NEEDHAM PLANNING BOARD
Tuesday, March 16, 2021
7:15 p.m.

Virtual Meeting using Zoom
Meeting ID: **878-8270-9890**
(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: 878-8270-9890

To view and participate in this virtual meeting on your computer, at the above date and time, go to www.zoom.us click "Join a Meeting" and enter the following ID: 878-8270-9890

1. Public Hearing:

   7:30 p.m.
   - Article 1: Amend Zoning By-Law – Highway Commercial 1 Zoning District
   - Article 2: Amend Zoning By-Law – Highway Commercial 1 Zoning District Schedule of Permitted Special Permit Uses
   - Article 3: Amend Zoning By-Law – Map Change to Highway Commercial 1

2. Board of Appeals – March 18, 2021.

3. Minutes.

4. Correspondence.

5. Report from Planning Director and Board members.

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

LEGAL NOTICE
Planning Board,
TOWN OF NEEDHAM
NOTICE OF HEARING

In accordance with the provisions of M.G.L., Chapter 40A, S.5, the Needham Planning Board will hold a public hearing on Tuesday, March 16, 2021 at 7:30 p.m. regarding certain proposed amendments to the Needham Zoning By-Law to be considered by the Spring 2021 Annual Town Meeting.

Pursuant to Governor Baker's March 12, 2020 Order Suspending Certain Provisions of the Open Meeting Law, G.L. c. 30A, Section 18, and the Governor's March 15, 2020 Order imposing strict limitations on the number of people that may gather in one place, this public hearing of the Needham Planning Board is being conducted via remote participation. No in-person attendance of members of the public will be permitted, but the public can view and participate in this meeting while in progress by remote access following the instructions detailed below.

To view and participate in this virtual hearing 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: 878-8270-9890

To view and participate in this virtual hearing on your computer, at the above date and time, go to www.zoom.us click "Join a Meeting" and enter the following ID: 878-8270-9890

Members of the public attending this meeting virtually will be allowed to make comments if they wish to do so, during the portion of the hearing designated for public comment through the zoom app.

Persons interested are encouraged to call the Planning Board office (781-455-7550) for more information. A copy of the complete text of the proposed article is detailed below. The article designation given has been assigned by the Planning Board for identification purposes only. An article number will subsequently be established by the Select Board for the Warrant.

ARTICLE 1: AMEND ZONING BY-LAW – HIGHWAY COMMERCIAL 1 ZONING DISTRICT

To see if the Town will vote to amend the Needham Zoning By-Law as follows:

1. Amend Section 2.1, Classes of Districts, by adding the following term and abbreviation under the subsection Industrial:

   "HC-1 -- Highway Commercial 1"

2. Amend Section 3.2, Schedule of Use Regulations, by adding a new Section 3.2.7 as follows:

   "3.2.7 Uses in the Highway Commercial 1 District

   3.2.7.1 Permitted Uses

   The following uses are permitted within the Highway Commercial 1 District as a matter of right:

(a) Uses exempt from local zoning control pursuant to M.G.L. Chapter 40A, Section 3.

(b) Public parks and playgrounds, municipal buildings or uses.

(c) Retail establishment (not including grocery stores) or combination of retail establishments serving the general public where each establishment contains less than 5,750 square feet of floor area and where all items for sale or rent are kept inside a building.

(d) Manufacturing clearly incidental and accessory to a retail use on the same premises and the product is customarily sold on the premises.

(e) Craft, consumer or commercial service establishment dealing directly with the general public.

(f) Laundry or dry cleaning pick-up station with processing done elsewhere.

(g) Professional, business or administrative office, but not including any of the following: a medical clinic or Medical Services Building or medical, surgical, psychiatric, dental, orthodontic, or psychologist group practices comprised of three or more such professionals (hereinafter "Group Practices") or physical therapy, alternative medicine practices, wellness treatments, including but not limited to, acupuncture, yoga, chiropractic and/or nutrition services. "Professional" shall include professional medical, surgical, psychiatric, dental, orthodontic or psychologist practice by a group of two or fewer such professionals ("Non-group Practice").

(h) Bank or Credit Union.

(i) Medical Laboratory or laboratory engaged in scientific research and development and/or experimental and testing activities including, but not limited to, the fields of biology, genetics, chemistry, electronics, engineering, geology, medicine and physics, which may include the development of mock-ups and prototypes.

(j) Radio or television studio.

(k) Light non-nuisance manufacturing, including, but not limited to, the manufacture of electronics, pharmaceutical, bio-pharmaceutical, medical, robotic, and micro-biotic products, provided that all resulting cinders, dust, flashing, fuses, gases, odors, smoke, noise, vibration, refuse matter, vapor, and heat are effectively confined in a building or are disposed of in a manner so as not to create a nuisance or hazard to safety or health.

(l) Telecommunications facility housed within a building.

(m) Other customary and proper accessory uses incidental to lawful principal uses. Further provided, accessory uses for seasonal temporary outdoor seating for restaurants serving meals for consumption on the premises and at tables with service provided by waitress or waiter shall be allowed upon minor project site plan review with waiver of all requirements of Section 7.4.4 and 7.4.6 except as are necessary to demonstrate compliance with Section 6.9 by the Planning Board or Select Board in accordance with Section 6.9.

(n) More than one building on a lot.

(o) More than one use on a lot.

3.2.7.2 Uses Permitted By Special Permit

The following uses are permitted within the Highway Commercial 1 District upon the issuance of a Special Permit by the Special Permit Granting Authority under such conditions as it may require:

(a) Light-rail train station.

(b) Adult day care facility.

(c) Private school, nursery, or kindergarten not otherwise classified under Section 3.2.7.1 (a).

(d) Retail establishment (not including grocery stores) or combination of retail establishments serving the general public where any establishment contains more than 5,750 but less than 10,000 square feet of floor area and where all items for sale or rent are kept inside a building.

(e) Equipment rental service but not including any business that uses outside storage.

(f) Grocery store provided it does not exceed 10,000 sq. ft. of floor area.

(g) Eat-in or take-out restaurant or other eating establishment except that a lunch counter incidental to a primary use shall be permissible by right.

(h) Veterinary office and/or treatment facility and/or animal care facility, including but not limited to, the care, training, sitting and/or boarding of animals.

(i) Indoor athletic or exercise facility or personal fitness service establishment, which may include outdoor pool(s) associated with such facilities.

