		#409	#750		191	162		#271			
Internal Link Dist (ft)		1245			611			311			2903		
Turn Bay Length (ft)	150			150				150					
Base Capacity (vph)	233	614		384	1042		378	752		768			
Starvation Cap Reductn	0	0		0	0		0	0		0			
Spillback Cap Reductn	0	0		0	0		0	0		0			
Storage Cap Reductn	0	0		0	0		0	0		0			
Reduced v/c Ratio	0.21	0.85		0.85	0.70		0.46	0.27		0.65			

Intersection Summary

Area Type: Other
 Cycle Length: 119.5
 Actuated Cycle Length: 94
 Natural Cycle: 130
 Control Type: Actuated-Uncoordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 14: Webster St & Highland Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	460	15	315	630	75	25	125	175	95	300	45
Future Volume (vph)	45	460	15	315	630	75	25	125	175	95	300	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	7.5	7.5		7.5	7.5			6.5	7.5		6.5	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		0.95	
Frb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	1.00		1.00	0.98			1.00	0.85		0.98	
Fit Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1803	1891		1787	1831			1884	1615		3508	
Fit Permitted	0.38	1.00		0.12	1.00			0.74	1.00		0.80	
Satd. Flow (perm)	716	1891		232	1831			1401	1615		2841	
Peak-hour factor, PHF	0.91	0.91	0.91	0.97	0.97	0.97	0.87	0.87	0.87	0.88	0.88	0.88
Adj. Flow (vph)	49	505	16	325	649	77	29	144	201	108	341	51
RTOR Reduction (vph)	0	1	0	0	3	0	0	0	0	0	0	0
Lane Group Flow (vph)	49	520	0	325	723	0	0	173	201	0	500	0
Confl. Peds. (#/hr)	2					2	2					2
Heavy Vehicles (%)	0%	0%	0%	1%	2%	1%	0%	0%	0%	0%	0%	0%
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases		6		5	2			8	5		4	
Permitted Phases	6			2			8		8	4		
Actuated Green, G (s)	30.6	30.6		53.4	53.4			21.9	37.2		21.9	
Effective Green, g (s)	30.6	30.6		53.4	53.4			21.9	37.2		21.9	
Actuated g/C Ratio	0.31	0.31		0.54	0.54			0.22	0.37		0.22	
Clearance Time (s)	7.5	7.5		7.5	7.5			6.5	7.5		6.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	219	580		363	981			308	603		624	
v/s Ratio Prot		0.28		0.14	c0.40				0.05			
v/s Ratio Perm	0.07			c0.34				0.12	0.07		c0.18	
v/c Ratio	0.22	0.90		0.90	0.74			0.56	0.33		0.80	
Uniform Delay, d1	25.7	33.0		25.3	17.7			34.6	22.3		36.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Incremental Delay, d2	0.5	16.4		23.4	2.9			2.3	0.3		7.3	
Delay (s)	26.2	49.4		48.7	20.6			36.9	22.7		44.1	
Level of Service	C	D		D	C			D	C		D	
Approach Delay (s)		47.4			29.3			29.3			44.1	
Approach LOS		D			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	36.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	99.6	Sum of lost time (s)	28.5
Intersection Capacity Utilization	89.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

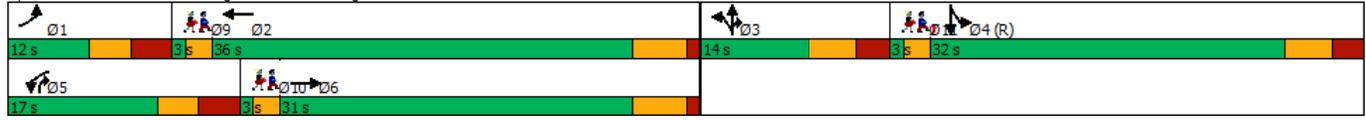


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9	Ø10	Ø11
Lane Configurations															
Traffic Volume (vph)	35	725	20	135	1015	270	20	65	90	765	190	135			
Future Volume (vph)	35	725	20	135	1015	270	20	65	90	765	190	135			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Storage Length (ft)	175		0	165		400	0		150	200		200			
Storage Lanes	1		0	1		0	0		1	1		0			
Taper Length (ft)	25			25			25			25					
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		345			745			3028			398				
Travel Time (s)		7.8			16.9			68.8			9.0				
Confl. Bikes (#/hr)						1									
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.83	0.83	0.83	0.83	0.83	0.83			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	38	819	0	142	1352	0	0	102	108	922	392	0			
Turn Type	Prot	NA		Prot	NA		Split	NA	pt+ov	Split	NA				
Protected Phases	1	6		5	2		3	3	3.5	4	4		9	10	11
Permitted Phases															
Detector Phase	1	6		5	2		3	3	3.5	4	4				
Switch Phase															
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0		1.0	1.0	1.0
Minimum Split (s)	12.0	20.0		12.0	25.0		12.0	12.0		21.0	21.0		3.0	3.0	3.0
Total Split (s)	12.0	31.0		17.0	36.0		14.0	14.0		32.0	32.0		3.0	3.0	3.0
Total Split (%)	12.0%	31.0%		17.0%	36.0%		14.0%	14.0%		32.0%	32.0%		3%	3%	3%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5		3.5	3.5		2.0	2.0	2.0
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5		2.5	2.5		0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0				
Total Lost Time (s)	6.0	5.0		6.0	5.0		6.0	6.0		6.0	6.0				
Lead/Lag	Lead			Lead			Lead	Lead					Lag	Lag	Lag
Lead-Lag Optimize?															
Recall Mode	None	Min		None	Min		Min	Min		C-Min	C-Min		None	None	None
v/c Ratio	0.36	0.80		0.78	1.02		0.73	0.26	0.93	0.74					
Control Delay	55.0	40.1		71.9	62.3		74.0	2.7	54.5	41.2					
Queue Delay	0.0	0.0		0.0	0.2		5.4	0.0	5.1	1.1					
Total Delay	55.0	40.1		71.9	62.5		79.4	2.7	59.6	42.3					
Queue Length 50th (ft)	24	252		89	~527		65	0	310	228					
Queue Length 95th (ft)	57	#373		#182	#702		#126	5	#376	#239					
Internal Link Dist (ft)		265			665		2948			318					
Turn Bay Length (ft)	175			165					150	200					
Base Capacity (vph)	106	1027		194	1324		147	424	987	527					
Starvation Cap Reductn	0	0		0	0		0	0	43	32					
Spillback Cap Reductn	0	0		0	1		17	0	0	0					
Storage Cap Reductn	0	0		0	0		0	0	0	0					
Reduced v/c Ratio	0.36	0.80		0.73	1.02		0.78	0.25	0.98	0.79					

Intersection Summary

Area Type: Other
 Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 4:SBTL, Start of Green
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 15: Hunting Rd/Gould St & Highland Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	725	20	135	1015	270	20	65	90	765	190	135
Future Volume (vph)	35	725	20	135	1015	270	20	65	90	765	190	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00	0.97	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	0.97			1.00	0.85	1.00	0.94	
Fit Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3525		1770	3413			1841	1583	3433	1747	
Fit Permitted	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3525		1770	3413			1841	1583	3433	1747	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	38	797	22	142	1068	284	24	78	108	922	229	163
RTOR Reduction (vph)	0	2	0	0	22	0	0	0	89	0	25	0
Lane Group Flow (vph)	38	817	0	142	1330	0	0	102	19	922	367	0
Confl. Bikes (#/hr)						1						
Turn Type	Prot	NA		Prot	NA		Split	NA	pt+ov	Split	NA	
Protected Phases	1	6		5	2		3	3	3 5	4	4	
Permitted Phases												
Actuated Green, G (s)	3.6	31.5		10.3	38.2			7.6	17.9	27.6	27.6	
Effective Green, g (s)	3.6	31.5		10.3	38.2			7.6	17.9	27.6	27.6	
Actuated g/C Ratio	0.04	0.32		0.10	0.38			0.08	0.18	0.28	0.28	
Clearance Time (s)	6.0	5.0		6.0	5.0			6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0		2.0	2.0	
Lane Grp Cap (vph)	63	1110		182	1303			139	283	947	482	
v/s Ratio Prot	0.02	0.23		c0.08	c0.39			c0.06	0.01	c0.27	0.21	
v/s Ratio Perm												
v/c Ratio	0.60	0.74		0.78	1.02			0.73	0.07	0.97	0.76	
Uniform Delay, d1	47.5	30.5		43.7	30.9			45.2	34.1	35.8	33.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.09	1.07	
Incremental Delay, d2	10.7	2.2		17.8	30.4			15.8	0.0	22.4	10.0	
Delay (s)	58.2	32.8		61.6	61.3			61.0	34.2	61.6	45.5	
Level of Service	E	C		E	E			E	C	E	D	
Approach Delay (s)		33.9			61.3			47.2			56.8	
Approach LOS		C			E			D			E	
Intersection Summary												
HCM 2000 Control Delay		52.9			HCM 2000 Level of Service				D			
HCM 2000 Volume to Capacity ratio		1.05										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			27.0				
Intersection Capacity Utilization		84.3%			ICU Level of Service			E				
Analysis Period (min)		15										
c Critical Lane Group												

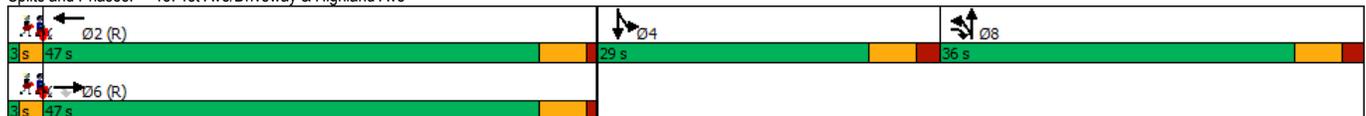


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø1	Ø5
Lane Configurations		↑↑	↗		↑↑		↗	↕			↕			
Traffic Volume (vph)	0	915	285	0	1675	5	630	0	110	1	1	10		
Future Volume (vph)	0	915	285	0	1675	5	630	0	110	1	1	10		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Storage Length (ft)	0		0	0		0	75		0	0		0		
Storage Lanes	0		1	0		0	1		0	0		0		
Taper Length (ft)	25			25			25			25				
Right Turn on Red			Yes			Yes			Yes			Yes		
Link Speed (mph)		30			30			30				30		
Link Distance (ft)		176			681			500				267		
Travel Time (s)		4.0			15.5			11.4				6.1		
Confl. Peds. (#/hr)									1	1				
Confl. Bikes (#/hr)						1								
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.63	0.63	0.63		
Heavy Vehicles (%)	0%	0%	2%	0%	2%	0%	2%	0%	1%	0%	0%	0%		
Shared Lane Traffic (%)							40%							
Lane Group Flow (vph)	0	1028	320	0	1888	0	425	407	0	0	20	0		
Turn Type		NA	pm+ov		NA		Split	NA		Split	NA			
Protected Phases		6	8		2		8	8		4	4		1	5
Permitted Phases			6											
Detector Phase		6	8		2		8	8		4	4			
Switch Phase														
Minimum Initial (s)		10.0	6.0		10.0		6.0	6.0		6.0	6.0		1.0	1.0
Minimum Split (s)		25.0	12.0		16.0		12.0	12.0		29.0	29.0		3.0	3.0
Total Split (s)		47.0	36.0		47.0		36.0	36.0		29.0	29.0		3.0	3.0
Total Split (%)		40.9%	31.3%		40.9%		31.3%	31.3%		25.2%	25.2%		3%	3%
Yellow Time (s)		4.0	4.0		4.0		4.0	4.0		4.0	4.0		2.0	2.0
All-Red Time (s)		1.0	2.0		1.0		2.0	2.0		2.0	2.0		0.0	0.0
Lost Time Adjust (s)		0.0	0.0		0.0		0.0	0.0		0.0	0.0			
Total Lost Time (s)		5.0	6.0		5.0		6.0	6.0		6.0	6.0			
Lead/Lag		Lag		Lag									Lead	Lead
Lead-Lag Optimize?														
Recall Mode		C-Min	None		C-Min		None	None		None	None		None	None
v/c Ratio		0.55	0.22		1.02		0.82	0.72		0.13	0.13			
Control Delay		22.5	0.9		53.9		51.1	34.9		23.6	23.6			
Queue Delay		0.0	0.0		0.0		0.0	0.0		0.0	0.0			
Total Delay		22.5	0.9		53.9		51.1	34.9		23.6	23.6			
Queue Length 50th (ft)		231	0		651		291	207		3	3			
Queue Length 95th (ft)		427	24		#1090		#532	#396		13	13			
Internal Link Dist (ft)		96			601		420	420		187	187			
Turn Bay Length (ft)							75							
Base Capacity (vph)		1874	1447		1856		518	568		350	350			
Starvation Cap Reductn		0	0		0		0	0		0	0			
Spillback Cap Reductn		0	0		0		0	0		0	0			
Storage Cap Reductn		0	0		0		0	0		0	0			
Reduced v/c Ratio		0.55	0.22		1.02		0.82	0.72		0.06	0.06			

Intersection Summary

Area Type: Other
 Cycle Length: 115
 Actuated Cycle Length: 115
 Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Green
 Natural Cycle: 150
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 18: 1st Ave/Driveway & Highland Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑	↗		↑↑		↖	↕			↕	
Traffic Volume (vph)	0	915	285	0	1675	5	630	0	110	1	1	10
Future Volume (vph)	0	915	285	0	1675	5	630	0	110	1	1	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	6.0		5.0		6.0	6.0			6.0	
Lane Util. Factor		0.95	1.00		0.95		0.95	0.95			1.00	
Frpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00			1.00	
Frt		1.00	0.85		1.00		1.00	0.95			0.89	
Fit Protected		1.00	1.00		1.00		0.95	0.97			1.00	
Satd. Flow (prot)		3610	1583		3538		1681	1630			1686	
Fit Permitted		1.00	1.00		1.00		0.95	0.97			1.00	
Satd. Flow (perm)		3610	1583		3538		1681	1630			1686	
Peak-hour factor, PHF	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.63	0.63	0.63
Adj. Flow (vph)	0	1028	320	0	1882	6	708	0	124	2	2	16
RTOR Reduction (vph)	0	0	63	0	0	0	0	66	0	0	15	0
Lane Group Flow (vph)	0	1028	257	0	1888	0	425	341	0	0	5	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)						1						
Heavy Vehicles (%)	0%	0%	2%	0%	2%	0%	2%	0%	1%	0%	0%	0%
Turn Type		NA	pm+ov		NA		Split	NA		Split	NA	
Protected Phases		6	8		2		8	8		4	4	
Permitted Phases			6									
Actuated Green, G (s)		56.7	92.2		56.7		35.5	35.5			5.8	
Effective Green, g (s)		56.7	92.2		56.7		35.5	35.5			5.8	
Actuated g/C Ratio		0.49	0.80		0.49		0.31	0.31			0.05	
Clearance Time (s)		5.0	6.0		5.0		6.0	6.0			6.0	
Vehicle Extension (s)		2.0	2.0		2.0		2.0	2.0			2.0	
Lane Grp Cap (vph)		1779	1351		1744		518	503			85	
v/s Ratio Prot		0.28	0.06		c0.53		c0.25	0.21			c0.00	
v/s Ratio Perm			0.10									
v/c Ratio		0.58	0.19		1.08		0.82	0.68			0.06	
Uniform Delay, d1		20.7	2.7		29.1		36.8	34.8			52.0	
Progression Factor		1.00	1.00		1.00		1.00	1.00			1.00	
Incremental Delay, d2		1.4	0.0		47.7		9.6	2.9			0.1	
Delay (s)		22.0	2.7		76.8		46.4	37.6			52.1	
Level of Service		C	A		E		D	D			D	
Approach Delay (s)		17.4			76.8		42.1				52.1	
Approach LOS		B			E		D				D	

Intersection Summary			
HCM 2000 Control Delay	50.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	115.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	83.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

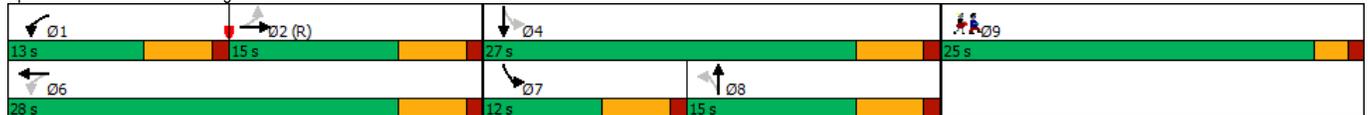


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9
Lane Configurations		↔↔		↔	↔			↔	↔	↔	↔	↔	
Traffic Volume (vph)	15	235	2	475	405	45	1	110	135	85	190	15	
Future Volume (vph)	15	235	2	475	405	45	1	110	135	85	190	15	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Storage Length (ft)	0		100	190		0	0		400	125		0	
Storage Lanes	0		1	1		0	0		1	1		0	
Taper Length (ft)	25			25			25			25			
Right Turn on Red			Yes			Yes			Yes			Yes	
Link Speed (mph)		30			30			30			30		
Link Distance (ft)		442			443			907			3028		
Travel Time (s)		10.0			10.1			20.6			68.8		
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.83	0.83	0.83	0.94	0.94	0.94	
Shared Lane Traffic (%)													
Lane Group Flow (vph)	0	276	0	500	473	0	0	134	163	90	218	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Free	pm+pt	NA		
Protected Phases		2		1	6			8		7	4		9
Permitted Phases	2			6			8		Free	4			
Detector Phase	2	2		1	6		8	8		7	4		
Switch Phase													
Minimum Initial (s)	10.0	10.0		7.0	10.0		10.0	10.0		5.0	10.0		7.0
Minimum Split (s)	15.0	15.0		12.0	16.0		15.0	15.0		10.0	27.0		25.0
Total Split (s)	15.0	15.0		13.0	28.0		15.0	15.0		12.0	27.0		25.0
Total Split (%)	18.8%	18.8%		16.3%	35.0%		18.8%	18.8%		15.0%	33.8%		31%
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0		2.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0		1.0
Lost Time Adjust (s)		0.0		0.0	0.0			0.0		0.0	0.0		
Total Lost Time (s)		5.0		5.0	5.0			5.0		5.0	5.0		
Lead/Lag	Lag	Lag		Lead			Lag	Lag		Lead			
Lead-Lag Optimize?													
Recall Mode	C-Min	C-Min		None	Min		None	None		None	None		None
v/c Ratio		0.53		0.57	0.41			0.58	0.10	0.33	0.48		
Control Delay		33.7		11.4	9.3			43.8	0.1	26.1	28.2		
Queue Delay		0.0		0.0	0.0			0.0	0.0	0.0	0.0		
Total Delay		33.7		11.4	9.3			43.8	0.1	26.1	28.2		
Queue Length 50th (ft)		68		126	113			64	0	34	87		
Queue Length 95th (ft)		97		196	176			109	0	71	150		
Internal Link Dist (ft)		362			363			827			2948		
Turn Bay Length (ft)				190					400	125			
Base Capacity (vph)		523		875	1159			232	1583	277	510		
Starvation Cap Reductn		0		0	0			0	0	0	0		
Spillback Cap Reductn		0		0	0			0	0	0	0		
Storage Cap Reductn		0		0	0			0	0	0	0		
Reduced v/c Ratio		0.53		0.57	0.41			0.58	0.10	0.32	0.43		

Intersection Summary

Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	80
Offset:	5 (6%), Referenced to phase 2:EBTL, Start of Green
Natural Cycle:	90
Control Type:	Actuated-Coordinated

Splits and Phases: 20: Hunting Rd & Kendrick St





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↔		↔	↔			↔	↔	↔	↔		
Traffic Volume (vph)	15	235	2	475	405	45	1	110	135	85	190	15	
Future Volume (vph)	15	235	2	475	405	45	1	110	135	85	190	15	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)		5.0		5.0	5.0			5.0	4.0	5.0	5.0		
Lane Util. Factor		0.95		1.00	1.00			1.00	1.00	1.00	1.00		
Frt		1.00		1.00	0.99			1.00	0.85	1.00	0.99		
Flt Protected		1.00		0.95	1.00			1.00	1.00	0.95	1.00		
Satd. Flow (prot)		3525		1770	1835			1862	1583	1770	1842		
Flt Permitted		0.91		0.38	1.00			1.00	1.00	0.42	1.00		
Satd. Flow (perm)		3202		704	1835			1857	1583	781	1842		
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.83	0.83	0.83	0.94	0.94	0.94	
Adj. Flow (vph)	16	258	2	500	426	47	1	133	163	90	202	16	
RTOR Reduction (vph)	0	1	0	0	3	0	0	0	0	0	4	0	
Lane Group Flow (vph)	0	275	0	500	470	0	0	134	163	90	214	0	
Turn Type	Perm	NA		pm+pt	NA		Perm	NA	Free	pm+pt	NA		
Protected Phases		2		1	6			8		7	4		
Permitted Phases	2			6			8		Free	4			
Actuated Green, G (s)		12.0		49.4	49.4			10.0	80.0	20.6	20.6		
Effective Green, g (s)		12.0		49.4	49.4			10.0	80.0	20.6	20.6		
Actuated g/C Ratio		0.15		0.62	0.62			0.12	1.00	0.26	0.26		
Clearance Time (s)		5.0		5.0	5.0			5.0		5.0	5.0		
Vehicle Extension (s)		2.0		2.0	2.0			2.0		2.0	2.0		
Lane Grp Cap (vph)		480		866	1133			232	1583	270	474		
v/s Ratio Prot				c0.23	0.26					0.02	c0.12		
v/s Ratio Perm		0.09		c0.12				c0.07	0.10	0.06			
v/c Ratio		0.57		0.58	0.42			0.58	0.10	0.33	0.45		
Uniform Delay, d1		31.6		8.6	7.9			33.0	0.0	23.4	25.0		
Progression Factor		1.00		1.00	1.00			1.00	1.00	1.00	1.00		
Incremental Delay, d2		4.9		0.6	0.1			2.2	0.1	0.3	0.3		
Delay (s)		36.5		9.2	8.0			35.2	0.1	23.7	25.2		
Level of Service		D		A	A			D	A	C	C		
Approach Delay (s)		36.5			8.6			15.9			24.8		
Approach LOS		D			A			B			C		
Intersection Summary													
HCM 2000 Control Delay			16.6		HCM 2000 Level of Service						B		
HCM 2000 Volume to Capacity ratio			0.65										
Actuated Cycle Length (s)			80.0		Sum of lost time (s)						23.0		
Intersection Capacity Utilization			58.5%		ICU Level of Service						B		
Analysis Period (min)			15										

c Critical Lane Group

Intersection						
Int Delay, s/veh	6.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↗		↘	↗
Traffic Vol, veh/h	105	70	305	20	15	615
Future Vol, veh/h	105	70	305	20	15	615
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	75	75	73	73
Heavy Vehicles, %	0	0	0	0	0	6
Mvmt Flow	130	86	407	27	21	842
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1305	421	0	0	434	0
Stage 1	421	-	-	-	-	-
Stage 2	884	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	178	637	-	-	1136	-
Stage 1	667	-	-	-	-	-
Stage 2	407	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	175	637	-	-	1136	-
Mov Cap-2 Maneuver	175	-	-	-	-	-
Stage 1	667	-	-	-	-	-
Stage 2	400	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	45.7	0	0.2			
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	175	637	1136	-
HCM Lane V/C Ratio	-	-	0.741	0.136	0.018	-
HCM Control Delay (s)	-	-	68.5	11.5	8.2	-
HCM Lane LOS	-	-	F	B	A	-
HCM 95th %tile Q(veh)	-	-	4.7	0.5	0.1	-

2009 MUTCD

TRAFFIC SIGNAL WARRANT ANALYSIS (VOLUME BASED)

Intersection: **Central Street at Cedar Street**

Major Street Direction: Eastbound-Westbound ▼

Year: **2022** Condition: **Existing Conditions**

Operating speed on major roadway: **35** mph

Number of approaches: **3**

Required approach volumes

Warrant 1 EIGHT-HOUR VEHICULAR VOLUME		Minimum*	Adjusted Minimum**
Warrant 1A	MINIMUM VEHICULAR VOLUME (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	500	500
	Minor Street : 1 Lane(s) on each approach	150	150
Warrant 1B	INTERRUPTION OF CONTINUOUS TRAFFIC (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	750	750
	Minor Street : 1 Lane(s) on each approach	75	75
80 PERCENT SATISFACTION OF WARRANT 1A AND WARRANT 1B		Warrant 1A	Warrant 1B
	Major Street : 1 Lane(s) on each approach	400	600
	Minor Street : 1 Lane(s) on each approach	120	60

Warrant 2 FOUR HOUR VEHICULAR VOLUME		
Major Street :	1 Lane(s) on each approach	If "verify" indicated, see Figure 4C-1 or 4C-2. 25 = accuracy of regression equations
Minor Street :	1 Lane(s) on each approach	

Warrant 3 PEAK HOUR VOLUME		
Major Street :	1 Lane(s) on each approach	If "verify" indicated, see Figure 4C-3 or 4C-4. 25 = accuracy of regression equations
Minor Street :	1 Lane(s) on each approach	

Hour	Entering Vol. Minor Road+	Entering Vol. on Major Road		Tot. Ent. Vol. On Major Rd	Meets the following volume-based warrants?				
		Eastbound	Westbound		1A	1B	80%(1A&1B)	2	3
6:00 - 7:00 AM	100	324	121	445	No	No	No	No	No
7:00 - 8:00 AM	203	656	226	882	Yes	Yes	Yes	Yes	No
8:00 - 9:00 AM	204	660	230	890	Yes	Yes	Yes	Yes	No
9:00 - 10:00 AM	156	505	215	720	Yes	No	Yes	No	No
10:00 - 11:00 AM	132	428	223	651	No	No	Yes	No	No
11:00 - 12:00 AM	140	451	243	694	No	No	Yes	No	No
12:00 - 1:00 PM	140	450	247	697	No	No	Yes	No	No
1:00 - 2:00 PM	150	314	401	715	No	No	Yes	No	No
2:00 - 3:00 PM	159	330	395	725	Yes	No	Yes	No	No
3:00 - 4:00 PM	184	384	367	751	Yes	Yes	Yes	Yes	No
4:00 - 5:00 PM	175	366	422	788	Yes	Yes	Yes	Yes	No
5:00 - 6:00 PM	141	295	540	835	No	Yes	Yes	Yes	No
6:00 - 7:00 PM	136	283	471	754	No	Yes	Yes	No	No
					No	No	Yes	Yes	No
					Warrants Met?		1	2	3
					Yes		Yes	Yes	No

Note: Major road volumes include through and left-turning vehicles.

Note: Minor Road volumes include 100% of left-turning volumes and 25% of right-turning volumes

*From the criteria described for the warrant in the MUTCD.

**If the operating speed is higher than 40mph then the volumes can be adjusted to 70%. (If no adjusted minimum, the minimum from the previous column is shown)

+If more than one approach, report the approach that has the higher volume.

NON-VOLUME-BASED WARRANTS

Warrant 4, Minimum Pedestrian Volume:
 *107 pedestrians per hour is the minimum threshold

Peak Four Hour Pedestrian Volumes: <100 7:00 AM
 <100 8:00 AM
 <100 4:00 PM
 <100 5:00 PM

Warrant 5, School Crossing:
 See MUTCD for details.

Warrant 6, Coordinated Signal System:
 See MUTCD for details.

Warrant 7, Crash Experience:
 # of accidents "correctable by signalization" occurring in the last 12 months:
 (threshold is 5 crashes in last year correctable by signalization)

Warrant 8, Roadway Network:
 See MUTCD for details.

Total Crashes 2015-2019 4
 based on MassDOT crash portal

Warrant 9, Grade Crossing:

2009 MUTCD

TRAFFIC SIGNAL WARRANT ANALYSIS (VOLUME BASED)

Intersection: **Central Street at Cedar Street**

Major Street Direction: Eastbound-Westbound ▼

Year: **2029** Condition: **No Build Conditions**

Operating speed on major roadway: **35** mph

Number of approaches: **3**

Required approach volumes

Warrant 1 EIGHT-HOUR VEHICULAR VOLUME		Minimum*	Adjusted Minimum**
Warrant 1A	MINIMUM VEHICULAR VOLUME (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	500	500
	Minor Street : 1 Lane(s) on each approach	150	150
Warrant 1B	INTERRUPTION OF CONTINUOUS TRAFFIC (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	750	750
	Minor Street : 1 Lane(s) on each approach	75	75
80 PERCENT SATISFACTION OF WARRANT 1A AND WARRANT 1B		Warrant 1A	Warrant 1B
	Major Street : 1 Lane(s) on each approach	400	600
	Minor Street : 1 Lane(s) on each approach	120	60

Warrant 2 FOUR HOUR VEHICULAR VOLUME	
Major Street :	1 Lane(s) on each approach
Minor Street :	1 Lane(s) on each approach

If "verify" indicated, see Figure 4C-1 or 4C-2.
25 = accuracy of regression equations

Warrant 3 PEAK HOUR VOLUME	
Major Street :	1 Lane(s) on each approach
Minor Street :	1 Lane(s) on each approach

If "verify" indicated, see Figure 4C-3 or 4C-4.
25 = accuracy of regression equations

Hour	Entering Vol. Minor Road+	Entering Vol. on Major Road		Tot. Ent. Vol. On Major Rd	Meets the following volume-based warrants?				
		Eastbound	Westbound		1A	1B	80%(1A&1B)	2	3
6:00 - 7:00 AM	109	349	132	481	No	No	No	No	No
7:00 - 8:00 AM	219	705	245	950	Yes	Yes	Yes	Yes	No
8:00 - 9:00 AM	220	710	250	960	Yes	Yes	Yes	Yes	No
9:00 - 10:00 AM	169	543	234	777	Yes	Yes	Yes	Yes	No
10:00 - 11:00 AM	143	462	242	704	No	No	Yes	No	No
11:00 - 12:00 AM	150	485	264	749	Yes	No	Yes	No	No
12:00 - 1:00 PM	150	484	268	752	Yes	Yes	Yes	No	No
1:00 - 2:00 PM	162	335	431	766	Yes	Yes	Yes	Yes	No
2:00 - 3:00 PM	171	352	425	777	Yes	Yes	Yes	Yes	No
3:00 - 4:00 PM	198	410	394	804	Yes	Yes	Yes	Yes	No
4:00 - 5:00 PM	190	391	453	844	Yes	Yes	Yes	Yes	No
5:00 - 6:00 PM	153	315	580	895	Yes	Yes	Yes	Yes	No
6:00 - 7:00 PM	146	302	506	808	No	Yes	Yes	No	No
					Yes	Yes	Yes	Yes	No
					Warrants Met?	1	2	3	
						Yes	Yes	Yes	No

Note: Major road volumes include through and left-turning vehicles.

Note: Minor Road volumes include 100% of left-turning volumes and 25% of right-turning volumes

*From the criteria described for the warrant in the MUTCD.

**If the operating speed is higher than 40mph then the volumes can be adjusted to 70%. (If no adjusted minimum, the minimum from the previous column is shown)

+If more than one approach, report the approach that has the higher volume.

NON-VOLUME-BASED WARRANTS

Warrant 4, Minimum Pedestrian Volume: No
*107 pedestrians per hour is the minimum threshold

Peak Four Hour Pedestrian Volumes: <100 7:00 AM
<100 8:00 AM
<100 4:00 PM
<100 5:00 PM

Warrant 5, School Crossing: No
See MUTCD for details.

Warrant 6, Coordinated Signal System: No
See MUTCD for details.

Warrant 7, Crash Experience: No
of accidents "correctable by signalization" occurring in the last 12 months:
(threshold is 5 crashes in last year correctable by signalization)

Warrant 8, Roadway Network: No
See MUTCD for details.

Total Crashes 2015-2019 4
based on MassDOT crash portal

Warrant 9, Grade Crossing: No

2009 MUTCD

TRAFFIC SIGNAL WARRANT ANALYSIS (VOLUME BASED)

Intersection: **Central Street at Cedar Street**

Major Street Direction: Eastbound-Westbound ▼

Year: **2029** Condition: **Build Conditions**

Operating speed on major roadway: **35** mph

Number of approaches: **3**

Required approach volumes

Warrant 1 EIGHT-HOUR VEHICULAR VOLUME		Minimum*	Adjusted Minimum**
Warrant 1A	MINIMUM VEHICULAR VOLUME (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	500	500
	Minor Street : 1 Lane(s) on each approach	150	150
Warrant 1B	INTERRUPTION OF CONTINUOUS TRAFFIC (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	750	750
	Minor Street : 1 Lane(s) on each approach	75	75
80 PERCENT SATISFACTION OF WARRANT 1A AND WARRANT 1B		Warrant 1A	Warrant 1B
	Major Street : 1 Lane(s) on each approach	400	600
	Minor Street : 1 Lane(s) on each approach	120	60

Warrant 2 FOUR HOUR VEHICULAR VOLUME		
Major Street :	1 Lane(s) on each approach	If "verify" indicated, see Figure 4C-1 or 4C-2. 25 = accuracy of regression equations
Minor Street :	1 Lane(s) on each approach	

Warrant 3 PEAK HOUR VOLUME		
Major Street :	1 Lane(s) on each approach	If "verify" indicated, see Figure 4C-3 or 4C-4. 25 = accuracy of regression equations
Minor Street :	1 Lane(s) on each approach	

Hour	Entering Vol. Minor Road+	Entering Vol. on Major Road		Tot. Ent. Vol. On Major Rd	Meets the following volume-based warrants?					
		Eastbound	Westbound		1A	1B	80%(1A&1B)	2	3	
6:00 - 7:00 AM	112	355	133	488	No	No	No	No	No	
7:00 - 8:00 AM	230	723	248	971	Yes	Yes	Yes	Yes	Yes	
8:00 - 9:00 AM	235	736	253	989	Yes	Yes	Yes	Yes	Yes	
9:00 - 10:00 AM	173	551	240	791	Yes	Yes	Yes	Yes	No	
10:00 - 11:00 AM	147	469	249	718	No	No	Yes	No	No	
11:00 - 12:00 AM	155	492	277	769	Yes	Yes	Yes	No	No	
12:00 - 1:00 PM	158	497	281	778	Yes	Yes	Yes	Yes	No	
1:00 - 2:00 PM	169	346	439	785	Yes	Yes	Yes	Yes	No	
2:00 - 3:00 PM	177	363	433	795	Yes	Yes	Yes	Yes	No	
3:00 - 4:00 PM	204	419	404	824	Yes	Yes	Yes	Yes	No	
4:00 - 5:00 PM	193	398	473	870	Yes	Yes	Yes	Yes	No	
5:00 - 6:00 PM	155	320	604	923	Yes	Yes	Yes	Yes	No	
6:00 - 7:00 PM	147	304	509	812	No	Yes	Yes	No	No	
					Yes	Yes	Yes	Yes	Yes	
					Warrants Met?			1	2	3
						Yes		Yes	Yes	

Note: Major road volumes include through and left-turning vehicles.

Note: Minor Road volumes include 100% of left-turning volumes and 25% of right-turning volumes

*From the criteria described for the warrant in the MUTCD.

**If the operating speed is higher than 40mph then the volumes can be adjusted to 70%. (If no adjusted minimum, the minimum from the previous column is shown)

+If more than one approach, report the approach that has the higher volume.

NON-VOLUME-BASED WARRANTS

Warrant 4, Minimum Pedestrian Volume: **No**
*107 pedestrians per hour is the minimum threshold

Peak Four Hour Pedestrian Volumes: <100 7:00 AM
<100 8:00 AM
<100 4:00 PM
<100 5:00 PM

Warrant 5, School Crossing: **No**
See MUTCD for details.

Warrant 6, Coordinated Signal System: **No**
See MUTCD for details.

Warrant 7, Crash Experience: **No**
of accidents "correctable by signalization" occurring in the last 12 months:
(threshold is 5 crashes in last year correctable by signalization)

Warrant 8, Roadway Network: **No**
See MUTCD for details.

Total Crashes 2015-2019 4
based on MassDOT crash portal

Warrant 9, Grade Crossing: **No**

2009 MUTCD

TRAFFIC SIGNAL WARRANT ANALYSIS (VOLUME BASED)

Intersection: **Central Street at Webster Street**

Major Street Direction: Eastbound-Westbound ▼

Year: **2022** Condition: **Existing Conditions**

Operating speed on major roadway: **35** mph

Number of approaches: **3**

Required approach volumes

Warrant 1 EIGHT-HOUR VEHICULAR VOLUME		Minimum*	Adjusted Minimum**
Warrant 1A	MINIMUM VEHICULAR VOLUME (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	500	500
	Minor Street : 1 Lane(s) on each approach	150	150
Warrant 1B	INTERRUPTION OF CONTINUOUS TRAFFIC (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	750	750
	Minor Street : 1 Lane(s) on each approach	75	75
80 PERCENT SATISFACTION OF WARRANT 1A AND WARRANT 1B		Warrant 1A	Warrant 1B
	Major Street : 1 Lane(s) on each approach	400	600
	Minor Street : 1 Lane(s) on each approach	120	60

Warrant 2 FOUR HOUR VEHICULAR VOLUME		
Major Street :	1 Lane(s) on each approach	If "verify" indicated, see Figure 4C-1 or 4C-2. 25 = accuracy of regression equations
Minor Street :	1 Lane(s) on each approach	

Warrant 3 PEAK HOUR VOLUME		
Major Street :	1 Lane(s) on each approach	If "verify" indicated, see Figure 4C-3 or 4C-4. 25 = accuracy of regression equations
Minor Street :	1 Lane(s) on each approach	

Hour	Entering Vol. Minor Road+	Entering Vol. on Major Road		Tot. Ent. Vol. On Major Rd	Meets the following volume-based warrants?				
		Eastbound	Westbound		1A	1B	80%(1A&1B)	2	3
6:00 - 7:00 AM	64	347	198	545	No	No	No	No	No
7:00 - 8:00 AM	128	700	369	1069	No	Yes	Yes	Yes	No
8:00 - 9:00 AM	129	705	375	1080	No	Yes	Yes	Yes	No
9:00 - 10:00 AM	99	539	351	890	No	Yes	No	No	No
10:00 - 11:00 AM	84	458	364	822	No	Yes	No	No	No
11:00 - 12:00 AM	88	482	395	877	No	Yes	No	No	No
12:00 - 1:00 PM	88	481	402	883	No	Yes	No	No	No
1:00 - 2:00 PM	92	341	553	894	No	Yes	No	No	No
2:00 - 3:00 PM	97	358	545	903	No	Yes	No	No	No
3:00 - 4:00 PM	112	417	506	923	No	Yes	No	No	No
4:00 - 5:00 PM	107	397	583	980	No	Yes	No	No	No
5:00 - 6:00 PM	86	320	745	1065	No	Yes	No	No	No
6:00 - 7:00 PM	83	307	649	956	No	Yes	No	No	No
					No	Yes	No	No	No
						1		2	3
						Yes		No	No

Note: Major road volumes include through and left-turning vehicles.

Note: Minor Road volumes include 100% of left-turning volumes and 25% of right-turning volumes

*From the criteria described for the warrant in the MUTCD.

**If the operating speed is higher than 40mph then the volumes can be adjusted to 70%. (If no adjusted minimum, the minimum from the previous column is shown)

+If more than one approach, report the approach that has the higher volume.

NON-VOLUME-BASED WARRANTS

Warrant 4, Minimum Pedestrian Volume:
*107 pedestrians per hour is the minimum threshold

Peak Four Hour Pedestrian Volumes: <100 7:00 AM
<100 8:00 AM
<100 4:00 PM
<100 5:00 PM

Warrant 5, School Crossing:
See MUTCD for details.

Warrant 6, Coordinated Signal System:
See MUTCD for details.

Warrant 7, Crash Experience:
of accidents "correctable by signalization" occurring in the last 12 months:
(threshold is 5 crashes in last year correctable by signalization)

Warrant 8, Roadway Network:
See MUTCD for details.

Total Crashes 2015-2019 1
based on MassDOT crash portal

Warrant 9, Grade Crossing:

2009 MUTCD

TRAFFIC SIGNAL WARRANT ANALYSIS (VOLUME BASED)

Intersection: **Central Street at Webster Street**

Major Street Direction: Eastbound-Westbound ▼

Year: **2029** Condition: **No Build Conditions**

Operating speed on major roadway: **35** mph

Number of approaches: **3**

Required approach volumes

Warrant 1 EIGHT-HOUR VEHICULAR VOLUME		Minimum*	Adjusted Minimum**
Warrant 1A	MINIMUM VEHICULAR VOLUME (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	500	500
	Minor Street : 1 Lane(s) on each approach	150	150
Warrant 1B	INTERRUPTION OF CONTINUOUS TRAFFIC (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	750	750
	Minor Street : 1 Lane(s) on each approach	75	75
80 PERCENT SATISFACTION OF WARRANT 1A AND WARRANT 1B		Warrant 1A	Warrant 1B
	Major Street : 1 Lane(s) on each approach	400	600
	Minor Street : 1 Lane(s) on each approach	120	60

Warrant 2 FOUR HOUR VEHICULAR VOLUME	
Major Street :	1 Lane(s) on each approach
Minor Street :	1 Lane(s) on each approach

If "verify" indicated, see Figure 4C-1 or 4C-2.
25 = accuracy of regression equations

Warrant 3 PEAK HOUR VOLUME	
Major Street :	1 Lane(s) on each approach
Minor Street :	1 Lane(s) on each approach

If "verify" indicated, see Figure 4C-3 or 4C-4.
25 = accuracy of regression equations

Hour	Entering Vol. Minor Road+	Entering Vol. on Major Road		Tot. Ent. Vol. On Major Rd	Meets the following volume-based warrants?				
		Eastbound	Westbound		1A	1B	80%(1A&1B)	2	3
6:00 - 7:00 AM	67	374	213	587	No	No	No	No	No
7:00 - 8:00 AM	135	755	398	1153	No	Yes	Yes	Yes	No
8:00 - 9:00 AM	136	760	405	1165	No	Yes	Yes	Yes	No
9:00 - 10:00 AM	104	581	379	960	No	Yes	No	No	No
10:00 - 11:00 AM	89	494	392	886	No	Yes	No	No	No
11:00 - 12:00 AM	93	519	427	946	No	Yes	No	No	No
12:00 - 1:00 PM	93	518	435	953	No	Yes	No	No	No
1:00 - 2:00 PM	100	367	602	969	No	Yes	No	No	No
2:00 - 3:00 PM	105	386	593	979	No	Yes	No	No	No
3:00 - 4:00 PM	123	449	551	1000	No	Yes	Yes	Yes	No
4:00 - 5:00 PM	117	428	634	1062	No	Yes	No	Yes	No
5:00 - 6:00 PM	94	345	810	1155	No	Yes	No	Yes	No
6:00 - 7:00 PM	90	331	706	1037	No	Yes	No	No	No
					No	Yes	No	Yes	No
					Warrants Met?		1	2	3
					Yes		Yes	No	

Note: Major road volumes include through and left-turning vehicles.

Note: Minor Road volumes include 100% of left-turning volumes and 25% of right-turning volumes

*From the criteria described for the warrant in the MUTCD.

**If the operating speed is higher than 40mph then the volumes can be adjusted to 70%. (If no adjusted minimum, the minimum from the previous column is shown)

+If more than one approach, report the approach that has the higher volume.

NON-VOLUME-BASED WARRANTS

Warrant 4, Minimum Pedestrian Volume: **No**
*107 pedestrians per hour is the minimum threshold

Peak Four Hour Pedestrian Volumes:

<100	7:00 AM
<100	8:00 AM
<100	4:00 PM
<100	5:00 PM

Warrant 5, School Crossing: **No**
See MUTCD for details.