(j) External automatic teller machine, drive-up window or auto-oriented branch bank accessory to a bank or credit union permitted under Section 3.2.7.1(h) hereof.

(k) Group Practices as defined in Section 3.2.7.1(g) and alternative medicine practices, physical therapy, and wellness treatments facilities including, but not limited to, acupuncture, yoga, chiropractic and/or nutrition services. Such uses may have customary and proper accessory uses incidental to the lawful principal uses, including but not limited to, pharmacies.

(l) Live performance theater, bowling alley, skating rink, billiard room, and similar commercial amusement or entertainment places."

3. Amend Section 4.7.1, Specific Front Setbacks, by deleting the following provisions:

"(b) On the easterly side of Gould Street from Highland Avenue northerly to land of the New York, New Haven and Hartford Railroad Company, there shall be a fifty (50) foot building setback line;

(c) On the northerly side of Highland Avenue from Gould Street northeasterly to the property of the Commonwealth of Massachusetts, there shall be a fifty (50) foot building setback line."

4. Amend Section 4, Dimensional Regulations, by adding a new Section 4.11 Dimensional Regulations for Highway Commercial Districts as follows:

"4.11 Dimensional Regulations for Highway Commercial Districts

4.11.1 Highway Commercial 1

Minimum Lot Area (Sq. Ft.)	Minimum Lot Frontage (Ft.)	Front Setback (Ft.) (1)	Side Setback (Ft.) (1) (3)	Rear Setback (Ft.) (1) (3)	Maximum Height (Ft.) (1)	Maximum Stories (1)	Maximum Lot Coverage (2) (4)	Floor Area Ratio (5) (6)
20,000	100	5	10	10	56	4	65%	1.00

(1) a. All buildings shall be limited to a height of 56 feet and four stories, except that buildings within 200 feet of Highland Avenue or the extension of the right-of-way line as described below in paragraph c. and buildings within 200 feet of Gould Street shall be limited to a height of 35 feet and 2 ½ stories as-of-right. If the height of a building is increased above the height of 35 feet, the front setback shall be increased to 15 feet and the side and rear setbacks to 20 feet except that, along the MBTA right-of-way the side and rear yard setbacks shall be 10 feet.

b. By Special Permit from the Planning Board, the maximum height of a building may be increased to the following limits within 200 feet of Highland Avenue or the extension of the right-of-way line as described below in paragraph c. and within 200 feet of Gould Street: 3 stories and 42 feet or 3 stories and 48 feet, provided the additional height is contained under a pitched roof or recessed from the face of the building in a manner approved by the Planning Board. By Special Permit from the Board, the maximum height of a building may be further increased to the following limits: 5 stories and 70 feet provided the building is not located within 200 feet of Highland Avenue or the extension of the right-of-way line as described below in paragraph c. or within 200 feet of Gould Street. If the height of a building is increased above the height of 42 feet, or 48 feet if under a pitched roof or recessed as aforesaid, the front setback shall be increased to 15 feet and the side and rear setbacks to 20 feet except that, along the MBTA right-of-way the side and rear yard setbacks shall be 10 feet.

c. The line from which the setbacks from Highland Avenue shall be measured is that line which starts at the point of curvature on Highland Avenue at Gould Street marked by a stone bound/drill hole (SB/DH) and runs northeasterly N63º56'51"E by the Highland Avenue 1980 State Highway Alteration 361.46 feet to a stone bond/drill hole, then continues on the same northeasterly course an additional 330.54 feet for a total distance from the first mentioned bound of 700 feet. Reference is made to a plan entitled "Plan of Land Gould Street, Needham, MA", prepared by Andover Engineering, Inc., dated July 27, 2000, last revised September 20, 2001, recorded in the Norfolk County Registry of Deeds as Plan No. 564 of 2001, Plan Book 489.

d. Buildings and structures abutting Highland Avenue, Gould Street and/or the layout of Route 128/95 shall be set back at least 20 feet from said streets and said layout. Notwithstanding the location of any building and structures, a 20 foot landscaped, vegetative buffer area shall be required along the aforementioned street frontages and said layout in order to screen the development. Driveway openings, sidewalks, walkways and screened mechanical equipment shall be permitted in the buffer area.

e. Structures erected on a building and not used for human occupancy, such as chimneys, heating-ventilating or air conditioning equipment, solar or photovoltaic panels, elevator housings, skylights, cupolas, spires 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. The Planning Board may require screening for such structures as it deems necessary. Notwithstanding the above height limitations, cornices and parapets may exceed the maximum building height provided they do not extend more than 5 feet above the highest point of the roof.

f. For purposes of clarity, the required building setbacks and allowed envelopes (including setbacks) for allowance of additional height above 35' for the as-of right circumstance and 42'/48' for the special permit circumstance are shown on figures 1 and 2 below.

Figure 1:

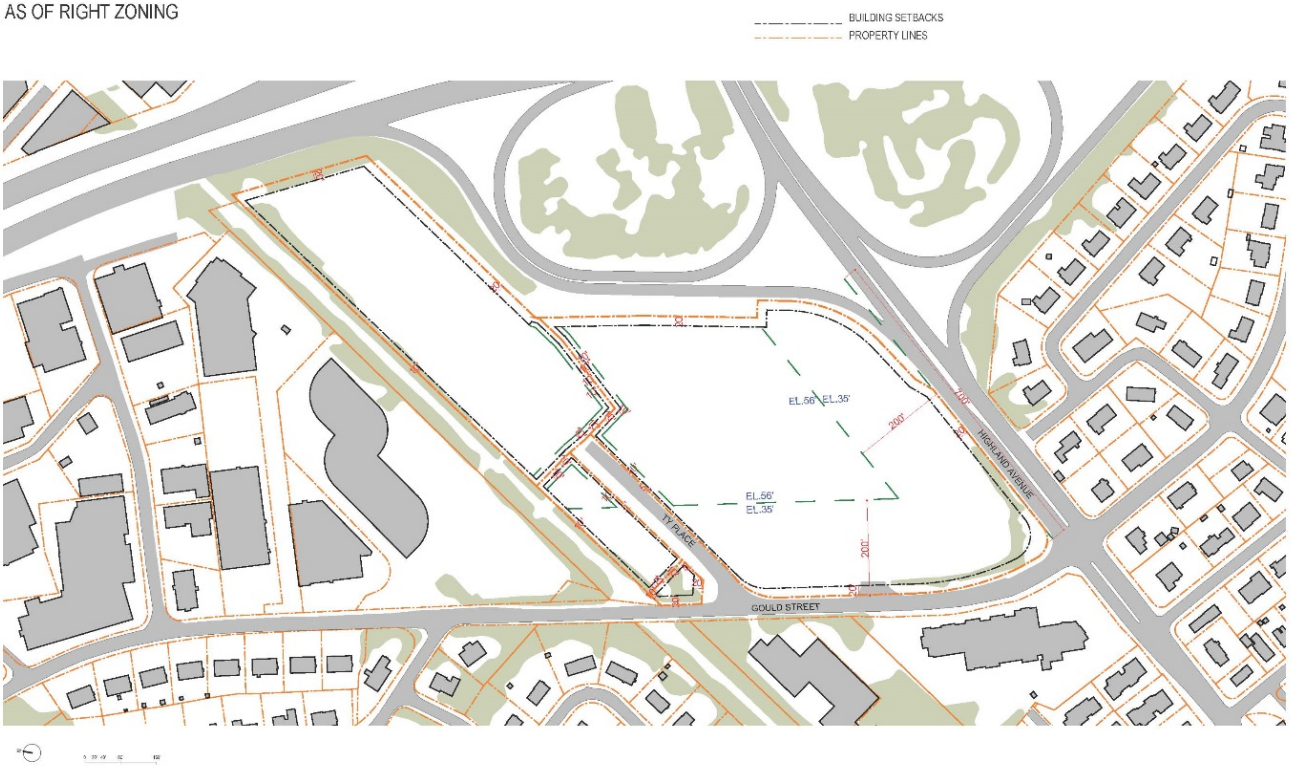
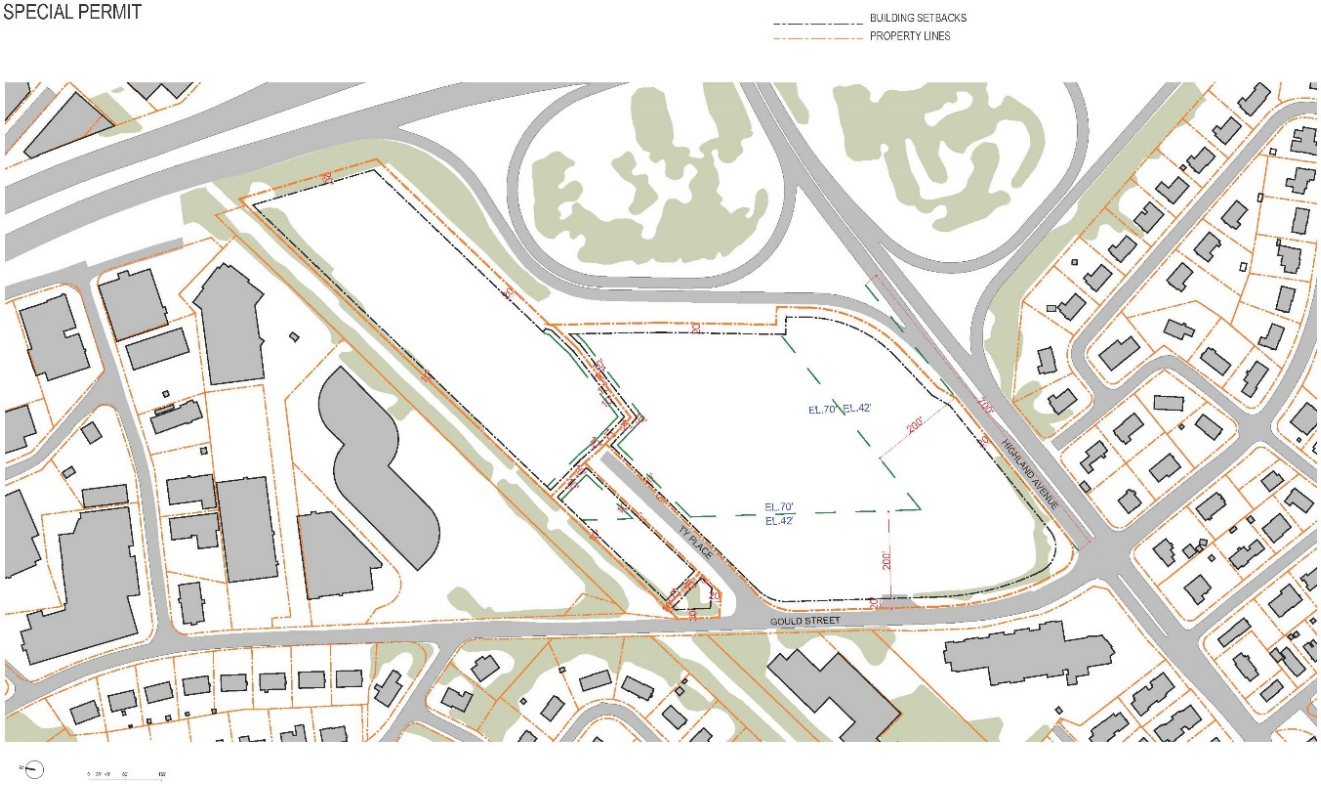


Figure 2:



(2) Maximum lot coverage shall be 65% for all projects. However, if a project is designed such that at least 65% of the required landscaped area immediately abuts at least 65% of the required landscaped area of an adjoining project for a distance of at least 50 feet, the maximum lot coverage may be increased to 75%.

(3) No side or rear yard setback is required for shared parking structures between adjoining properties, but only on one side of each lot, leaving the other side or rear yards open to provide access to the interior of the lot.

(4) A minimum of 20% of total lot area must be open space. The open space area shall be landscaped and may not be covered with buildings or structures of any kind, access streets, ways, parking areas, driveways, aisles, walkways, or other constructed approaches or service areas. Notwithstanding the preceding sentence, open space shall include pervious surfaces used for walkways and patios. (Pervious surfaces shall not preclude porous pavement, porous concrete, and/or other permeable pavers.)

(5) A floor area ratio of up to 1.35 may be allowed by a special permit from the Planning Board. In granting such special permit, the Planning Board shall consider the following factors: 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; 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; the environmental impacts of the proposal; and the fiscal implications of the proposal to the Town. 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.

(6) The calculation of floor area in determining floor area ratio shall not include parking areas or structures.

4.11.2 Supplemental Dimensional Regulations

(1) Parking structures shall be set back at least 100 feet from Highland Avenue and/or Gould Street.