Warrant 6, Coordinated Signal System: **No**
See MUTCD for details.

Warrant 7, Crash Experience: **No**
of accidents "correctable by signalization" occurring in the last 12 months:
(threshold is 5 crashes in last year correctable by signalization)

Warrant 8, Roadway Network: **No**
See MUTCD for details.

Total Crashes 2015-2019 1
based on MassDOT crash portal

Warrant 9, Grade Crossing: **No**

2009 MUTCD

TRAFFIC SIGNAL WARRANT ANALYSIS (VOLUME BASED)

Intersection: **Central Street at Webster Street**

Major Street Direction: Eastbound-Westbound ▼

Year: **2029** Condition: **Build Conditions**

Operating speed on major roadway: **35** mph

Number of approaches: **3**

Required approach volumes

Warrant 1 EIGHT-HOUR VEHICULAR VOLUME		Minimum*	Adjusted Minimum**
Warrant 1A	MINIMUM VEHICULAR VOLUME (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	500	500
	Minor Street : 1 Lane(s) on each approach	150	150
Warrant 1B	INTERRUPTION OF CONTINUOUS TRAFFIC (8 hours of day)		
	Major Street : 1 Lane(s) on each approach	750	750
	Minor Street : 1 Lane(s) on each approach	75	75
80 PERCENT SATISFACTION OF WARRANT 1A AND WARRANT 1B		Warrant 1A	Warrant 1B
	Major Street : 1 Lane(s) on each approach	400	600
	Minor Street : 1 Lane(s) on each approach	120	60

Warrant 2 FOUR HOUR VEHICULAR VOLUME	
Major Street :	1 Lane(s) on each approach
Minor Street :	1 Lane(s) on each approach

If "verify" indicated, see Figure 4C-1 or 4C-2.
25 = accuracy of regression equations

Warrant 3 PEAK HOUR VOLUME	
Major Street :	1 Lane(s) on each approach
Minor Street :	1 Lane(s) on each approach

If "verify" indicated, see Figure 4C-3 or 4C-4.
25 = accuracy of regression equations

Hour	Entering Vol. Minor Road+	Entering Vol. on Major Road		Tot. Ent. Vol. On Major Rd	Meets the following volume-based warrants?				
		Eastbound	Westbound		1A	1B	80%(1A&1B)	2	3
6:00 - 7:00 AM	67	384	214	598	No	No	No	No	No
7:00 - 8:00 AM	135	784	402	1186	No	Yes	Yes	Yes	No
8:00 - 9:00 AM	136	801	411	1212	No	Yes	Yes	Yes	No
9:00 - 10:00 AM	104	594	388	982	No	Yes	No	No	No
10:00 - 11:00 AM	89	505	404	909	No	Yes	No	No	No
11:00 - 12:00 AM	93	531	448	979	No	Yes	No	No	No
12:00 - 1:00 PM	93	539	455	994	No	Yes	No	No	No
1:00 - 2:00 PM	100	385	615	1000	No	Yes	No	No	No
2:00 - 3:00 PM	105	403	605	1008	No	Yes	No	Yes	No
3:00 - 4:00 PM	123	464	568	1031	No	Yes	Yes	Yes	No
4:00 - 5:00 PM	117	438	665	1104	No	Yes	No	Yes	No
5:00 - 6:00 PM	94	352	848	1200	No	Yes	No	Yes	No
6:00 - 7:00 PM	90	334	710	1044	No	Yes	No	No	No
					No	Yes	No	Yes	No
						1		2	3
						Yes		Yes	No

Note: Major road volumes include through and left-turning vehicles.
 Note: Minor Road volumes include 100% of left-turning volumes and 25% of right-turning volumes

*From the criteria described for the warrant in the MUTCD.
 **If the operating speed is higher than 40mph then the volumes can be adjusted to 70%. (If no adjusted minimum, the minimum from the previous column is shown)
 +If more than one approach, report the approach that has the higher volume.

NON-VOLUME-BASED WARRANTS

Warrant 4, Minimum Pedestrian Volume: **No**
 *107 pedestrians per hour is the minimum threshold

Peak Four Hour Pedestrian Volumes: <100 7:00 AM
 <100 8:00 AM
 <100 4:00 PM
 <100 5:00 PM

Warrant 5, School Crossing: **No**
 See MUTCD for details.

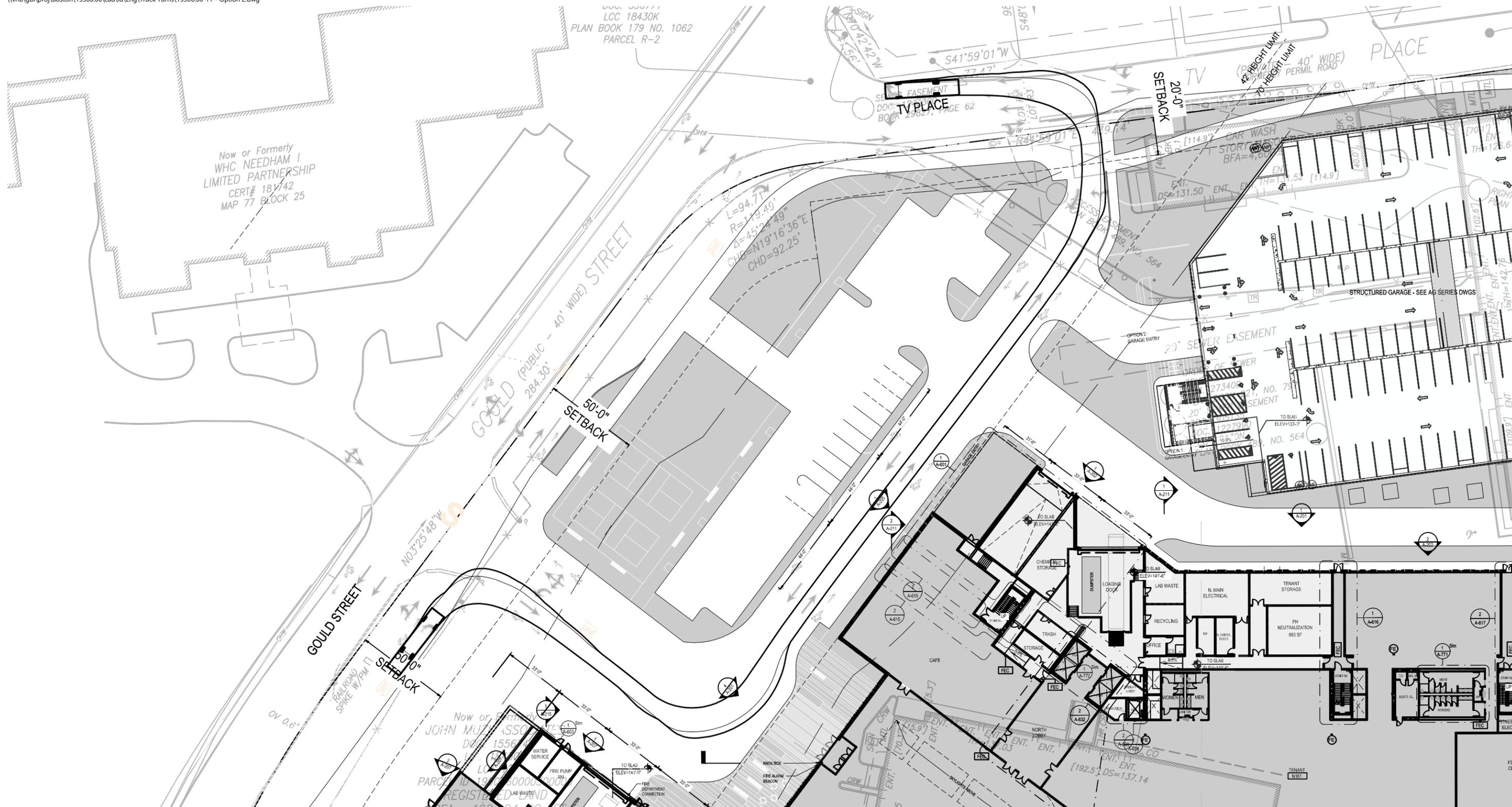
Warrant 6, Coordinated Signal System: **No**
 See MUTCD for details.

Warrant 7, Crash Experience: **No**
 # of accidents "correctable by signalization" occurring in the last 12 months:
 (threshold is 5 crashes in last year correctable by signalization)

Warrant 8, Roadway Network: **No**
 See MUTCD for details.

Total Crashes 2015-2019 1
 based on MassDOT crash portal

Warrant 9, Grade Crossing: **No**

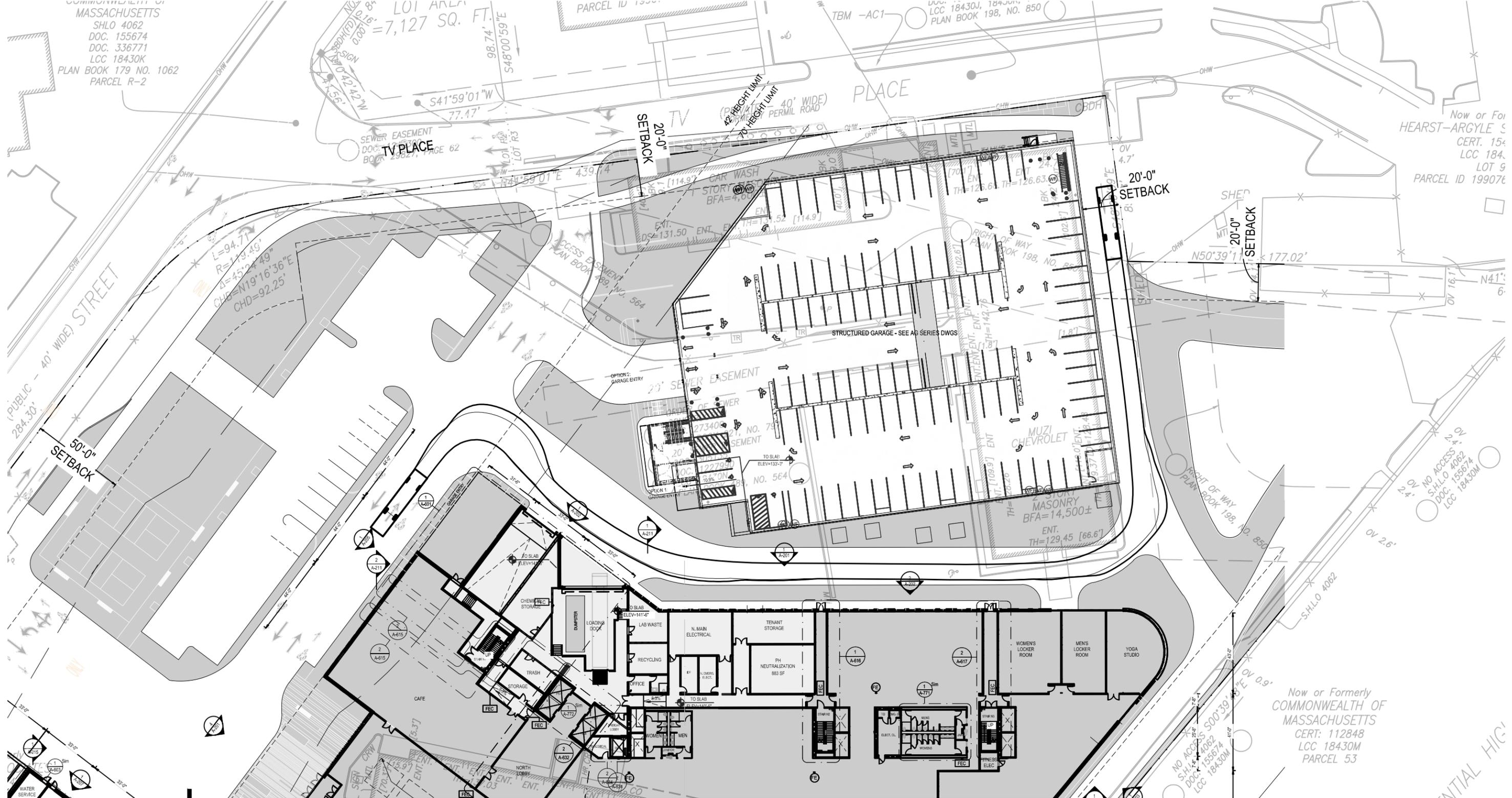


Firetruck Turn Figure 5A

557 Highland Ave
Needham, MA

Source:
Prepared for:
Date: 2021-10-26

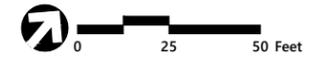


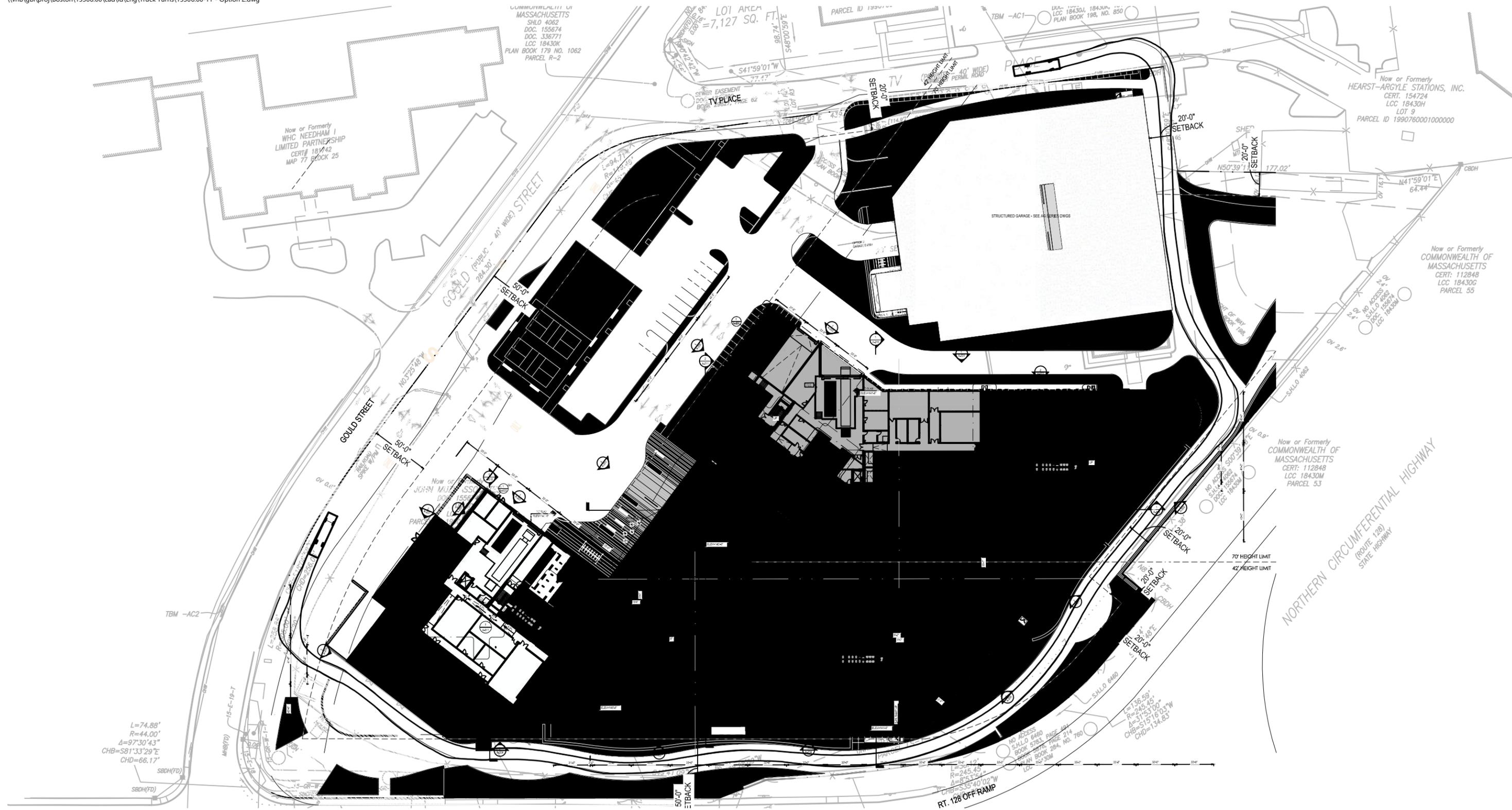


Firetruck Turn Figure 5B

557 Highland Ave Needham, MA

Source:
Prepared for:
Date: **2021-10-26**

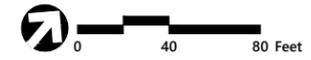




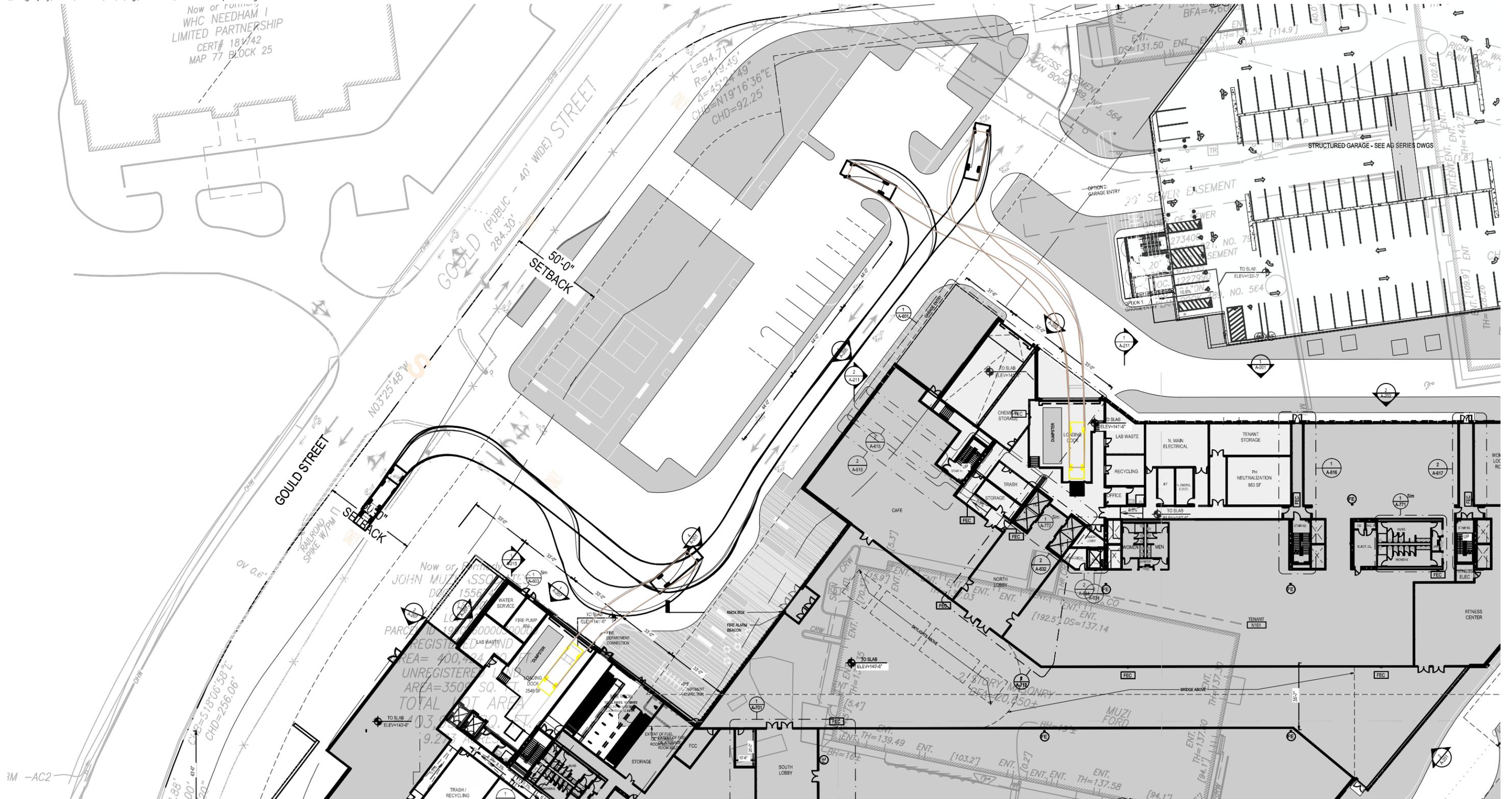
Firetruck Turn Figure 5C

557 Highland Ave Needham, MA

Source:
Prepared for:
Date: **2021-10-26**



Now or Formerly
WHC NEEDHAM I
LIMITED PARTNERSHIP
CERT# 181742
MAP 77 BLOCK 25



SU-30 Truck Turn Figure 1A

557 Highland Ave Needham, MA

Source:
Prepared for:
Date: 2021-10-26



Now or Formerly
WHC NEEDHAM I
LIMITED PARTNERSHIP
CERT# 181742
MAP 77 BLOCK 25



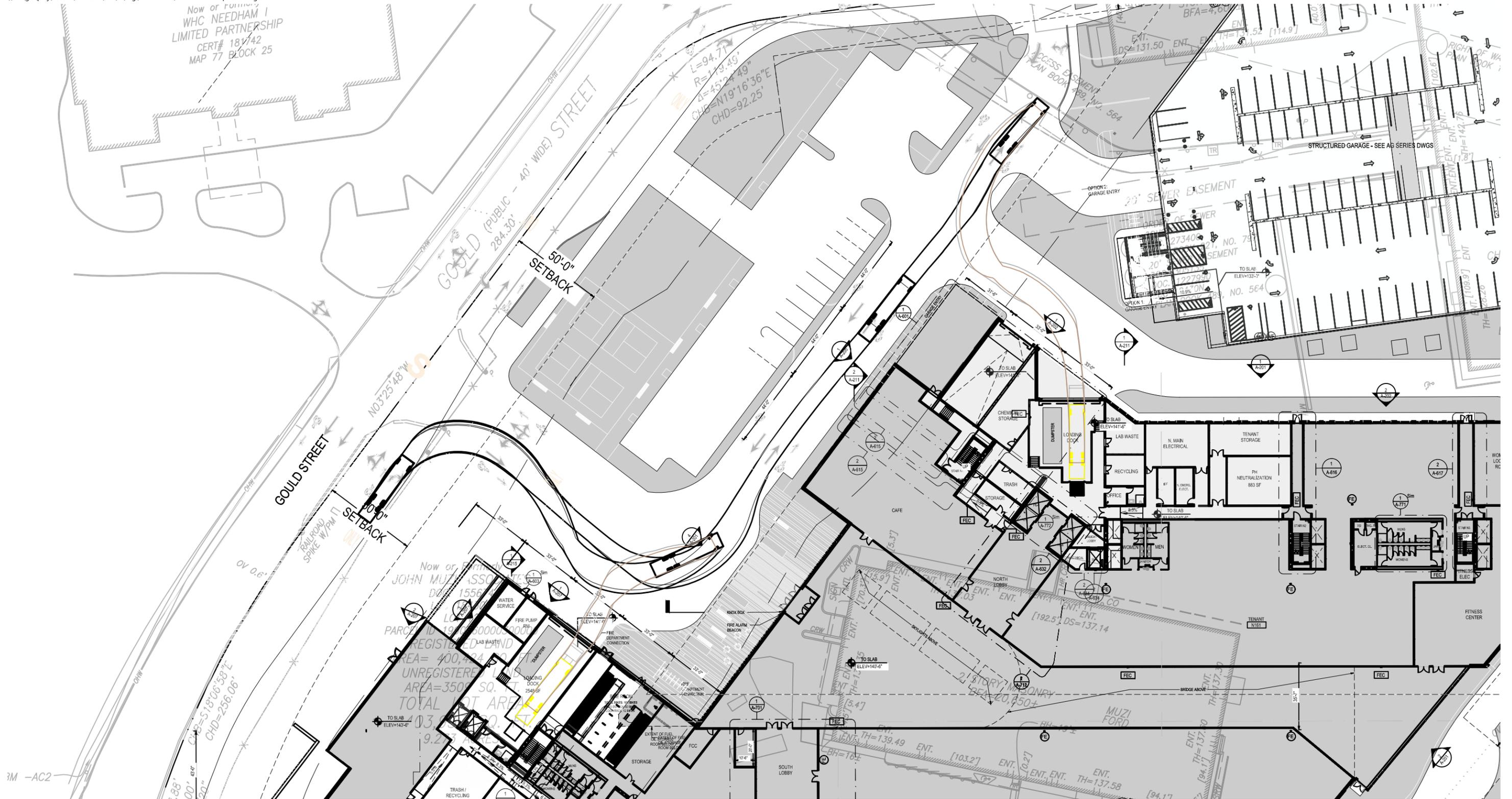
SU-30 Truck Turn Figure 1B

557 Highland Ave Needham, MA

Source:
Prepared for:
Date: 2021-10-26



Now or Formerly
WHC NEEDHAM I
LIMITED PARTNERSHIP
CERT# 181742
MAP 77 BLOCK 25



SU-40 Truck Turn Figure 2A

557 Highland Ave Needham, MA

Source:
Prepared for:
Date: 2021-10-26



Now or Formerly
WHC NEEDHAM I
LIMITED PARTNERSHIP
CERT# 181742
MAP 77 BLOCK 25



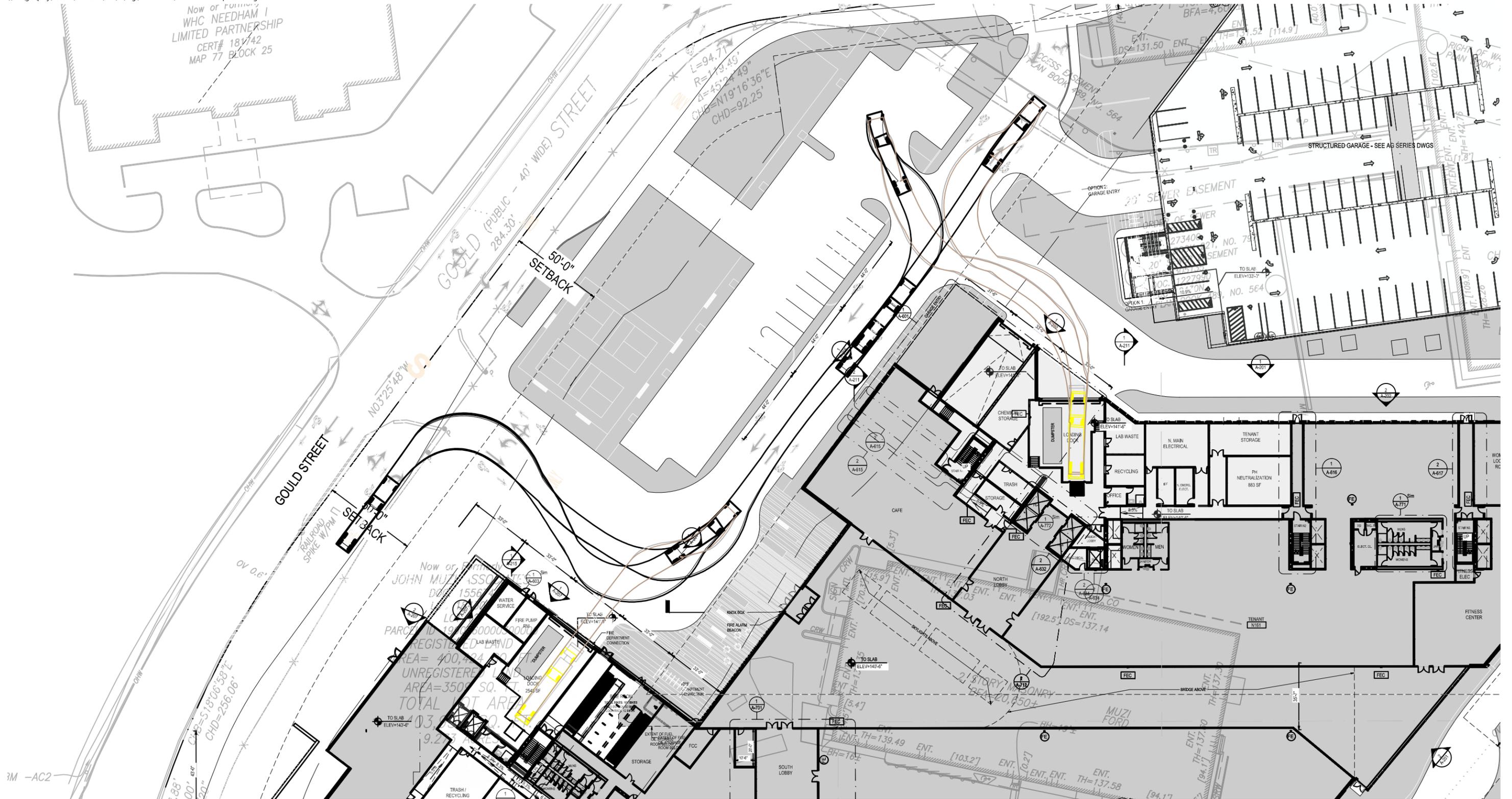
SU-40 Truck Turn Figure 2A

557 Highland Ave Needham, MA

Source:
Prepared for:
Date: 2021-10-26



Now or Formerly
WHC NEEDHAM I
LIMITED PARTNERSHIP
CERT# 181742
MAP 77 BLOCK 25



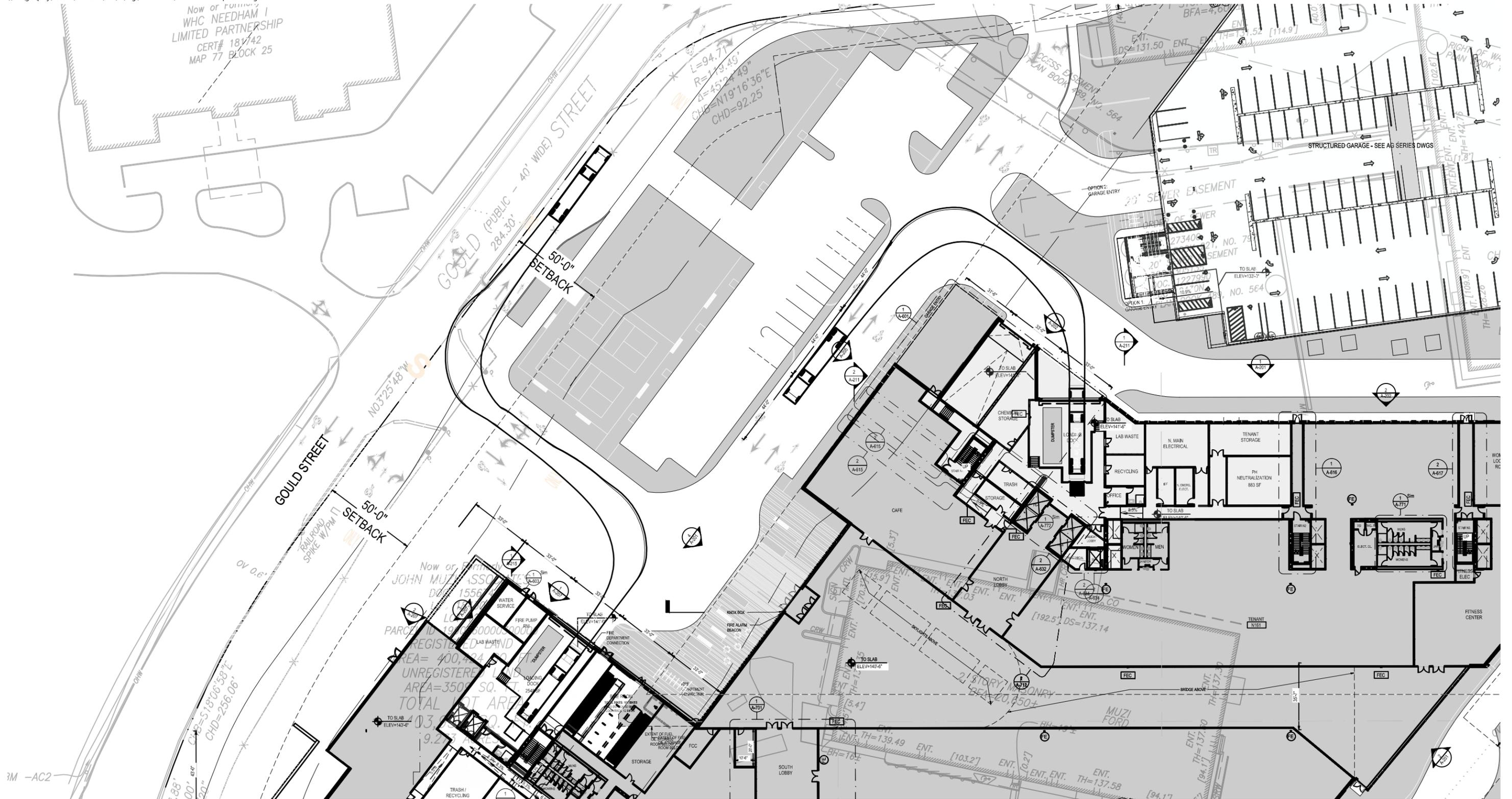
WB-40 Truck Turn Figure 3A

557 Highland Ave Needham, MA

Source:
Prepared for:
Date: 2021-10-26



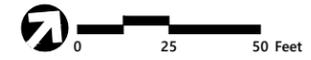
Now or Formerly
WHC NEEDHAM I
LIMITED PARTNERSHIP
CERT# 181742
MAP 77 BLOCK 25



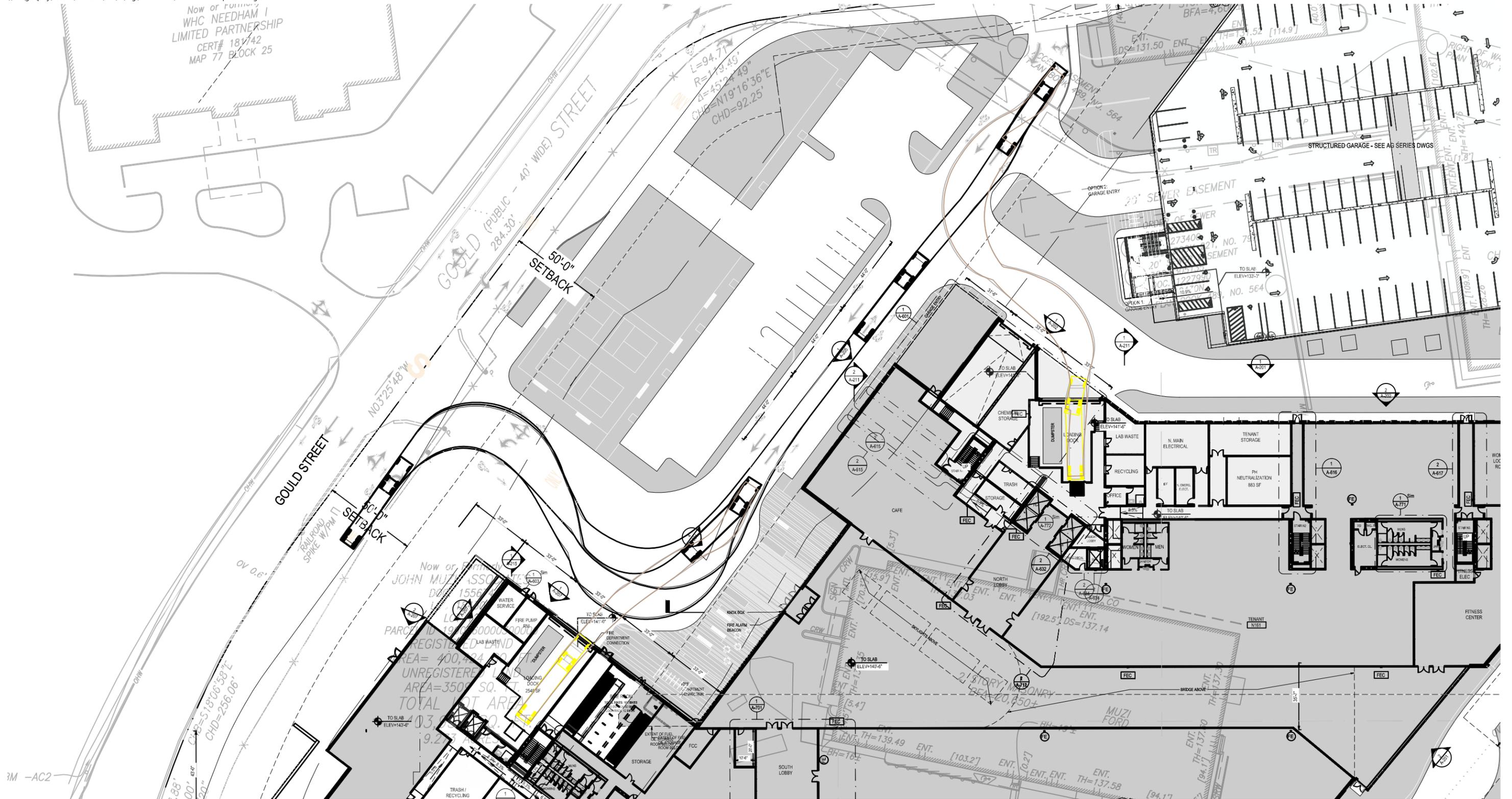
WB-40 Truck Turn Figure 3B

557 Highland Ave Needham, MA

Source:
Prepared for:
Date: 2021-10-26



Now or Formerly
WHC NEEDHAM I
LIMITED PARTNERSHIP
CERT# 181742
MAP 77 BLOCK 25



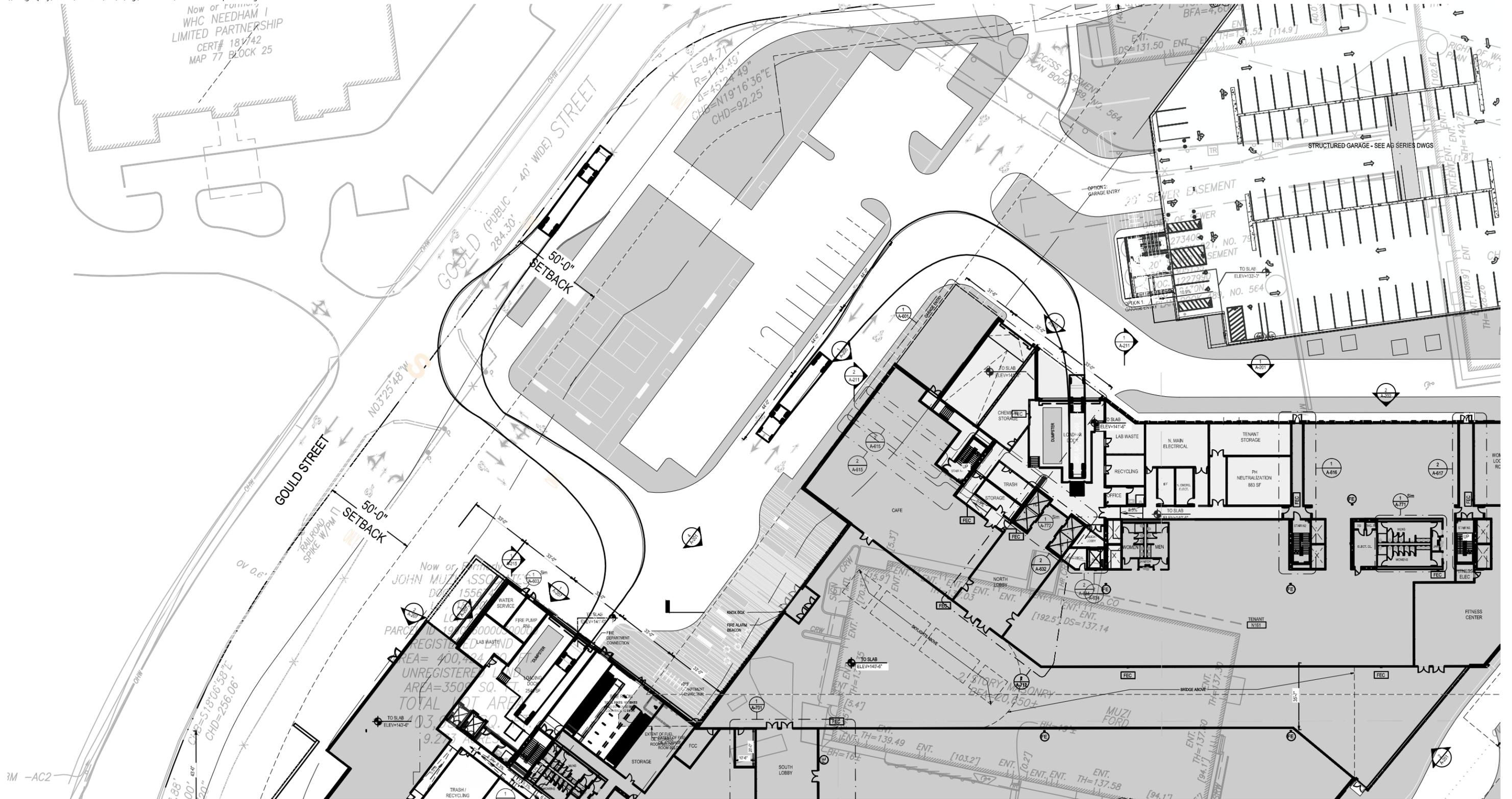
WB-50 Truck Turn Figure 4A

557 Highland Ave
Needham, MA

Source:
Prepared for:
Date: 2021-10-26



Now or Formerly
WHC NEEDHAM I
LIMITED PARTNERSHIP
CERT# 181742
MAP 77 BLOCK 25



WB-50 Truck Turn Figure 4B

557 Highland Ave
Needham, MA

Source:
Prepared for:
Date: 2021-10-26



Planning Board Members
June 30, 2022

EXHIBIT D

**RESPONSE TO NITSCH COMMENTS ON
TRANSPORTATION IMPACT AND ACCESS STUDY
(557 HIGHLAND AVENUE)**

[see attached]



To: Holly Charbonnier
Needham Heights Alliance

Date: June 29, 2022

Memorandum

Project #: 15306.00

From: Sean Manning, PE, PTOE
Matthew Duranleau, PE
Ariella Liebman, EIT

Re: Response to Transportation Impact and Access Study
Traffic Peer Review Comments dated June 9, 2022
By Nitsch Engineering
557 Highland Avenue
Needham, Massachusetts

Overview

VHB has received and reviewed the Transportation Impact and Access (TIA) study Transportation Engineering Peer Review submitted to the Needham Heights Alliance by Nitsch Engineering, dated June 9, 2022, for the proposed 557 Highland Avenue redevelopment in Needham, Massachusetts. This memorandum summarizes VHB's responses to the comments in that review. Each comment raised by the reviewer is listed below followed by the response by VHB. The comments follow the format and structure outlined in the Transportation Engineering Peer Review.

Since the submittal of the Transportation Engineering Peer Review, the Proponent has received feedback from the community and the Town of Needham on the proposed Gould Street off-site improvements, including the desire for more family-friendly bicycle accommodations and the wish to reduce the amount of new pavement added on Gould Street. Based on this feedback, new additional improvement concepts have been developed. Concept plans for the following three improvement alternatives along Gould Street are included in the Attachments to this memorandum:

- › Option 1: Previously Proposed Concept
- › Option 2: Two-Way Separated Bicycle Lanes on East Side with Reduced Gould Street Cross-Section
- › Option 3: Two-Way Separated Bicycle Lanes on West Side with Reduced Gould Street Cross-Section

The two additional improvement concept plans include dedicated sidewalk-level bicycle facilities in each direction along Gould Street between Highland Avenue and just north of TV Place. In addition, the two additional concepts eliminate the Gould Street dedicated northbound right-turn lane into TV Place and the dedicated southbound right-turn lane onto Highland Avenue based on feedback from the Town of Needham to reduce the amount of pavement. While these turn lanes were included in the initial concept design, the lanes are not required to provide an adequate level of operations for vehicles. Intersection traffic analyses for the new concepts are included in the Attachments to this memorandum.