(2) Parking structures may have an active ground floor use, such as retail, office, institutional, or display. Structured parking must be located at least 20 feet from adjacent buildings, but may be attached to the building it is servicing if all fire and safety requirements are met.

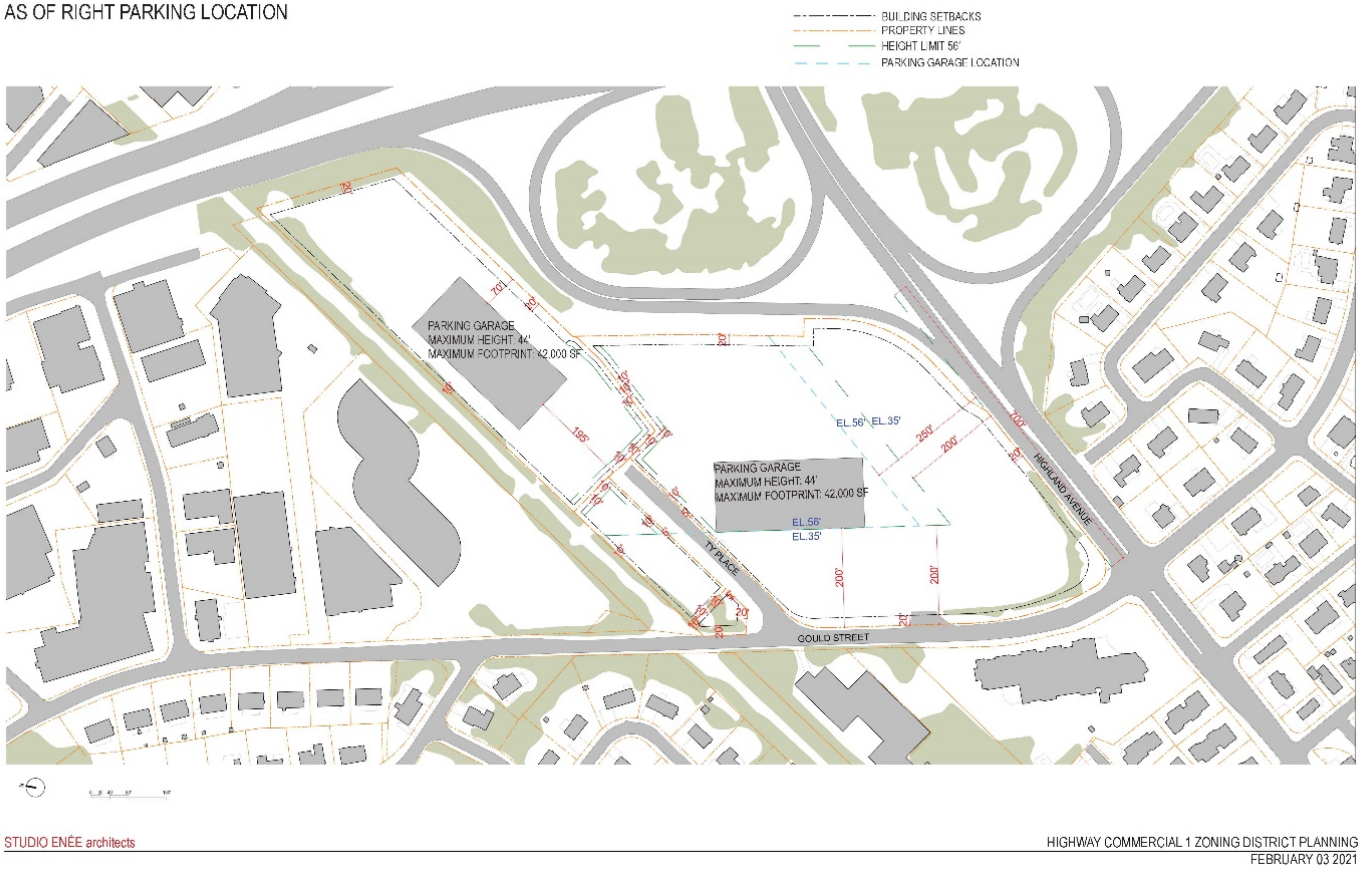
(3) Buildings abutting Highland Avenue and/or Gould Street must have a public entrance facing one street on which the building fronts. This requirement may be waived by special permit from the Planning Board for buildings abutting the 20-foot landscaped setback on Gould Street and Highland Avenue where the arrangements for pedestrian access are such that entrances facing these streets are not the best design option.

(4) Maximum uninterrupted facade length shall be 200 feet.

(5) Notwithstanding Section 3.2.7.1(m) and any other provision of this Section 4.11 to the contrary, a parking garage, even if it is for an as-of-right development, may not exceed 44 feet in height, may not have a building footprint in excess of 42,000 square feet and may not be located within 250 feet of Highland Avenue or the extension of the right-of-way line described in Section 4.11.1 (1) (c) or within 200 feet of Gould Street without the issuance of a special permit by the Planning Board. A parking garage for an as-of-right development may, however, be located within the area

beyond said setbacks as-of-right if the parking garage is located easterly or northeasterly of said 200-feet or 250-feet setbacks. For purposes of clarity the height, coverage and location requirements for the as-of-right circumstance are shown on figure 3 below.

Figure 3



(6) All setback, height, and bulk requirements applicable to this Section 4.11 are contained in this Section and no additional requirements occasioned by this district abutting Route 128/95's SRB district shall apply.

4.11.3 Special Permit Provision

The Planning Board may, by special permit, waive any or all dimensional requirements set forth above in this Section 4.11 (including sections 4.11.1 and 4.11.2), by relaxing each by up to a maximum percentage of 25% if it finds that, given the particular location and/or configuration of a project in relation to the surrounding neighborhood, such waivers are consistent with the public good, and that to grant such waiver(s) does not substantially derogate from the intent and purposes of the By-Law. This section does not authorize the Planning Board to waive the maximum height regulations, maximum story regulations, reduce the 20 foot landscaped buffer area requirement along Gould Street, Highland Avenue and the layout of Route 128/95, reduce the 100 foot garage setback requirement along Gould Street and Highland Avenue, or reduce the 20% open space requirement of Section 4.11.1(4), except as specifically provided in Section 4.11.1(1) for pitched or recessed roofs. (By way of example, a 15' front yard setback could be waived to 11.25' or the 20,000 sq. ft. minimum lot area could be waived to 15,000 sq. ft.)