Peer Review Comments

Existing Conditions

Study Area

1. The Applicant studied/examined 20 intersections including:

- › Central Avenue at Cedar Street
- › Central Avenue at Webster Street
- › Central Avenue at Gould Street
- › Central Avenue at Hampton Avenue
- › Central Avenue at River Park Street
- › Gould Street at Ellis Street
- › Gould Street at Kearney Road
- › Gould Street at Station Road
- › Gould Street at Noanett Road
- › Gould Street at TV Place
- › Gould Street at Muzi Ford/Wingate Residences driveways
- › Highland Avenue at West Street
- › Highland Avenue at Hunnewell Street
- › Highland Avenue at Webster Street
- › Highland Avenue at Gould Street / Hunting Road
- › Highland Avenue at I-95 SB Ramps
- › Highland Avenue at I-95 NB Ramps
- › Highland Avenue at 1st Avenue
- › Highland Avenue at 2nd Avenue
- › Kendrick Street at Hunting Road

Nitsch agrees with the selected Study Area.

[Applicant Response:](#) No response needed

Existing Traffic Data

2. Traffic volumes were collected during the weekday morning and weekday evening peak periods at each of the study area intersections. Applicant indicates that since traffic volumes may not have represented normal travel conditions due to the coronavirus (COVID-19) pandemic, they used MassDOT guidelines, and 2019 data were considered as existing traffic volumes. At locations where pre-pandemic counts were not available, new traffic counts were conducted in July 2021 and adjusted to represent "pre-pandemic" conditions based on traffic volumes at nearby intersections. ***Nitsch agrees with the Applicant's data collection methodology.***

[Applicant Response:](#) No response needed

Seasonal Adjustment

3. The Applicant utilized MassDOT's 2019 Weekday Seasonal Adjustment Factor data sheet to quantify the seasonal variation of traffic volumes in the area. **Nitsch finds the Applicant's methodology to be conservative and thereby acceptable.**

[Applicant Response:](#) No response needed

Public Transportation

4. **Nitsch finds the Applicant's discussion on public transportation in the area to be adequate.**

[Applicant Response:](#) No response needed

Pedestrian and Bike Facilities

5. **Nitsch finds the Applicant's discussion on existing pedestrian and bicycle facilities to be adequate.**

[Applicant Response:](#) No response needed

Safety Analysis

6. The Applicant examined crash data from the MassDOT Crash Database for the years of 2015 to 2019 at all study area intersections. **Nitsch finds the crash data analysis appropriate.**

[Applicant Response:](#) No response needed

Future Conditions

7. Traffic volumes in the study area were projected to the year 2029, reflecting a typical seven-year traffic-planning horizon as required by MassDOT. **Nitsch finds the Applicant's methodology to be acceptable.**

[Applicant Response:](#) No response needed

Background Growth

8. Background traffic growth was examined the historic traffic data, project-specific growth and roadway improvement projects. The Applicant determined that a growth rate of 1.0 percent to be appropriate for the study. **Nitsch finds the Applicant's methodology to be conservative and thereby acceptable.**

[Applicant Response:](#) No response needed

Build Conditions

Trip Generation

9. Projected trip generation for the proposed development was estimated using the following Land Use Codes (LUC) from the Institute of Transportation Engineers' (ITE) Trip Generation Manual, 11th Edition:

- › LUC 710 – General Office Building
- › LUC 760 – Research and Development Center
- › LUC 822 – Retail Plaza (<40,000 SF)

Nitsch finds the Applicant's trip generation estimation acceptable.

Applicant Response: No response needed

Internal Capture Trips and Mode Share

10. **Nitsch finds the Applicant's discussion and methodology for these sections to be acceptable.**

Applicant Response: No response needed

Pass-By-Trips

11. For this evaluation, the Applicant used ITE pass-by rates for LUC 821 (Shopping Plaza) for the retail trip generation and applied to existing trips on Gould Street. ITE identifies LUC 821 as a Shopping Plaza (40-150KSF). For project related trip generation, the Applicant used LUC 822-Retail Plaza (<40K SF) since the retail portion of the project consists of approximately 10,000 SF. However, for pass-by-trips they used LUC 821.

Nitsch requests the Applicant provide additional information detailing the estimated pass-by-trips for a LUC 822.

Applicant Response: The most recent edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual (11th edition, 2021) was reviewed to determine trip generation characteristics and applicable pass-by rates for the retail portion of the Site. Pass-by rates are provided for different land uses in the Appendix to the Trip Generation Manual. As the retail portion of the Site is proposed to consist of 10,000 square feet (SF) of space, the most applicable land use code (LUC) was determined to be LUC 822 (Strip Retail Plaza (<40 ksf)). However, no pass-by rates are included in the Appendix to the Trip Generation Manual for LUC 822, as data have not been provided. Instead, the pass-by rates for LUC 821 (Shopping Plaza (40-150 ksf)) were applied to the Site-generated retail trips. While the two land use codes are not identical, it is expected that the pass-by rates for LUC 822 and LUC 821 would be similar, as the two uses consist of the same types of retail establishments; the only difference between the two land use codes is the total SF of retail included in a Site. Therefore, due to a lack of specific pass-by rate data for LUC 822, the pass-by rates for LUC 821 are expected to provide an accurate estimate of the pass-by trips for the proposed retail uses on Site.

It is also important to note that pass-by trips are only applicable to the retail portion of the Project. Retail constitutes only a very small portion of the total Project (approximately 10,000 SF, or roughly 2 percent of the Project). The retail pass-by trips total only 4 trips during the weekday morning peak hour and 30 trips during

the evening peak hour. Exclusion of these trips from the project trip generation would have no measurable impact on the findings of the TIA or the level of transportation improvements and mitigation that is being proposed.

Project-generated Trips

12. As stated by the Applicant in the report, the pass-by-trips include trips for the retail uses already traveling on the roadway network under Existing Conditions. However, these trips still enter and exit the project site. They should only be adjusted for adjacent roadways, but not for entering and exiting the project site. **Nitsch requests the Applicant provide update Table 5, as well as Figures 11 through 14. Also, the capacity analysis for Build Condition may need to be revised.**

Applicant Response: VHB agrees that pass-by trips still enter and exit the Project Site and should only be adjusted for adjacent roadways. Table 5 in the TIA provides a summary of the total Project-generated trips and includes both the total number of vehicles expected to enter and exit the Project Site as well as the total net new trips added to the roadway network. The "Adjusted Vehicle Trips – Total" column in Table 5 presents the number of total trips to enter and exit the Project Site and the "Total Net New Vehicle Trips" column in Table 5 presents the new trips added to the roadway, which does not include the pass-by trips or the existing trips already on the roadway that were generated by the previous uses on-Site.

Figures 11 and 12 presented in the TIA only showed the total net new vehicle trips and did not include the pass-by trips that will enter and exit the Project Site. These figures have been updated to also illustrate the pass-by trips and are included in the Attachments to this memorandum.

Figures 13 and 14 presented in the TIA illustrate the 2029 Build Conditions peak hour traffic volumes. The traffic volumes include all Project-generated trips entering and exiting the Project Site, including existing trips generated by the previous uses and the pass-by trips. The intersection capacity analyses for the Build Condition are based on the traffic volumes presented in Figure 13 and 14 and include the pass-by trips. Therefore, the intersection capacity analyses for the Build Condition do not need to be revised, as they already include the pass-by trips entering and exiting the Project Site.

Comparison to Previous Zoning Traffic Study

13. The Applicant provides a comparison of the trip generation presented in the GPI's 2020 traffic study with the trip generation for the proposed development. **Nitsch requests the Applicant provide clarification for providing this comparison and how it impacts the analysis.**

Applicant Response: The comparison of the proposed Project-generated trips to the site-generated trips in the 2020 GPI traffic study was included for comparison purposes only. No analyses were conducted based on the comparison to the site-generated trips in the 2020 GPI traffic study.

The 2020 traffic study was conducted to support the rezoning of the Site and the trip generation presented in the study was based on the maximum build-out of the Site and the adjacent Channel 5 property based on the new zoning guidelines. The purpose of including the comparison in the TIA was to simply illustrate that the proposed Project will generate significantly fewer trips than what was estimated in the 2020 traffic study to

support the rezoning of the Site. However, the proposed mitigation for the Project along Gould Street mirrors what was proposed by GPI in the 2020 traffic study. The Proponent is committed to providing the full set of proposed improvements along Gould Street plus additional significant bicycle accommodations, even though the Site will generate fewer trips than anticipated when the concept was presented in the 2020 traffic study.

Project Trip Distribution

14. Projected vehicle trips generated to the site were distributed to the study area network based on Journey-to-Work data for the Town of Needham with the 2010 U.S. Census data. **Nitsch finds the Applicant's trip distribution estimation acceptable.**

Applicant Response: No response needed

Transportation Operations Analysis

15. The Applicant examined Existing and projected No-Build and Build traffic conditions for both weekday morning and weekday evening peak hours at the 20 study area intersections. The Applicant also analyzed the interchange of Highland Avenue at I-95 (Ramp) using methodology for merge, diverge, and weaving conflicts. **Nitsch finds the Applicant's methodology to be acceptable.**

Applicant Response: No response needed

Signal Warrant Analysis

16. To determine the feasibility of potential mitigation measures, signal warrant analyses were conducted at two intersections: Central Avenue at Gould Street and Gould Street at the Project Site driveway / Wingate Driveway. Based on the analysis, both intersections meet the three-traffic volume-based warrants (Warrant 1-8-Hour, Warrant 2 4-Hour and Warrant 3 Peak Hour). **Nitsch finds the Applicant's analysis to be acceptable.**

Applicant Response: No response needed

Transportation Mitigation

17. As mitigation measures the Applicant proposes to add on-road bicycle accommodations along Gould Street to create a new north-south bicycle network within this area of Needham and connect Mills Field and the commercial and residential uses on Gould Street with the under-construction bicycle accommodations along Highland Avenue and the existing bicycle lanes in each direction on Hunting Road that include the following:

- › Bicycle accommodations consisting of on-road bicycle lanes in each direction for approximately 900 feet between Highland Avenue and the former MBTA railroad ROW just north of TV Place.
- › Between the former MBTA railroad ROW and Central Avenue, a distance of approximately ½ mile, the Proponent will fund the installation of shared lane pavement markings and signage in each direction.
- › Coordinate with the Town of Needham to fund a study evaluating the feasibility of converting the former railroad ROW into a shared-use path between the Charles River and the commuter rail at Needham Heights.
- › A crosswalk at the location of the future shared-use path.

On-road and shared bicycle lanes are intended for commuter, intermediate and experienced cyclists and primarily assist in promoting alternative means of travel for the development. They are not recommended for leisure use and do not provide sufficient accommodations for residents, including children, to access the new rail-trail and Mills Field Playground. **Nitsch feels it's pertinent for the Applicant to provide wider sidewalks and separated (buffered) bike lanes for leisure bicyclists from Highland Avenue to Ellis Street (Mills Field Playground) for a safe means of community connectivity for all users, especially for children.**

Applicant Response: As presented in the TIA, the Proponent is proposing significant pedestrian and bicycle improvements along Gould Street. Based on feedback received in neighborhood community meetings and from the Town of Needham since the submittal of the TIA, the Proponent is now in the process of revising those preliminary pedestrian and bicycle improvements to provide a higher level of accommodations, including separated bicycle facilities. The currently proposed Gould Street pedestrian and bicycle accommodation improvements are as follows:

- › Sidewalk-level separated bicycle facilities in both directions on Gould Street between Highland Avenue and just north of TV Place
- › Shared lane pavement markings and signage in each direction for bicyclists along Gould Street for approximately ½ mile between just north of TV Place and Central Avenue
- › Sidewalk improvements along the west side of Gould Street between Highland Avenue and Noanett Road.
- › A new pedestrian facility on the east side of Gould Street along the Site frontage between Highland Avenue and just north of TV Place
- › A new crosswalk across Gould Street at the location of the abandoned railroad right-of-way with either an LED Warning sign or a rapid rectangular flashing beacon (RRFB) to alert drivers.

The Gould Street pedestrian and bicycle accommodations will tie into the Highland Avenue accommodations that are currently under construction by MassDOT as well as a potential future shared-use path along the former MBTA railroad right-of-way north of the Site. The Proponent will work with the Town of Needham to support additional funding for a study of the feasibility of converting the former MBTA railroad right-of-way north of the Project Site and the Channel 5 property into a shared use path that would connect with Needham Heights to the south.

As noted above, the Proponent will fund the design and construction of approximately 800 feet of sidewalk-level separated bicycle facilities in both directions on Gould Street between Highland Avenue and just north of TV Place. The Proponent reviewed the feasibility of providing separated bicycle facilities on Gould Street between TV Place and Central Avenue, extending past Mills Field. However, dedicated bicycle facilities cannot

be added within the existing width of the Gould Street cross-section, as the right-of-way is too narrow. Any expansion of the right-of-way north of TV Place would require significant impact to adjacent properties along Gould Street, which the Proponent does not control. Based on coordination with the Town of Needham, the Proponent is proposing the installation of shared lane pavement markings and signage for the segments of Gould Street that are beyond the control of the Proponent.

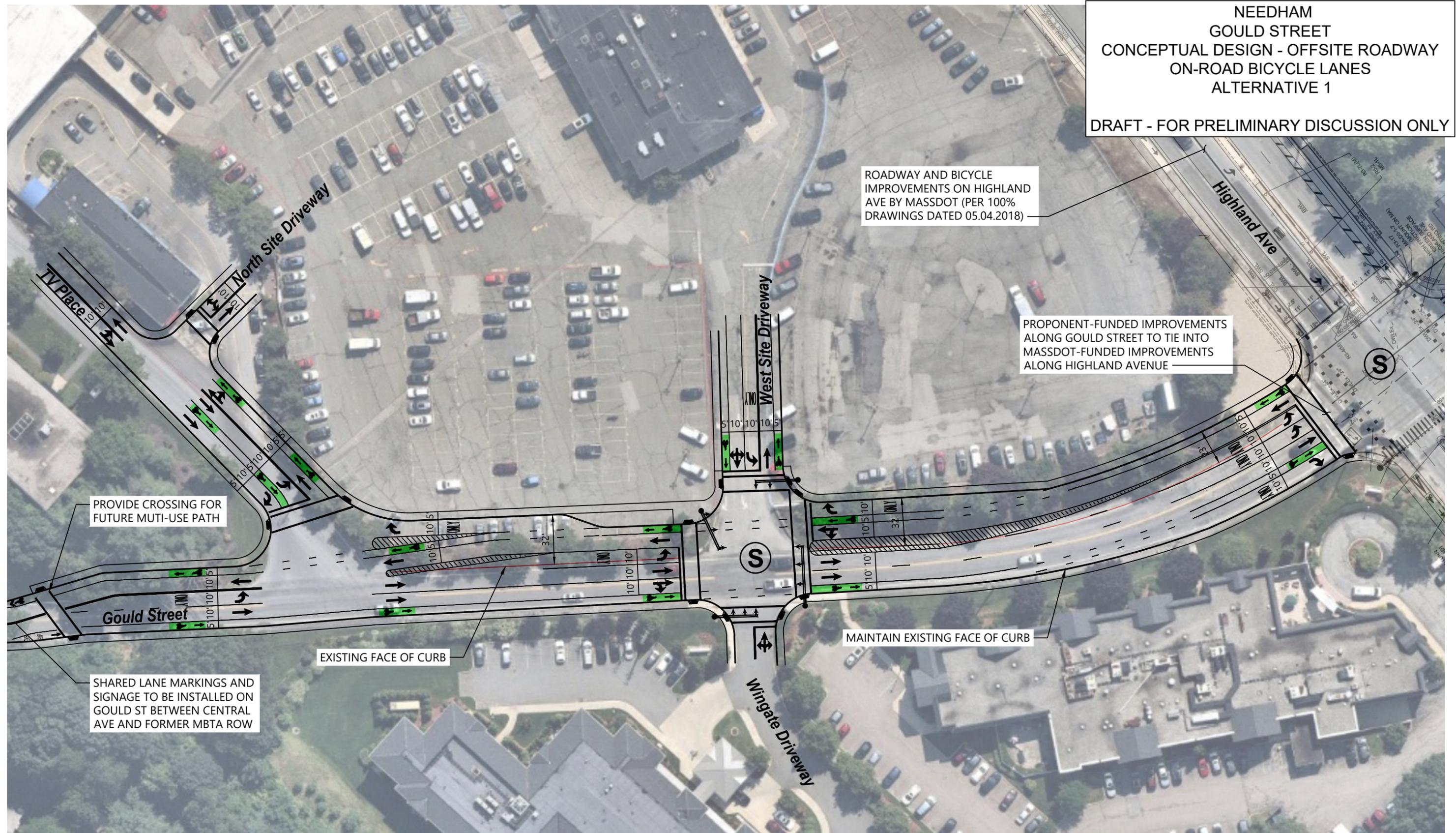
Attachments

- › Revised Off-Site Roadway Mitigation
 - Concept Plans
 - Intersection Capacity Analyses
- › Revised Site-Generated Peak Hour Traffic Volume Networks

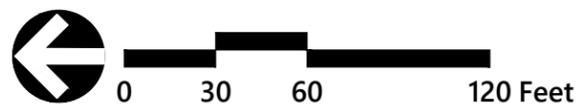
Revised Off-Site Roadway Mitigation

Concept Plans

NEEDHAM
 GOULD STREET
 CONCEPTUAL DESIGN - OFFSITE ROADWAY
 ON-ROAD BICYCLE LANES
 ALTERNATIVE 1
 DRAFT - FOR PRELIMINARY DISCUSSION ONLY



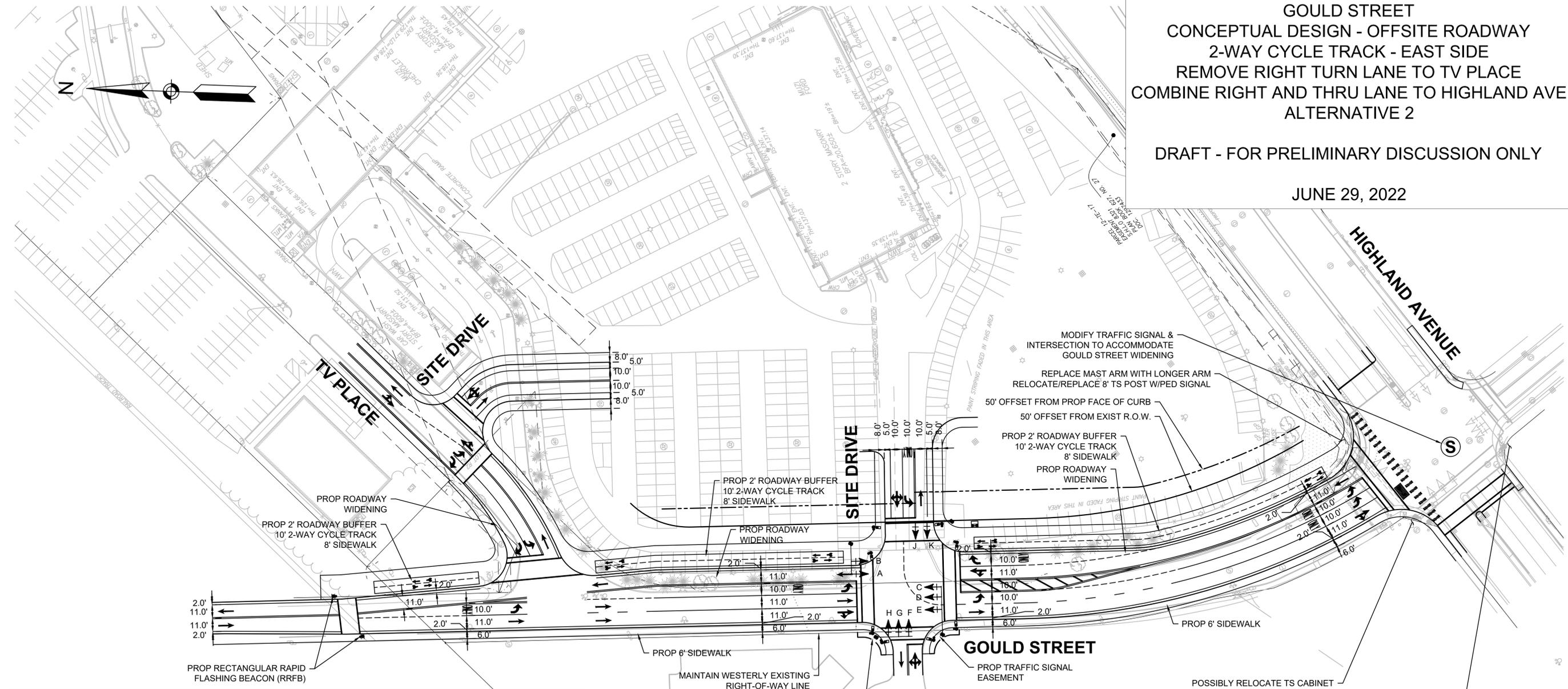
NOT FOR CONSTRUCTION



NEEDHAM
GOULD STREET
CONCEPTUAL DESIGN - OFFSITE ROADWAY
2-WAY CYCLE TRACK - EAST SIDE
REMOVE RIGHT TURN LANE TO TV PLACE
COMBINE RIGHT AND THRU LANE TO HIGHLAND AVE
ALTERNATIVE 2

DRAFT - FOR PRELIMINARY DISCUSSION ONLY

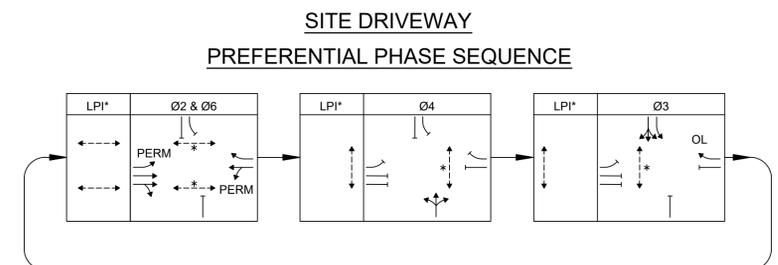
JUNE 29, 2022



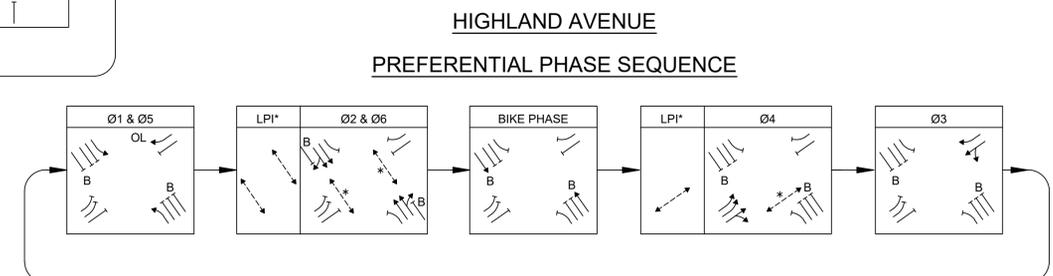
SIGNAL HEAD DATA

A,D,E,H,K	B	C	F	G,J	ALL
ALL 12" LENS					

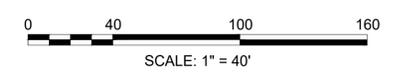
- NOTES:**
- ALL SIGNAL HEADS SHALL BE RIGID MOUNTED.
 - ALL SIGNAL HEADS SHALL BE EQUIPPED WITH 5"± NON- LOUVERED BACKPLATES. ALL BACKPLATES SHALL CONTAIN A 3" WIDE YELLOW REFLECTIVE BORDER.
 - ALL SIGNAL HEADS SHALL BE EQUIPPED WITH TUNNEL VISORS.
 - ALL SIGNAL DISPLAYS SHALL BE EQUIPPED WITH L.E.D. MODULES.



* NORMALLY DW, W/FDW UPON PEDESTRIAN PUSH BUTTON ACTUATION
 PERM = PERMISSIVE
 LPI = LEADING PEDESTRIAN INTERVAL



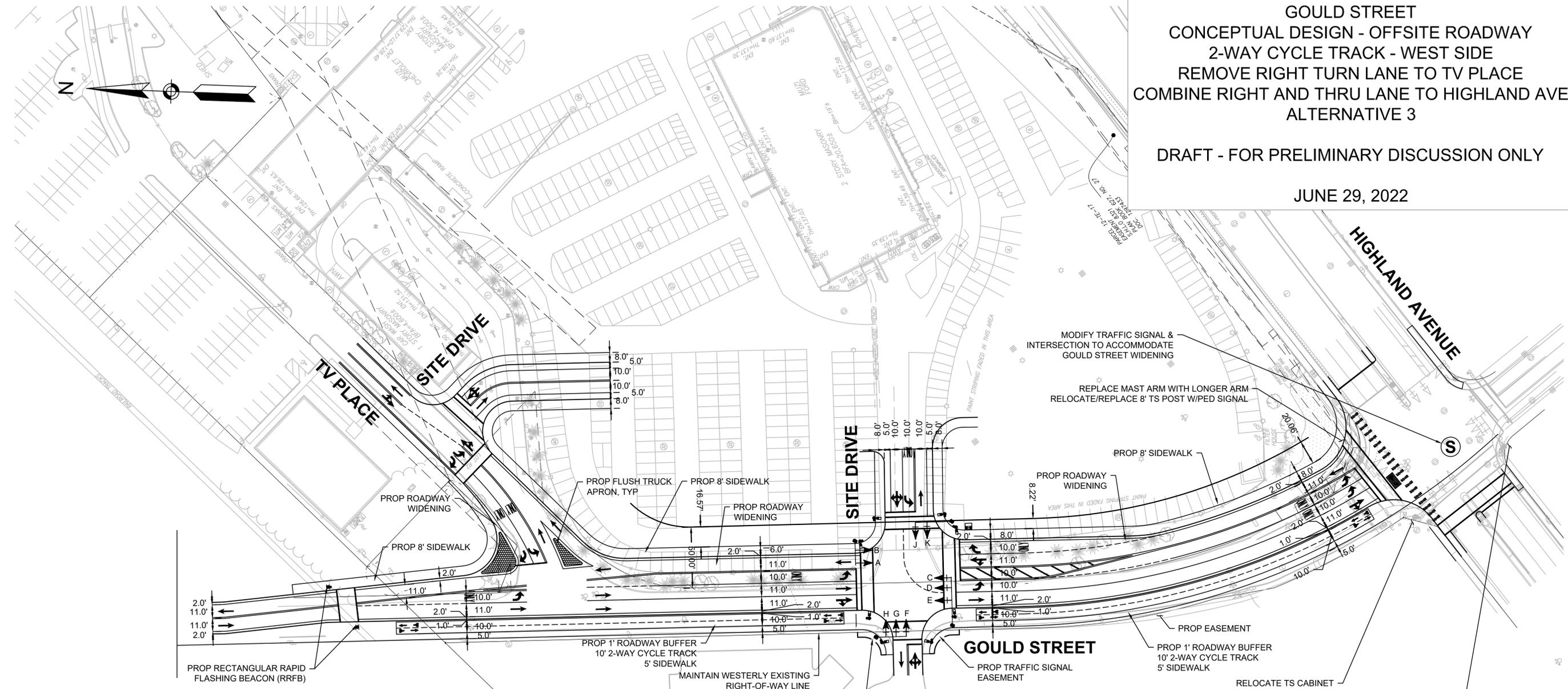
* NORMALLY DW, W/FDW UPON PEDESTRIAN PUSH BUTTON ACTUATION
 OL = OVERLAP
 LPI = LEADING PEDESTRIAN INTERVAL
 B = HIGHLAND AVENUE SEPARATED BIKE LANE



NEEDHAM
GOULD STREET
CONCEPTUAL DESIGN - OFFSITE ROADWAY
2-WAY CYCLE TRACK - WEST SIDE
REMOVE RIGHT TURN LANE TO TV PLACE
COMBINE RIGHT AND THRU LANE TO HIGHLAND AVE
ALTERNATIVE 3

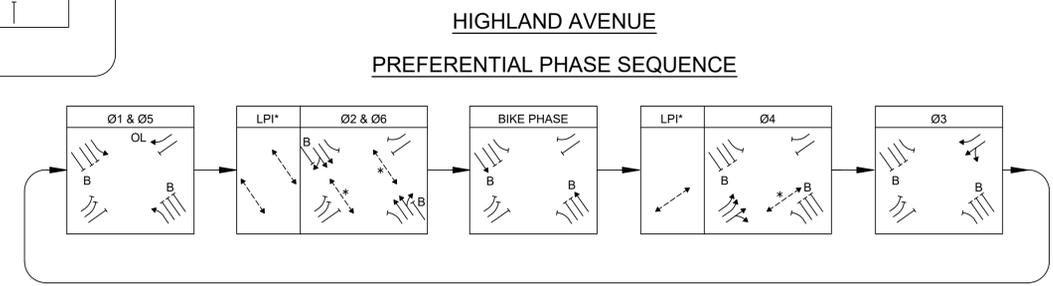
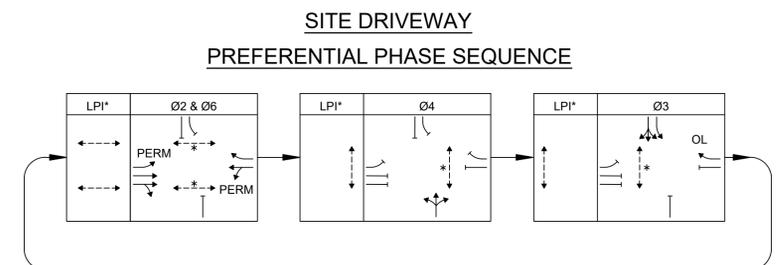
DRAFT - FOR PRELIMINARY DISCUSSION ONLY

JUNE 29, 2022



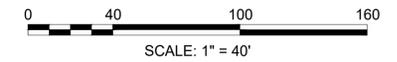
SIGNAL HEAD DATA

A,D,E,H,K	B	C	F	G,J	ALL
ALL 12" LENS					



- NOTES:**
- ALL SIGNAL HEADS SHALL BE RIGID MOUNTED.
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* NORMALLY DW, W/FDW UPON PEDESTRIAN PUSH BUTTON ACTUATION
 OL = OVERLAP
 LPI = LEADING PEDESTRIAN INTERVAL
 B = HIGHLAND AVENUE SEPARATED BIKE LANE



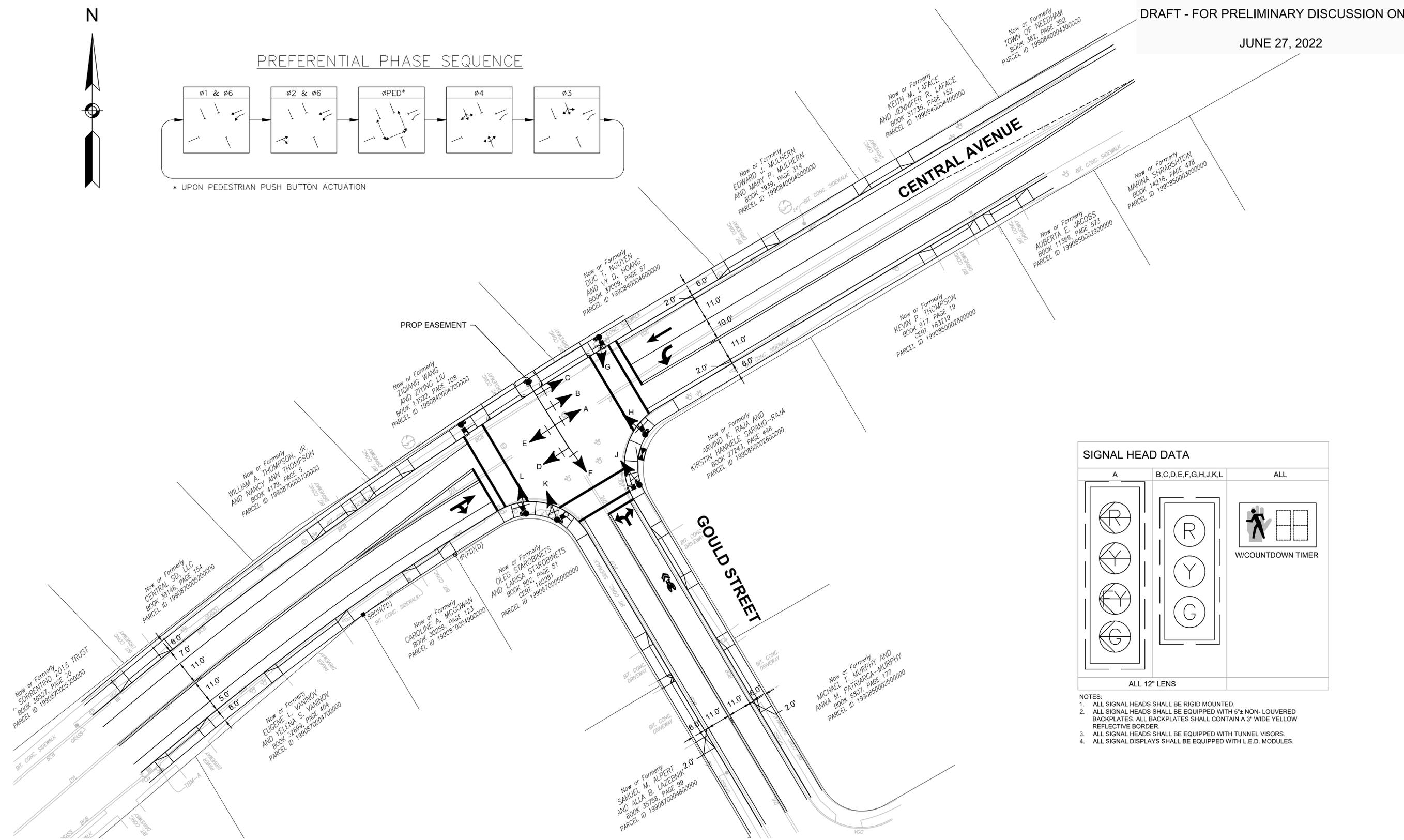
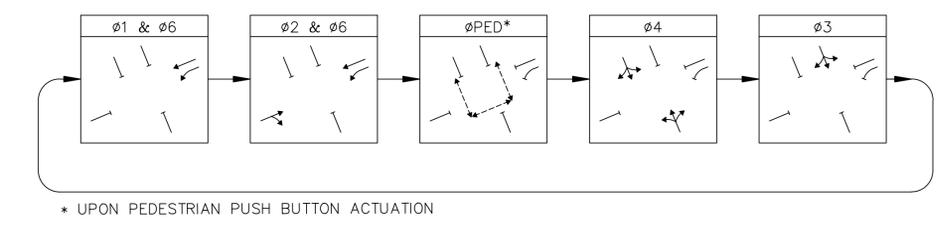
NEEDHAM
GOULD STREET @ CENTRAL AVENUE
CONCEPTUAL LAYOUT

DRAFT - FOR PRELIMINARY DISCUSSION ONLY

JUNE 27, 2022



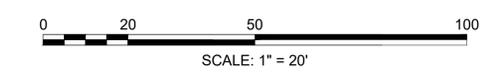
PREFERENTIAL PHASE SEQUENCE



SIGNAL HEAD DATA

A	B,C,D,E,F,G,H,J,K,L	ALL
ALL 12" LENS		

- NOTES:
1. ALL SIGNAL HEADS SHALL BE RIGID MOUNTED.
 2. ALL SIGNAL HEADS SHALL BE EQUIPPED WITH 5"± NON- LOUVERED BACKPLATES. ALL BACKPLATES SHALL CONTAIN A 3" WIDE YELLOW REFLECTIVE BORDER.
 3. ALL SIGNAL HEADS SHALL BE EQUIPPED WITH TUNNEL VISORS.
 4. ALL SIGNAL DISPLAYS SHALL BE EQUIPPED WITH L.E.D. MODULES.



Revised Off-Site Roadway Mitigation
Intersection Capacity Analyses

Table A Signalized Intersection Capacity Analysis Summary – Revised Gould Street Concepts

Location / Movement	2029 No-Build Condition					2029 Build without Mitigation					2029 Build with Mitigation				
	v/c ^a	Del ^b	LOS ^c	50 Q ^d	95 Q ^e	v/c	Del	LOS	50 Q	95 Q	v/c	Del	LOS	50 Q	95 Q
Highland Avenue at Gould Street and Hunting Road															
<i>Weekday Morning</i>															
Highland Ave EB L	1.04	>120	F	~93	#234	>1.20	>120	F	~190	#353	0.96	115.7	F	153	#330
Highland Ave EB T/R	0.86	40.2	D	364	#512	0.79	36.6	D	364	#512	0.66	30.2	C	363	503
Highland Ave WB L	0.58	58.6	E	36	83	0.61	65.3	E	38	83	0.42	61.4	E	42	83
Highland Ave WB T/R	0.94	52.1	D	362	#545	1.15	117.8	F	~616	#841	0.97	54.3	D	587	#797
Hunting Rd NB L/T	0.96	89.0	F	206	#434	1.13	>120	F	~263	#480	0.96	96.8	F	265	#433
Hunting Rd NB R	0.48	39.8	D	48	102	0.51	44.0	D	52	102	0.53	46.1	D	93	136
Gould St SB L	0.82	64.8	E	145	#281	0.91	84.5	F	182	#347	0.70	71.7	E	136	180
Gould St SB L/T/R	0.78	59.4	E	137	#264	0.88	77.3	E	175	#335	0.57	72.7	E	107	166
Overall	0.98	55.1	E	-	-	1.20	100.2	F	-	-	0.95	55.5	E	-	-
<i>Weekday Evening</i>															
Highland Ave EB L	>1.20	>120	F	19	57	>1.20	>120	F	27	72	0.60	58.2	E	24	57
Highland Ave EB T/R	0.81	42.3	D	287	440	0.81	42.4	D	290	442	0.74	32.8	C	252	#373
Highland Ave WB L	0.86	83.3	F	100	194	0.87	84.5	F	101	196	0.78	61.6	E	89	#182
Highland Ave WB T/R	1.00	61.7	E	~535	#774	1.07	84.0	F	~599	#861	1.02	61.3	E	~527	#702
Hunting Rd NB L/T	0.56	51.4	D	66	127	0.58	52.2	D	70	134	0.73	61.0	E	65	#126
Hunting Rd NB R	0.10	35.7	D	4	24	0.10	35.7	D	4	24	0.07	34.2	C	0	5
Gould St SB L	0.91	61.1	E	295	#574	>1.20	>120	F	~681	#1051	0.97	61.6	E	310	#376
Gould St SB L/T/R	0.88	56.9	E	284	#554	>1.20	>120	F	~653	#1022	0.76	45.5	D	228	#239
Overall	1.03	59.5	E	-	-	>1.20	>120	F	-	-	1.05	52.9	D	-	-
Gould Street at Wingate Driveway / Project Site Driveway															
<i>Weekday Morning</i>															
Wingate Dwy EB L/T/R											0.01	61.9	E	0	0
Site Dwy WB L											0.50	65.0	E	46	90
Site Dwy WB L/T/R											0.29	62.1	E	25	68
Gould St NB L/T	<i>Intersection unsignalized under 2029 No Build Conditions without Mitigation</i>					<i>Intersection unsignalized under 2029 Build Conditions without Mitigation</i>					0.57	5.0	A	153	m273
Gould St NB R											0.31	4.0	A	22	m78
Gould St SB L											0.08	3.1	A	3	24
Gould St SB T/R											0.15	3.0	A	20	88
Overall											0.54	7.8	A		
<i>Weekday Evening</i>															
Wingate Dwy EB L/T/R											0.03	43.4	D	0	12
Site Dwy WB L											0.75	44.2	D	174	187
Site Dwy WB L/T/R											0.70	41.6	D	163	176
Gould St NB L/T	<i>Intersection unsignalized under 2029 No Build Conditions without Mitigation</i>					<i>Intersection unsignalized under 2029 Build Conditions without Mitigation</i>					0.31	10.7	B	56	m252
Gould St NB R											0.07	13.2	B	1	m30
Gould St SB L											0.03	8.8	A	4	21
Gould St SB T/R											0.37	11.4	B	124	270
Overall											0.44	21.8	C		

- a Volume to capacity ratio.
- b Average total delay, in seconds per vehicle.
- c Level-of-service.
- d 50th percentile queue, in feet.
- e 95th percentile queue, in feet.
- # 95th percentile volume exceeds capacity, queue may be longer.
- m Volume for 95th percentile queue is metered by upstream signal.

Note: Elimination of Gould Street northbound right-turn lane onto TV Place does not impact operations as northbound approach is under free-flow conditions.

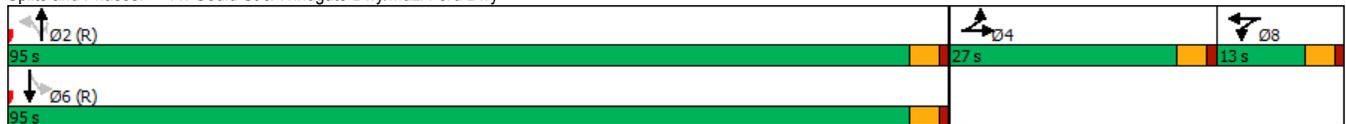
Intersection						
Int Delay, s/veh	2.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔		↔	↔
Traffic Vol, veh/h	25	20	635	135	85	355
Future Vol, veh/h	25	20	635	135	85	355
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	60	60	95	95	91	91
Heavy Vehicles, %	0	0	2	2	0	3
Mvmt Flow	42	33	668	142	93	390
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1315	739	0	0	810	0
Stage 1	739	-	-	-	-	-
Stage 2	576	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	176	421	-	-	825	-
Stage 1	476	-	-	-	-	-
Stage 2	566	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	156	421	-	-	825	-
Mov Cap-2 Maneuver	156	-	-	-	-	-
Stage 1	476	-	-	-	-	-
Stage 2	502	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	26.5	0	1.9			
HCM LOS	D					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	156	421	825	-
HCM Lane V/C Ratio	-	-	0.267	0.079	0.113	-
HCM Control Delay (s)	-	-	36.3	14.3	9.9	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	1	0.3	0.4	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕	↕	↕	↕	
Traffic Volume (vph)	1	0	5	70	1	20	15	750	385	30	350	2
Future Volume (vph)	1	0	5	70	1	20	15	750	385	30	350	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	13	13	12	12	12	12	12	12
Storage Length (ft)	0	0	0	0	0	0	0	100	150	0	0	0
Storage Lanes	0	0	1	0	0	0	0	1	1	0	0	0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		151			225			398			315	
Travel Time (s)		3.4			5.1			9.0			7.2	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.63	0.63	0.63	0.90	0.90	0.90	0.90	0.90	0.90	0.83	0.83	0.83
Shared Lane Traffic (%)				34%								
Lane Group Flow (vph)	0	10	0	51	50	0	0	850	428	36	424	0
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Detector Phase	4	4		8	8		2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.0	27.0		11.0	11.0		15.0	15.0	15.0	23.0	23.0	
Total Split (s)	27.0	27.0		13.0	13.0		95.0	95.0	95.0	95.0	95.0	
Total Split (%)	20.0%	20.0%		9.6%	9.6%		70.4%	70.4%	70.4%	70.4%	70.4%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min	C-Min	C-Min	C-Min	
v/c Ratio		0.07		0.43	0.36			0.55	0.32	0.08	0.14	
Control Delay		0.8		70.6	44.5			7.1	3.2	5.8	4.0	
Queue Delay		0.0		0.0	0.0			4.5	1.2	0.0	0.0	
Total Delay		0.8		70.6	44.5			11.6	4.5	5.8	4.0	
Queue Length 50th (ft)		0		46	25			153	22	3	20	
Queue Length 95th (ft)		0		90	68			m273	m78	24	88	
Internal Link Dist (ft)		71			145			318			235	
Turn Bay Length (ft)									100	150		
Base Capacity (vph)		313		128	147			1550	1339	447	2978	
Starvation Cap Reductn		0		0	0			611	669	0	0	
Spillback Cap Reductn		0		0	0			0	0	0	0	
Storage Cap Reductn		0		0	0			0	0	0	0	
Reduced v/c Ratio		0.03		0.40	0.34			0.91	0.64	0.08	0.14	

Intersection Summary

Area Type: Other
 Cycle Length: 135
 Actuated Cycle Length: 135
 Offset: 15 (11%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 80
 Control Type: Actuated-Coordinated
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Gould St & Windgate Dwy/Muzi Ford Dwy





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕	↕	↕	↕	
Traffic Volume (vph)	1	0	5	70	1	20	15	750	385	30	350	2
Future Volume (vph)	1	0	5	70	1	20	15	750	385	30	350	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13	12	12	12	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95			1.00	1.00	1.00	0.95	
Frb, ped/bikes		1.00		1.00	1.00			1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt		0.89		1.00	0.93			1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	0.97			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1645		1681	1663			1861	1551	1770	3537	
Flt Permitted		0.99		0.95	0.97			0.99	1.00	0.29	1.00	
Satd. Flow (perm)		1645		1681	1663			1841	1551	531	3537	
Peak-hour factor, PHF	0.63	0.63	0.63	0.90	0.90	0.90	0.90	0.90	0.90	0.83	0.83	0.83
Adj. Flow (vph)	2	0	8	78	1	22	17	833	428	36	422	2
RTOR Reduction (vph)	0	10	0	0	21	0	0	0	40	0	0	0
Lane Group Flow (vph)	0	0	0	51	29	0	0	850	388	36	424	0
Conf. Bikes (#/hr)									1			
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		5.8		8.3	8.3			108.9	108.9	108.9	108.9	
Effective Green, g (s)		5.8		8.3	8.3			108.9	108.9	108.9	108.9	
Actuated g/C Ratio		0.04		0.06	0.06			0.81	0.81	0.81	0.81	
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		70		103	102			1485	1251	428	2853	
v/s Ratio Prot		c0.00		c0.03	0.02						0.12	
v/s Ratio Perm								c0.46	0.25	0.07		
v/c Ratio		0.01		0.50	0.29			0.57	0.31	0.08	0.15	
Uniform Delay, d1		61.8		61.3	60.5			4.7	3.4	2.7	2.9	
Progression Factor		1.00		1.00	1.00			0.98	1.14	1.00	1.00	
Incremental Delay, d2		0.0		3.7	1.6			0.4	0.2	0.4	0.1	
Delay (s)		61.9		65.0	62.1			5.0	4.0	3.1	3.0	
Level of Service		E		E	E			A	A	A	A	
Approach Delay (s)		61.9			63.6			4.7			3.0	
Approach LOS		E			E			A			A	
Intersection Summary												
HCM 2000 Control Delay			7.8			HCM 2000 Level of Service				A		
HCM 2000 Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			135.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			67.0%			ICU Level of Service				C		
Analysis Period (min)			15									

c Critical Lane Group



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9	Ø10	Ø11
Lane Configurations															
Traffic Volume (vph)	150	890	15	45	605	760	25	240	240	290	90	45			
Future Volume (vph)	150	890	15	45	605	760	25	240	240	290	90	45			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Storage Length (ft)	175		0	165		400	0		150	200		200			
Storage Lanes	1		0	1		0	0		1	1		0			
Taper Length (ft)	25			25			25			25					
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		30			30			30			30				
Link Distance (ft)		345			745			3028			398				
Travel Time (s)		7.8			16.9			68.8			9.0				
Confl. Peds. (#/hr)	1		1	1		1									
Confl. Bikes (#/hr)									1						
Peak Hour Factor	0.87	0.87	0.87	0.92	0.92	0.92	0.88	0.88	0.88	0.94	0.94	0.94			
Heavy Vehicles (%)	3%	2%	0%	0%	5%	1%	0%	1%	0%	3%	2%	0%			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	172	1040	0	49	1484	0	0	301	273	309	144	0			
Turn Type	Prot	NA		Prot	NA		Split	NA	pm+ov	Split	NA				
Protected Phases	1	6		5	2		3	3	5	4	4		9	10	11
Permitted Phases									3						
Detector Phase	1	6		5	2		3	3	5	4	4				
Switch Phase															
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0	6.0	6.0	6.0		1.0	1.0	1.0
Minimum Split (s)	12.0	20.0		12.0	25.0		12.0	12.0	12.0	29.5	29.5		3.0	3.0	3.0
Total Split (s)	16.0	50.5		24.0	58.5		28.5	28.5	24.0	26.0	26.0		3.0	3.0	3.0
Total Split (%)	11.9%	37.4%		17.8%	43.3%		21.1%	21.1%	17.8%	19.3%	19.3%		2%	2%	2%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5		2.0	2.0	2.0
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5	3.0	2.5	2.5		0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0			0.0	0.0	0.0	0.0				
Total Lost Time (s)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0				
Lead/Lag	Lead			Lead			Lead	Lead	Lead				Lag	Lag	Lag
Lead-Lag Optimize?															
Recall Mode	None	Min		None	Min		Min	Min	None	C-Min	C-Min		None	None	None
v/c Ratio	0.96	0.66		0.42	1.00			0.96	0.61	0.66	0.56				
Control Delay	117.3	33.3		70.2	56.2			98.4	22.8	68.6	63.4				
Queue Delay	15.8	0.0		0.0	2.4			0.0	0.0	0.0	0.0				
Total Delay	133.2	33.3		70.2	58.6			98.4	22.8	68.6	63.4				
Queue Length 50th (ft)	153	363		42	587			265	93	136	107				
Queue Length 95th (ft)	#330	503		83	#797			#433	136	180	166				
Internal Link Dist (ft)		265			665			2948			318				
Turn Bay Length (ft)	175			165					150	200					
Base Capacity (vph)	179	1574		240	1479			312	548	509	280				
Starvation Cap Reductn	0	0		0	0			0	0	0	0				
Spillback Cap Reductn	11	0		0	13			0	0	0	0				
Storage Cap Reductn	0	0		0	0			0	0	0	0				
Reduced v/c Ratio	1.02	0.66		0.20	1.01			0.96	0.50	0.61	0.51				

Intersection Summary

Area Type: Other
 Cycle Length: 135
 Actuated Cycle Length: 135
 Offset: 0 (0%), Referenced to phase 4:SBTL, Start of Green
 Natural Cycle: 145
 Control Type: Actuated-Coordinated
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Splits and Phases: 15: Hunting Rd/Gould St & Highland Ave

16 s	3 s 58.5 s	28.5 s	3 s 26 s
24 s	3 s 50.5 s		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Traffic Volume (vph)	150	890	15	45	605	760	25	240	240	290	90	45	
Future Volume (vph)	150	890	15	45	605	760	25	240	240	290	90	45	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0		
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00	0.97	1.00		
Frb, ped/bikes	1.00	1.00		1.00	0.99			1.00	0.99	1.00	1.00		
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00		
Fr t	1.00	1.00		1.00	0.92			1.00	0.85	1.00	0.95		
Fit Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1752	3530		1805	3178			1874	1600	3400	1781		
Fit Permitted	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00		
Satd. Flow (perm)	1752	3530		1805	3178			1874	1600	3400	1781		
Peak-hour factor, PHF	0.87	0.87	0.87	0.92	0.92	0.92	0.88	0.88	0.88	0.94	0.94	0.94	
Adj. Flow (vph)	172	1023	17	49	658	826	28	273	273	309	96	48	
RTOR Reduction (vph)	0	1	0	0	159	0	0	0	74	0	14	0	
Lane Group Flow (vph)	172	1039	0	49	1325	0	0	301	199	309	130	0	
Confl. Peds. (#/hr)	1		1	1		1							
Confl. Bikes (#/hr)									1				
Heavy Vehicles (%)	3%	2%	0%	0%	5%	1%	0%	1%	0%	3%	2%	0%	
Turn Type	Prot	NA		Prot	NA		Split	NA	pm+ov	Split	NA		
Protected Phases	1	6		5	2		3	3	5	4	4		
Permitted Phases									3				
Actuated Green, G (s)	13.8	60.2		8.9	58.2			22.5	31.4	17.5	17.5		
Effective Green, g (s)	13.8	60.2		8.9	58.2			22.5	31.4	17.5	17.5		
Actuated g/C Ratio	0.10	0.45		0.07	0.43			0.17	0.23	0.13	0.13		
Clearance Time (s)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0		
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0	2.0	2.0	2.0		
Lane Grp Cap (vph)	179	1574		118	1370			312	372	440	230		
v/s Ratio Prot	c0.10	0.29		0.03	c0.42			c0.16	0.04	c0.09	0.07		
v/s Ratio Perm									0.09				
v/c Ratio	0.96	0.66		0.42	0.97			0.96	0.53	0.70	0.57		
Uniform Delay, d1	60.3	29.4		60.6	37.5			55.9	45.4	56.3	55.2		
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.12	1.14		
Incremental Delay, d2	55.3	0.8		0.9	16.8			40.9	0.7	9.0	9.6		
Delay (s)	115.7	30.2		61.4	54.3			96.8	46.1	71.7	72.7		
Level of Service	F	C		E	D			F	D	E	E		
Approach Delay (s)		42.3			54.5			72.7			72.1		
Approach LOS		D			D			E			E		
Intersection Summary													
HCM 2000 Control Delay			55.5		HCM 2000 Level of Service						E		
HCM 2000 Volume to Capacity ratio			0.95										
Actuated Cycle Length (s)			135.0		Sum of lost time (s)						27.0		
Intersection Capacity Utilization			91.0%		ICU Level of Service						E		
Analysis Period (min)			15										
c Critical Lane Group													

Intersection						
Int Delay, s/veh	6.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↖		↘	↗
Traffic Vol, veh/h	105	70	305	20	15	615
Future Vol, veh/h	105	70	305	20	15	615
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	150	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	75	75	73	73
Heavy Vehicles, %	0	0	0	0	0	6
Mvmt Flow	130	86	407	27	21	842
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1305	421	0	0	434	0
Stage 1	421	-	-	-	-	-
Stage 2	884	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	178	637	-	-	1136	-
Stage 1	667	-	-	-	-	-
Stage 2	407	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	175	637	-	-	1136	-
Mov Cap-2 Maneuver	175	-	-	-	-	-
Stage 1	667	-	-	-	-	-
Stage 2	400	-	-	-	-	-
Approach	WB	NB	SB			
HCM Control Delay, s	45.7	0	0.2			
HCM LOS	E					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	175	637	1136	-
HCM Lane V/C Ratio	-	-	0.741	0.136	0.018	-
HCM Control Delay (s)	-	-	68.5	11.5	8.2	-
HCM Lane LOS	-	-	F	B	A	-
HCM 95th %tile Q(veh)	-	-	4.7	0.5	0.1	-

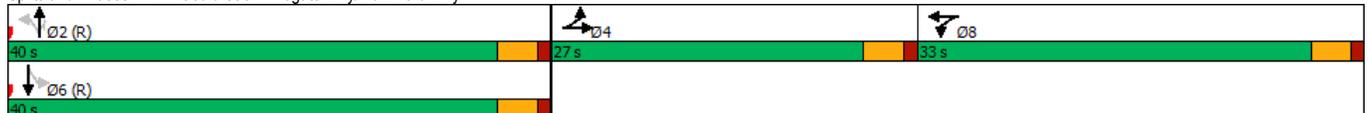


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕	↕	↕	↕	
Traffic Volume (vph)	1	0	30	360	1	40	5	285	80	15	700	5
Future Volume (vph)	1	0	30	360	1	40	5	285	80	15	700	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	13	13	12	12	12	12	12	12
Storage Length (ft)	0		0	0		0	0		100	150		0
Storage Lanes	0		0	1		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Right Turn on Red			Yes			Yes			Yes			Yes
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		151			225			398			315	
Travel Time (s)		3.4			5.1			9.0			7.2	
Peak Hour Factor	0.75	0.75	0.75	0.72	0.72	0.72	0.86	0.86	0.86	0.92	0.92	0.92
Shared Lane Traffic (%)				44%								
Lane Group Flow (vph)	0	41	0	280	277	0	0	337	93	16	766	0
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2			6	
Permitted Phases							2		2	6		
Detector Phase	4	4		8	8		2	2	2	6	6	
Switch Phase												
Minimum Initial (s)	6.0	6.0		6.0	6.0		10.0	10.0	10.0	10.0	10.0	
Minimum Split (s)	27.0	27.0		11.0	11.0		15.0	15.0	15.0	23.0	23.0	
Total Split (s)	27.0	27.0		33.0	33.0		40.0	40.0	40.0	40.0	40.0	
Total Split (%)	27.0%	27.0%		33.0%	33.0%		40.0%	40.0%	40.0%	40.0%	40.0%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)		0.0		0.0	0.0			0.0	0.0	0.0	0.0	
Total Lost Time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		C-Min	C-Min	C-Min	C-Min	C-Min	
v/c Ratio		0.20		0.75	0.71		0.30	0.09	0.03	0.36		
Control Delay		8.5		48.3	43.8		14.0	8.2	15.4	13.9		
Queue Delay		0.0		0.0	0.0		0.6	0.0	0.0	0.1		
Total Delay		8.5		48.3	43.8		14.6	8.2	15.4	14.0		
Queue Length 50th (ft)		0		174	163		56	1	4	124		
Queue Length 95th (ft)		12		187	176		m252	m30	21	270		
Internal Link Dist (ft)		71			145			318		235		
Turn Bay Length (ft)								100	150			
Base Capacity (vph)		413		487	503		1112	986	568	2134		
Starvation Cap Reductn		0		0	0		437	0	0	0		
Spillback Cap Reductn		4		0	0		0	0	0	276		
Storage Cap Reductn		0		0	0		0	0	0	0		
Reduced v/c Ratio		0.10		0.57	0.55		0.50	0.09	0.03	0.41		

Intersection Summary

Area Type: Other
 Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
 Natural Cycle: 65
 Control Type: Actuated-Coordinated
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Gould St & Windgate Dwy/Muzi Ford Dwy





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕		↕	↕			↕	↕	↕	↕	↕
Traffic Volume (vph)	1	0	30	360	1	40	5	285	80	15	700	5
Future Volume (vph)	1	0	30	360	1	40	5	285	80	15	700	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	12	13	13	12	12	12	12	12	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00		0.95	0.95			1.00	1.00	1.00	0.95	
Fr't		0.87		1.00	0.97			1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.96			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1615		1681	1705			1861	1583	1770	3536	
Flt Permitted		1.00		0.95	0.96			0.99	1.00	0.51	1.00	
Satd. Flow (perm)		1615		1681	1705			1842	1583	941	3536	
Peak-hour factor, PHF	0.75	0.75	0.75	0.72	0.72	0.72	0.86	0.86	0.86	0.92	0.92	0.92
Adj. Flow (vph)	1	0	40	500	1	56	6	331	93	16	761	5
RTOR Reduction (vph)	0	38	0	0	10	0	0	0	32	0	0	0
Lane Group Flow (vph)	0	3	0	280	267	0	0	337	61	16	766	0
Turn Type	Split	NA		Split	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	4	4		8	8			2	2	6	6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		7.0		22.3	22.3			58.7	58.7	58.7	58.7	
Effective Green, g (s)		7.0		22.3	22.3			58.7	58.7	58.7	58.7	
Actuated g/C Ratio		0.07		0.22	0.22			0.59	0.59	0.59	0.59	
Clearance Time (s)		4.0		4.0	4.0			4.0	4.0	4.0	4.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		113		374	380			1081	929	552	2075	
v/s Ratio Prot		c0.00		c0.17	0.16						c0.22	
v/s Ratio Perm								0.18	0.04	0.02		
v/c Ratio		0.03		0.75	0.70			0.31	0.07	0.03	0.37	
Uniform Delay, d1		43.3		36.2	35.8			10.4	8.9	8.7	10.9	
Progression Factor		1.00		1.00	1.00			0.99	1.48	1.00	1.00	
Incremental Delay, d2		0.1		8.0	5.8			0.4	0.1	0.1	0.5	
Delay (s)		43.4		44.2	41.6			10.7	13.2	8.8	11.4	
Level of Service		D		D	D			B	B	A	B	
Approach Delay (s)		43.4			42.9			11.2			11.3	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø9	Ø10	Ø11
Lane Configurations															
Traffic Volume (vph)	35	725	20	135	1015	270	20	65	90	765	190	135			
Future Volume (vph)	35	725	20	135	1015	270	20	65	90	765	190	135			
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Storage Length (ft)	175		0	165		400	0		150	200		200			
Storage Lanes	1		0	1		0	0		1	1		0			
Taper Length (ft)	25			25			25			25					
Right Turn on Red			Yes			Yes			Yes			Yes			
Link Speed (mph)		30			30			30				30			
Link Distance (ft)		345			745			3028				398			
Travel Time (s)		7.8			16.9			68.8				9.0			
Confl. Bikes (#/hr)						1									
Peak Hour Factor	0.91	0.91	0.91	0.95	0.95	0.95	0.83	0.83	0.83	0.83	0.83	0.83			
Shared Lane Traffic (%)															
Lane Group Flow (vph)	38	819	0	142	1352	0	0	102	108	922	392	0			
Turn Type	Prot	NA		Prot	NA		Split	NA	pt+ov	Split	NA				
Protected Phases	1	6		5	2		3	3	3.5	4	4		9	10	11
Permitted Phases															
Detector Phase	1	6		5	2		3	3	3.5	4	4				
Switch Phase															
Minimum Initial (s)	6.0	10.0		6.0	10.0		6.0	6.0		6.0	6.0		1.0	1.0	1.0
Minimum Split (s)	12.0	20.0		12.0	25.0		12.0	12.0		21.0	21.0		3.0	3.0	3.0
Total Split (s)	12.0	31.0		17.0	36.0		14.0	14.0		32.0	32.0		3.0	3.0	3.0
Total Split (%)	12.0%	31.0%		17.0%	36.0%		14.0%	14.0%		32.0%	32.0%		3%	3%	3%
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5		3.5	3.5		2.0	2.0	2.0
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5		2.5	2.5		0.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0				
Total Lost Time (s)	6.0	5.0		6.0	5.0		6.0	6.0		6.0	6.0				
Lead/Lag	Lead			Lead			Lead	Lead					Lag	Lag	Lag
Lead-Lag Optimize?															
Recall Mode	None	Min		None	Min		Min	Min		C-Min	C-Min		None	None	None
v/c Ratio	0.36	0.80		0.78	1.02		0.73	0.26	0.93	0.74					
Control Delay	55.0	40.1		71.9	62.3		74.0	2.7	54.5	41.2					
Queue Delay	0.0	0.0		0.0	0.2		5.4	0.0	5.1	1.1					
Total Delay	55.0	40.1		71.9	62.5		79.4	2.7	59.6	42.3					
Queue Length 50th (ft)	24	252		89	~527		65	0	310	228					
Queue Length 95th (ft)	57	#373		#182	#702		#126	5	#376	#239					
Internal Link Dist (ft)		265			665		2948			318					
Turn Bay Length (ft)	175			165					150	200					
Base Capacity (vph)	106	1027		194	1324		147	424	987	527					
Starvation Cap Reductn	0	0		0	0		0	0	43	32					
Spillback Cap Reductn	0	0		0	1		17	0	0	0					
Storage Cap Reductn	0	0		0	0		0	0	0	0					
Reduced v/c Ratio	0.36	0.80		0.73	1.02		0.78	0.25	0.98	0.79					

Intersection Summary

Area Type: Other
 Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 4:SBTL, Start of Green
 Natural Cycle: 110
 Control Type: Actuated-Coordinated
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

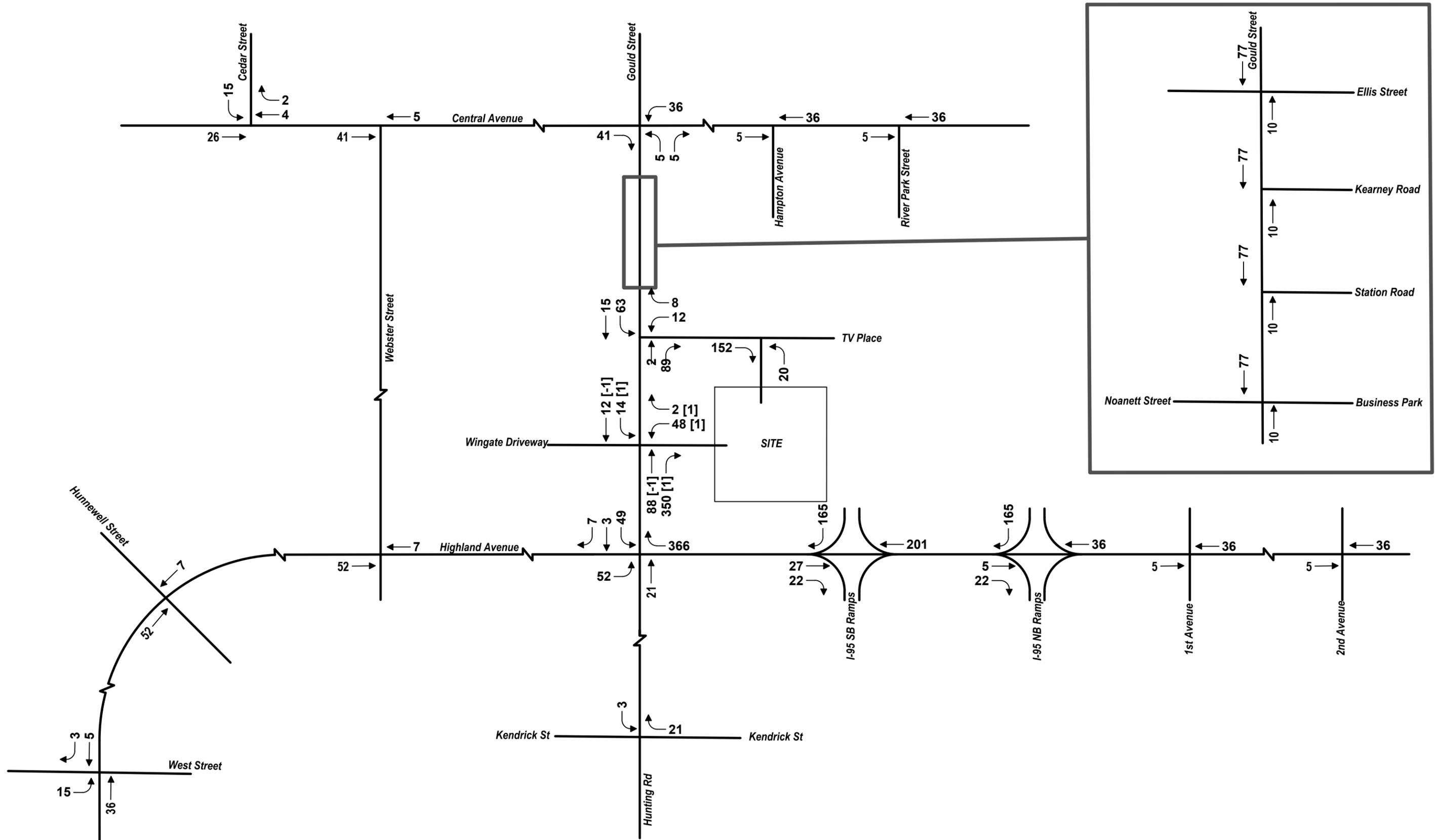
Splits and Phases: 15: Hunting Rd/Gould St & Highland Ave





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	35	725	20	135	1015	270	20	65	90	765	190	135
Future Volume (vph)	35	725	20	135	1015	270	20	65	90	765	190	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00	0.97	1.00	
Frbp, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	0.97			1.00	0.85	1.00	0.94	
Fit Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	3525		1770	3413			1841	1583	3433	1747	
Fit Permitted	0.95	1.00		0.95	1.00			0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	3525		1770	3413			1841	1583	3433	1747	
Peak-hour factor, PHF	0.91	0.91	0.91	0.95	0.95	0.95	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	38	797	22	142	1068	284	24	78	108	922	229	163
RTOR Reduction (vph)	0	2	0	0	22	0	0	0	89	0	25	0
Lane Group Flow (vph)	38	817	0	142	1330	0	0	102	19	922	367	0
Confl. Bikes (#/hr)						1						
Turn Type	Prot	NA		Prot	NA		Split	NA	pt+ov	Split	NA	
Protected Phases	1	6		5	2		3	3	3 5	4	4	
Permitted Phases												
Actuated Green, G (s)	3.6	31.5		10.3	38.2			7.6	17.9	27.6	27.6	
Effective Green, g (s)	3.6	31.5		10.3	38.2			7.6	17.9	27.6	27.6	
Actuated g/C Ratio	0.04	0.32		0.10	0.38			0.08	0.18	0.28	0.28	
Clearance Time (s)	6.0	5.0		6.0	5.0			6.0		6.0	6.0	
Vehicle Extension (s)	2.0	2.0		2.0	2.0			2.0		2.0	2.0	
Lane Grp Cap (vph)	63	1110		182	1303			139	283	947	482	
v/s Ratio Prot	0.02	0.23		c0.08	c0.39			c0.06	0.01	c0.27	0.21	
v/s Ratio Perm												
v/c Ratio	0.60	0.74		0.78	1.02			0.73	0.07	0.97	0.76	
Uniform Delay, d1	47.5	30.5		43.7	30.9			45.2	34.1	35.8	33.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.09	1.07	
Incremental Delay, d2	10.7	2.2		17.8	30.4			15.8	0.0	22.4	10.0	
Delay (s)	58.2	32.8		61.6	61.3			61.0	34.2	61.6	45.5	
Level of Service	E	C		E	E			E	C	E	D	
Approach Delay (s)		33.9			61.3			47.2			56.8	
Approach LOS		C			E			D			E	
Intersection Summary												
HCM 2000 Control Delay		52.9			HCM 2000 Level of Service				D			
HCM 2000 Volume to Capacity ratio		1.05										
Actuated Cycle Length (s)		100.0			Sum of lost time (s)			27.0				
Intersection Capacity Utilization		84.3%			ICU Level of Service			E				
Analysis Period (min)		15										
c Critical Lane Group												

Revised Site-Generated Peak Hour Traffic Volume Networks

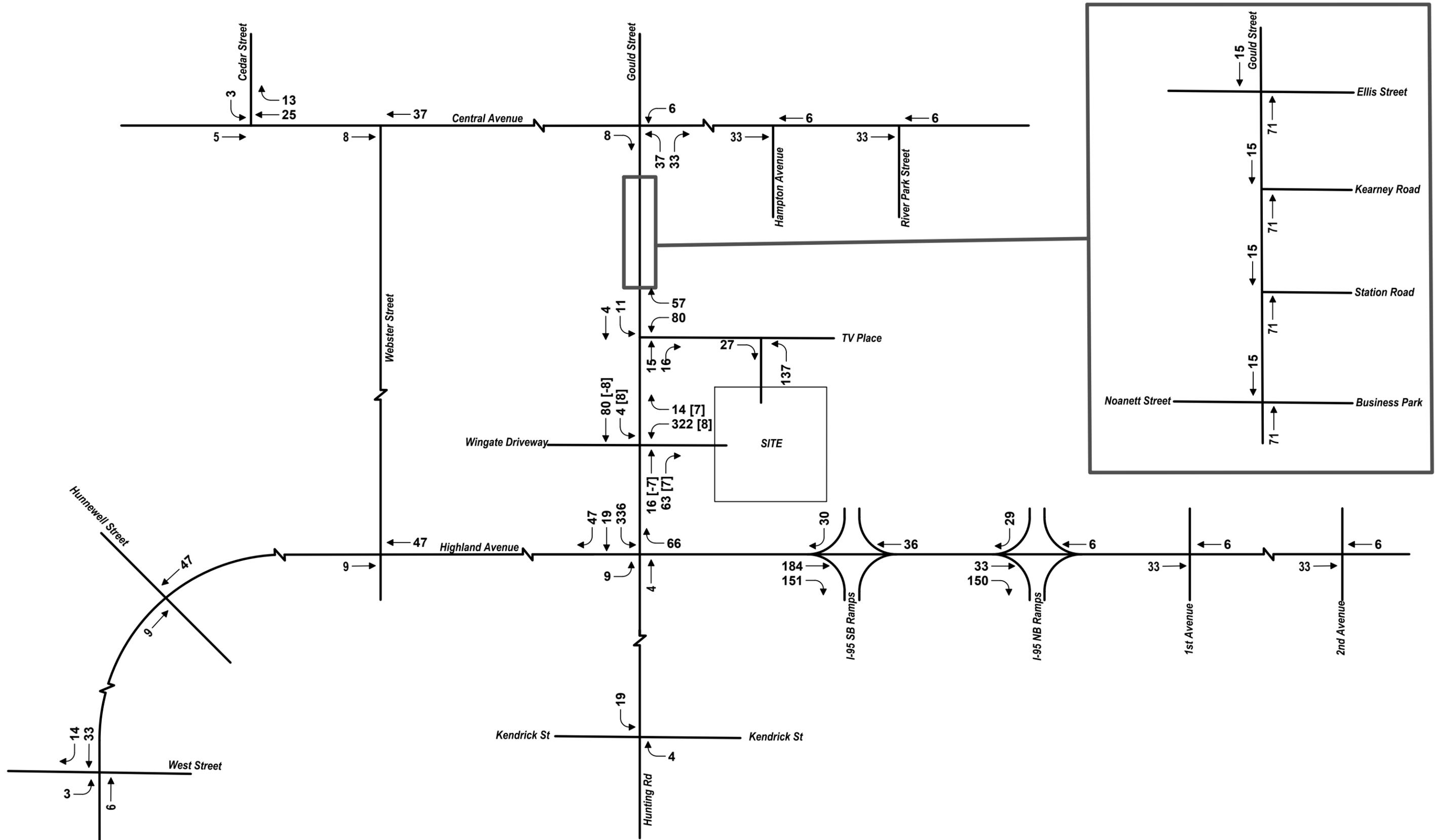


XX = New Project Generated Vehicles
 [XX] = Pass-By Vehicles



Project Generated Vehicle Volumes
 Weekday Morning Peak Hour
 Highland Science Center
 Needham, Massachusetts

Figure 11



XX = New Project Generated Vehicles
 [XX] = Pass-By Vehicles



Not to Scale



Project Generated Vehicle Volumes
 Weekday Evening Peak Hour
 Highland Science Center
 Needham, Massachusetts

Figure 12

Planning Board Members
June 30, 2022

EXHIBIT E

**ACENTECH PRELIMINARY NOISE EVALUATION
(557 HIGHLAND AVENUE)**

[see attached]



June 28, 2022

Mr. Robert Schlager, CPM
Bulfinch Companies
116 Huntington Avenue, Suite 600
Boston, MA 02116
Via email: RAS@Bulfinch.com

Subject **Preliminary Exterior/Community Noise Evaluation/Narrative – Revision 1**
557 Highland Avenue (former Muzi Ford Site), Office & Lab Conversion
Needham, MA
Acentech Project J635632.00

Dear Robert:

This letter provides a preliminary discussion of the community (exterior) noise emissions at 557 Highland Avenue, the proposed research and development office at the former Muzi Ford dealership site in Needham, Massachusetts. We understand this project consists of two buildings and a parking garage. The South Building will be 3-stories with 215,000 square feet of office and lab space. The North Building will have 5-stories with 255,000 square feet of office and lab space. There will be a connecting glass atrium of 2-stories between the two buildings. Sound from the proposed campus described above will have to comply applicable noise limits from the Town of Needham and the Commonwealth of Massachusetts as discussed below.

SOUND LIMITS

TOWN OF NEEDHAM

It is our understanding that the Town of Needham does not have numerical noise limits that are part of the town bylaws. We have identified Section 3.8, Noise Regulation of the Town's General bylaws dated July 2021. Section 3.8.1 simply states:

Except in an emergency, construction activity conducted pursuant to a building permit, which causes noise that extends beyond the property line, shall be limited to the hours of 7AM to 8PM unless authorized by rules or regulations adopted by the Select Board. The penalty for violation of this regulation shall be a \$50 fine.

COMMONWEALTH OF MASSACHUSETTS

The Commonwealth of Massachusetts has enacted regulations for the control of air pollution (310 CMR 7.10¹). To enforce these regulations, the Massachusetts Department of Environmental Protection (MassDEP) has issued guidelines that limit noise levels at property lines and the nearest residence. These limitations are: (a) not to increase the residual overall A-weighted background sound level by more than 10 dB and (b) not to produce a pure tone condition; where the sound pressure level (SPL) in one octave band exceeds the levels in the two adjacent octave bands by 3 dB or more.

¹ 310 Massachusetts Regulation 7.10, U Noise:
<https://casetext.com/regulation/code-of-massachusetts-regulations/department-310-cmr-department-of-environmental-protection/title-310-cmr-700-air-pollution-control/section-710-u-noise>

BACKGROUND SOUND SURVEY

In order to determine compliance with the MassDEP noise limits, a background sound survey was performed from March 2 to 7, 2022. Acentech deployed two sound level meters at the locations (A and B) shown in Figure 1. We monitored sound continuously for a period over 6 days. During this period, we measured the A-weighted ninetieth percentile sound pressure level (L_{90}) on an hourly basis 24 hours per day along with other metrics that can be reported as needed.

INSTRUMENTATION

We used Type 1 sound level meters (SLMs) in accordance with IEC 61672-1. The SLMs were factory-calibrated to National Institute of Standards and Technology (NIST) traceable sources within the previous 12 months; the laboratory calibration certificates are available upon request. Each SLM was also field-calibrated before and after the start of the survey. Each SLM was set to slow response, and recorded L_{90} sound pressure levels in one hour increments in octave-bands with center frequencies between 31.5 and 8,000 Hz. The equivalent continuous (L_{EQ}) A-weighted sound level (dBA), and unweighted (dBZ) octave-band SPLs were also recorded and will be used as necessary.

RESULTS

Figure 2 is a graph of the A-weighted L_{90} sound levels for the 6-day period. For unknown reasons, the data collection at Location A (Gould Street) abruptly stopped after 19-hours of monitoring. Given the limited amount of data, we are recommending a retest of Location A only. We have compiled the L_{90} sound level and determined the lowest L_{90} sound level for the daytime (7:00 am to 10:00 pm), and nighttime (10:00 pm to 7:00 am) as given in Table 1.

TABLE 1: Summary of L_{90} Sound Levels and MassDEP Limits

PERIOD	Day (7:00 am-10:00 pm)	Night (10:00 pm-7:00 am)
Location A (Gould Street)	51	40
Location B (I-95 Ramps)	49	42
MassDEP Limit (min + 10 dB)	59*	50*

* These limits are preliminary subject to potential change after the retesting.

PROJECT NOISE LIMIT

The project noise limit is 10 dB higher than the minimum of the two locations. For daytime the limit would be 59 dBA (49 dBA + 10 dB), and for nighttime the limit is 50 dBA (40 dBA + 10 dB).

NOISE MODELING

The equipment that will generate sound from this Project includes:

- Two Air Handling Units (AHU)
- Two Cooling Towers (CT)
- Loading dock Exhaust Fans
- Multiple Garage Exhaust Fans
- Multiple General Exhaust Fans
- Multiple Exhaust Air Handling Unit (EAHU)
- Multiple Emergency Generators

All of the above equipment will be located on the roof of Building A or Building B. We will conduct a noise evaluation using Cadna/A acoustic modeling software, which complies with the international standard ISO 9613-2, "Attenuation of sound during propagation outdoors -- Part 2: General method of calculation". All rooftop equipment will be evaluated for sound transmission to abutting properties, especially the Wingate Residences at Needham located at 235 Gould Street. As necessary to achieve noise limits, we will recommend noise control features such as acoustic screens/barriers, silencers, acoustic louvers, enclosures, and other treatments.

SUMMARY

We believe the Project at 557 Highland Avenue will be compliant with the local and State limits noted above, given the potential use of sound mitigation. Once we have completed our evaluation, a final report will be issued that will document the predicted sound levels at various receptor points.

Please contact me at 617-499-8058 or mBahtiarian@acentech.com with any questions or comments.

Sincerely,
ACENTECH INCORPORATED



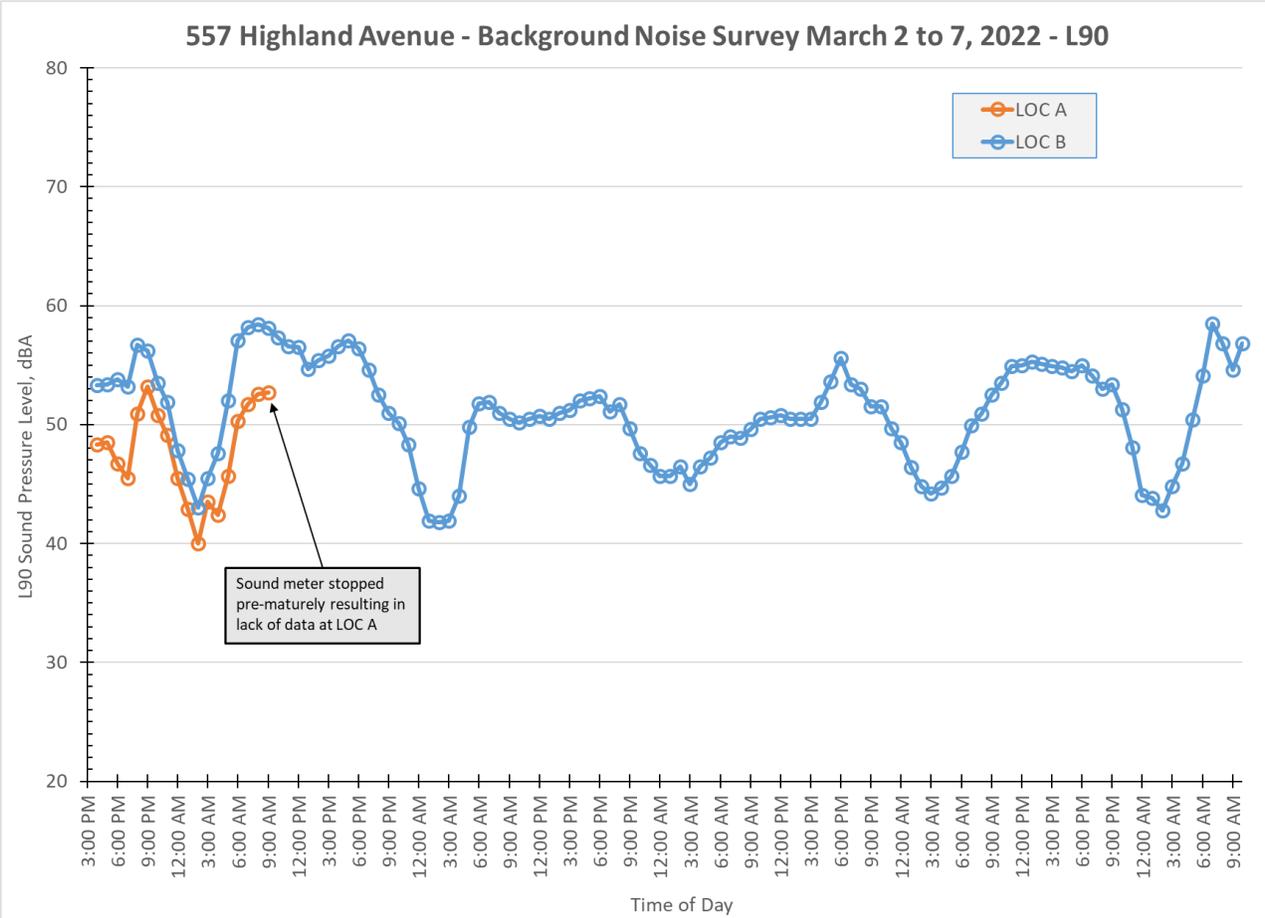
Michael Bahtiarian, INCE Bd. Cert.

Cc: Marc Newmark, Acentech
Ben Stracco, Stantec

FIGURE 1: Background Sound Survey Monitoring Locations, A & B



FIGURE 2: Background Sound Levels, hourly L₉₀, dBA



Planning Board Members
June 30, 2022

EXHIBIT F

**JULY 7, 2022 HEARING PRESENTATION
(557 HIGHLAND AVENUE)**

[see attached]

Highland Innovation Center Planning Board Meeting #2, July 07, 2022

Meeting #1 June 07, 2022

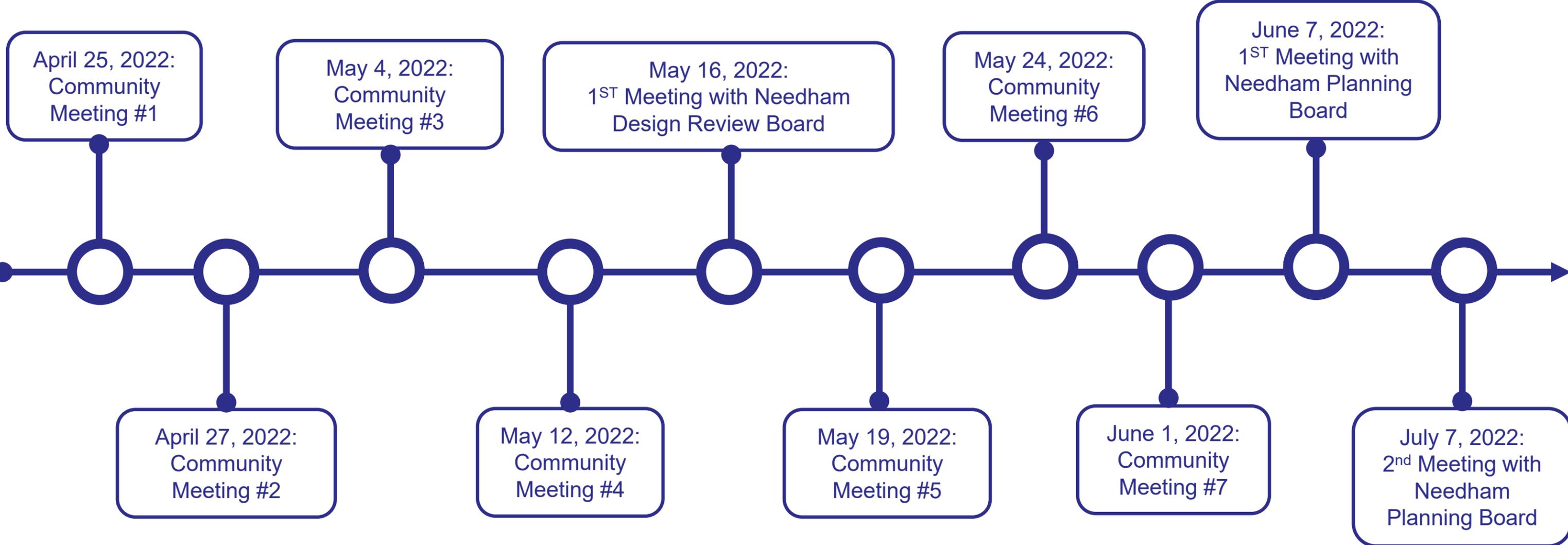
557highland.com
557 Highland Ave, Needham MA

Bulfinch

H **HIGHLAND**
INNOVATION CENTER

Stantec

PROJECT OUTREACH



ADDITIONAL PROJECT MEETINGS:

- TOWN PLANNING
- TOWN ENGINEERING
- FIRE DEPARTMENT
- TOWN ARBORIST
- TRAFFIC



July 7, 2022



PROJECT TEAM

Bulfinch

 **Stantec**



MORIARTY

 **PAUL FINGER ASSOCIATES**
Landscape Architects - Planners
Civil Engineers - Wetland Scientists

AHA
CONSULTING
ENGINEERS

SGH




ACENTECH

*goulston&storr*s

Frieze Cramer Rosen & Huber LLP

ATTORNEY AT LAW
ROBERT T. SMART, JR.