4.11.4 Special Permit Requirements

In approving any special permit under this Section 4.11, the Planning Board shall consider the following design guidelines for development: (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; (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; (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; (d) The proposed development should promote site features and a layout which is conducive to the uses proposed; (e) the proposed development should incorporate as many green building standards as practical, given the type of building and proposed uses; and (f) 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."

5. Amend Section 5.1.3, Parking Plan and Design Requirements, by adding at the end of the second sentence of subsection (j) which reads "Such parking setback shall also be twenty (20) feet in an Industrial-1 District" the words "and Highway Commercial 1 District."

6. Amend Section 7.2.5 of Section 7.2 Building or Use Permit, by adding after the words "Industrial-1 District," in the first sentence, the words "Highway Commercial 1 District,".

7. Amend Section 7.4.2 of Section 7.4 Site Plan Review, by adding in the first sentence of the last paragraph, the words "Highway Commercial 1 District," after the words "Highland Commercial-128,".

8. Amend Section 7.7.2.2, Authority and Specific Powers (of Design Review Board) by adding after the words "Industrial-1 District," in the first sentence of the second paragraph, the words "Highway Commercial 1 District,".

ARTICLE 2: AMEND ZONING BY-LAW – HIGHWAY COMMERCIAL 1 ZONING DISTRICT SCHEDULE OF PERMITTED SPECIAL PERMIT USES

To see if the Town will vote to amend the Needham Zoning By-Law as follows:

1. Amend 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) to read as follows:

"(m) Apartment or multi-family dwelling provided that (1) the proposed apartment or multi-family dwelling complies with the lot area per unit requirements for apartments in the A-1 district as detailed in Section 4.3, (2) no more than 240 dwelling units shall be permitted in the Highway Commercial 1 District, (3) at least 40% but not more than 70% of all dwelling units within any project shall be one-bedroom units, and (4) at least 12.5% of all dwelling units shall be Affordable Units as defined in Section 6.12."

2. Amend Section 6.12, Affordable Housing, by revising the first paragraph to read as follows:

"Any mixed-use building in the Neighborhood Business District (NB) with six or more dwelling units shall include affordable housing units as defined in Section 1.3 of this By-law. Any building in the Highway Commercial 1 District with six or more dwelling units shall include affordable housing units

as defined in Section 1.3 of this By-law. The requirements detailed in paragraphs (a) thru (i) below shall apply to a development that includes affordable units in the Neighborhood Business District. The requirements detailed in paragraphs (a), (c), (d), (e), (f), (g), and (h) below shall apply to a development that includes affordable units in the Highway Commercial 1 District."

ARTICLE 3: AMEND ZONING BY-LAW – MAP CHANGE TO HIGHWAY COMMERCIAL 1

To see if the Town will vote to amend the Needham Zoning By-Law by amending the Zoning Map as follows:

Place in the Highway Commercial 1 District all that land now zoned Industrial-1 and lying between the Circumferential Highway, known as Route 128/95 and Gould Street and between the Massachusetts Bay Transit Authority (M.B.T.A.) right-of-way and Highland Avenue. Said land is bounded and described as follows:

Beginning at a stone bound on the northerly layout line of Highland Avenue at the intersection of Gould Street as shown on a plan recorded at the Norfolk County Registry of Deeds, Plan No. 564 of 2001, Plan Book 489; thence turning and running southwesterly, westerly and northwesterly along a radius of 44.00 feet a distance of 80.06 feet to a stone bound on the easterly sideline of Gould Street; thence running northwesterly, northerly, and northeasterly along a curve of radius of 505.00 feet of said sideline of Gould Street a distance of 254.17 feet to a point on the said easterly sideline of Gould Street; thence running N10º49'50"E a distance of 284.29 feet to a point on the said easterly sideline of Gould Street at the intersection of TV Place, a privately owned Right of Way; thence continuing N10º49'50"E a distance of 160.00 feet more or less to a stone bound as shown on a plan recorded at the Norfolk County Registry of Deeds Land Court Case No. 18430I; thence continuing N10º49'50"E a distance of 84.82 feet to a stone bound located at the intersection of the easterly sideline of Gould Street and the southerly sideline of the M.B.T.A. Right of Way as shown on a plan recorded at the Norfolk County Registry of Deeds Land Court Case No. 18430I; thence turning and running along said southerly M.B.T.A. Right of Way line northeasterly a distance of 1,219.55 feet as shown on a plan recorded at the Norfolk County Registry of Deeds Land Court Case No. 18430I, 18430J and 18430H to a point at the intersection of the westerly sideline of the Route 128 Right of Way and said southerly sideline of the M.B.T.A. Right of Way; thence turning and running S4º25'46"E a distance of 292.00 feet to a stone bound as shown on a plan recorded at the Norfolk County Registry of Deeds Land Court Case No. 18430H; then turning and running southwesterly along the Route 128 Right of Way a distance of 484.61 feet to a point; thence turning and running S13º34'58"W a distance of 451.02 feet as shown on a plan recorded at the Norfolk County Registry of Deeds, Plan No. 564 of 2001, Plan Book 489 to a point; thence turning and running S76º26'41"E a distance of 35.56 feet to a point; thence turning and running S13º34'58"W a distance of 67.34 feet to a point; thence running southwesterly along a curve of radius 245.45 feet a distance of 136.59 feet to a point; thence running southwesterly along a curve of radius 248.02 feet a distance of 38.04 feet to a point; thence running southwesterly along a curve of radius 1180.00 feet a distance of 140.09 feet to a point; thence turning and running S42º43'47"W a distance of 42.52 feet to a stone bound located in the westerly sideline of the Route 128 Right of Way; thence turning and running S63º56'51"W a distance of 361.46 feet to the point of beginning.

Interested persons are encouraged to attend the public hearing and make their views known to the Planning Board. This legal notice is also posted on the Massachusetts Newspaper Publishers Association's (MNPA) website at (http://masspublicnotices.org/).

Needham Times, February 25, 2021 and March 4, 2021.