 **DAIN | TORPY**



George Giunta Jr.

SAFETY PARTNERS
Hands-on Workplace Safety

 **ENVIRONMENTAL HEALTH & ENGINEERING, INC.**

Margaret Murphy
Community Resources Group
SLS Consulting


www.557highland.com







July 7, 2022

Bulfinch 

AGENDA

1. Response to Planning Board Comments from June 7th
2. Plan Updates in Response to Comments on June 7th
3. Transportation Overview
4. Questions and Answers

EXHIBIT A

**RESPONSES TO TOWN OF NEEDHAM PLANNING BOARD COMMENTS AT
JUNE 7, 2022 PUBLIC HEARING (557 HIGHLAND AVENUE)**

Question/Topic	Response
PLANNING BOARD	
<p><i>Whether the current setback on Gould Street is measured from the current layout of the street.</i></p>	<p>The plan filed with the Special Permit application contemplates that all of the Gould Street improvements will be subject to an easement in favor of the Town of Needham for public travel. Accordingly, the plan measures all setbacks and dimensional requirements based on the existing lot. The Applicant is working with Town Counsel regarding the application of setbacks in the context of the proposed roadway improvements.</p>
<p><i>Provide an itemized list of strategies to address climate change as referenced in the applicant's cover letter.</i></p>	<p>Impacts from climate change on the Project may include urban flooding and extreme heat events.</p> <p>With respect to urban flooding, the Property is located in Zone X (area of minimal flood hazard) according to FEMA Flood Insurance Rate Mapping. The existing site consists almost completely of impervious buildings and paved parking lots. The proposed Project represents a 1.8-acre decrease in impervious coverage compared to the existing condition. This reduction in impervious coverage, and the addition of a surface stormwater detention basin, will result in decreased stormwater peak runoff rates and volumes from the Site overall. The project represents a significant decrease in peak rates to the offsite MassDOT and municipal drainage systems to which the site is tributary, reducing downstream flooding potential should those systems become surcharged in extreme precipitation events.</p> <p>Extreme heat event mitigation strategies include: improved envelope insulation and infiltration to minimize cooling demand and better maintain indoor temperature conditions; high efficiency chilled water plant to minimize cooling demand and energy usage; laboratory exhaust monitoring controls to minimize outside air cooling load.</p>

Question/Topic	Response
<p><i>Whether the planned solar array will violate any height restrictions in zoning.</i></p>	<p>Pursuant to Section 4.11.2 of the Zoning By-Law, the parking garage may be allowed a maximum height of 55 ft. by special permit. Pursuant to Section 4.11.1(1)(e) “Structures erected on a building and not used for human occupancy, such as . . . solar or photovoltaic panels . . . and the like may exceed the maximum building height provided that no part of such structure shall project more than 15 feet above the maximum allowable building height, the total horizontal coverage of all of such structures on the building does not exceed 25 percent, and all of such structures are set back from the roof edge by a distance no less than their height.”</p> <p>The parking structure is proposed at 55 ft. in height and the Applicant has requested a special permit for this increased height.</p> <p>The proposed solar photovoltaic canopies on the parking structure may not exceed the 15 ft. limit imposed by Section 4.1.1(1)(e), which we assume is applicable to parking structures, depending upon final design. However, the proposed solar photovoltaic canopies would likely exceed the maximum horizontal coverage limitation of 25%.</p>
<p><i>Is there an opportunity to further reduce parking and what the impacts on the project might result?</i></p>	<p>The Project is requesting a reduction in proposed parking based upon documented employment densities of other peer research and development centers in eastern Massachusetts. With approximately 1,408 parking spaces proposed on-site, there will be adequate parking provided for the Project.</p>
<p><i>Can additional green space be incorporated into the design?</i></p>	<p>The site design has been revised to address prior community comments with an aim to include less grass and to maximize diverse and native plantings.</p>
<p><i>Will all amenities be accessible by the community?</i></p>	<p>All outdoor amenities for the Project are intended to be available to the public, as will the retail/restaurant tenant spaces.</p>
<p><i>Can the bike lanes/infrastructure be designed to favor families instead of commuters?</i></p>	<p>In close consultation with our neighbors, we are working to develop transportation improvements, including separated bike lanes/infrastructure that</p>

Question/Topic	Response
	address neighborhood concerns along Gould Street on or adjacent to the Property.
<i>Can the scale of the structures along Gould Street be further offset or reduced?</i>	As we further studied moving the North Loading Dock from the Gould Street elevation to the north side of the building, we have studied different fenestration options which may help the building read at a smaller scale on this elevation, but will still provide the areas needed to best serve the building tenants and community. Additional trees/planting are being considered in order to help further screen the building from view along Gould Street.
<i>Can the planned greenbelt be connected to the park/trail across from TV Place on neighboring property?</i>	This is currently part of a separate property at 0 Gould Street and no changes to this property are anticipated at this time.
<i>What will acoustic levels be from rooftop mechanicals?</i>	The Applicant has engaged Acentech as an acoustical consultant to provide a qualitative report on this topic and the results of the report are included as Exhibit E to this letter.
<i>Provide additional clarity on loading dock operations and whether loading dock access can be provided off of TV Place rather than facing Gould Street.</i>	Due to the location of the garage structure, as required by the recent rezoning, locating the North Building's loading dock off of TV Place was not achievable. However, the team has reviewed moving the loading dock to the north side of the North Building so the loading dock no longer faces Gould Street, which adds additional window area and a park along the west face of the North Building.
<i>Has the Fire Department approved of the driveway/roadway widths and can a permeable paving material be used for emergency lanes?</i>	In our meeting with the Fire Department on March 24, 2022, the Fire Department requested fire access lanes around the building which are being provided. These lanes are to be 18' minimum width, but 20' preferred due to snow clearing. The landscape architect is planning to provide the fitness path as bituminous concrete or gravel, then flank the sides with permeable structured grass or permeable pavers if allowed by the Fire Department.

Question/Topic	Response
<p><i>Can additional public transportation be provided through relocating or adding an MBTA bus route?</i></p>	<p>The Applicant will reach out to MBTA to evaluate the feasibility of providing additional MBTA service. However, in light of the MBTA’s Bus Network Redesign plan, released in May 2022, which proposes to maintain Route 59’s existing alignment in Needham while eliminating route variations in Newton, the Applicant thinks it unlikely that the MBTA will agree to shift a segment of Route 59 from serving residential neighborhoods to serving the Project site.</p> <p>The Applicant will be providing a direct shuttle service (via use of an electric shuttle) that will connect the site with nearby transit nodes.</p>

EXHIBIT B

**RESPONSES TO TOWN OF NEEDHAM DEPARTMENT COMMENTS
(557 HIGHLAND AVENUE)**

Question/Topic	Response
FIRE DEPARTMENT	
<i>Confirm with the Fire Department to ensure public safety vehicle access during the winter.</i>	Final plans will be resubmitted for Fire Department approval including all truck turn requirements, etc., to confirm acceptable access as is required by applicable codes and regulations.
POLICE DEPARTMENT	
<i>Address potential for use of cut-through streets off of Gould Street and address potential use of Noanett, Ellis, Kearney, Beech and Arnold Streets as cut-through streets to avoid light at Gould and Central intersection. Place signage at these locations restricting traffic during commuting hours.</i>	<p>The Applicant will work with the Town to design and install signage at Noanett Road to deter unwanted cut-through turning movements during the weekday peak commuting hours. In addition, the installation of a traffic signal at Central Avenue and Gould Street will improve operations on Gould Street and reduce the desire for vehicles to use side streets as a cut-through by providing gaps for vehicles to turn efficiently at that intersection.</p> <p>The Applicant will supplement these actions with information dissemination and enforcement funding in connection with close collaboration with the Needham Police Department.</p>
<i>Address potential impacts on Hunting and Greendale from drivers utilizing these streets during hours of heavy traffic on Route 128.</i>	<p>Traffic volumes on Hunting and Greendale have decreased in the last several years due to the completion of the Route 128 add-a-lane project in the area, and most notably, due to the implementation of the new interchange connection at Kendrick Street. The Project is expected to add only a very small number of new trips to Hunting and Greendale, as the additional southbound left-turn lane on Gould Street will make it easier for drivers from the site to directly access Route 128 via Highland Ave. In addition, the Applicant will fund the installation of radar embedded speed limit signs along Hunting Road as a measure to deter speeding during off-peak hours.</p>

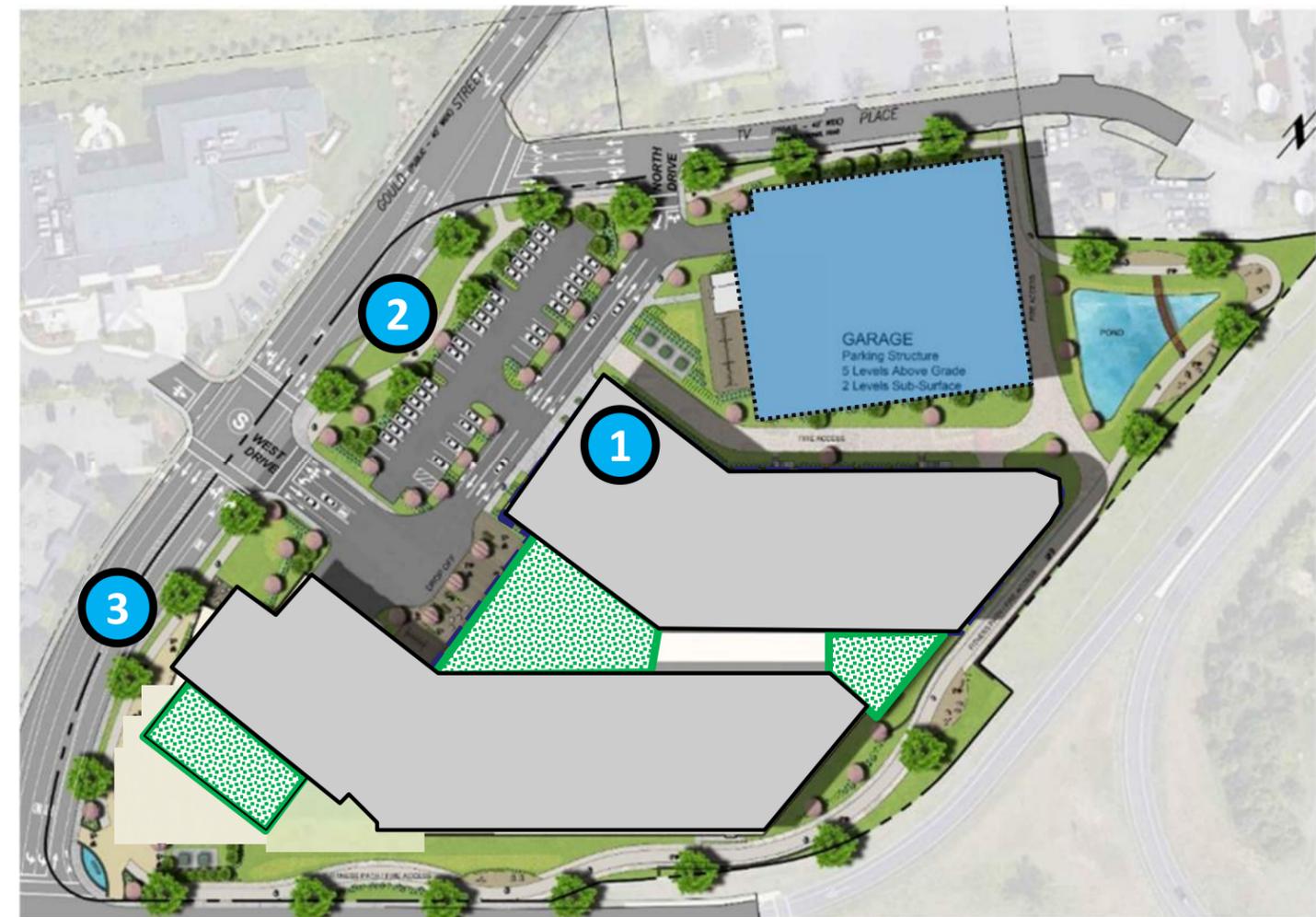
Question/Topic	Response
<i>Confirm that walking paths, bike paths, and similar spaces running around perimeter of project site have adequate emergency vehicle access.</i>	The perimeter paths along Highland Avenue / Route 128 have been designed with stabilized gravel shoulders that will provide 20' wide emergency access. A 20' wide gravel access drive has also been provided around the proposed garage.
BUILDING DEPARTMENT	
<i>The site as presented appears to meet the zoning regulations for the site, Special Permits are required for some dimensional requirements based on the design of the structures.</i>	The Applicant has requested such special permit relief in its Application.
PUBLIC WORKS DEPARTMENT	
<i>We are seeking clarification for the facility's proposed water use of 129,172 GPD while the wastewater design flow generation is 54,554 GPD.</i>	Water demand and sewer generation for lab uses can vary and are highly dependent on the specific processes involved. These numbers have been estimated by the Project's MEP Engineer. The difference between the water demand and sewer generation represents water that will be consumed or otherwise used up by lab processes and mechanical equipment (such as evaporative cooling).
<i>We expect to work with the developer on determining the optimum water loop design. The current proposal shows a 10-inch water connection to the site off a 12-inch main on Gould Street and a connection to an existing 8-inch water main on TV place. The additional loop connection may be more optimum if connected from Highland Avenue in front of the development instead of, or an addition to the 8-inch on TV Place connection.</i>	The Applicant will work with the Town to coordinate the water loop connection points. Connections to the 12-inch mains in Highland and Gould as described can be incorporated into a future revised utility plan.
<i>We concur with traffic comments/ recommendations prepared by GPI in their April 25, 2022 letter to the Planning and Community Development Office.</i>	Responses to the peer review comments by GPI are included as Exhibit C .
<i>We expect the Developer to work with the town in providing an alteration/taking plan and recordings for a new Road Right of Way layout on Gould Street and to optimize the traffic signals at Highland at Gould.</i>	The Applicant will work with the Town to develop and finalize the necessary alteration/taking plan and recordings for a new Road Right of Way layout on Gould Street and to optimize the traffic signals at Highland at Gould.

Question/Topic	Response
<p><i>For the new facility, four times the increased flow equates to a total of 126,004 GPD I/I removal anticipated from the development. This may be satisfied by either undertaking a construction project or paying a fee to the Town's I&I program at a rate of \$8.00 per gallon required to be removed. We are in the process of analyzing the target areas for the inflow/infiltration to be removed and expect to work with the developer through the site plan approval process</i></p>	<p>The Applicant will work with the Town to satisfy the I/I removal requirements.</p>
<p><i>As part of the NPDES requirements, the applicant must comply with the Public Outreach & Education and Public Participation & Involvement control measures. The applicant shall submit a letter to the town identifying the measures selected and dates by which the measures will be completed in order to incorporate it into the Planning Board's decision</i></p>	<p>The Applicant understands that the Town's Stormwater Management Program, prepared in accordance with NPDES MS4 General Permit, requires the Town to perform public education and outreach / public involvement and participation. The Applicant will work with the Town to satisfy any of these requirements applicable to the Project.</p>
<p><i>If emergency generators are proposed, they should indicate on the plans with proper screening and noise reduction according to a sound study for the proposed generators</i></p>	<p>Emergency Generators will be provided as required by code for life safety and emergency uses. Separate tenant backup generators may also be provided to support the lab and office uses of the building. All emergency generators are currently planned to be located on the roofs behind the mechanical screen walls with final number and locations being determined. The generators will be designed to meet all sound and noise reduction requirements of the Town and state.</p>
<p>PUBLIC HEALTH DIVISION</p>	
<p><i>Food Establishments will require approval through Food Permit Plan Review, including evaluation of adequacy of dumpsters, grease traps, etc.</i></p>	<p>Upon selection of final tenants for the restaurant space, all Food Establishment tenants will undergo the necessary permitting and approval process, including review by Needham's Public Health Division. Adequate grease traps are planned for the retail and restaurant space with final design to be determined as the Project advances and tenants are chosen. There will be interior waste/recycling rooms.</p>
<p><i>Continue working on environmental remediation of the site and provide continual updates to Public Health on remediation efforts.</i></p>	<p>The Applicant will comply with applicable environmental laws and will provided updates to the Needham Public Health Department as appropriate.</p>

Question/Topic	Response
<i>Obtain MassDEP approval for reclaiming water, specifically for - cooling tower water, toilet and urinal flushing, boiler feed, industrial process water and irrigation for landscaped areas, etc. All these uses are allowed under 314 CMR 20.00., if approved.</i>	No wastewater re-use is planned for the Project. The Project will capture and reuse stormwater and will file for necessary MassDEP permitting.
<i>Any biolaboratory proposed as part of the Project must complete the Public Health Division's online permitting application including provision of proper biohazardous waste containment.</i>	The Applicant will require any life sciences tenants to comply with all applicable rules and regulations.
DESIGN REVIEW BOARD	
<i>Provide Design Review Board with updates to project landscaping, lighting, and screening in connection with the Design Review Board's comments.</i>	The Applicant intends to submit the information requested by the Design Review Board's comments for the Board's consideration.

WHAT WE UPDATED - REV. #3, 7/07/2022

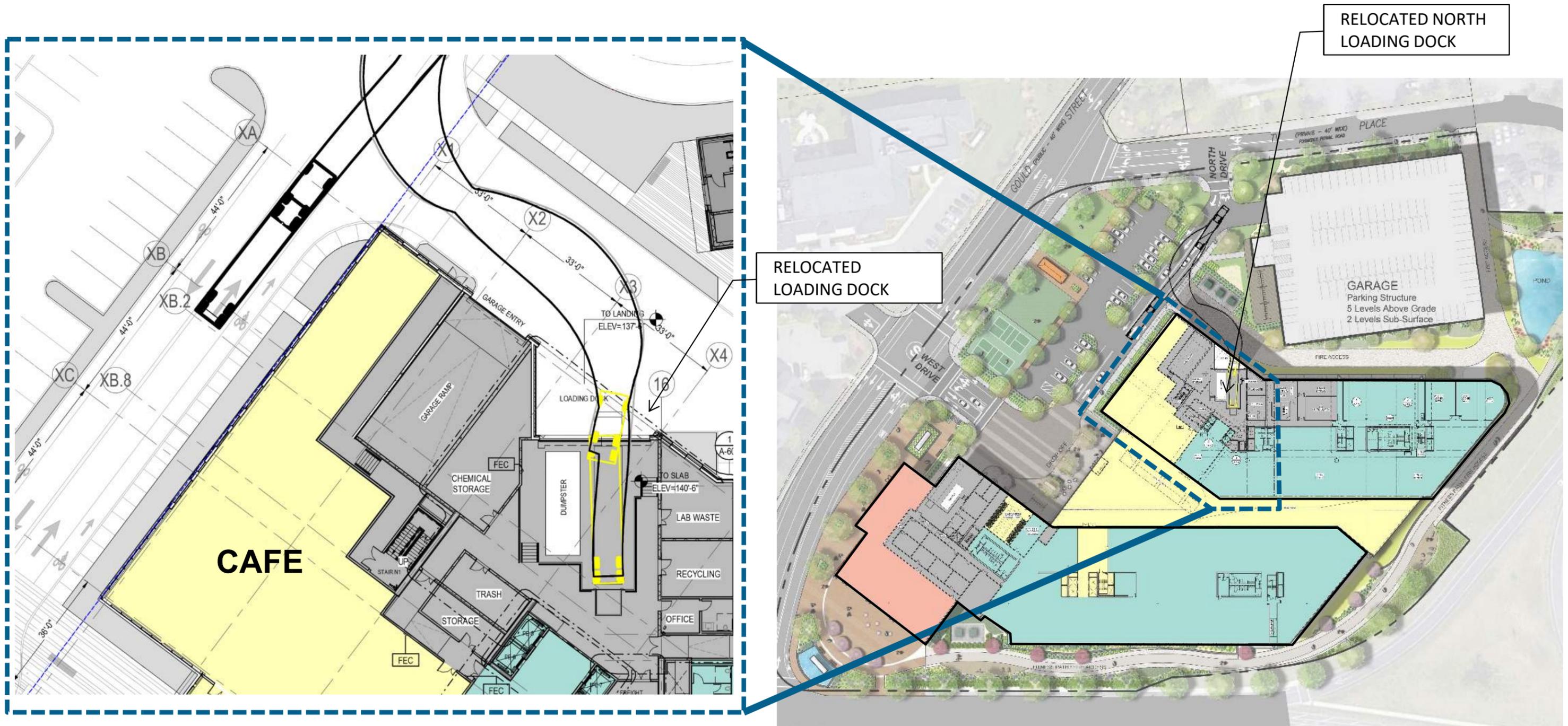
1. Relocated North Loading Dock and Garage Access from Gould St. Elevation around to Service Driveway
2. Studied incorporation of Family-Friendly separated bike lanes along Gould St.
3. Roadway improvements on Gould St.



PROPOSED DESIGN REV #3, 7/07/2022: SITE PLAN



PROPOSED DESIGN REV #3, 7/07/2022: LOADING DOCK



PROPOSED DESIGN REV #3, 7/07/2022: AERIAL LOOKING NORTH



PROPOSED DESIGN REV. #3, 7/07/2022: AERIAL LOOKING N-W



GOULD ST AMENITY: OPEN LAWN, SHADE STRUCTURE, PICKLE BALL COURTS, SEASONAL ICE SKATING

MASSING PULLED BACK TO SOFTEN CORNER & PROVIDE ADDITIONAL OPEN SPACE

Gould Street

GREEN ROOF

ROOF TERRACE

Highland Ave

INCREASED PLANTINGS & SCREENING. FITNESS PATH PUSHED BACK. ADDED LANDSCAPE VARIETY

PROPOSED DESIGN REV. #3, 7/07/2022: PEDESTRIAN VIEW AT GOULD



ADDED PICKLEBALL, FLEXIBLE LAWN SPACE,
& SHADE STRUCTURE

RELOCATED NORTH LOADING
DOCK & CREATED MORE ACTIVE
FAÇADE ALONG PEDESTRIAN PATH

PROPOSED DESIGN REV. #3, 7/07/2022: AERIAL LOOKING SOUTH





Highland Innovation Center
557 Highland Ave, Needham, MA
Transportation Summary Focus

Planning Board Meeting #2 – July 7, 2022

Sean Manning, PE | smanning@vhb.com
Matt Duranleau, PE | mduranleau@vhb.com



Highland Innovation Center (557 Highland Avenue) Transportation Summary

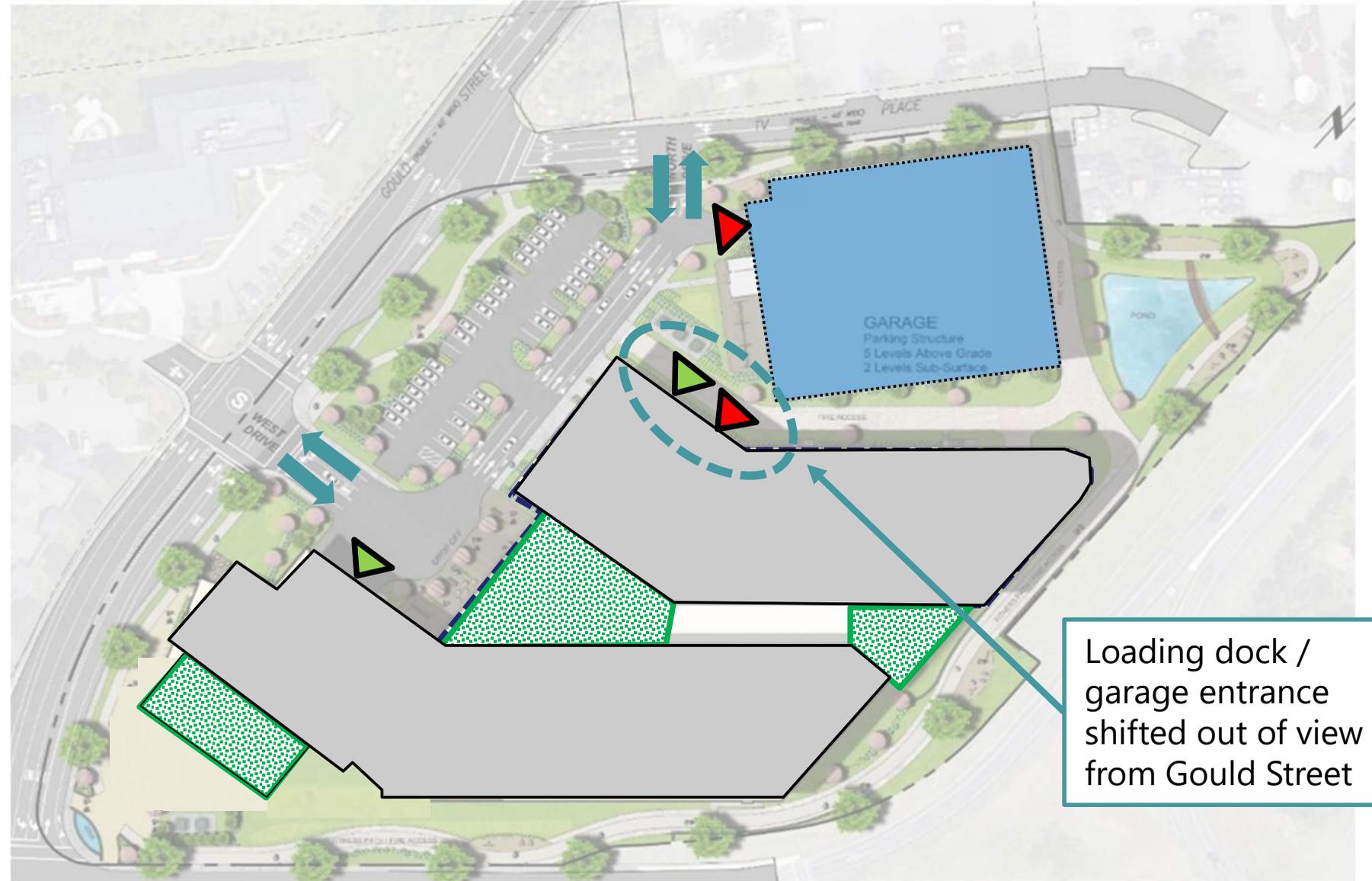
Agenda

- Project Summary
- Traffic Study Methodology
- Project Trip Generation
- Transportation Mitigation

Project Site Plan

Building Program

Use	Size (SF)
Office	248,347
R&D	248,347
Retail	10,000
Total	506,694



-  Garage Access
-  Loadings Access

Transportation Study Process

Comprehensive Transportation Impact and Access Study conducted by VHB supporting both Special Permit (town) and MEPA (state) application processes

Prior to study:

- Transportation Scoping Letter submitted to MassDOT.
- Coordination with Town of Needham and Greenman-Pederson, Inc. (GPI) (the Town's transportation consultant).
- Careful review of the 2020 GPI Transportation Study and related outcomes commissioned by the Town in connection with the recent rezoning effort for this site.

Local Submittal Timeline:

- Special Permit Submission with Traffic Study: April 8, 2022
- Neighborhood community meetings and coordination with Town departments: April-June 2022
- GPI Peer Review report: May 27, 2022
- First Planning Board Meeting: June 7, 2022

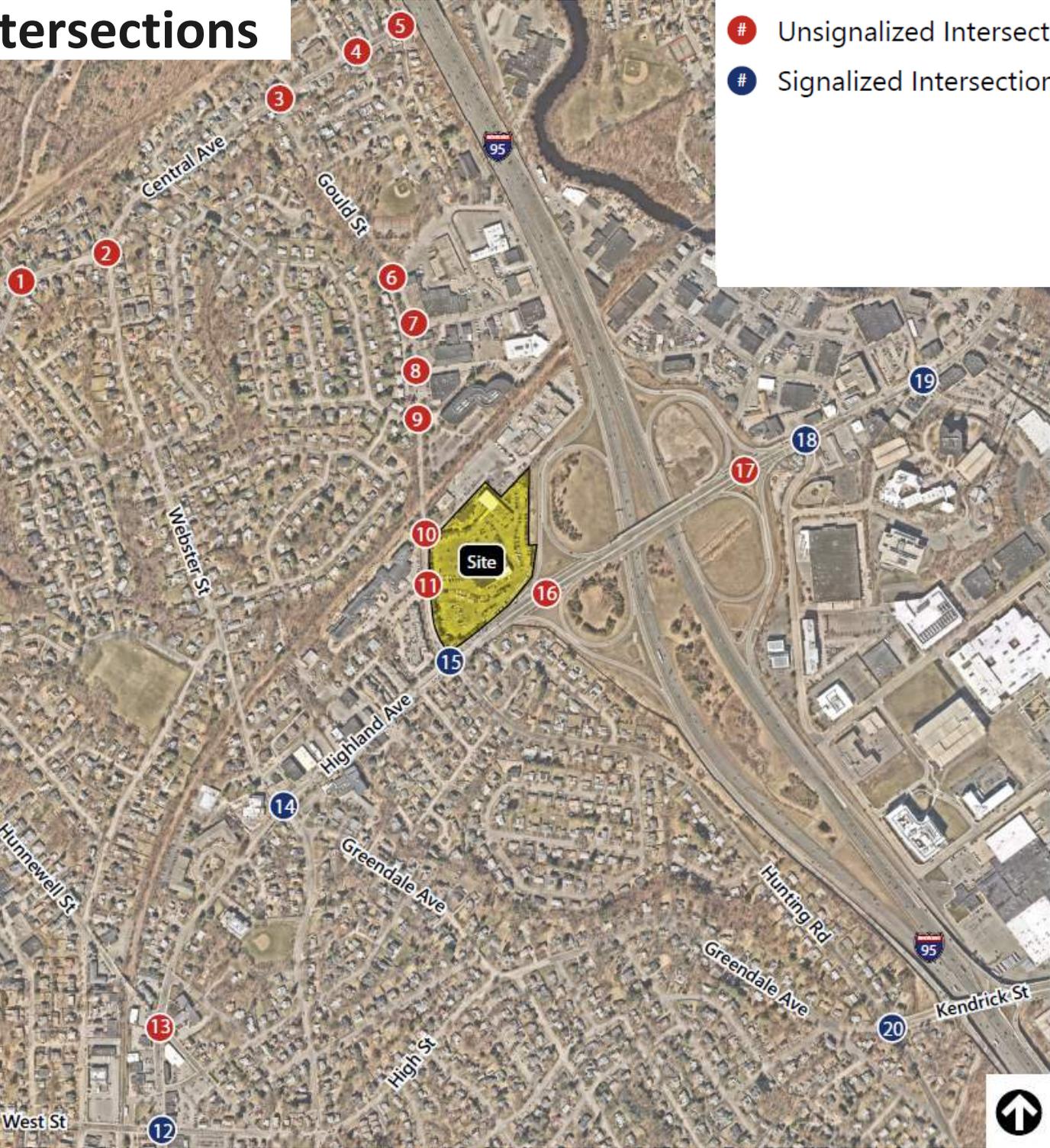
State Submittal Timeline:

- State MEPA ENF Submission with Traffic Study: April 1, 2022
- Certificate / Comment Letters Received: May 9, 2022
- Draft Environmental Impact Report to be submitted July 15, 2022

Traffic Study Overview

- Review of Existing (2022) Conditions
- Assessment of Future (2029) Conditions without the proposed Project
 - › Includes completion of MassDOT reconstruction of Highland Avenue
 - › Includes other nearby developments (100 West Street, Boston Children's Hospital at Founders Park, Newton Northland Development)
- Assessment of Future (2029) Conditions with the proposed Project
 - › Impacts with and without mitigation
 - › Summary of Transportation mitigation and TDM

Study Area Intersections



- 1 Central Avenue at Cedar Street
- 2 Central Avenue at Webster Street
- 3 Central Avenue at Gould Street
- 4 Central Avenue at Hampton Avenue
- 5 Central Avenue at River Park Street
- 6 Gould Street at Ellis Street
- 7 Gould Street at Kearney Road
- 8 Gould Street at Station Road
- 9 Gould Street at Noanett Street
- 10 Gould Street at TV Place
- 11 Gould Street at Muzi Ford/Wingate Res.
- 12 Highland Avenue at West Street
- 13 Highland Avenue at Hunnewell Street
- 14 Highland Avenue at Webster Street
- 15 Highland Avenue at Gould Street
- 16 Highland Avenue at I-95 SB Ramps
- 17 Highland Avenue at I-95 NB Ramps
- 18 Highland Avenue at 1st Avenue
- 19 Highland Avenue at 2nd Avenue
- 20 Kendrick Street at Hunting Road

Trip Generation | Existing Site Trips

Existing Site Vehicle Trips	
Weekday Daily	
Total	887
Weekday Morning Peak Hour	
Enter	37
<u>Exit</u>	<u>24</u>
Total	61
Weekday Evening Peak Hour	
Enter	29
<u>Exit</u>	<u>57</u>
Total	87

- Car wash alone was known to service **up to 1,300 cars/day at peak times** with daily averages between October and May approximately 600 cars/day as reported by Felix Taranto of Wash World, the car wash operator since the 1990s
- Car wash was **busiest in late Winter/Spring**, less busy in Summer
- Existing daily trips for Muzi site included Chevrolet dealership, Ford dealership, body shop, service center, new car sales, used car sales, outsourced sales, and parts pick-up (new and used) including gas, fuel, hazardous waste, and other removals constituting commercial trucks
- Existing trips quantified during COVID (July 2021) and **pre-COVID volumes were likely measurably higher** than what is quantified in the Transportation Study (conservative assumption)

Note: based on empirical counts conducted by VHB in July 2021, during COVID-19, and during the "slow" portion of the season

Trip Generation | Estimated Proposed Site Trips

Adjusted Vehicle Trips

	Office	R&D	Retail	Total Driveway Trips	Pass-by	Existing Site Trips	Total Net-New Vehicle Trips
Weekday Daily							
Total	2,658	2,763	629	6,050	(-158)	(-887)	5,005 *
Weekday Morning Peak Hour							
Enter	334	209	11	554	(-2)	(-37)	515 *
Exit	<u>42</u>	<u>44</u>	<u>9</u>	94	<u>(-2)</u>	<u>(-24)</u>	68 *
Total	376	253	20	649	(-4)	(-61)	584 *
Weekday Evening Peak Hour							
Enter	62	39	36	136	(-15)	(-29)	92 *
Exit	<u>303</u>	<u>204</u>	<u>38</u>	545	<u>(-15)</u>	<u>(-57)</u>	473 *
Total	365	242	74	681	(-30)	(-87)	565 *

* Trip Generation Likely Over-Estimated, Does Not Account For:

1. Local Trip Rates
2. Transit Use or Walk / Bike Trips
3. Work from Home / Hybrid Work Environment

Trip Generation | “Actual” Site Trips - Local Trip Rates

Estimated vs “Actual” Trip Rates

- Estimated trip rates based on national data from the Institute of Transportation Engineers (ITE) between the 1980s and 2010s
- Data provided based on three different land use codes: Office, R&D, and Retail
- Local trip rate data for office and R&D sites was reviewed from actual developments in the City of Cambridge from 2017/2018 to determine a more accurate representation of Project-generated trips

Office Trip Rate per 1,000 SF

	ITE National Data	Local Cambridge Data	Percent Difference
Weekday Daily			
Total	10.25	8.29	-19%
Weekday Morning Peak Hour			
Total	1.46	1.15	-21%
Weekday Evening Peak Hour			
Total	1.41	1.25	-11%

R&D Trip Rate per 1,000 SF

	ITE National Data	Local Cambridge Data	Percent Difference
Weekday Daily			
Total	10.65	5.95	-44%
Weekday Morning Peak Hour			
Total	0.98	0.72	-27%
Weekday Evening Peak Hour			
Total	0.94	0.72	-23%

Trip rates include all commuters (drivers, transit riders, walkers, and bikers)

Trip Generation | “Actual” Site Trips – Mode Share

Estimated vs “Actual” Mode Share / Work from Home

- Estimated Site-generated trips assume 100% of commuters will drive to work
- Estimated Site-generated trips do not include the impact of work from home / hybrid work schedules
- Analyses are highly conservative as some commuters will take transit (with shuttle connection), walk, bike, and/or work from home
- US Census data for City of Newton reviewed to determine potential transit/walk/bike/work from home mode share for Site
 - Newton data reviewed as Site is expected to operate more similarly to workplaces in Newton with connections to transit and direct interstate access
- Pre-COVID work from home share assume to double in future (at a minimum) to account for new hybrid work environment

Site Mode Share

	Vehicle	Transit, Walk, Bike	Work From Home
Estimated in Traffic Study	100%	0%	0%
City of Newton pre-COVID data ^a	77%	16%	7%
Potential Site “Actual” Mode Share ^b	72%	14%	14%

a – Mode shares determined from US Census Journey to Work Data (2012-2016) for workplaces located within the City of Newton, MA.

b – The estimated work from home mode share was doubled to account for the impacts of COVID-19 on the remote working environment.

Trip Generation | “Actual” Site Trips

“Actual” Site-Generated Trips estimated based on

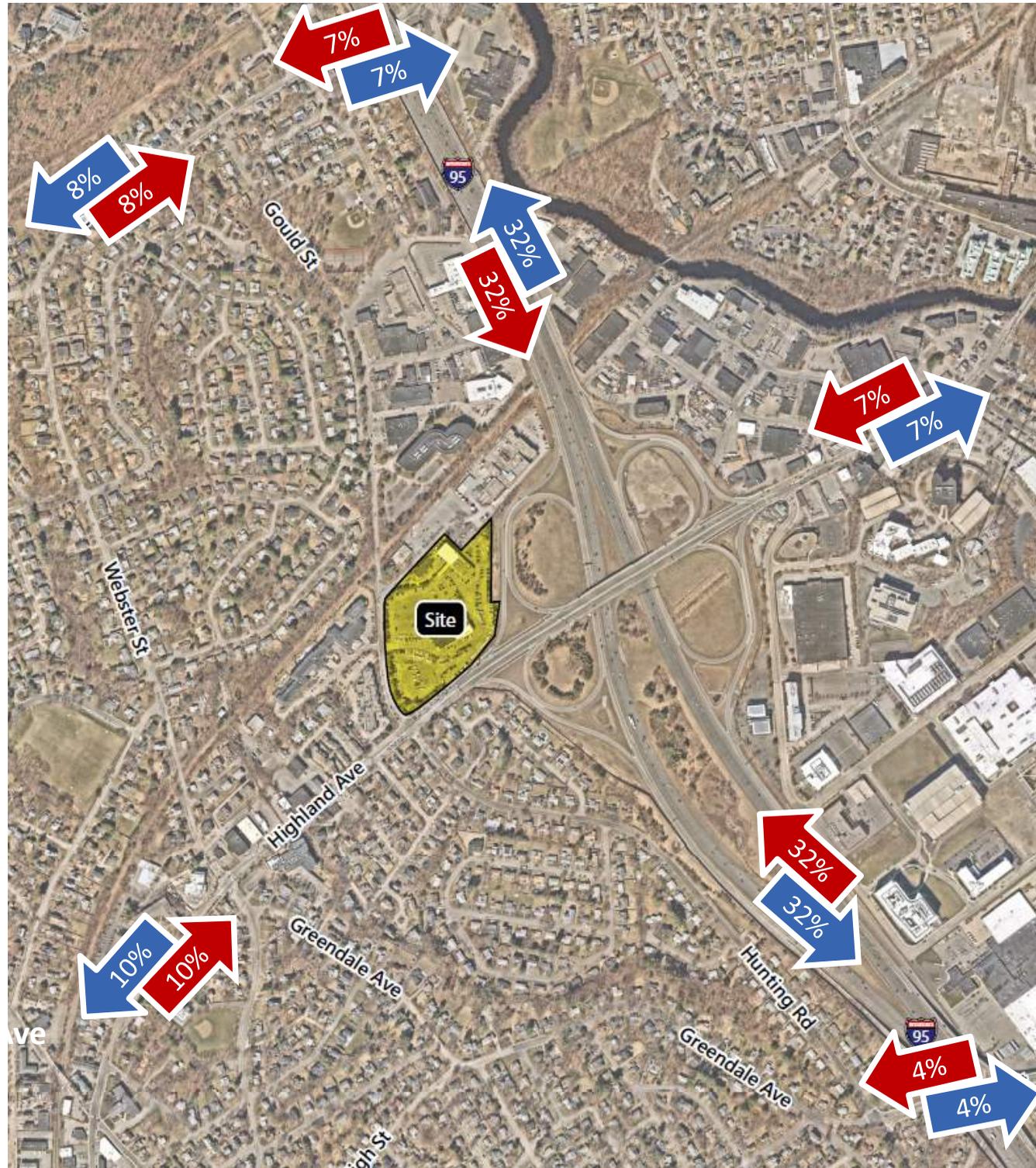
1. Local Trip Rates
2. Transit Use and Walk / Bike Trips
3. Work from Home / Hybrid Work Environment

- To be conservative, traffic analyses conducted without these estimated credits applied
- All roadway improvements designed to accommodate “worse-case” scenario

Total New Project Vehicle Trips

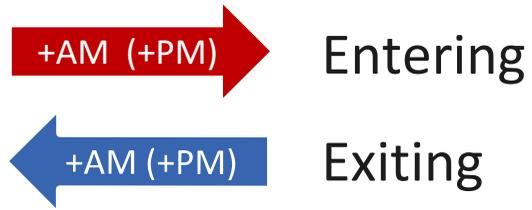
	Estimated New Vehicle Trips	“Actual” New Vehicle Trips	Percent Difference
Weekday Daily			
Total	5,005	2,072	-59%
Weekday Morning Peak Hour			
Enter	515	291	
<u>Exit</u>	<u>68</u>	<u>-12</u>	
Total	584	279	-52%
Weekday Evening Peak Hour			
Enter	92	29	
<u>Exit</u>	<u>473</u>	<u>273</u>	
Total	565	302	-47%

Trip Distribution



Source: Trip Distribution based on US Census Journey to Work Data (2012-2016) for workplaces located within the Town of Needham, MA.

New Project-Generated Trips



*** Trip Generation Likely Over-estimated, Does Not Account For:**

1. Transit Use or Walk / Bike Trips
2. Work from Home / Hybrid Work Environment

Based on higher Trip Generation to determine proposed mitigation



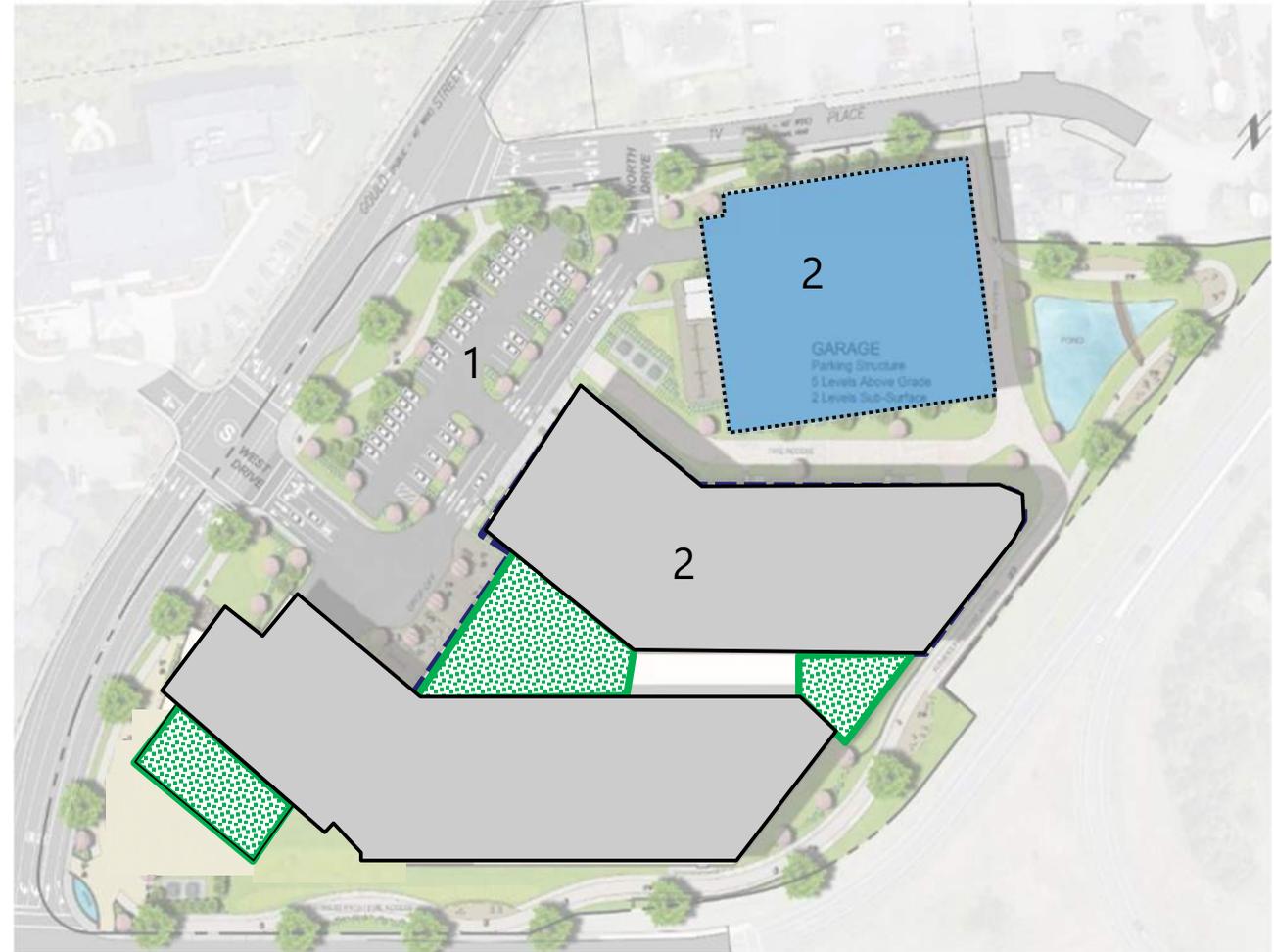
Parking Supply

Type	Spaces
Vehicle	1,408 spaces
Bike	154 spaces

1. Small surface parking lot for patrons and visitors
2. Stand-alone garage and underground parking for employees



25% of all parking spaces will include **EV charging stations**



Parking Demand

Conservative Analysis based on 100% Auto Use

The proposed Project parking supply of up to **1,408 off-street parking spaces** exceeds the expected demand.

Use	Size (SF)	Employee/Patron Density ^a	VOR ^b	Parking Demand
Office	248,347	3.33/ksf	1.15	719 spaces
R&D	248,347	2.46/ksf	1.15	531 spaces
Retail	10,000	3.33/ksf	1.15	29 spaces
Total				1,279 spaces ^c

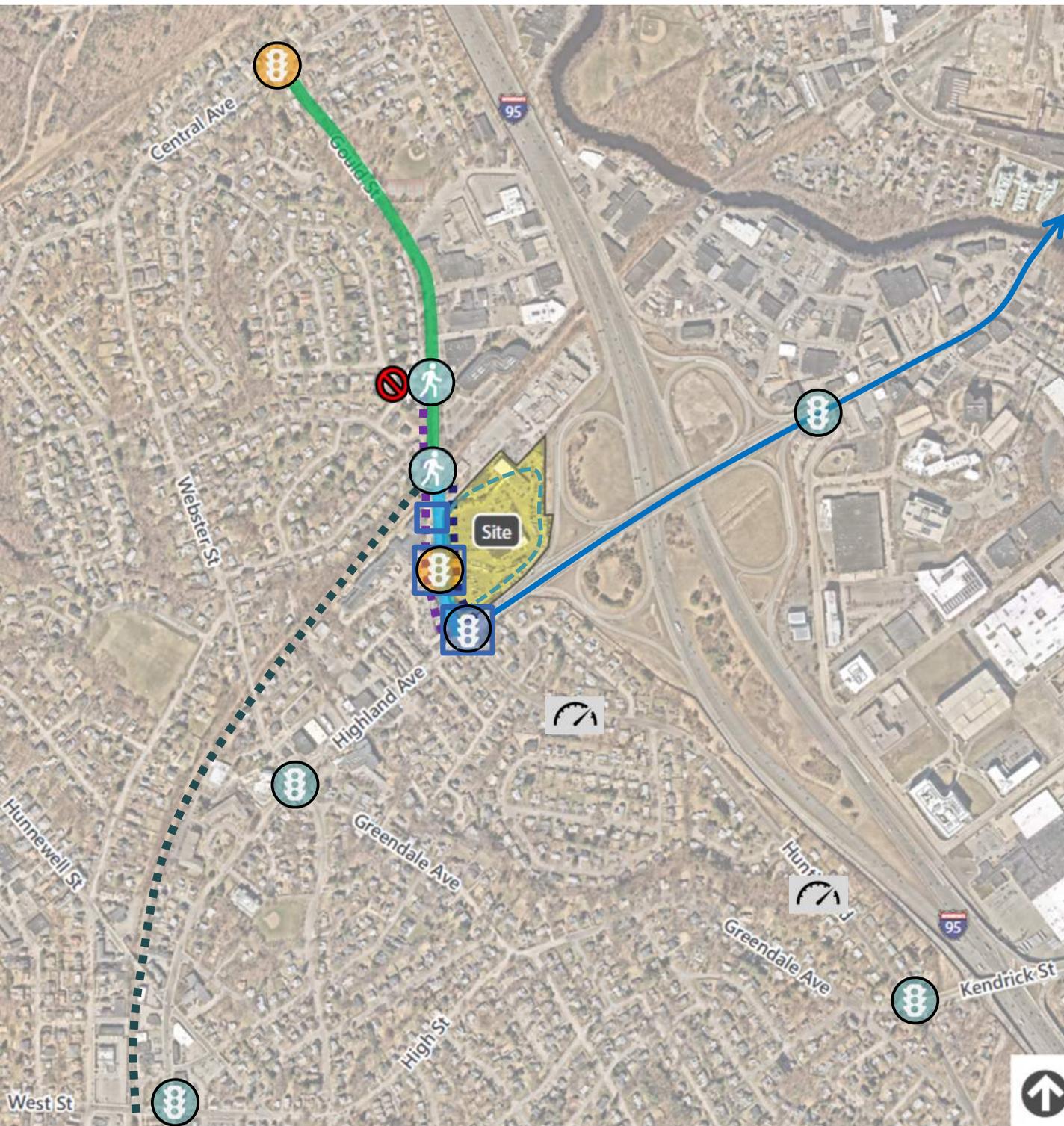
a – Based on Town of Needham zoning requirements for office and retail and employee density data from existing sites in Cambridge for R&D

b – Vehicle Occupancy Rates (VOR) based on Existing data for workplaces within Needham

c – Would result in parking rate of 2.52 spaces per kSF

Parking demand likely to be lower than 1,279 spaces due to transit/walk/bike commuters and hybrid work environment

*25% of all parking spaces to include **EV charging stations***



Mitigation Measures

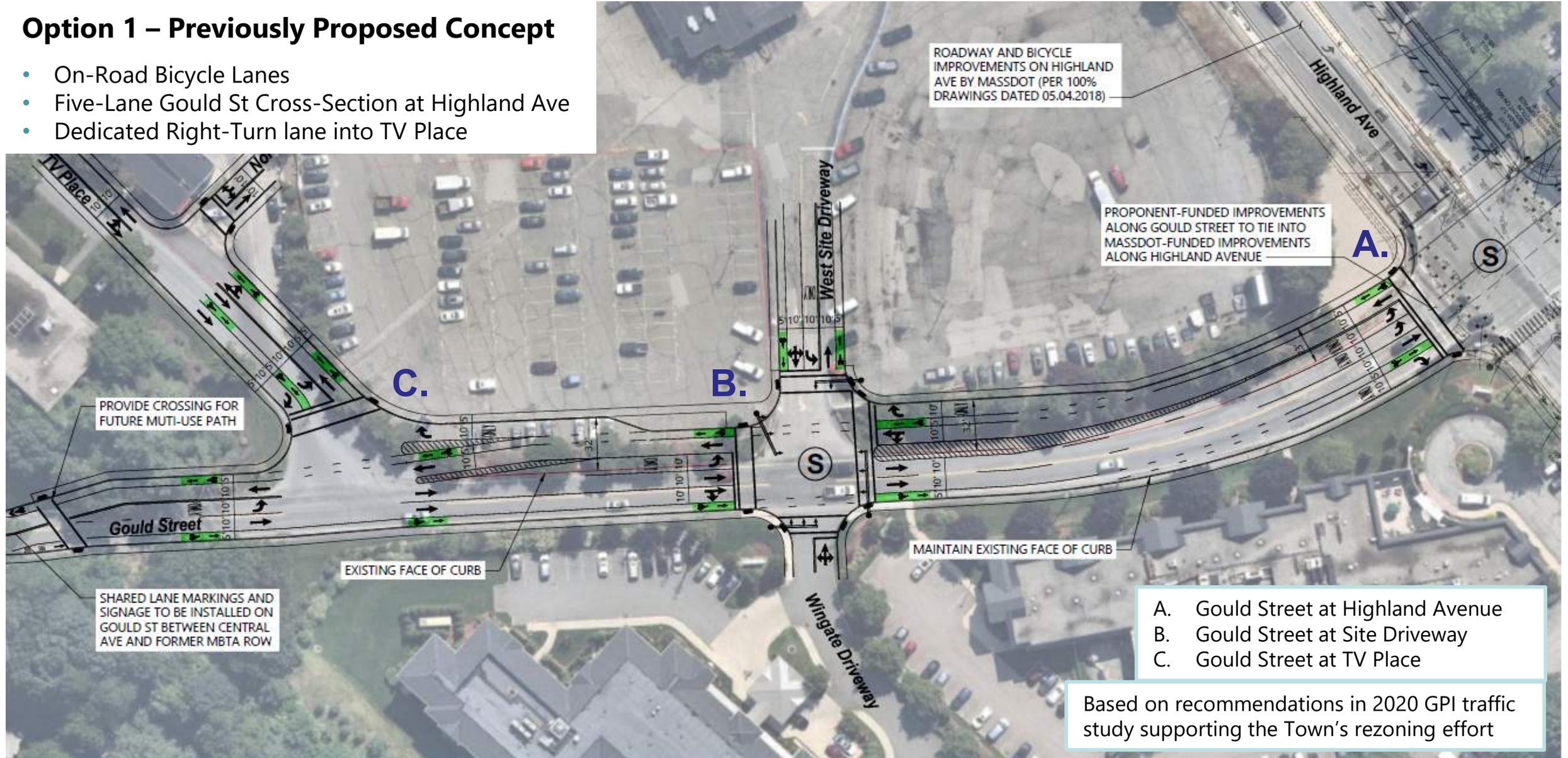
-  New traffic signal
-  Signal Timing and Equipment Improvement
-  Signal Timing Modifications
-  Geometric Improvements
-  Sidewalk Level Separated Bicycle Facilities
-  Shared Bicycle Lane Markings and Signage
-  Reconstruction of Sidewalk
-  New Pedestrian Facility
-  Pedestrian Infrastructure Improvements
-  Signage to deter cut-through traffic during peak hours
-  Installation of radar-embedded speed limit signs
-  On-Site Walking/Fitness Path
-  Shared Use Path Feasibility Study
-  Shuttle Service (Connection to Transit Station)

Transportation Mitigation | Gould Street

DRAFT – FOR PRELIMINARY DISCUSSION ONLY

Option 1 – Previously Proposed Concept

- On-Road Bicycle Lanes
- Five-Lane Gould St Cross-Section at Highland Ave
- Dedicated Right-Turn lane into TV Place



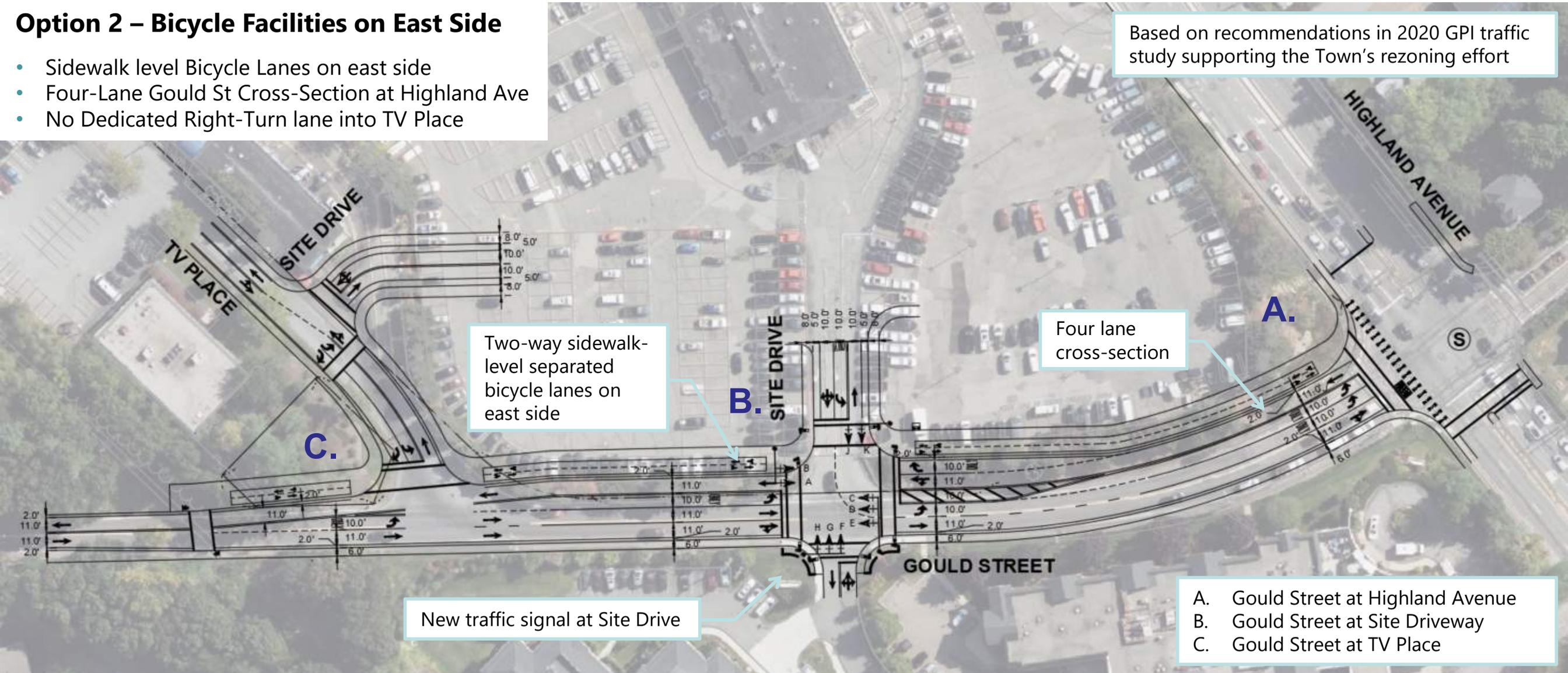
Transportation Mitigation | Gould Street

DRAFT – FOR PRELIMINARY DISCUSSION ONLY

Option 2 – Bicycle Facilities on East Side

- Sidewalk level Bicycle Lanes on east side
- Four-Lane Gould St Cross-Section at Highland Ave
- No Dedicated Right-Turn lane into TV Place

Based on recommendations in 2020 GPI traffic study supporting the Town's rezoning effort



Two-way sidewalk-level separated bicycle lanes on east side

Four lane cross-section

New traffic signal at Site Drive

- A. Gould Street at Highland Avenue
- B. Gould Street at Site Driveway
- C. Gould Street at TV Place

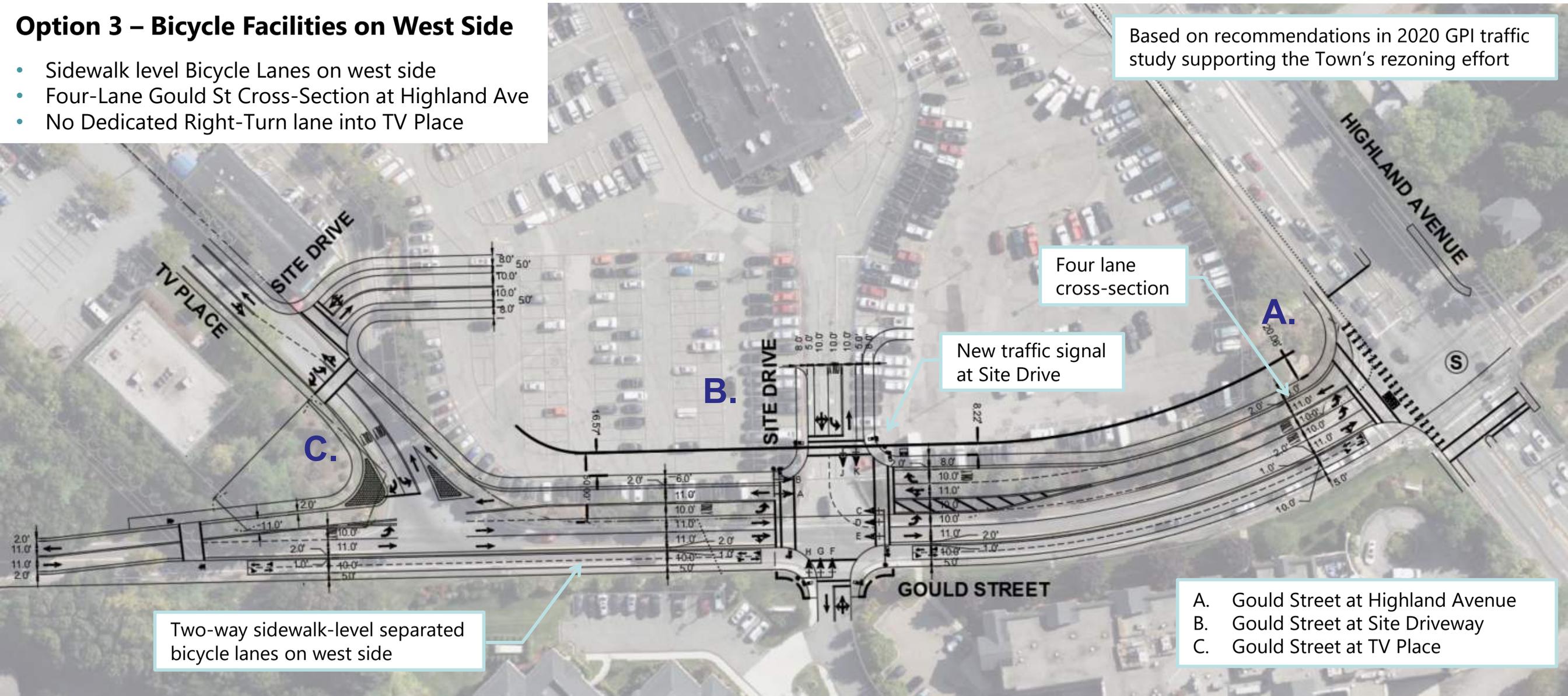
Transportation Mitigation | Gould Street

DRAFT – FOR PRELIMINARY DISCUSSION ONLY

Option 3 – Bicycle Facilities on West Side

- Sidewalk level Bicycle Lanes on west side
- Four-Lane Gould St Cross-Section at Highland Ave
- No Dedicated Right-Turn lane into TV Place

Based on recommendations in 2020 GPI traffic study supporting the Town's rezoning effort



Four lane cross-section

New traffic signal at Site Drive

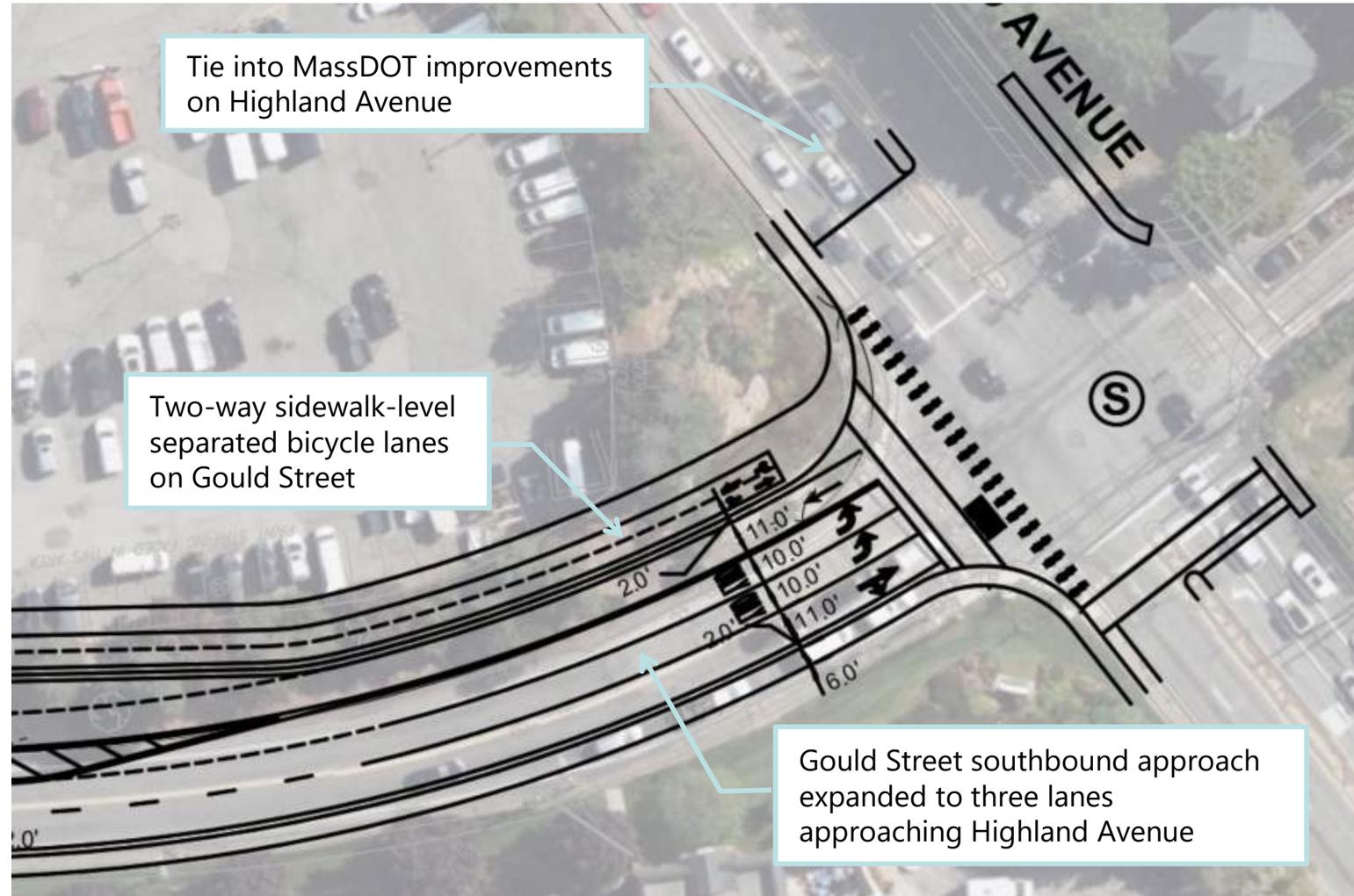
Two-way sidewalk-level separated bicycle lanes on west side

- A. Gould Street at Highland Avenue
- B. Gould Street at Site Driveway
- C. Gould Street at TV Place

Transportation Mitigation | Gould Street at Highland Avenue

DRAFT – FOR PRELIMINARY DISCUSSION ONLY

A.

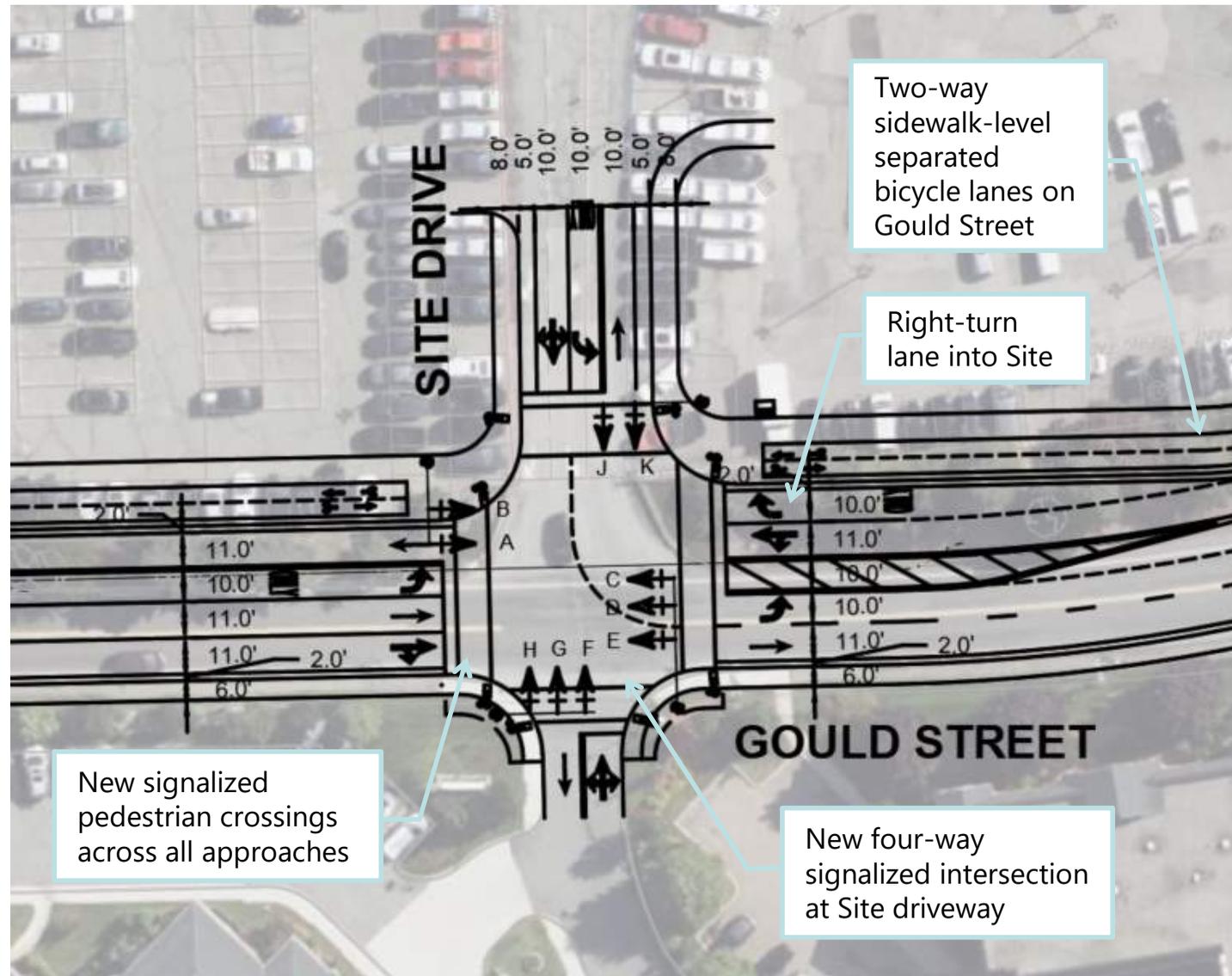


Option 2 (Separated bike facility on east side) shown for reference

Transportation Mitigation | Gould Street at Site Driveway

DRAFT – FOR PRELIMINARY DISCUSSION ONLY

B.

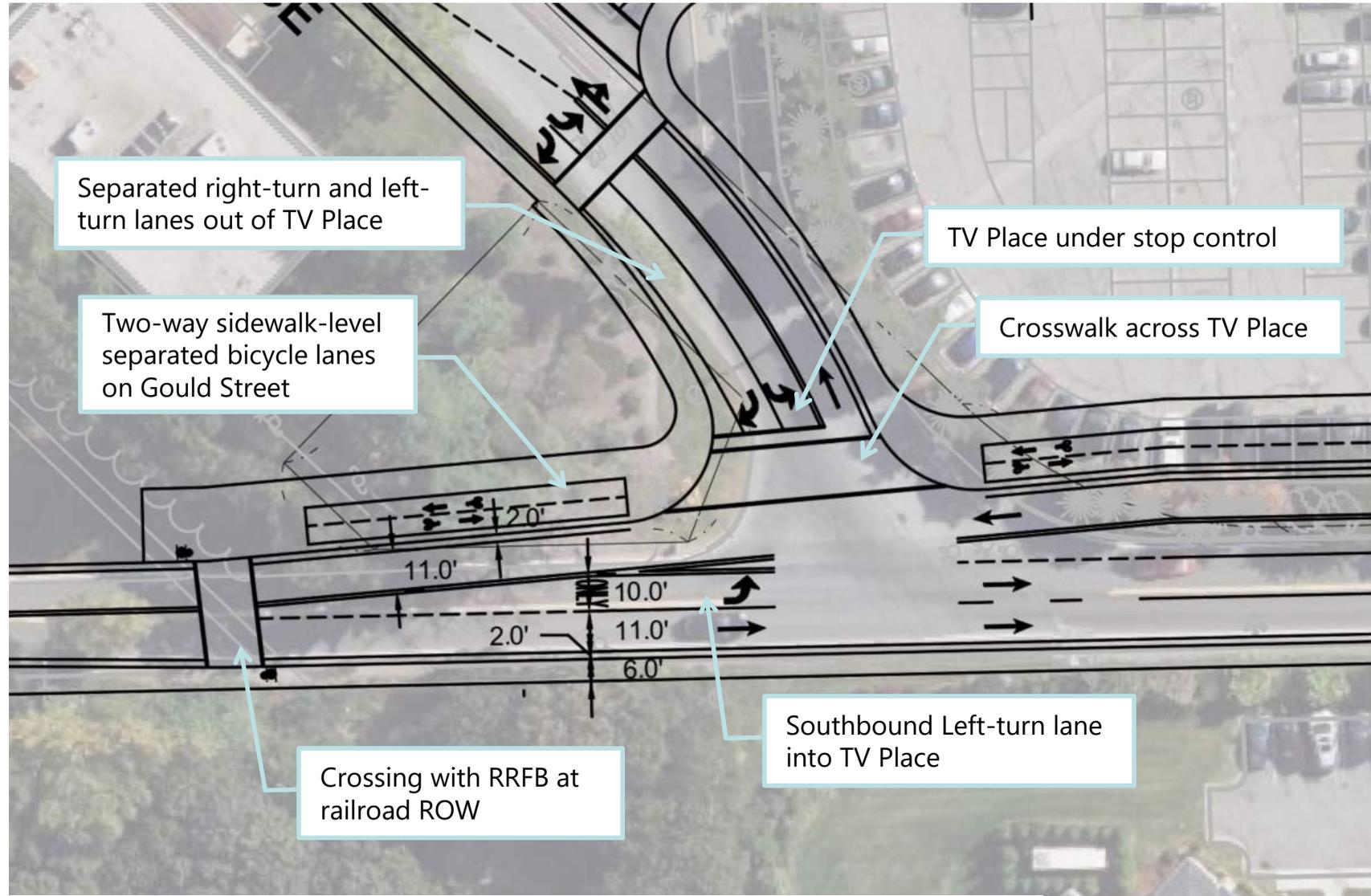


Option 2 (Separated bike facility on east side) shown for reference

Transportation Mitigation | Gould Street at TV Place

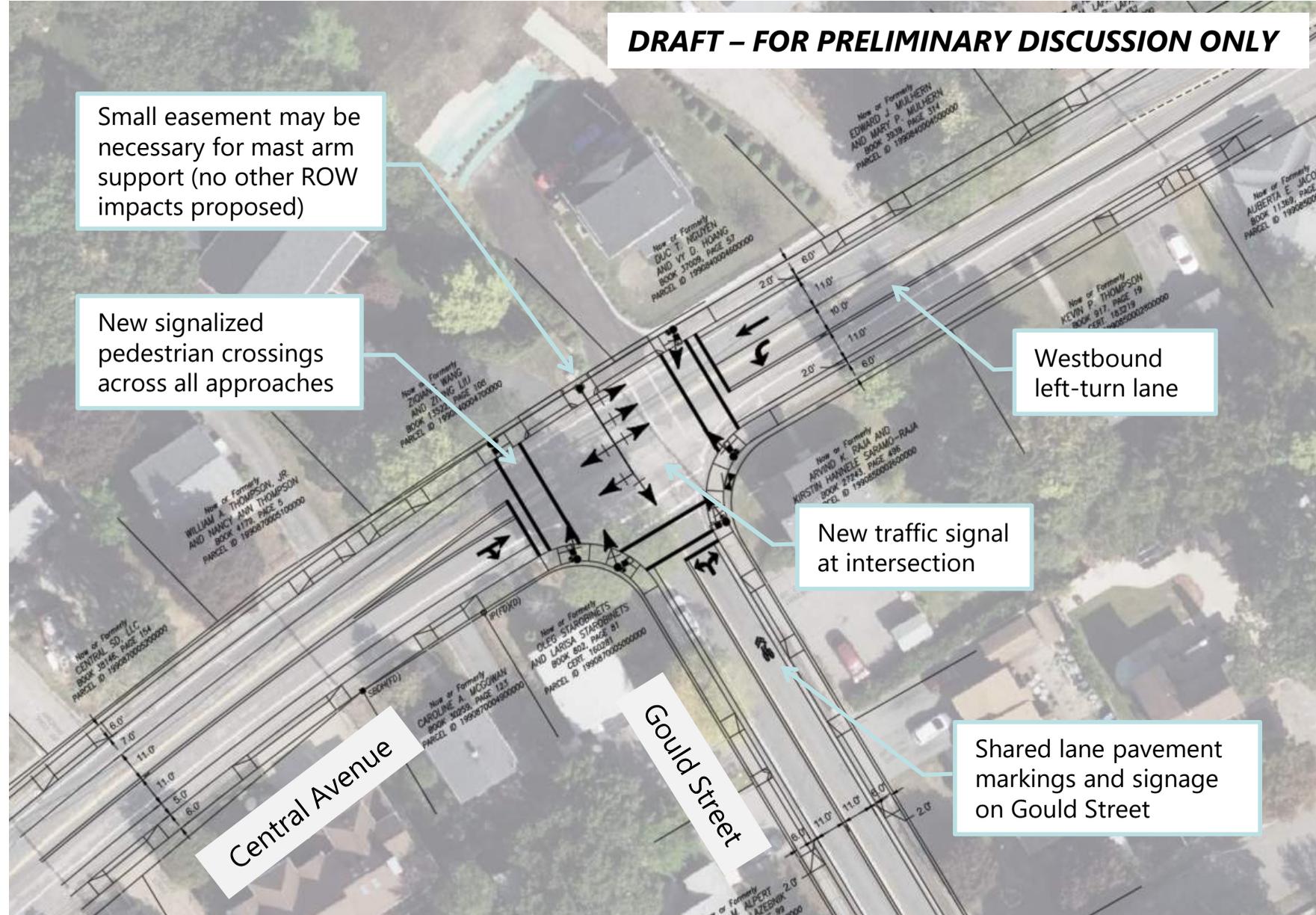
DRAFT – FOR PRELIMINARY DISCUSSION ONLY

C.



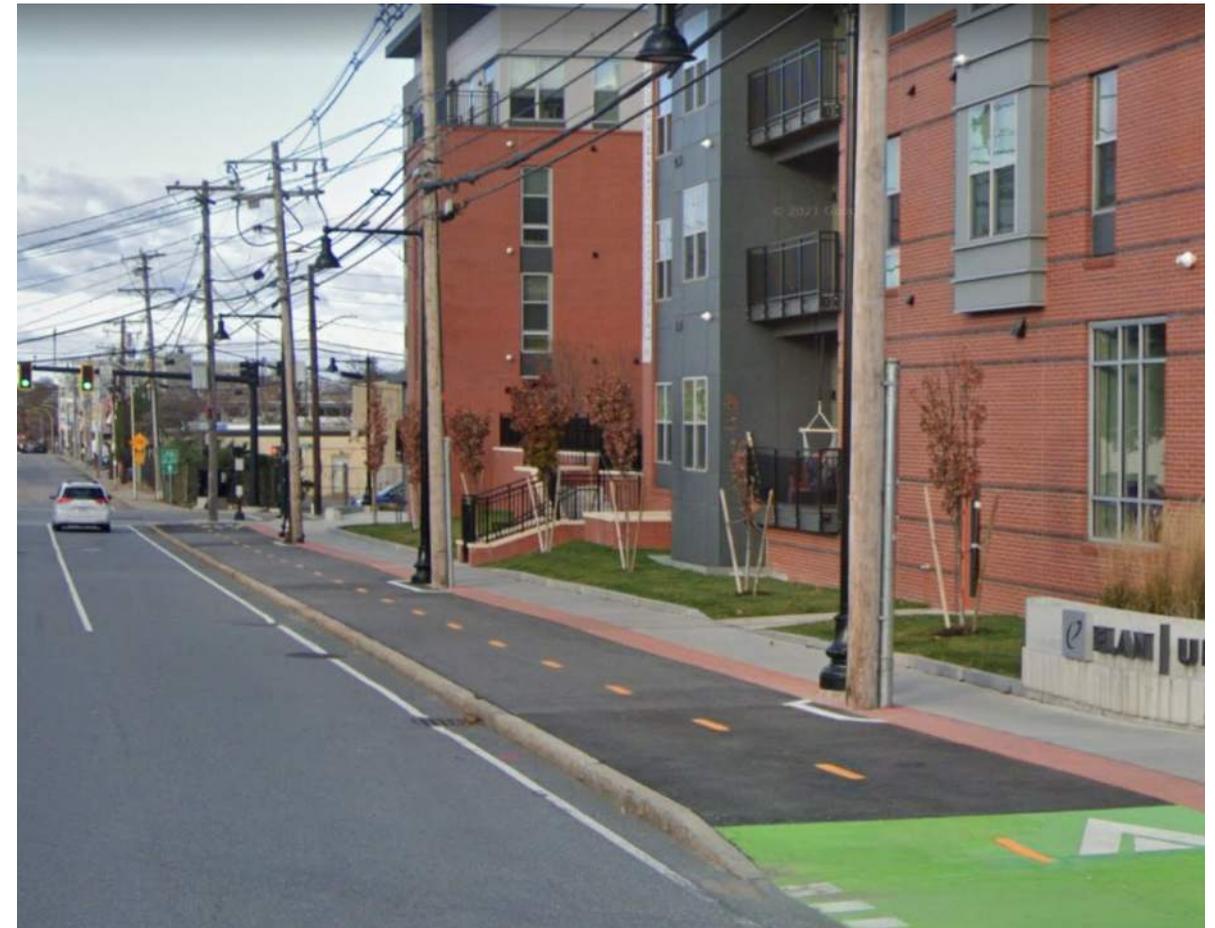
Option 2 (Separated bike facility on east side) shown for reference

Transportation Mitigation | Gould Street at Central Avenue



Transportation Mitigation | Pedestrian and Bicycle Accommodations

1. Up to **154 bicycle parking spaces** on-site
 - 104 secure spaces for employees in bike room
 - 50 spaces for visitors in outdoor public bike racks
2. Walking/fitness path on-site (0.5 miles) open to public
3. Construction of **two-way sidewalk-level separated bike lanes** on Gould Street between Highland Avenue and former MBTA ROW to provide a family-friendly facility
4. Full **Reconstruction of sidewalk** on west side of Gould Street between Highland Avenue and Noanett Road



Arsenal Street in Watertown, Massachusetts



Transportation Mitigation | Pedestrian and Bicycle Accommodations (cont.)

5. Support Town of Needham with additional funding for feasibility study of converting the former MBTA railroad ROW north of the Project Site into a **shared use path**
6. Construction of crosswalk across Gould Street at former MBTA ROW with **Rapid Rectangular Flashing Beacon (RRFB)** or **LED Warning signs**



Rapid Rectangular Flashing Beacon (RRFB)

LED lights flash only when the pedestrian push button is activated to warn drivers that a pedestrian is present in the crosswalk and lights flash only for the time needed to safely cross the roadway



LED Pedestrian Warning Sign

Illuminates 24/7 the pedestrian warning sign for added awareness

Transportation Mitigation | Transit Connection

- Direct connection to nearby public transit stations via an **electric shuttle**
- Potential connections to **Green Line D Branch** (at Newton Highlands) and/or **Commuter Rail** (at Needham Heights)
- Provides access to Site for employees who live closer to Boston



Transportation Mitigation | Noanett Road

Mitigation proposed based on feedback from neighborhood residents:

1. Reconfiguring the sidewalk ramps on the northwest and southwest corners of the intersection with Gould Street to be ADA accessible and striping of a crosswalk across the Noanett Road approach to Gould Street
2. Installing “Do Not Enter” signs between 7:00-10:00 AM and 3:00-6:00 PM such that the road will be limited to residents only – no through traffic.
3. Commissioning a police detail stationed in an unmarked cruiser, who will issue citations to violators upon opening of the project for the first three months and at such other intervals from time-to-time, as required (as done by the Proponent in Cambridge, MA on Acorn Park Drive)
4. Installing a traffic light at Gould Street and Central Avenue to facilitate traffic and encourage users to utilize the Gould/Central light in both directions.
5. Installing “Blind Driveway” signs and “Slow Children” signs as needed.



Example of peak period “Do Not Enter” sign in Cambridge, MA

Transportation Mitigation | Hunting Road



1. Speed limit signs with embedded radar
 - Alerts drivers to current speed in comparison to posted speed limit to try to slow speeds and increase driver awareness
 - Can be permanent or temporary installments
2. Intermittent police speed detail to enforce speed limit
3. Traffic monitoring to understand if cut-through traffic activity occurs and when
4. Installing directional signage to deter through traffic on Hunting Road

Transportation Mitigation | Sachem Road



Transportation Demand Management (TDM)

Proposed Measures

1. Shuttle Service to nearby transit stations
2. Transportation Employee Advisor
3. Secure/Indoor bicycle parking (104 spaces)
4. 50-percent transit pass subsidy
5. Emergency ride home
6. Carpool assistance and incentives
7. Bicycling/walking incentives and amenities
8. On-site locker rooms and showers
9. On-site amenities for employees to reduce midday trips
10. Telecommuting and compressed workweeks
11. Display real-time transportation-related information
12. Promotional efforts
13. EV charging stations (25-percent of all spaces)

Transportation Management Association (TMA):

The Proponent will join and become an active member of the 128 Business Council.