HIGHWAY COMMERCIAL 1 ZONING DISTRICT PLANNING

NEEDHAM, MA

MARCH 16, 2021

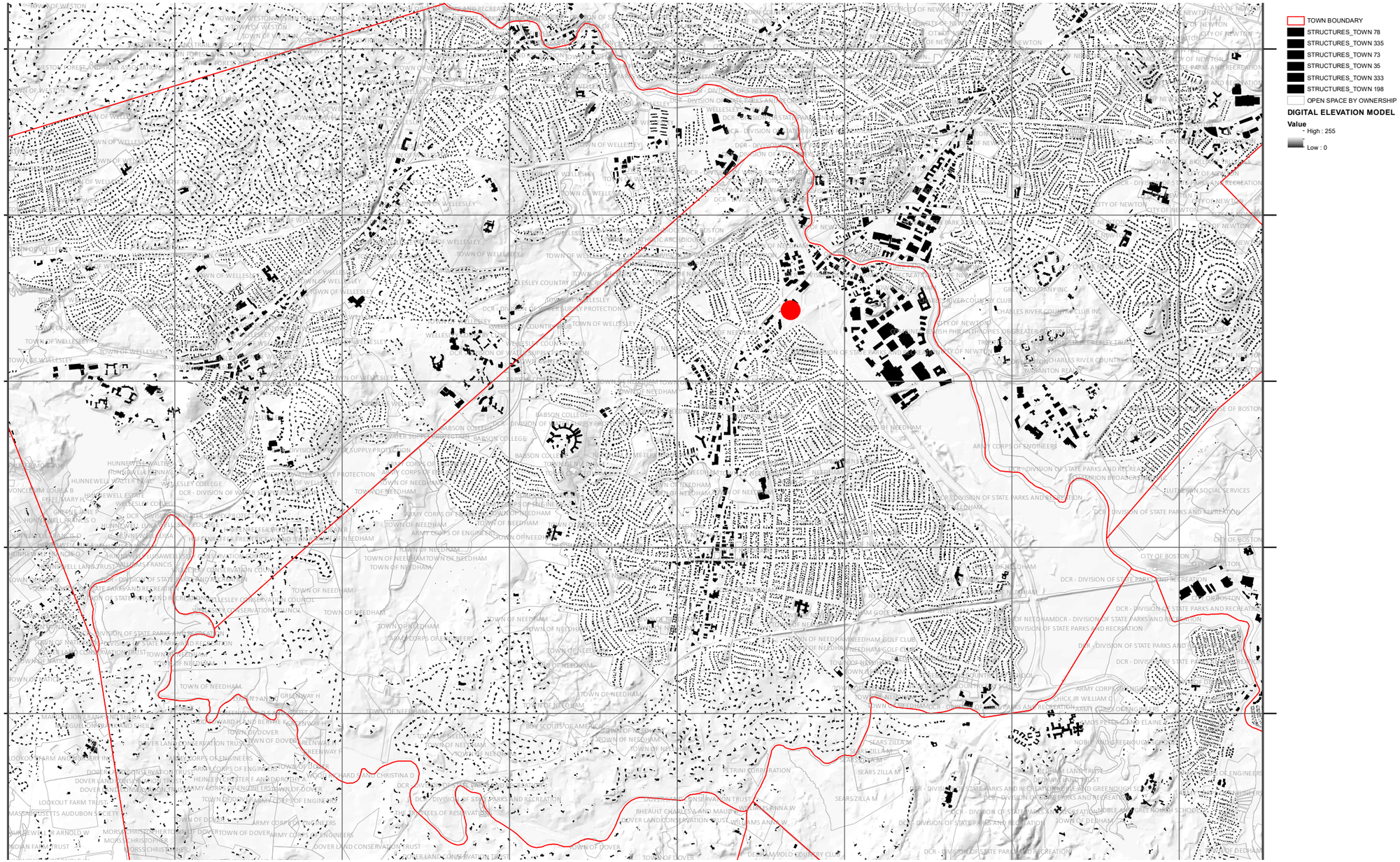
PREPARED BY:

STUDIO ENÉE

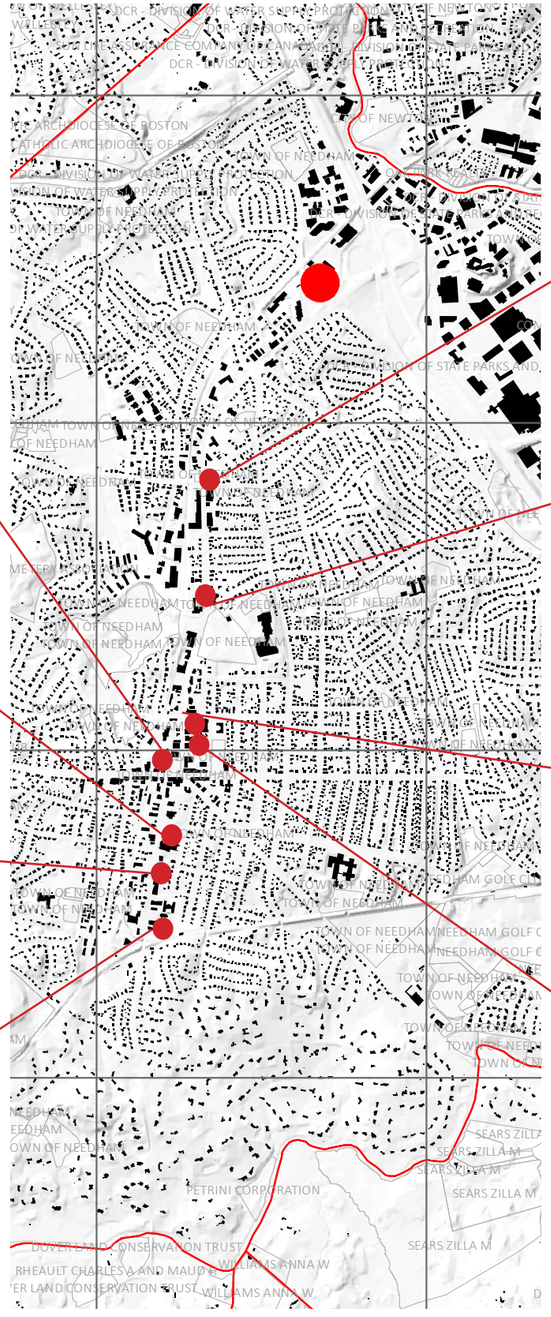

SITE 1
5.8 Acres = 252,952 SF
SITE 2
9.4 Acres = 411,250 SF
STATE CIRCUMF. HWY.
(RTE.128 - 1953 LO.)
SEE PLAN 300
SEE PLAN 300
HIGHLAND
AVE.
SEE PLAN 72
PLACE
GOULD
SEE PLAN 77
SEE PLAN 79