Transportation Monitoring:

Annual traffic collection program for five year, including:

- Parking garage counts
- Intersection counts at four off-site locations
- Intersection capacity analyses
- Travel survey of employees and patrons

Proponent will work with Town of Needham on monitoring commitment to not exceed projected trip generation

Project Mitigation Summary



Sustainable Transportation Modes:

- Gould St sidewalk level separated bicycle facilities between Highland Ave and former MBTA ROW
- Gould St shared lane markings and signage between former MBTA ROW and Central Ave
- Reconstruction of the sidewalk on the west side of Gould St between Highland Ave and Noanett Road
- Construction of a new pedestrian facility on the east side of Gould St along Site frontage
- New crossing of Gould St at former MBTA ROW with rectangular rapid flashing beacons
- Reconfiguring the sidewalk ramps on the corners of Noanett Rd and Gould St
- Support Town of Needham with Shared use path feasibility study for former MBTA ROW
- Transit connector shuttle service (with electric shuttle)



Targeted Intersection/Signal/Roadway Improvements:

- Highland Ave at Gould St/Hunting Rd: Geometric improvements, signal timing and equipment improvements, expansion of Gould St SB approach, and pedestrian infrastructure improvements
- Central Ave at Gould St: Traffic signal installation and pedestrian infrastructure improvements
- Gould St at Site Driveway/Wingate Driveway: Traffic signal installation, expansion of Gould St cross-section, and pedestrian infrastructure improvements
- Gould St at TV Place: Geometric improvements
- Signal timing modifications at Highland Ave at West St, at Webster St, at 1st Ave, and Hunting Rd at Kendrick St



Speed and Traffic Calming:

- Installation of signage to deter cut-through traffic during the peak hours at Noanett Rd
- Installation of two radar-embedded speed limit signs on Hunting Rd to encourage lower vehicle speeds

**FOR ANY QUESTIONS, PLEASE E-MAIL
TRANSPORTATION CONSULTANTS.**

Sean Manning, PE | smanning@vhb.com | 617.607.2971

Matt Duranleau, PE | mduranleau@vhb.com | 617.607.1584

www.vhb.com



Offices located throughout the east coast



PUBLIC BENEFITS

- Bicycle lanes incorporated into site circulation
- Plaza adjacent to public retail amenities
- Enhanced pedestrian accessibility
- Ground level activation with retail and community space at the corner of Gould Street and Highland Avenue
- Provide approximately 1,250 permanent jobs at full occupancy
- Provide 300 construction jobs
- Tax revenue of approximately \$5 million (annually), to support Town of Needham's educational and recreational programs, housing initiatives, community and open spaces, and other Town priorities
- Improved water quality and stormwater management
- Improved open space along Highland Avenue



Q+A





TOWN OF NEEDHAM

TOWN HALL
Needham, MA 02492-2669

TEL: (781) 455-7500

FAX: (781) 449-4569

Office of the
TOWN MANAGER

June 15, 2022

Planning Board
500 Dedham Avenue
Needham, MA 02492

Dear Planning Board Members:

At its meetings on May 24 and June 14, 2022 the Select Board discussed the 557 Highland Avenue/Highland Innovation Center project. The Select Board supported the zoning that led to the development of this parcel, and wholeheartedly supports the project as it is being developed. The Board believes that the scope of the project is consistent with Town Meeting's approval of the zoning change, and that the new growth associated with the facility will be the cornerstone of the Town's plan to finance up-coming school projects.

The Board offers the following comments to the Planning Board as part of the Special Permit Hearing process.

Sustainability

The Board is encouraged that the developer has indicated a plan to achieve LEED Gold certification and to seek WELL and Fitwel building certifications. The Board supports the installation of solar facilities at the site, including on buildings and by means of parking lot canopies. To the extent that a zoning amendment may be required for the use of solar canopies, the Board urges the Planning Board to consider such a change. The Board encourages the Developer to evaluate ways to ensure that the facility could comply with future requirements like the City of Boston's Building Emissions Reduction and Disclosure Ordinance (BERDO).

Traffic

The Board recognizes that the developer has recommended roadway improvements that reflect the potential build-out of the entire area of the traffic study, not just the site proposed for development. While the developer could have proposed only those measures related to the 557 Highland Avenue parcel, the proposed improvements will ensure that when and if the entire area is developed the associated traffic will be addressed consistent with the Town's traffic consultant's recommendations. Moreover, the addition of bicycle infrastructure is reflective of community-wide planning efforts. The Board encourages substantive discussion about the potential of increased traffic associated with this project in a post-Pandemic era.

Transportation Demand Management

The Board supports the transportation demand management plan proposed by the Developer. The Board is encouraged by the Developer's commitment to participate with the Town in developing last-mile transportation infrastructure along the MBTA rail corridor after the upcoming feasibility study is complete. The Board supports all initiatives to encourage employees to access the facility through public transportation, walking and/or biking rather than taking personal vehicles to work, and is encouraged by the proposed use of electric shuttle buses for that purpose.

Parking

It appears based on the Developer's estimate and the Town's traffic study that the actual need for parking spaces is 1,400 rather than the 1,700+ required under the Town's zoning. The Board supports the relief requested by the Developer in this regard. Ideally, lowering the parking demand would serve to lower the height of the parking structure.

Race Equity Vision

The Board supports the Developer's intent to seek significant participation of women and minority-owned businesses in the construction and management of the new facility. We look forward to ongoing reporting on this topic as the project is constructed.

Very truly yours,



Kate Fitzpatrick
Town Manager

Cc: Select Board
Katie King, Assistant Town Manager
David Davison, Assistant Town Manager
Lee Newman, Director of Planning & Community Development
Robert Schlager, Bulfinch Company

Public Comments on 557 Highland Avenue

Received between June 4, 2022 and June 28, 2022.

1. Email from Carlos Agualimpia, Town Meeting Member - Precinct C, dated June 4, 2022.
2. Email from Steven Sussman, 30 Davenport Road, dated June 6, 2022.
3. Email from Henry Ragin, 25 Bennington Street, dated June 6, 2022.
4. Email from Casey Fedde, 16 Mills Rd, dated June 6, 2022.
5. Email from Avery, dated June 6, 2022.
6. Email from Karen Quigley, dated June 6, 2022.
7. Email from Kim Stone, Kim Stone, 45 Greendale Ave, dated June 6, 2022.
8. Email from MaeLynn Patten, 16 Ledge Street, dated June 6, 2022.
9. Email from Valerie Maio, 15 Park Ave., dated June 6, 2022.
10. Email from Maggie Flanagan, dated June 6, 2022.
11. Email from Nicole Nasson, dated June 6, 2022.
12. Email from Brooke Reilly, 41 Pine Grove Street, dated June 6, 2022.
13. Email from Jennie Jonas, 93 Sachem Road, dated June 6, 2022.
14. Email from Shannon Shavor, dated June 6, 2022.
15. Email from Matt Flanagan, 54 Sachem Road, dated June 6, 2022.
16. Email from Holly Charbonnier, 94 Sachem Road, dated June 6, 2022.
17. Email from Joanne Garabedian, dated June 6, 2022.
18. Email from Ali Dabuzhsky, 42 Aletha Road, dated June 6, 2022.
19. Email from Ashly Scheufele, 52 Greendale Avenue, dated June 6, 2022.
20. Letter from the Needham Heights Alliance, dated June 6, 2022.
21. Email from Paul Charbonnier, 94 Sachem Road, dated June 6, 2022.
22. Email from Emily Pick, 12 Mills Road, dated June 6, 2022.
23. Email from Natalie and Eugene Ho, 21 Utica Rd, dated June 26, 2022.

24. Email from Russell Smith, dated June 6, 2022.
25. Email from Julie Tracey, Beech Street, dated June 6, 2022.
26. Email from Ada Lei Chan, dated June 6, 2022.
27. Email from Elizabeth C Rich, 323 West Street, dated June 6, 202.
28. Email from Alanna Burke, dated June 6, 2022.
29. Email from Maureen and Jim DiMeo, 442 Central Avenue, dated June 6, 2022.
30. Email from Larry Tobin, 31 Greendale Ave, dated June 6, 2022.
31. Email from Michael Diener, dated June 7, 2022.
32. Email from Laura Ruch, dated June 7, 2022.
33. Email from Kelly Close, dated June 7, 2022.
34. Email from Robert Deutsch, dated June 7, 2022.
35. Email from Callie Curran Morrell, 2 Central Terrace, dated June 7, 2022.
36. Email from Jackie Boni, 13 Nichols Rd, dated June 7, 2022.
37. Letter from Deb Whitney, dated June 7, 2022.
38. Email from Kate Robey, dated June 7, 2022.
39. Email from Gilad & Rachel Skolnic, 33 Park Avenue, dated June 8, 2022.
40. Email from Kathleen Robey, 150 Warren Street, dated June 7, 2022.
41. Email from Kira Robinson-Kates, dated June 8, 2022.
42. Email from Ryan Ciporkin, 42 Park Avenue, dated June 9, 2022.
43. Email from Alex Boni, 13 Nichols Rd, dated June 9, 2022.
44. Email from Robert Dangel, 28 Hewitt Circle, dated June 11, 2022.
45. Email from Susan B. McGarvey, 66 Upland Road, dated June 11, 2022.
46. Email from Shari Stier, 23 Park Ave, dated June 14, 2022.
47. Email from Christine Dedek, 55 Hunting Road, dated June 28, 2022.

From: [Carlos Agualimpia](#)
To: [Planning](#); [Kate Fitzpatrick](#); [David Roche](#); [Lee Newman](#); [Selectboard](#)
Cc: [Theodora Eaton](#)
Subject: Muzi Lot Planning Board Hearing
Date: Saturday, June 4, 2022 10:12:40 AM

Dear Planning Board Members, et al: (trying to best convey the below message):

As a Town Meeting member, I would appreciate you conveying the following message to those attending the Hearing, as I will not be able to attend this important meeting.

Thanks in advance for your help.....stay safe.

Carlos Agualimpia
Town Meeting Member - Precinct C

Town Meeting Members,

As I will not be able to attend the coming Tuesday session of the Planning Board re the Special Permit requested by the developer of the ex-Muzi lot, I want to share my thoughts as I find it unacceptable, or disappointing, to say the least, what the developer intends.

After several iterations in past meetings, Town Meeting voted for the zoning bylaws acceptable by Town Meeting for that property. It seems to me that this special permit request basically intends to bypass a significant amount of zoning bylaws approved by Town Meeting, without going through Town Meeting. This seems to be a disregard of Town Meeting's decisions, trying to avoid complying with what has been approved, and as such, **I oppose this permit request and expect the developer to comply with the conditions approved by and at Town Meeting.** Alternatively, to present their request for Town Meeting approval at a next Town Meeting Meeting....the developed could and should have taken advantage of our TMM meeting last month.

Hope this helps in Tuesday's discussions, wish you and your loved ones are safe and healthy.

Carlos Agualimpia
Town Meeting Member
Precinct C

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Carlos Agualimpia

From: [Kevin and Avery](#)
To: [Planning](#)
Subject: Re: the Muzi site
Date: Monday, June 6, 2022 1:30:08 PM

Hi there,

I understand there is a hearing about the (former) Muzi site this Thursday and that this project will involve a great deal of complexity and special considerations from both the planning board and the community at large. I appreciate your efforts in this as well as your willingness to collect input from the community.

As a Needham resident who deeply values our community's access to nature and recreational opportunities, I hope you will consider what Bulfinch is offering on this site beyond "tax revenue." I hope there is a way to ensure the developer preserves green space, nature trails, and perhaps a park or other grassy gathering area.

In addition, is there any flexibility for ground-floor retail and restaurant space? The employee population will need some access to these amenities, and those living nearby may benefit from these features as well.

While my personal preference for the space would have been a mixed-use area with recreational facilities, affordable/mixed housing, and space for restaurants and other small businesses, the next best thing is ensuring some of these opportunities are still possible even if the primary feature is a life sciences office park.

Thank you for considering my input!

Avery

--

The Newton Family [Home Account]

From: [Sussman Family](#)
To: [Planning](#)
Subject: Muzi site
Date: Monday, June 6, 2022 8:53:07 AM

The proposed development is far too large. More traffic, pollution in the form of noise, lights and the unknown repercussions of a Level 2 Bio Lab will be imposed upon the neighbors transforming our area and quality of living not for the better. From my observation developers only care about the neighborhood when they are presenting their plans at the Planning Board or ZBA meetings.

The following is a letter I wrote to R. Schlager a few weeks ago which never was acknowledged with a response.

Mr. Schlager:

Good evening and thank you for the public meetings on the plans for the Muzi site. Thinking of amenities for the neighboring communities is a positive approach and I applaud you for the efforts. As I listened to descriptive explanations about the walking trail, the exercise stations, the atrium, the possible open field, the benches, the fountain, the green roof space, the covered pergola for shade and the possible pickleball courts I found myself wondering who are all these amenities really for. My initial thought this is all very nice for those who work there but I am doubtful that neighborhood folks are coming by to sit on a bench, throw a frisbee or walk the perimeter of the complex. The pickleball courts will get an enthusiastic cheer but that seems like a very small bone to throw the community. Doesn't do anything for me.

Again I do appreciate the effort to involve the community but as you know when the dust finally settles it will be the neighborhoods close to the complex that will have to deal with the final results. More traffic, more mechanical noise from HVAC systems, more light pollution because for some reason inside lights tend to stay on 24/7 in commercial buildings, not to mention the lights that need to illuminate the grounds, parking and entrances.

The project is obviously moving forward so how can you optimize this ambitious project and please the neighbors. I realize this is an impossible task with a project of this size but I trying to think productively.

I think the most important decision should be about trees. Plant as many as possible on the perimeter, on the buffer to the roads, on any small green space available. Strategically place mature trees. I'm sure the building will have a certain aesthetic appeal trees makes the complex blend in with the neighborhood softening it's rather imposing presence. Most don't care about a building front but will appreciate the trees. Nobody wants to feel like they live in an office park or want a building to dominate their immediate surroundings.

The exercise stations are a waste. Hardly ever seen anybody use them. People who want to walk walk. People who want to exercise strenuously find a way. Plant more trees.

The pickleball courts will get hoorays but these are not home courts for the close neighbors. Thought it was funny that if the plan calls for 4 courts the dozen or so parking spaces that would be sacrificed would have to be incorporated elsewhere. Don't you have parking for almost 2,000? What's 12 spots?

How about this: I am in the arts, musician. Maybe you can make a space in the lobby, in the atrium, in a "gallery" that would showcase art shows for local artists; professionals and HS students as well. This space could also house a piano and be available for small concerts and musical performances. This space could also be available for informal events that the tenants will certainly be hosting. This would be the type of community outreach that may find strong support.

Steven Sussman
30 Davenport Road
Needham resident since 1988.

From: [Henry Ragin](#)
To: [Planning](#)
Subject: 557 Highland Project
Date: Monday, June 6, 2022 9:18:40 AM

To the Planning Board,

I am writing to express my concerns regarding the proposal for 557 Highland Ave. I have watched several of the meetings conducted by the developer and have to credit them for their willingness to engage the community in an open dialogue.

However, I have concerns regarding certain aspects of the proposal. First, is the density. While the proposed density of 1.25 is below the maximum allowed by Special Permit, I would like to see it lowered further so that the development is less overwhelming for the neighborhood. Second, I am concerned about the traffic impact on a neighborhood that is already frequently congested. Finally, it is not clear to me how the developer can be so certain of so many aspects of the project when their tenant has not yet been selected.

Thank you.

Henry Ragin
25 Bennington St.
TMM Precinct J

From: [Casey Fedde](#)
To: [Planning](#)
Subject: Bulfinch building concerns
Date: Monday, June 6, 2022 11:28:22 AM

Dear Needham Planning Board,
First off, I appreciate all your work on the proposed Bulfinch biolab project and for listening to the community's concerns. Secondly, I'm overall very impressed with Bulfinch's dedication to environmental issues and ensuring that its proposed project includes green spaces and green design.

However, I urge the Planning Board to consider the ramifications of the special permit, especially on traffic in the area and the change in character to this part of Needham Heights – the so-called "Gateway to Needham." My family lives on Mills Rd – which is already a tough street to enter/exit from Highland – so I'm shocked to learn that the Bulfinch property could produce about 6,000 trips to/from the property per day, according to their report. Will new traffic lights and additional turn lanes really mitigate the potential congestion? Is our Gateway to Needham going to morph into an endless line of cars and honking horns?

Also, the proposed increase in the building heights seems out of character for the location of the property, which sits in a residential area. The commercial properties abutting the property are not very tall, so an increase from 35 feet to 42 feet seems unnecessary. Plus, the additional heights go hand in hand with the number of people/cars on site. Please, strongly consider how the additional height will factor into the traffic and congestion of Needham Heights.

Ultimately, I want the Planning Board to weigh the above concerns, as well as those by other families, because this project sets the tone for the Heights and the future of our town. Like all parents, I want my child to grow up in a safe, vibrant community. What will the Bulfinch biolab do to the community? It could be absolutely wonderful, but it could also be an overdevelopment for this neighborhood that could cause the families nearby to leave in search of the quiet, safe residential neighborhoods they once had here in the Heights.

Thank you for your time,
Casey Fedde
16 Mills Rd

From: [Quigley, Karen](#)
To: [Planning](#)
Subject: Planning Board Meeting for 6/7/2022
Date: Monday, June 6, 2022 1:53:22 PM

Dear Planning Board Members:

I am concerned about the building sizes, parking allotment and likely resulting traffic congestion that will result from the proposed use of the land at the former Muzi Ford site, which is walking distance from my home in Needham Heights. A proposed project of this size, which would entail quite a number of special permissions from the Planning Board, is very concerning, in particular, due to the very large variances that would be required for the floor area ratio (1.25 vs. that allowed by right of only 0.7) and the enormous increase in traffic into this area and the surrounding quiet Needham neighborhoods. Also, I understand that Bulfinch would be asking for a reduction in the required number of parking spaces, which again, could have an enormous impact on the local neighborhood, as would requested increments over and above the usual 'by rights' building heights.

I strongly urge the Planning Board to consider the health, safety, and welfare of Needham citizens in weighing the suite of requested special permissions that are being considered here. Presumably, Needham has made such 'by right' rules because over the years, these rules have helped to ensure the health and safety of this great town.

I would strongly urge the Planning Board not to make decisions on behalf of Needham citizens that will have negative repercussions for the entire town for many years to come without strong justification, community input, and considerable discernment about the likely effects of so many variances to the 'by right' rules.

Karen Quigley
Needham Heights resident

From: [Kim Stone](#)
To: [Planning](#)
Subject: Concerned about traffic with new Bulfinch Development Project
Date: Monday, June 6, 2022 2:39:31 PM

Hello,

How do you plan to address this for our small town?

The Bulfinch report shows that the new development will bring in an additional 5000 car trips per day - totally 5,892 trips every day. I don't know about you, but I already have trouble driving down Highland Ave - getting to the schools, the fields, Sudbury Farm during rush hour. This is going to make it so much more congested.

Thank you,
Kim Stone
45 Greendale Ave
Needham

From: [MaeLynn Patten](#)
To: [Planning](#)
Subject: Muzi Ford site
Date: Monday, June 6, 2022 2:49:37 PM

Good afternoon, because I am traveling for work, I am emailing to log my concerns about the scale of the proposed development on the Muzi site. First, I'm disappointed this project made it this far. Second, given it's unlikely to be stopped at this point I have to beg for your consideration of the size. How can a building of that size and with increase of car trips detailed in the plan truly work at that location? Do planning members drive down there during rush hours and school pick-up? I do because I live In the heights. It's already very congested - too congested. Please sit down there and see for yourself, or better yet, try to get your child across town. Please consider heights residents' concerns at least at this stage. Thank you, MaeLynn Patten, 16 Ledge street, Needham

Sent from my iPhone

From: [Valerie Maio](#)
To: [Planning](#)
Subject: Comments regarding Bullfinch Project
Date: Monday, June 6, 2022 3:02:09 PM

Hello,

I am writing to express some concerns about the Bullfinch Project in Needham Heights. My primary concerns are:

- (1) increase in traffic, especially along Highland Ave., Gould St., and Hunting Rd. and
- (2) general skepticism about the size of the project.

The size and scope of the buildings seems overwhelmingly large for our neighborhood, with its location tucked within a residential area. I'm particularly concerned with the large scale and obtrusive nature of the parking garage, and the effect of that many cars on the road and the traffic issues. I don't claim to understand the nuance of FAR, etc., but as a resident, it just feels like a slightly smaller project and footprint of buildings would be better for our community, and more in line for this location which directly abuts residential and, equally important, serves as entryway into Needham.

Additionally, while unrelated to this project, I am aware that Temple Beth Shalom, located just down the road on Highland, will be tearing down a residential house located on the corner of highland and Webster/Greendale and to replace with a parking lot as expansion to their current lot. These changes that are happening on this stretch of Highland Ave., as proposed, do not add value, and in fact, greatly diminish the beauty and quality of the residential life we would like in Needham. While these projects are unrelated, I wish we would consider the larger scope of loss of residential feel in Needham that will not be easy to get back or return to in the future.

Thank you for the opportunity to voice my concerns.

Valerie Maio
15 Park Ave., Needham

From: [Maggie Flanagan](#)
To: [Planning](#)
Subject: Bullfinch project
Date: Monday, June 6, 2022 3:05:22 PM

I am writing to request that you take the time on accepting any special permits for this project. Some people in Needham who do not live on this side think that this is a great idea but what they don't realize is that is our neighborhood. We have kids playing, people walking, families going to games at the baseball fields and a lot of other traffic coming just from general Needham people going to town.

I have lived on my road for 15 years and In the town for over 40. Muzi held a large space but did not take over that area or increase the traffic as much as this project will. I have no issue with something going in there but to have something this large with so many parking spots will not benefit Needham or this area.

Please make sure that this is something that is helping our community and not hurting it. Gould connects two major streets in Needham and it is already busy. To add this building at the dice they want, possible restaurants, etc seems not at all the Needham we want. It will just bring more chaos to the beginning of Needham, not a "gateway" to our town. What I worry about is what comes next. They build something at this size and then another building comes for sale and they take that up. And, all of sudden, we have Legacy place being built. This is where we need to make sure not only what we want now in that area but what we want in the future.

Thank you so much for listening to all the opinions in this town. My husband and I moved back here 15 years ago for a reason. We loved the community and the ability to find what works best for this town. Let's keep it that way.

Maggie Flanagan

[Sent from Yahoo Mail for iPhone](#)

From: [Nicole Nasson](#)
To: [Planning](#)
Subject: Resident of Needham Heights-Muzi Project
Date: Monday, June 6, 2022 3:09:41 PM

Good afternoon,

I am writing to express my concerns for the development at Muzi Ford. While I understand a business is going there, I do not understand why a building of that size needs to go there. I hear all the time that if you attend a planning meeting your voice will make a difference. Never have I ever seen residents voicing their opinion and it is considered. As it is, I live on highland ave, my land has been taken from me for a silly bike lane that will not be used. The project in front of my house is not moving along at all and I get to stare at my ugly yard until they decide to fix it, and now with this building coming there will be more traffic in front of my house. My kids are little and this situation of 5000 more cars a day is not good. I feel my opinion does not matter, but I wish it did.

Thank you for listening and I wish you would consider making this building a bit smaller.

Nicole Nasson

From: [Brooke Reilly](#)
To: [Planning](#)
Subject: Concerned Needham resident
Date: Monday, June 6, 2022 3:19:57 PM

To whom it may concern:

I understand that tomorrow the first planning board hearing will be held regarding this massive project (Bulfinch biolab building(s)).

I now have a better grasp on the proposed size of this site and am very concerned about resulting traffic, congestion, etc. Many of my neighbors feel similarly. Please reconsider the size at the very least. Also, we have high hopes that this project will include development of more amenities for the community.

Thank you for considering.

Respectfully,
Brooke Reilly

Of 41 Pine Grove St Needham

From: [Jennie Freedman](#)
To: [Planning](#)
Subject: Muzi site
Date: Monday, June 6, 2022 3:25:25 PM

Hello,

As a resident living just across the street from the new development I'm highly concerned with the scope of this project in terms of size and increase in traffic. Our neighborhood will become a cut through and the quiet street our kids play safely on will be dangerous.

Please consider a revision of the size to reduce traffic implications.

Thank you,

Jennie Jonas
93 Sachem Rd.

Sent from my iPhone

From: [Shannon Shavor](#)
To: [Planning](#)
Subject: Bullfinch project
Date: Monday, June 6, 2022 3:25:32 PM

Hello,

I am a Needham Heights resident for 15 years now. I would like to express my concern over the size of the Bullfinch project as we prepare for the upcoming meeting. From what I've read, it seems like quite a large project and I am worried about the congestion and traffic it will bring to my neighborhood. I have three school aged children (one with special needs) who travel by wheelchair, foot or bike in this area.

I would like to express my thoughts for a smaller project, include at least some business that would be useful to the Needham community as well as outdoor space (handicap accessible) that we can all enjoy.

Thank you for your time.
Shannon

Sent from my iPhone

From: [Matt Flanagan](#)
To: [Planning](#)
Subject: Concerns about Bullfinch Biolab Project at former Muzi site
Date: Monday, June 6, 2022 3:35:35 PM

Hi Planning Board,

After the process last time around the rezoning and sale of the Muzi site, I continue to have significant concerns about the size, scope and utilization of the proposed development. Between the increase of traffic in/around/through our neighborhood and the desired adjustments to the current development project to include a wider variety of potential bio lab space than previously/currently allowed, the project -- and its impact on our neighborhood that surround it -- are once again being pushed through with few voices being heard/listened to.

We need to retain or REDUCE the FAR, not increase it. Keep the buildings low(er) profile, ensure ample/more green space and keep the traffic from getting even more out of hand than it is around Gould/Hunting/Highland -- the traffic is atrocious, and only going to get worse with Highland Ave work and Needham Street developments already impacting our corner of the town.

Please refrain from expanding (height, traffic or lease space) beyond what's already in the plans. Or shrink those FAR parameters.

Thank you.

Matt Flanagan
Needham Resident
54 Sachem Road

From: [Holly Charbonnier](#)
To: [Planning](#)
Subject: Special Permit Hearing for 557 Highland Avenue
Date: Monday, June 6, 2022 3:40:32 PM

Dear Members of the Planning Board,

I understand that you have the first hearing related to the Bulfinch Group's 557 Highland Avenue project tomorrow night. As a resident of Needham Heights and a Town Meeting Member, I have many concerns related to this project.

1. The Size - While they appear to be coming in under the Special Permit size 1.35 FAR, that is only calculating the Office, Lab and Retail space. It doesn't take into consideration the massive 7-story parking garage that will also be on the site. When you take that building's sf into consideration, the project is 1.1 million square feet. This seems way too large for our residential neighborhood.

2. Traffic - I have asked the Bulfinch Group multiple times how many total trips to the site will there be per day. They have continued to write back with a response that isn't the most forthcoming. They have stated approx. 644 trips in the morning peak hour and 651 trips in the evening peak hour. After spending some time reviewing their MEPA information, I was able to find that it will be a total of 5000 additional vehicle trips every day. The traffic in the Heights is already challenging. Dropping our children off at Eliot in the morning can take a half hour because of the traffic backups. These additional 5000 cars are going to make it nearly impossible to get out of our neighborhood. I ask that you request the Bulfinch Group to do more mitigation work for the Town of Needham.

I know that this is just the first hearing and that you plan to have multiple hearings. I appreciate the effort that you are and will be putting into this project. I ask that you listen to the concerns of the residents that will be impacted by this development. While I agree it is an important project for the Town and will move forward, I hope that there will be some changes to the scope so that the project doesn't create a situation where people no longer wish to live near the Heights.

Thank you for your consideration,
Holly Charbonnier
Town Meeting Member, Precinct J
94 Sachem Road, Needham Heights

From: [Joanne Garabedian](#)
To: [Planning](#)
Subject: Muzi Ford site
Date: Monday, June 6, 2022 3:45:39 PM

Please reconsider the enormous size of the proposed development for this site. The traffic on Highland Ave. is already difficult without the huge increase this will bring to the area. This is a largely residential area on three sides. The planning board must do something to reduce the size of the proposed development and consider its impact on the Heights.

Thank you.

Joanne Garabedian

From: [Ali Lothes](#)
To: [Planning](#)
Subject: Muzi Ford Site - Scale back the Plans!
Date: Monday, June 6, 2022 4:14:40 PM

I live in Needham, in the Broadmeadow school district. I am emailing because I am extremely concerned about the size of the development being proposed for the Muzi Ford site. Traffic and congestion aside, I worry about the visual blight changing the feel of our town. A huge commercial site with multiple buildings will not create the town environment that we in Needham love and expect.

I vote for scaling back the size of the development as much as possible, and prioritizing green space and trees to create separation from the industry and commercial zones of the 128 corridor, and trying to keep the feel and character of Needham.

Please stop all the over-development.

A concerned Resident,
Ali Dabuzhsky
42 Aletha Road

From: [Ashly Scheufele](#)
To: [Planning](#)
Subject: 557 Highland Avenue
Date: Monday, June 6, 2022 4:20:45 PM

Dear Members of the Planning Board:

I am writing to comment on the proposed development of 557 Highland Avenue. I oppose the project as currently proposed for several reasons, including but not limited to the following.

The project density and heights do not align with our neighborhood, which includes a mix of commercial and residential uses. The project would consist of two five-story buildings, including a seven-level parking garage, and more than 1,100,000 square feet of development on a lot that is approximately 400,000 square feet. I do not support that level of density and building height in our neighborhood. We should not permit anything that could be considered a precedent for development of that scale in our neighborhood, where residential uses abut commercial buildings. Due to the proximity between different types of uses in the Heights, I request that the proposed building heights and density be reduced so that commercial uses do not dwarf nearby homes. If the Planning Board is inclined, over objections like this one, to permit the project, then it should require the developer to offset the density of its development with amenities for the community, such as new public park space.

As proposed, the project does not include safe means for pedestrians and bicyclists to navigate the increased traffic lanes and congestion that will be caused by the new development. On-road bike lanes are inadequate for average cyclists and downright dangerous for young families. Raised, shared-use sidewalks or protected bike lanes would be a much better and safer option. The nearby neighbors will bear a disproportionate burden during and after construction if this project is approved. Let's make sure they at least have meaningful non-vehicular access to existing and proposed amenities on Gould Street. For new projects -- especially one this prominent in terms of both location and scope -- the Town should require the developer to install "future-proof" pedestrian and bicycle accommodations. This is the right infrastructure planning decision from health, safety, environmental, and finance standpoints, as the developer can fund these improvements when they redesign existing infrastructure as part of mitigating their project's impacts on roadways and traffic congestion.

Reducing the density and building heights of the proposed development and improving pedestrian and cyclist accommodations on Gould Street would allow Bulfinch to build its project (albeit on a slightly smaller scale) *and* would make Needham a better place to live.

Thank you for considering my comments and thank you for your service to the Town of Needham.

Best,

Ashly Scheufele
52 Greendale Avenue
02494



June 6, 2022

Dear Members of the Planning Board:

The Needham Heights Alliance is a non-profit organization dedicated to enhancing the residential character and livability of the Needham Heights neighborhood and advocating for the interests of the residents of Needham Heights. The Needham Heights Alliance is writing to express our concerns related to the special permit application for 557 Highland Avenue submitted by the Bulfinch Group. The proposed biolab is a massive project that raises substantial concerns about safety, traffic, and density, among other things. If approved, it will change the Heights for decades to come.

We trust that the Planning Board will provide an open forum for citizens of the Heights to voice their concerns and a process by which Bulfinch's application will be thoroughly interrogated with respect to its impacts on the health, safety, and welfare of Needham citizens, overcrowding and density, traffic congestion, and the preservation and creation of amenities for Town residents. The aspects of the proposed biolab project with which we have concerns include but are not limited to:

- **The proposed FAR of 1.25 and traffic congestion.**¹ The project proposes more than 1,100,000 square feet of development (approximately 500,000 square feet of office, lab, R&D, and restaurant/retail and approximately 600,000 square feet of parking garages) on a lot that is approximately 400,000 square feet. Commercial development of this density changes the residential character of the community and is likely to have significant traffic and safety impacts. If the Planning Board is inclined to approve the project, please include specific conditions requiring Bulfinch to mitigate those impacts at Bulfinch's cost.
- **Pedestrian and family cycling safety.** Bulfinch has, to its credit, included some community amenities in its plans – *i.e.*, pickleball courts and a nature trail. However, these amenities are meaningless to nearby neighbors (*i.e.*, those who will be most burdened by the downsides of development) if they are not safely accessible on foot and by bicycle. We request a continuation of raised shared-use sidewalks or sidewalks plus *protected* bike lanes from Highland Avenue through the terminus of Bulfinch's road work on Gould Street. Without this critical safety measure, citizens – including young families and seniors – will not be able to safely navigate the increased traffic and congestion caused by the proposed project in order to make use of the existing and planned amenities on Gould Street and beyond.
- **Lab safety.** Bulfinch has recently removed its proposal for BSL-3 lab space at the site, including removing any plans for a BSL-3 "cabinet" or "container" within a BSL-2 lab. We request that the Planning Board impose a condition within any special permit requiring that Bulfinch adhere to its

¹ In recent community meetings, there has been some discussion about a slight reduction in proposed FAR. In this letter, we are responding to what is contained in Bulfinch's application to the Town.



commitment. We are still looking into the implications of a BSL-2 lab and whether one would be appropriate in the area in such close proximity to residential neighborhoods, playgrounds, and schools.

- **Parking.** Based on our understanding of the proposal, Bulfinch estimates that this project will generate 500-600 trips during the peak hour in the morning and another 500-600 trips during the peak hour in the evening. If that is the case, why is a seven-level parking garage and more than 1,400 parking spaces – which is not in keeping with development on this side of 128 – necessary? We seek more clarity on this issue and hope that the Planning Board’s hearing process will provide additional information.
- **Restaurant and retail uses.** We request that, if restaurant and retail uses are permitted, that the Planning Board include conditions on hours of operation and type of establishment consistent with the neighborhood’s feedback in order to ensure that the community enjoys what benefits may be had from these uses and avoid undue burdens on neighbors.

We understand that this project is an important one for the Town of Needham and agree that it will provide some benefits for the community, including increased tax revenue. We also appreciate that Bulfinch so far has been willing to engage with neighbors in the Heights, and we hope that will continue as the project is examined. A project of this scope necessitates communication between the applicant, the Town, and the community and careful vetting, as all of Needham – but particularly those neighbors residing in the Heights – will feel the impacts of the final development at 557 Highland Avenue for a very long time.

If not done right, this project could significantly and permanently change the character of Needham Heights. We don’t want to get this one wrong.

Thank you for your service to the Town of Needham.

Sincerely,

The Needham Heights Alliance

From: [Paul Charbonnier Jr.](#)
To: [Planning](#)
Subject: Bulfinch/Muzi
Date: Monday, June 6, 2022 4:32:33 PM

To the planning board,
I reside at 94 Sachem Road with my wife Holly, 2 children Lily and Thomas, and 2 dogs Odin and Freyja.

I'm writing today to voice my concern about Bulfinch's move for special permitting to increase the FAR of the proposed development at Muzi.

It has come to my understanding that with the proposal as is the site it likely to add over 5000 cars a day to an already very busy intersection at Gould and Highland and over 500 cars during peak driving times AM/PM.

Pre-Covid Mills Street was increasingly used as a cut through to avoid the light at Gould/Hunting and Highland. With the influx of new traffic this will only get worse.

We are a dense community that is home to over 50 children under the age of 13. Needless to say the parents of this community take their safety seriously.

So I write to you to urge you not to allow the special permit. It is bad enough that we will have a Trip Advisoresque campus (times two) a stones throw away from us.

Please stand up for the residents that will be on the front line of this drastic disruption to our family centric community.

Thank you for your consideration,
Paul

Sent from my iPhone
Paul Charbonnier
508.782.8883
personal: charbojr@yahoo.com

From: [Emily Pick](#)
To: [Planning](#)
Subject: Bullfinch Biolab proposal
Date: Monday, June 6, 2022 4:52:16 PM
Importance: High

Hello Planning Committee.

I live at 12 Mills Road in Needham, which is 2 blocks West of the project.

I'm reaching out to reiterate my opposition to any expansion of the Bullfinch project. I live just off of Highland Avenue, and I'm absolutely opposed to any increases in size, scope, occupancy, or footprint of this facility. I'm opposed to the increase in FAR, and I'm opposed to the board allowing Bullfinch to increase the building height, and I'm opposed to increasing the number of stories on the facility, on any parts of the project. Furthermore, I would suggest that Bullfinch minimize the size of the parking garage, to decrease the impact and scale of this project. Furthermore, I'm opposed to allowing the developer to build a restaurant, bar, pub, brewery or entertainment venue on this site.

My primary concern is traffic volume in the region. Over the years, I do not feel that the Town of Needham or the Planning Board has been listening to local residents on this project, and in fact when I attended a meeting a few weeks back, my feedback was snubbed on the grounds of my concerns. My family and I must live with the consequences of your decisions on a daily basis.

The quality of life in Needham Heights continues to deteriorate, and traffic is now worse than ever before on the Highland Ave-Needham Street corridor, and I measure this based on my experiences as I attempt to make a LEFT OR RIGHT turn from Mills on to Highland everyday, both at rush hour and at mid-day. It is increasingly dangerous just to get onto the street. When the light turns Green at Highland and Hunting, the traffic is unrelenting, in allowing new traffic to merge, especially after southbound drivers come off of I-95. Furthermore, the increases in pollution and litter thrown from cars is noticeable in past few weeks, and with many of the sidewalks in poor condition due to ongoing construction on Highland, its not even comfortable to walk on Highland Ave anymore.

Furthermore, I am strongly opposed to any special permits that would allow a restaurant, bar or brewery in this neighborhood. A "Trillium" type facility was suggested on the call I attended. I'm sharply opposed, on the basis of increased nighttime traffic and noise to the neighborhood.

Furthermore, such a facility would cannibalize existing struggling businesses in Needham Heights and Needham Center.

Finally, I don't accept the meager attempts to sell this project to Needham leadership on aesthetic improvements as the 'gateway to Needham' or 'community benefits' of this facility. A commercial lab (with potential bio-hazard risks) next to a highway will never be a destination for local kids to ride their bikes or play ball, and nor would I ever consider it as a destination for outdoor physical fitness or as community center, since the traffic has made it nearly impossible to cross Highland Ave.

In short, I'm most concerned with the day-to-day traffic patterns, and the impact that this additional

expansion-oriented proposal has on quality of life in Needham Heights, and the health, safety and welfare of this community. I hope that my feedback is duly noted as the planning board evaluates this request for expansion.

Thank you,
Emily

Emily Pick
617.784.2796

From: [Natalie Ho](#)
To: [Planning](#)
Subject: Biolab
Date: Monday, June 6, 2022 4:58:22 PM
Attachments: [image.png](#)

Dear Planning Board,

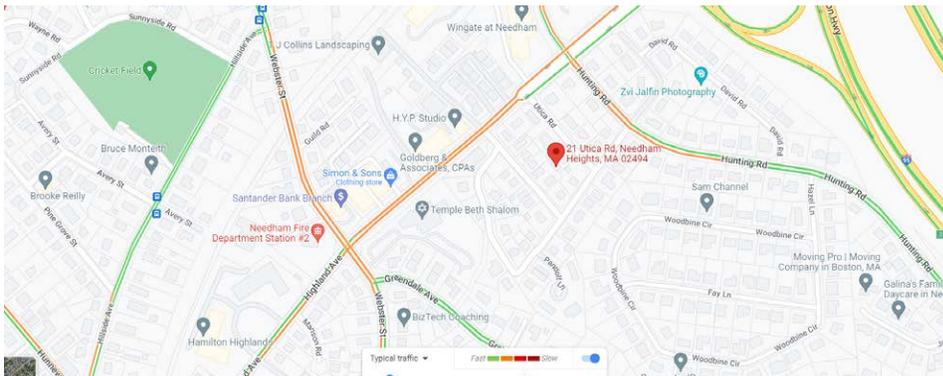
As residents of 21 Utica Rd and abutters to the Bulfinch biolab, we are not in favor of any increase to the FAR of the project via special permit. Currently there is congestion just right outside our street on Highland Ave during lunch and rush hours. An additional estimated 5000 car trips will only cause more asthma to our family, decrease the air quality while adding to current traffic congestion without any traffic mitigation.

We would love to request the following as it relate to current project without any FAR increase:

Air monitor that measure (PM2.5) be installed on our street. Mitigation funds to be set aside to deal with decreasing air quality in our homes.

Direct hourly shuttle to green line to mitigate the use of cars.

Traffic mitigation efforts on our street (Utica Rd) and the surrounding side streets



Thanks,

Natalie and Eugene of 21 Utica Rd, neeham

From: [Russell Smith](#)
To: [Planning](#)
Subject: re: Bulfinch development
Date: Monday, June 6, 2022 5:00:46 PM

Dear Planning Board,

I am a resident of Needham Heights and write to express my concerns about the Muzi/Bulfinch development.

While I appreciate that there may be benefits to Needham generally, the Planning Board should be paying particular attention to the impact on neighbors nearest the development.

First and foremost, I would ask that the Board ask itself whether it is truly necessary for the project to be done at the proposed scale. A seven level parking structure with 1,400 spaces does not seem consistent with the anticipated trips per day. Either traffic will be worse or this scale of development is not truly necessary (particularly if this space does not include retail that is open generally to the public). It seems that this project could be done at a slightly reduced scale.

I appreciate that Bulfinch has offered to include amenities for the local community. However, in order for community members who are close enough to walk or bike (and therefore the most impacted) to use the proposed amenities, there needs to be a safe way for them to do so. Raised shared-use sidewalks or dedicated, separate bike lanes should be included in the development. On-road bike lanes are dangerous for families.

Finally, I find the proposed development to be short on meaningful park, greenspace, and public art opportunities. Such additions are an easy, cost-efficient way to ensure the development truly provides something for everyone -- neighbors near and far alike. It also creates a reason for the community to remain invested in the development's success. We have all lived through enough development-crushing recessions to know that even a top-tier building in a nice town can sit vacant for years.

The proposed "nature trail" is an OK start, but is absolutely not enough in light of how massive the rest of the project is. If the proposal incorporates park/art/green space that the community will visit independently, then it is good for the developer, now, and neighbors even if the development runs into difficulties down the road. Community space should be a significant part of every commercial development that abuts residential areas: it is the only benefit that development can guarantee.

Thank you for your time.

Truly Yours,

Russell Smith

From: [Julie Devoll Tracey](#)
To: [Planning](#)
Subject: Concerns over Bulfinch Biolab Project
Date: Monday, June 6, 2022 5:02:15 PM

Hello,

I am a resident of Beech Street and am writing to express my concerns over the latest requests made by the new owners of the Muzi site.

We live on the corner of Gould and Beech and as it is, cars use our street as a cut through in order to not get stuck at Central/Gould. They race down our street and I've witnessed numerous near misses of children and people walking their dogs, almost hit.

Adding an even larger building(s) than originally scoped makes me even more concerned about the safety of the area. It's already unsafe riding a bike down Gould and the speed by which cars travel down it.

Please consider those living in the area of Gould Street and its side streets. We already feel the brunt of speed and other traffic-oriented issues.

Sincerely,
Julie Tracey

--

Julie Tracey
julietracey@gmail.com
617-429-3535

From: [Ada Chan](#)
To: [Planning](#)
Subject: Bulfinch Biolab Project at the former Muzi site
Date: Monday, June 6, 2022 5:03:15 PM

Dear Planning Board committee,

I'm really concerned about the Bulfinch Biolab Project at the former Muzi site. After looking for more information about the project, there will be additional 5000 car trips per day. That added to a lot of traffic to Highland Ave. , especially during rush hours. I can foresee that this is going to make the traffic so much more congested. Please reconsider the project's size.

Thanks,

- *Ada*

22 Mills RD

--

Ada Lei Chan

Phone: 617-669-6682

Email: dada061085@gmail.com

From: [Lid Rich](#)
To: [Planning](#)
Subject: Fwd: Muzi Ford site concerns
Date: Monday, June 6, 2022 5:06:34 PM

----- Forwarded message -----

From: **Lid Rich** <lidrich6@gmail.com>
Date: Mon, Jun 6, 2022 at 5:03 PM
Subject: Muzi Ford site concerns
To: <@needhamma.gov>

I have serious concerns about a five story high building and parking garage. It seems to me that a four story max building should be built.

I also have concerns about the density of the development.

The traffic on Highland ave light is already terrible with a long light and it backs up, with a dense development this is sure to worsen considerably. Over 500 cars entering and exiting will stress out the traffic in the Heights.

Overall I am very disappointed with the zoning in the Heights with buildings not having enough setbacks etc. I am not confident that this building development will be built with consideration for the quality of life in the Heights.

yours,

Elizabeth C Rich
323 West St
Needham MA 02494

From: [Alanna Burke](#)
To: [Planning](#)
Subject: Bulfinch Development Project
Date: Monday, June 6, 2022 5:30:32 PM

Hello,

I am writing to express my concerns, as a resident of the Needham community, regarding the magnitude in size of the Bulfinch project, at the former Muzi Ford site. The scale of this project truly neglects to adequately address the larger issues of traffic congestion that growth of this magnitude would bring to an already congested area. In addition to traffic, developments such as this, despite the illusion of being community-centric, are in fact simply industrial and large business efforts sold under the guise of added social and commercial draws, stated to improve the community, as a means to obtain town approval. I find that often the social, community and small business plans fall by the wayside when construction is officially underway.

Individuals of this town appreciate the small town community feel, with the benefits of being within close proximity to a cosmopolitan city. Projects such as this detract from the intimate feeling of small town living. Growth and development in urban and suburban areas is inevitable, but the scale of this project is simply inconsistent with the needs, wants and values of this community. It places a burden on the already increasing traffic congestion our town faces and is a build in magnitude simply inconsistent with the scale of our town and what it can afford to absorb- optically, transportationally and socially. I strongly urge you to scale back the size of the development and to take into consideration the true needs and wants of this town.

Regards,

Alanna Burke

From: [Maureen DiMeo](#)
To: [Planning](#)
Subject: 557 Highland Ave
Date: Monday, June 6, 2022 6:22:05 PM

Hi,

I am writing to again voice my concerns over the proposed property at the former Muzi site. I am a resident of the Heights neighborhood for 30+ years.

I have attended several of the Bullfinch community/traffic meetings and planning board meetings.

At the initial planning board presentation about rezoning, I recall one of the experts talking about the height and size of properties coming into Needham from Dover. The discussion was about how these building heights and sizes all flowed into each other.

This is the crux of my argument. The heights neighborhood is not the business district in Needham. It is a neighborhood. Please vote to limit the size of this project in height and scope. This neighborhood cannot support a line of high rises and all the traffic that comes with it.

We are a neighborhood. Not a business district. Please keep it that way.

Thank you.

Maureen and Jim DiMeo
442 Central Ave

From: [Larry Tobin](#)
To: [Planning](#)
Subject: 557 Highland
Date: Monday, June 6, 2022 10:17:48 PM

Hi planning board!

Thanks so much for your incredible service to our town.

I wanted to write in response to the 5 changes that the owners of 557 Highland are requesting. For 4 of the 5, I don't see any benefits for the residents of Needham—there's no way that an increase in FAR or raising the roof could yield enough incremental tax revenue to make it worth the eyesore and incremental traffic.

I can, however, see real value in a retail and restaurant establishment there—we don't have a ton of options between the Heights and Panera so it would be great. Hopefully there's a way to ensure it's an establishment(s) that are open to the general public and not just a commissary type set-up for breakfast/lunch at an office park.

Thank you!
Larry Tobin
31 Greendale Ave

Larry Tobin
LT@TheShapiroFoundation.org
781-864-2222

From: [Michael Diener](#)
To: [Planning](#)
Subject: Brief comments on 557 Highland
Date: Tuesday, June 7, 2022 9:45:39 AM

Dear Planning Board,

I am writing in support generally of more density, and flexibility for less parking, at 557 Highland.

The developers believe this property is well-suited for commercial space; one driving along Route 128 would be hard pressed to disagree. With that, I believe we should allow them to build with high density both in principle, because buildable land in the area is a finite resource, and because I believe we should try to get as much revenue as we reasonably can to help pay for the needs of the town, including school buildings and potentially more operating costs to schools and other services if there is housing growth. These revenues will benefit us all.

Based on the location of this site, there should be significant latitude to build bigger. This property is directly bounded by – and downwardly sloping toward -- a clover leaf interchange and by a parking lot for WCVB and a small building. Another side has a five-lane road with highway connection, across which are four homes facing laterally away and behind large stockade fences; and the last side, across a street, is a nursing home complex that appears to have been built from the 1990s to the 2010s, well after the property had long been an auto dealership. In short, it's hard to say that this property would significantly alter any reasonable expectations (assuming that were a significant factor).

How many football fields the space is, or how it would be bigger than anything on this side of the highway, are not relevant to this specific site. And I do not believe there is a benefit to treat the FAR like a negotiation over the price of a car where the lower you can go, the better it is. Car-buying is a zero-sum game, whereas more town revenue should benefit all, and as best I can tell, with little cost. I predict that after it is built, like many other projects, people will be asking what they were afraid of in the first place. I live near the religious center on Greendale and have read there was significant opposition in the early 1990s, even though you would barely know it is there. We would not want to look back and say we gave up, say, \$500,000 per year for 50 years and got little real benefit in return.

Regarding parking, the developer has every incentive to get the parking correct -- tenants with insufficient parking will be a problem for them. Two-hour parking will protect neighbors if spillover becomes an issue. In general, we should be flexible where we can -- an aerial view of this area shows significant space devoted to cars and often not used. Here fortunately, parking would be in a vertical structure, which is highly desirable to save space -- If less parking is approved, I would rather they keep more height and lower the footprint if they can.

Michael Diener

From: [Laura Ruch](#)
To: [Planning](#)
Subject: Size of the Bulfinch Biolab Project and Traffic
Date: Tuesday, June 7, 2022 10:17:16 AM

Hello,

I'm writing to ask that the Planning Board consider limiting the size of the Bulfinch Biolab Project so that the traffic created by the project will be limited hopefully.

Also, if this project is going to increase the traffic in the Heights, will any changes be made to help deal with the traffic increase? Creating more traffic in this area is going to make Needham a less desirable area.

Thank you,
Laura Ruch

From: [Ken Horton](#)
To: [Planning](#)
Subject: Concerns Regarding Former Muzi Site
Date: Tuesday, June 7, 2022 1:49:56 PM

Dear Members of the Planning Board-

Community members concerned about the impact of the development on the former Muzi site have made a compelling case that the size, traffic issues and other impacts created by the special permission requested by the developer that are not within what they can do by right with this parcel would have a negative impact on the community.

Being a unique tract of land in a community with scarce property to develop, I would urge you not to approve these special conditions or to extract greater concessions and benefits for the community before you grant them. I would also encourage you to communicate more clearly to the community why granting special permission to the developer for the requested increases in density, height and particular use is of benefit to Needham.

Very truly yours,

Kenneth L. Horton
44 Rae Ave.

From: [Kelly Close](#)
To: [Planning](#)
Subject: Bulfinch
Date: Tuesday, June 7, 2022 2:05:42 PM

Hello,

I'm writing to voice my concerns regarding the size of the project and the impact on traffic that this will have. The scope seems much larger than originally discussed.

Thank you,

Kelly

From: robertdeutsch@icloud.com
To: [Planning](#)
Cc: [Ryan McKee](#); [Tonya McKee](#); [lihwen lin](#); [Samson Chu](#); [Emily Keller](#); [Janice Epstein](#); [Diane Abbott](#); melaprescott72@gmail.com; bugout6@gmail.com [Manning](#)
Subject: Bullfinch & Muzi
Date: Tuesday, June 7, 2022 2:26:14 PM

Dear Planning Board:

Needham did not create the problem; nor can it eliminate the problem. However, there is a problem wherein studies are done by respectable research companies where the results say “there will be no or negligible traffic impact from this project.” There are actually two problems: one, so far no one has been able to reliably predict the future (ask TripAdvisor if you doubt me), and two, no one has gone back to check if those original predictions are true.

As we are on the precipice of remaking/rezoning/rebuilding/re-imagining this little corner of Needham, I beg you to keep in mind that the results of previous engagements, including but not limited to Charles River Landing project and perhaps the monstrous-in-size Northland project in Newton. The Bullfinch and Northland projects establish a ‘bookend’ to my neighborhood (neighbors copied here) with the highway entrance and exit in the middle.

Lots of people tonight will challenge and address individual facets of the plan, but I ask you all to represent both the community of neighbors you are part of, and the sacred mission to do your best to serve that community with the choices you make. You can’t add a destination site to Needham without the neighbors feeling the effects. I know the Select board sees economic growth, but the planning board has more nuance than that. You know that more traffic brings more pain in every form.

I trust your decisions about nearly everything else. After all, we are all one community.

Robert Deutsch
Precinct J
Needham, MA
617-817-3222

From: [Callie Curran Morrell](#)
To: [Planning](#)
Subject: Muzi/Bulfinch development
Date: Tuesday, June 7, 2022 3:10:57 PM

Hello,

While I can't the hearing tonight on the proposal for the Muzi development, I do want to pass along my interest in ensuring that the Heights neighborhoods are front of mind when you are considering the proposed plans. This development is certain to make a huge impact on a number of residents who live within this area, much of it not likely positive.

Pre-pandemic, there was already issues with traffic around the areas of Highland and Gould and Gould and Central. The additional traffic is an enormous concern and I have not had confidence in some of the previous assessments around this big issue. I hope going forward, there will be a more realistic consideration of traffic impacts and measures put in place to both limit and alleviate traffic going to and from the buildings.

The Town seems to pay very little attention to the upkeep of Mills playground or sidewalks around these neighborhoods (see Central Ave next to Parkland Ave for a perfect example). For the increased number of people/cars this will bring to the area, I'd like to see the developer also bringing amenities that can be enjoyed both by employees/visitors to the buildings and residents alike.

Thanks for your attention.

Best,

Callie Curran Morrell

2 Central Terrace, Needham, MA 02494

callie.a.curran@gmail.com

June 7, 2022

Dear Members of the Planning Board:

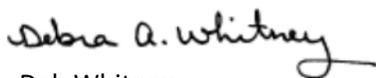
I am writing regarding the special permit application for development at the 557 Highland Avenue property by the Bullfinch Group. While the property has been commercially zoned and used for an extended time, the proposed development is substantially different and more dense than the prior development. It will permanently change the character of the surrounding residential community and neighborhoods, and Needham Heights.

I urge you to carefully evaluate the proposed development and special permit application with regard to the impact on traffic and congestion, noise and light pollution, safety of the proposed biolab use, and how the building on this property will benefit (or detract from) the surrounding neighborhoods and families that reside in them.

There are several houses directly across Highland Avenue and many more within direct view and earshot of the property, and an independent living complex immediately across Gould Street. Families with young children access the roads, sidewalks, baseball field, tennis courts, and nearby playground and park. Existing traffic and congestion make the surrounding roads almost inaccessible or “pass at your own risk” at certain times by pedestrians, cyclists, and young children. Given the proximity to major commuting highways, these roads also serve as bypass roads during heavy highway traffic. Adding significant development and density at 557 Highland Avenue will only exacerbate the impact and widen its footprint further.

You have the ability and responsibility to represent the interests of all Needham residents in your decision making. I urge you to carefully consider all aspects of this project and the resultant impact it will have for many years and generations of Needham residents.

Sincerely,

A handwritten signature in cursive script that reads "Debra A. Whitney".

Deb Whitney

dwhitney96@gmail.com

From: [Kate Robey](#)
To: ras@bulfinch.com; [Planning](#)
Subject: Dana Farber Zakim Center for Muzi location
Date: Tuesday, June 7, 2022 6:57:35 PM

Good evening,

As a resident of Needham on and off for 51 years I would like to offer a suggestion.

As said in the October 2016 Special Town Meeting by our Health department "Needham has a higher average of cancer than surrounding towns". I am one of those statistics getting diagnosed with Leukemia at 45. I was lucky enough to have a doctor at the Dana Farber and found a Match in Germany. After a year from transplant I started having bad side effects from what is called Graft vs host disease. It was like having a body suit on 2 sizes too tight. I was lucky enough to run into another person who had cancer from Needham who told me about the Zakim Center across from Dana Farber in Boston. I started acupuncture and got massage from people who understood my condition. With their help and my own self care of adding CBD to my journey I'm a thousand times better and have reached my 5 year birthday of being cancer free.

A place like the Zakim center who offers reduced rate care, free classes, meetings, etc could be so valuable in this location for everyone up and down 128. Also a great charitable partner for this location too.

Please think about putting a place like this in your plan to improve the lives of the people surrounding this area.

Sincerely,
Kate Robey

Sent from my iPhone

From: [Gilad Skolnick](#)
To: [Planning](#); [Selectboard](#)
Cc: [Rachel Gurevich](#)
Subject: Thorpe park
Date: Wednesday, June 8, 2022 1:02:29 PM

Dear select board and planning board,

Thorpe park is under utilized and the talk of our neighborhood. Currently it's a grassy patch with benches that can seat a dozen but rarely even have a single person there.

We would love a dog park/playground/or even a picnic bench there. Has the planning board explored better uses of this space? It's especially relevant since there isn't a close dog park or playground in the immediate vicinity.

How can we help make this happen?

Perhaps there would be more excitement about the proposals for the Muzi property if there was a conversation about ideas for how the increased tax revenue would be reinvested in our community.

Cheers,
Gilad & Rachel
33 Park Ave, Needham Heights

From: [Kate Robey](#)
To: [Planning](#)
Subject: Muzi traffic lane additions
Date: Wednesday, June 8, 2022 5:26:08 PM

Good afternoon,

I believe to reduce havoc on the neighbors that their should be an additional lane built on the the property on the Highland Ave side to directly take all traffic from the highway to a turn right into the property. I then believe 2 lanes should be built onto the property on the Gould Street side. one lane that will be the right off of Highland Ave that will turn directly into the property and then one on the Nursing Home side autos to turn left easily back onto Highland Ave when leaving. The easier we can make this on and off the exit the better it will be for the neighbors and 500 autos. We do not want over 500 motorists trying to cut through small neighborhoods because the backup is so large.

As it is the Highland Ave merge to 3 lanes from Newton to Needham are causing 10 minute waits from Panera to the Muzi light. People are doing illegal U turns on Highland Ave because they can't get over to the left lane when getting off the exit (I watch 3 in a 3 minute period). Maybe put some cameras there and track the traffic before putting up the lights that are just going to have to be moved.

Thank you,
Kathleen Robey
150 Warren Street

Sent from my iPhone

From: noreply@civicplus.com
To: [Alexandra Clee](#); [Lee Newman](#); [Elisa Litchman](#)
Subject: Online Form Submittal: Contact Planning Board
Date: Wednesday, June 8, 2022 11:46:04 PM

The following form was submitted via your website: Contact Planning Board

Full Name:: Kira Robinson-Kates

Email Address:: Kira.Rkates@gmail.com

Address::

City/Town:: Needham

State:: MA

Zip Code::

Telephone Number::

Comments / Questions: Hello, I am writing to voice serious concern about the new development at Muzi. It certainly feels like consideration for the members of the neighborhood is taking a backseat to developers trying to push for bigger, louder and more congested developments that will ruin the experience for those in the area. How many members on the board live in the Heights? Is anyone on the board directly tied to this project? I am quite disturbed by the potential conflict of interest here. I also don't see how we can be playing the tax revenue card when we have no problem spending 20mill on an administrative building. Thank you for your time.

Additional Information:

Form submitted on: 6/8/2022 11:45:56 PM

Submitted from IP Address: 73.126.86.84

Referrer Page: <https://m.facebook.com/>

Form Address: https://linkprotect.cudasvc.com/url?a=http%3a%2f%2fwww.needhamma.gov%2fForms.aspx%3fFID%3d229&c=E,1_9R_GgxPhHRqVXMV-5uA51FV0qeOJXZYwsP-6IkFDD73Ljb9-FrNvsrrGintdaOYS_Td9831p6zGxHSG7gIw5o6uwQHxX-RwjVfCla0xqjmqU8dSX_A16pk3Agl.&typo=1

From: noreply@civicplus.com
To: [Alexandra Clea](#); [Lee Newman](#); [Elisa Litchman](#)
Subject: Online Form Submittal: Contact Planning Board
Date: Thursday, June 9, 2022 12:32:25 AM

The following form was submitted via your website: Contact Planning Board

Full Name:: Ryan Ciporkin

Email Address:: rciporki@hotmail.com

Address:: 42 Park Avenue

City/Town:: Needham

State:: MA

Zip Code:: 02494

Telephone Number:: 617-817-0263

Comments / Questions: It is enough that a new large development is going in where Muzi used to be. But a development proposal to increase the size 80%? This may be a boost in tax revenues, but is it worth commercializing our town even more and adding to the congestion ?

Additional Information:

Form submitted on: 6/9/2022 12:32:17 AM

Submitted from IP Address: 73.126.86.84

Referrer Page: No Referrer - Direct Link

Form Address: <https://linkprotect.cudasvc.com/url?>

[a=http%3a%2f%2fwww.needhamma.gov%2fForms.aspx%3fFFID%3d229&c=E.1.d2AVHG2iXZrMc0V0l5fjAJbeD5qlNaOMwb5DwwEiRh6Oo8hnMirpDCVbFG9V4xUxOEFD1scia-ITBIAk_z7RYYGmNgkdfUu3YwegbTjllwUbF0omubKv8.&typo=1](http://www.needhamma.gov/Forms.aspx?FFID%3d229&c=E.1.d2AVHG2iXZrMc0V0l5fjAJbeD5qlNaOMwb5DwwEiRh6Oo8hnMirpDCVbFG9V4xUxOEFD1scia-ITBIAk_z7RYYGmNgkdfUu3YwegbTjllwUbF0omubKv8.&typo=1)

From: [Alex Boni](#)
To: [Planning](#)
Subject: Bio Lab Project Comment
Date: Thursday, June 9, 2022 3:19:05 PM

Hi Needham Planing Board,

I wanted to share my thoughts regarding the proposal for the building project at 557 Highland Ave. As a Needham resident who enjoys recreation, as all of us do, I would like to see this space use for a project that would be useful to us all. I believe the proposal is too dense and should be in a more industrial part of the town instead of across the highway.

Thank you,
Alex Boni
13 Nichols Rd Needham MA

From: [Jackie Boni](#)
To: [Planning](#)
Subject: 557 Highland Ave Biolab Project Comment
Date: Tuesday, June 7, 2022 3:29:07 PM

Hi Planning Board,

I wanted pass along my thoughts regarding the proposal for the building project at 557 Highland Ave. Based on the current proposal, I find that it is much too dense and would like to see more green space and less height to the project. The proposal seems like something that should be part of the industrial part vs. at that location.

Please take the concerns of Needham citizens when deciding.

Thanks,
Jackie Boni
13 Nichols Rd, Needham, MA 02492

From: noreply@civicplus.com
To: [Alexandra Clee](#); [Lee Newman](#); [Elisa Litchman](#)
Subject: Online Form Submittal: Contact Planning Board
Date: Saturday, June 11, 2022 8:49:16 AM

The following form was submitted via your website: Contact Planning Board

Full Name:: Robert Dangel

Email Address:: Rob@dangel.us

Address:: 28 Hewitt Circle

City/Town:: Needham

State:: MA

Zip Code:: 02494

Telephone Number:: 6178758858

Comments / Questions: Hello, I am a town meeting member and resident near the proposed Muzi development site. I have sat on all the bulfinch presentations and attended planning board meetings in person regarding the special permit. The proposed project is too large for the area and you must not grant the special permit. This rezone was forced through town meeting multiple times, was misled regarding communications with the land owner and planning board. There is so much opposition to this large project. There is no reason to grant the max FAR for this project. When you factor in the garage, the FAR they are proposing is significantly larger than the permit would allow. Needham does not need this. Stop looking at the tax revenue and please consider and actually care about the neighborhoods you don't live in. The heights families do not want this large project. Reject the special permit. It's much too large of a project. This can be much smaller and still be of value to the owner and the town.

Additional Information:

Form submitted on: 6/11/2022 8:49:10 AM

Submitted from IP Address: 108.7.74.151

Referrer Page: <http://m.facebook.com>

Form Address: https://linkprotect.cudasvc.com?url?a=http%3a%2f%2fwww.needhamma.gov%2fForms.aspx%3fFID%3d229&c=E.1.kFl_3O40p1c1bLJuFFR9TEGenWkvEZLzYA7SkI8cx1ZgYeoNmH9VqbtYFuGCG8YNmtL-t_GPO9KA_U4BpRrr5ljvwtrHJjgpmZHSx7HeO5tl08.&typo=1

From: [Susan McGarvey](#)
To: [Planning](#)
Subject: Bulfinch project
Date: Saturday, June 11, 2022 10:28:26 AM

I'm not an expert but I'm wondering if geothermal is a good way to go with this project. There is plenty of room to dig the holes there.

--

Susan B. McGarvey
Town Meeting Member Precinct G
66 Upland Road
Needham, MA 02492
781-444-5286

From: [Shari Stier](#)
To: [Planning](#)
Subject: Bullfinch Project
Date: Tuesday, June 14, 2022 9:50:15 PM

Hi - I am writing to express my concerns about the Bullfinch Project in Needham Heights. I live in the immediate area and am very concerned that it will significantly impact the quality of life I have enjoyed in Needham for over 25 years.

Here are a list of my concerns:

- 1) increase in traffic, especially along Highland Ave., Gould St., and Hunting Rd.
- 2) Size of the project.

The size and scope of the buildings seems overwhelmingly large for our neighborhood, with its location tucked within a residential area. I'm particularly concerned with the large scale and obtrusive nature of the parking garage, and the effect of that many cars on the road and the traffic issues. I don't claim to understand the nuance of FAR, etc., but as a resident, it just feels like a slightly smaller project and footprint of buildings would be better for our community, and more in line for this location which directly abuts residential and, equally important, serves as entryway into Needham.

- 3) I heard at the meeting that some Needham families do not want breweries or pubs at the location. I very much would like a brewery or a wine bar so that we can walk there from our homes and it can enhance the interest in our community. We are a family friendly town and many of us have older children that can also enjoy a brewery or wine bar with food. An Art house or small movie theater would also be terrific in the area. We had one many years ago and it would be great to bring some type of creative art center to the area.

Additionally, while unrelated to this project, Temple Beth Shalom, located just down the road on Highland, will be tearing down a residential house located on the corner of highland and Webster/Greendale and replacing it with a parking lot as expansion to their current lot. These changes that are happening on this stretch of Highland Ave., as proposed, do not add value, and in fact, greatly diminish the beauty and quality of the residential life we would like in Needham. While these projects are unrelated, we must consider the larger scope of loss of residential feel in Needham that will be impossible to reclaim in the future.

Thank you for taking my concerns seriously
Shari Stier
23 Park Ave

From: [cpd1667](#)
To: [Planning](#)
Subject: Bullfinch Project at Muzi
Date: Tuesday, June 28, 2022 4:14:12 PM

Hello,

I am writing to express some concerns about the Bullfinch Project in Needham Heights. My primary concerns are:
the increase in traffic, along Highland Ave., Gould St., and Hunting Rd.
and
(2) the size of the project.

The size and scope of the buildings was already agreed upon by Bullfinch and the community and now they are seeking a special permit to increase the size of the project. This seems like it was a deliberate attempt to mislead the community. The project is already too large for our neighborhood, without the request for the special permit to increase its size.

Also adding that many cars on the road to an already very busy intersection that was poorly designed in the first place, is cause for alarm. Getting off the highway at the exit and trying to get over to the left hand lane to make a left onto Hunting Road is already dangerous. As a resident of Hunting Road, it just feels like a smaller project would be better for our community.

As a side note, as I mentioned I live on Hunting Road and would be in total favor of some sort of craft brewery or small restaurant added to the project.

Thank you,

Christine Dedek
55 Hunting Road, Needham

**ARTICLE 5: AMEND ZONING BY-LAW – SCHEDULE OF USE REGULATIONS
BREW PUB AND MICROBREWERY**

To see if the Town will vote to amend the Zoning By-Law as follows:

1. In Section 1.3 Definitions, by adding the following after the existing definition of “Basement” and before the existing definition of “Building (or part or parts thereof)”:

“Brew Pub – Eat-in restaurant, licensed under relevant local, state and federal statutes to produce and sell malt beverages at the location, whose primary business is the preparation and sale of food to be consumed on the premises, and whose accessory business is the production of malt beverages, including beer and ales, which may include packaging of such beverages and on-premises sale of such beverages for consumption on or off the premises. Malt beverages produced on the premises, may be sold to other establishments in compliance with relevant state and federal statutes and regulations, but such sales shall not exceed 40 percent of the establishment’s production capacity. Accessory outdoor dining and live indoor entertainment is allowed if otherwise permitted in the zoning district in which the brew pub is located, if and as permitted by its license.”

2. In Section 1.3 Definitions, by adding the following after the existing definition of “Medical Services Building,” and before the existing definition of “Mixed-Use Building”:

“Microbrewery - A facility, licensed under relevant local, state and federal statutes, for the production and packaging of malt beverages, including beer and ales, for retail sale and for consumption on or off the premises or wholesale distribution, with a capacity and production of not more than fifteen thousand (15,000) barrels per year, (a barrel being equivalent to thirty-one (31) gallons) and which may include as an accessory use preparation and/or sale of food for on premises consumption or for take-out. Any such facility may also provide samples limited in size, provided that such sampling is allowed under relevant local, state, and federal statutes, regulations and licenses issued thereunder. The facility may host marketing events, special events, and/or factory tours. The facility may include as an accessory use an eat-in or take-out restaurant that may include outdoor dining, which restaurant may occupy more than half of the area of the facility and may include live indoor entertainment if otherwise permitted in the zoning district in which the microbrewery is located, if and as permitted by its license.”

Commented [CH1]: Does this addition make sense here? I’m not sure if we are primarily concerned with limiting capacity or actual production, but I wonder if it makes sense to mention both.

3. In Section 3.2, Schedule of Use Regulations, Subsection 3.2.2, Uses in Business, Chestnut Street Business, Center Business, Avery Square Business and Hillside Avenue Business Districts, by inserting immediately below the row that reads “medical clinic” a new entry, which shall read as follows:

“ <u>USE</u>	<u>B</u>	<u>CSB</u>	<u>CB</u>	<u>ASB</u>	<u>HAB</u>
Brew Pub	SP	SP*	SP	SP	N”

*Applies only to the Chestnut Street Business District that is west of Chestnut Street and south of Keith Place, otherwise N.

4. In Section 3.2, Schedule of Use Regulations, Subsection 3.2.1, Uses in the Rural Residence-Conservation, Single Residence A, Single Residence B, General Residence, Apartment A-1, Apartment A-2, Apartment A-3, Institutional, Industrial, and Industrial-1 Districts, by inserting immediately below the row that reads “medical clinic” a new entry, which shall read as follows:

<u>“USE</u>	<u>RRC</u>	<u>SRB</u>	<u>GR</u>	<u>A-1.2</u>	<u>I</u>	<u>IND</u>	<u>IND-1</u>
	<u>SRA</u>			<u>&3</u>			
Brew Pub	N	N	N	N	N	N	N
Microbrewery	N	N	N	N	N	N	SP”

5. In Section 3.2.4 Uses in the New England Business Center District, Subsection 3.2.4.2 Uses Permitted by Special Permit, by adding a new paragraph (k) that states “Microbrewery, allowable only in the portion of the New England Business Center District located west and south of Second Avenue.” and new paragraph (l) that states “Brew Pub, allowable only in the portion of the New England Business Center District located west and south of Second Avenue.”
6. In Section 3.2.5, Uses in the Highland Commercial-128 District, Subsection 3.2.5.2, Uses Permitted by Special Permit, by adding a new paragraph (q) that states “Microbrewery, allowable only in the portion of the Highland Commercial-128 District located a) north of Highland Avenue and b) south of Highland Avenue and west of Second Avenue.” and a new paragraph (r) that states “Brew Pub, allowable only in the portion of the Highland Commercial-128 District located a) north of Highland Avenue and b) south of Highland Avenue and west of Second Avenue.” and by renumbering former paragraphs (q), (r) and (s) as paragraphs (s), (t) and (u) respectively.
7. In Section 3.2.6, Uses in the Mixed Use-128 District, Subsection 3.2.6.2, Uses Permitted by Special Permit, by adding a new paragraph (k) that states “Microbrewery” and a new paragraph (l) that states “Brew Pub” and by renumbering former paragraphs (k), (l) as paragraphs (m) and (n) respectively.
8. In Section 3.2.7 Uses in the Highway Commercial 1 District, Subsection 3.2.7.2 Uses Permitted by Special Permit, by adding a new paragraph (m) that states “Microbrewery” and a new paragraph (n) that states “Brew Pub” and by renumbering former paragraphs (m) and (n) as paragraphs (o) and (p) respectively.

Or take any other action relative thereto.

INSERTED BY: Planning Board
FINANCE COMMITTEE RECOMMENDS THAT:

Article Information: Article 5 provides for the establishment of Brew Pubs and Microbreweries within Needham. The Needham Zoning By-Law does not currently have any provisions for Brew Pubs or Breweries and because the noted uses are not specifically identified as permissible, they are prohibited. Accordingly, the proposed zoning amendment seeks to introduce Brew Pubs and Microbreweries as permitted uses in Needham and takes the following approach: 1) defines the terms “Brew Pub” and “Microbrewery”); 2) identifies the zoning districts in which a Brew Pub and/or Microbrewery will be allowed; and 3) establishes that a Brew Pub and Microbrewery will only be allowed by special permit from either from the Planning Board or the Zoning Board of Appeals.

Brew Pub Definition. A Brew Pub is a hybrid between a restaurant and a Microbrewery. It sells at least 60% of its beer on-site with significant food services. At a Brew Pub the beer is primarily brewed for sale in the restaurant. Brew Pubs may sell beer to go or distribute to some off-site destinations. Under the proposed amendment a Brew Pub is defined as an eat-in restaurant, licensed under relevant local, state and federal statutes to produce and sell malt beverages at the location, whose primary business is the preparation and sale of food to be consumed on the premises, and whose accessory business is the production of malt beverages, including beer and ales, which may include packaging of such beverages and on-premises sale of such beverages for consumption on or off the premises. Malt beverages produced on the premises, may be sold to other establishments in compliance with relevant state and federal statutes

and regulations, but such sales shall not exceed 40 percent of the establishment's production capacity. Accessory outdoor dining and live indoor entertainment is allowed if otherwise permitted in the zoning district in which the brew pub is located, if and as permitted by its license.

Microbrewery Definition. A Microbrewery is a brewery that produces 15,000 barrels or less of beer per year. ~~A Microbrewery They sell the majority of that beer in off site locations. Although some microbreweries have small tasting rooms for consumers, they complete~~ s ~~its~~ ~~their~~ primary sales using ~~in one or more of the se three way~~ following approaches: (1) Three-tier system: The brewer sells to a wholesaler who sells to a retailer who sells to the consumer; (2) Two-tier system: The brewer acts as a wholesaler and sells to the retailer who sells to the consumer. (3) Direct Sales: The brewer sells directly to the consumer for on-site consumption and/or for ~~via carry-outs or sales from an on site tasting room or restaurant.~~ Under the proposed amendment a Microbrewery is defined as a facility, licensed under relevant local, state and federal statutes, for the production and packaging of malt beverages, including beer and ales, for retail sale and for consumption on or off the premises or wholesale distribution, with a capacity and production of not more than fifteen thousand (15,000) barrels per year, (a barrel being equivalent to thirty-one (31) gallons) and which may include as an accessory use preparation and/or sale of food for on premises consumption or for take-out. In addition to service for on-site consumption, a ~~Any~~ such facility may also provide samples limited in size, provided that such sampling is allowed under relevant local, state, and federal statutes, regulations and licenses issued thereunder. The facility may include as an accessory use an eat-in or take-out restaurant that may include outdoor dining, which restaurant may occupy more than half of the area of the facility and may include live indoor entertainment if otherwise permitted in the zoning district in which the microbrewery is located, if and as permitted by its license.

District Location. The amendment would permit a Brew Pub in the Business District, Center Business District, Avery Square Business District, and the portion of the Chestnut Street Business located west of Chestnut Street and south of Keith Place. A Brew Pub and a Microbrewery would be permitted in the Mixed Use-128 District, Highway Commercial 1 District, portion of the New England Business Center District located west and south of Second Avenue, and the portion of the Highland Commercial-128 District located a) north of Highland Avenue and b) south of Highland Avenue and west of Second Avenue.

Special Permit Requirement. Given the desire for close review, the amendment proposes to permit a Brew Pub and a Microbrewery by special permit from the Planning Board in circumstances where a Major Project Site Plan Review Special Permit is triggered and outside of those circumstances to name Zoning Board of Appeals as the special permit granting authority. The special permit requirement would allow for a meaningful review of design and transportation impacts, as well as a greater level of oversight and assurance that the facilities will be operated in a manner that is consistent with the intent of the zoning and other regulations.

From: [Lee Newman](#)
To: [Alexandra Clee](#)
Subject: FW: Brewery Comments
Date: Thursday, June 30, 2022 9:15:54 AM

From: Louis Wolfson <lw29@comcast.net>
Sent: Monday, June 27, 2022 9:41 PM
To: Office of the Town Manager <OTM@needhamma.gov>; Lee Newman <LNewman@needhamma.gov>
Cc: 'lw29' <lw29@comcast.net>; adamjblock@kw.com; Marianne Cooley <mcooley@needhamma.gov>
Subject: Brewery Comments

Select Board and Planning Board members.

I quickly reviewed the proposed changes to the Alcohol License changes as well as the license comparison chart.

It appears to me that the allowed use in industrial zones that presently permit, manufacturing, bottling, distribution, eating and entertainment has not been considered in the proposed language changes.

I believe as present planning board members have acknowledged that the industrial zones and the proposed ability to manufacture, bottle, taste, distribute etc of beer / alcohol would be the only areas in town that the use would be allowed presently. All that would be required is to apply to the State for a liquor license and be granted one.

It is important to protect the industrial property owner / taxpayers and their rights. I would like to be assured that any changes in the language and zoning will not adversely affect the present allowed uses in the industrial zones.

Please let me know you have received this.

Thank you,

Louis

Louis Wolfson
Crescent Road Realty LLC
29 Cimino Road
Needham, MA 02494

617-799-3326



TOWN OF NEEDHAM

TOWN HALL
Needham, MA 02492-2669

TEL: (781) 455-7500
FAX: (781) 449-4569

Office of the
TOWN MANAGER

TO: Boards, Committees, Commissions
FROM: Kate Fitzpatrick, Town Manager
CC: David Davison, Assistant Town Manager/Finance; Katie King, Assistant
Town Manager/Operations; Department and Division Managers;
Committee Staff Liaisons
DATE: June 28, 2022
RE: Board and Committee Member Remote Participation in Public Meetings

Since the start of the COVID-19 pandemic, the State has provided flexibilities under the Open Meeting Law, which has allowed the public and members of boards and committees to participate in public meetings remotely. Those flexibilities are set to expire on July 15, 2022, unless the Governor and Legislature act before then.

If there are no changes in state law, as of July 15, 2022:

- All public meetings must have an in-person option for the public to attend.
- Board and committee members can only participate remotely if approved by their board or committee chair, subject to the Select Board's new [Member Remote Participation in Public Meetings Policy](#).
- Public meetings can no longer be entirely remote (Zoom-only).

Scenario	Board & Committee Members	Public Access & Participation	What is allowed as of July 15, 2022?
1	Remote only.	Remote only.	Not allowed after July 15, 2022. Per state law, the public must be provided an in-person option to access meetings.
2	Hybrid: remote & in-person		
3	In-person.		
4	Hybrid: remote & in-person	Hybrid: remote & in-person	Allowed, subject to the Select Board's Member Remote Participation in Public Meetings Policy.
5	In-person.	Hybrid: remote & in-person	Allowed.
6		In-person.	

The Attorney General's Open Meeting Law regulations ([940 CMR 29.10](#)) allow members of public bodies to participate remotely in limited circumstances and subject to local authorization. On June 14, 2022, the Select Board adopted a new Member Remote Participation in Public Meetings Policy (#SB-ADMIN-0008), which can be found

attached and here: <https://needhamma.gov/3652/BOS-Policy-Section-G-ADMINISTRATION>

This policy applies to local board and committee members, not to how the public can access open meetings. While offering an in-person option for the public will be required, the Select Board encourages all boards and committee to also provide a means for the public to view and participate in meetings remotely and have recordings made available.

If you have any questions about this policy, please contact Katie King, Assistant Town Manager/Director of Operations, at kking@needhamma.gov or (781) 455-7500 ext. 233.

If you have any questions about how to set-up or run a hybrid meeting, please contact your staff liaison.

Thank you.

Town of Needham Select Board	
Policy Number:	SB-ADMIN-008
Policy:	Member Remote Participation in Public Meetings
Date Approved:	06/14/2022
Date Revised:	
Approved:	 _____ Chair, Select Board

Section 1. Purpose

The Office of the Attorney General’s Open Meeting Law regulations at 940 CMR 29.10 allow members of public bodies, in limited circumstances, to participate remotely in meetings. While all members of Town boards and committees are strongly encouraged to attend meetings in person whenever possible, the regulations and this policy seek to promote greater participation in government meetings by allowing members to participate remotely when physical attendance would be unreasonably difficult.

The intent of this policy is to establish clear guidelines on the practice of remote participation by Town boards and committees under the Open Meeting Law, M.G.L. c.30A, §§18-25. Under the enabling authority of 940 CMR 29.10(8), a municipality may adopt a policy that prohibits or further restricts the use of remote participation by public bodies within its jurisdiction.

This policy applies to the remote participation of Town board and committee members only, not to how members of the public access open meetings. The Select Board encourages all boards and committees to provide a means for the general public to view and participate in public meetings remotely and have recordings made available to the public.

Section 2. Policy

2.1 The Select Board, on June 14, 2022, voted to adopt this policy and to authorize the Town Manager to approve remote participation for meetings of all local public bodies within the municipality. In accordance with 940 CMR 29.10(3), the Town’s adoption of remote participation can be revoked at any time.

2.2 In accordance with 940 CMR 29.10(2)(g) and M.G.L. c.30A, §20(e), a local commission on disability may by majority vote of the commissioners at a regular meeting authorize remote participation applicable to a specific meeting or generally to all of the commission's meetings. If

a local commission on disability is authorized to utilize remote participation, a physical quorum of that commission's members shall not be required to be present at the meeting location; provided, however, that the chair or, in the chair's absence, the person authorized to chair the meeting, shall be physically present at the meeting location. The commission shall comply with all other requirements of law.

2.3 This policy and 940 CMR 29.10 shall apply to all Town boards, committees, commissions, subcommittees and working groups regardless of whether such public bodies are appointed or elected, with the exception of the Commission on Disabilities which may independently authorize remote participation in accordance with 940 CMR 29.10.

2.4 Where the Remote Participation Policy is more stringent than 940 CMR 29.10, the Policy shall control.

Section 3. Minimum Requirements for Remote Participation

3.1 Members of the public body who participate remotely and all persons present at the meeting location shall be clearly audible to each other, as required by M.G.L. c.30A, §20(d).

3.2 A quorum of the body shall be physically present at the meeting location, as required by M.G.L. c.30A, §20(d).

3.3 The chair or, in the chair's absence, the person authorized to chair the meeting, shall be physically present at the meeting location, as required by M.G.L. c.30A, §20(d).

3.4 Members of the public body who participate remotely must have access to the same materials being used at the meeting location.

3.5 Members of public bodies who participate remotely may vote and shall not be deemed absent for the purposes of M.G.L. c.39, §23D.

Section 4. Permissible Reasons for Remote Participation

It is the express desire of the Select Board that remote participation in meetings be an infrequent event, for both individual board members and Town Boards and Committees as a whole. Chairs of public bodies are encouraged to interpret these rules in a strict fashion and to continue to induce all members to attend meetings in person as a general rule, due to the inherent benefits of physical presence in a meeting.

A board or committee member may attend a meeting through electronic conferencing if their physical presence would be unreasonably difficult, due to extenuating circumstances, including but not limited to:

- Personal or family illness or disability;
- a family or other emergency;

- military service; or
- geographic distance.

No member of a board or committee will be allowed to join the board or committee meetings remotely more than 25% of the time, over a calendar year, except in extraordinary circumstances.

The chair or the person designated to chair the meeting may allow or decline to allow remote participation that is not consistent with the terms of this policy; any such determination shall be final and shall not be appealable.

Section 5. Acceptable Methods of Remote Participation

- 5.1 Accommodations shall be made for any public body member who requires TTY service, video relay service, or other form of adaptive communications.
- 5.2 Telephone, internet, or satellite enabled audio or video conferencing are all acceptable methods of participation.
- 5.3 Other technology that enables the remote participant and all persons present at the meeting location to be clearly audible is acceptable. When video technology is in use, the remote participant shall be clearly visible to all persons present in the meeting location.
- 5.4 The Town does not guarantee that sufficient technology for remote participation will be available for any given meeting.
- 5.5 Any costs incurred by a remote participant will not be reimbursed by the Town.

Section 6. Procedures

- 6.1 Any member of a public body who wishes to participate remotely shall, at least 48 hours or as soon as reasonably possible prior to the meeting, notify the chair or person chairing the meeting of their desire to do so and the reason for and facts supporting their request.
- 6.2 Prior to the meeting the chair shall make every effort to ensure the equipment is available and functioning properly. If the required equipment is not available, then the chair shall deny the request for remote participation.
- 6.3 At the start of the meeting, the chair shall announce the name of any member who will be participating remotely, as approved by the chair. This information shall also be recorded in the meeting minutes.
- 6.4 All votes taken during any meeting in which a member participates remotely shall be by roll call vote.

- 6.5 If technical difficulties arise as a result of utilizing remote participation the chair should suspend discussion while reasonable efforts are made to correct any problem that interferes with remote participant's ability to hear or be heard clearly by all persons at the meeting location.
- 6.6 If communication problems inhibit the progress of the meeting, the chair must decide whether to continue the meeting, suspend the meeting, or terminate the participation of the remote participant. In the event that more than one member remotely participates, the chair shall evaluate each connection separately and may elect to terminate the participation of one or more of the remote participants should technical difficulties inhibit the progress of the meeting. The meeting minutes must reflect any such decision.
- 6.7 If technical difficulties result in a remote participant being disconnected from the meeting, that fact and the time at which the disconnection occurred and subsequent reconnection if achieved shall be noted in the meeting minutes. If a public hearing occurs after disconnection, the member shall be noted as absent.
- 6.8 Remote participants shall preserve the confidentiality of the executive session. The remote participant shall state at the start of any such session that no other person is present and/or able to hear the discussion at the remote location, unless presence of that person is approved by simple majority vote of the public body, and that the session is not being remotely recorded by any device.