EXISTING AERIAL VIEW

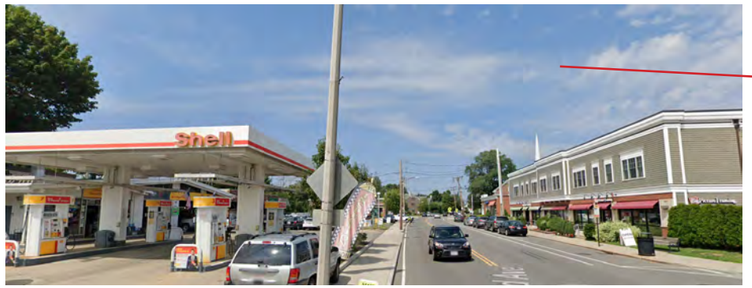
DENSITY

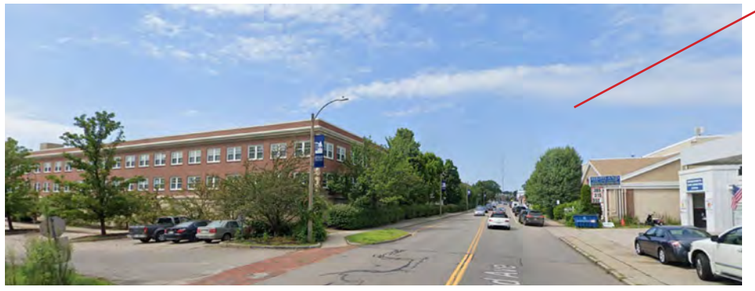

TOWN BOUNDARY
STRUCTURES_TOWN 78
STRUCTURES_TOWN 335
STRUCTURES_TOWN 73
STRUCTURES_TOWN 35
STRUCTURES_TOWN 333
STRUCTURES_TOWN 198
OPEN SPACE BY OWNERSHIP
DIGITAL ELEVATION MODEL
Value
High : 255
Low : 0

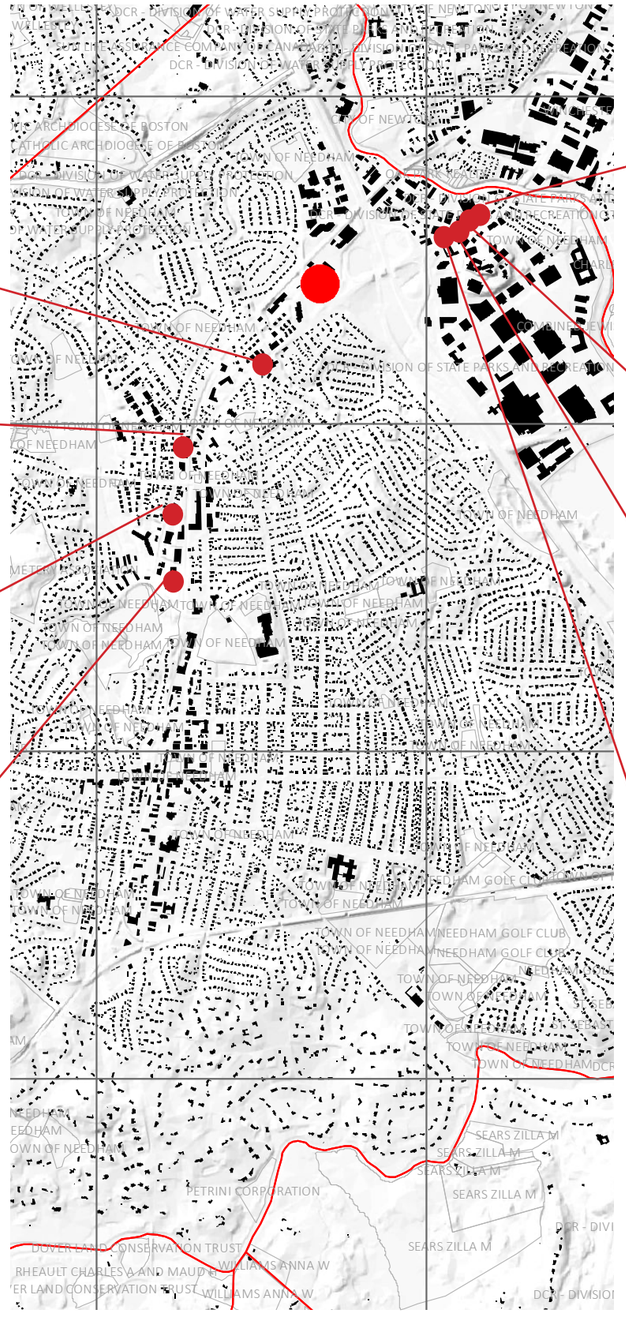
HIGHLAND AVENUE : CIVIC AND COMMERCIAL CORRIDOR



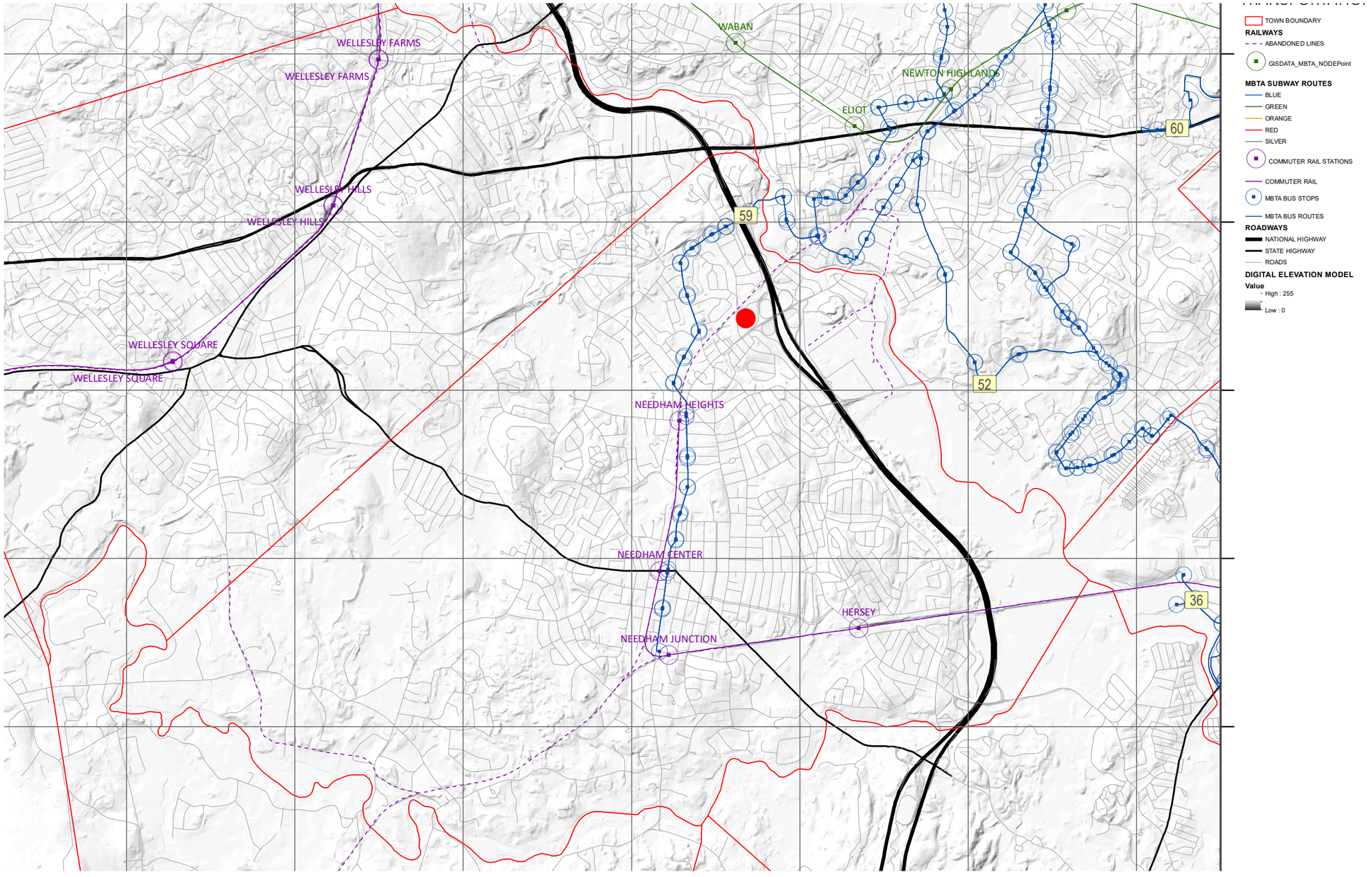
HIGHLAND AVENUE : CIVIC AND COMMERCIAL CORRIDOR







TRANSPORTATION



EXISTING AERIAL VIEW

3 Essential Changes to 2019 Proposal

- **Reduced scope and scale of development**
- **Reduced maximum build heights**
- **Included option for multifamily residential development**

Needham Planning Board
Highway Commercial 1
Use Table

Zoning Element	Existing By-law		2019 Proposal		2021 Proposal	
	By Right	Special Permit	By Right	Special Permit	By Right	Special Permit
Uses	Chapter 40A exempt uses, lib/mus, muni water tower, park, passenger station, single family, boarding house, dormitory, retail up to 5750 sf, accessory manufacturing, offices, banks, various services, theaters, movie houses, indoor athletic/exercise facilities, entertainment buildings, distribution warehouse, storage, machine shop, bottling plant, equipment rental, garment manufacturing, laboratory, radio/TV studio, light manufacturing, municipal building, accessory use for home office or small repairs	Farmers market, nursing home, private club, private school, retail over 5750 sf, fitness, trucking terminal, gas station, vehicle repair, laundry, junk yard, lumber establishment, hotel, restaurant, veterinary, medical clinic, medical marijuana treatment, car sales and parking, welding, stone cutting, autobody, food processing, genetic research, medical lab, more than one municipal building or use on a lot, off-street parking	Chapter 40A exempt uses, public parks, municipal buildings or uses, retail up to 10,000sf, accessory manufacturing, various services, offices, banks, medical laboratory or laboratory engaged in research and development, radio/TV studio, light manufacturing, telecommunications facility, laundry pickup/dropoff, more than one building or use on a lot	Light-rail train station, adult day care, private school or nursery, retail establishment from 10,000 to 25,000sf, equipment rental service, grocery store up to 25,000sf, restaurant, veterinary office, indoor athletic or exercise facility, drive-up window, medical group practice, live performance theater, bowling alley, and similar commercial amusement or entertainment places	Chapter 40A exempt uses, public parks, municipal buildings or uses, retail up to 5,750sf, accessory manufacturing, various services, offices, banks, medical laboratory or laboratory engaged in research and development, radio/TV studio, light manufacturing, telecommunications facility, laundry pickup/dropoff, more than one building or use on a lot	Up to 240 multi family dwelling units**, light-rail train station, adult day care, private school or nursery, retail establishment from 5750sf to 10,000sf, equipment rental service, grocery store up to 10,000sf, restaurant, veterinary office, indoor athletic or exercise facility, drive-up ATM/teller, medical group practice, live performance theater, bowling alley, and similar commercial amusement or entertainment places

discontinued uses
uses new in 2019
uses new in 2021

** Residential units are restricted in the following ways:
- min of 40% and max of 70% 1 bedroom units
- min of 12.5% of all units will be "affordable"

ZONING COMPARISON - DIMENSIONS

Needham Planning Board
Highway Commercial 1
Dimensional Requirements

Zoning Element	Existing By-law		2019 Proposal		2021 Proposal	
	By Right	Special Permit	By Right	Special Permit	By Right	Special Permit
FAR	0.5	0.65-0.75	1.00	1.75	1.00	1.35
Height	2 stories (30')	2 stories (30')	5 stories 70' [1]	6 stories 84' [1]	4 stories (56') [2]	5 stories (70') [3]
Front Setback	20' (50' on Gould + Highland)	20' (50' on Gould + Highland)	(internal - TV Pl) 5' [4]	(internal - TV Pl) 5' [4]	(internal - TV Pl) 5' [7]	(internal - TV Pl) 5' [7]
Side Setback	20'	20'	10' [5]	10' [5]	10' [8]	10' [8]
Rear Setback	10'	10'	10' [6]	10' [6]	10' [9]	10' [9]
Min Lot Area (SF)	20,000	20,000	20,000	20,000	20,000	20,000
Min Lot Frontage (Ft)	100	100	100	100	100	100
Max Lot Coverage	N/A	N/A	65%	65%	65%	65%
Min Open Space	N/A	N/A	20%	20%	20%	20%
Parking Garage Setback	N/A	N/A	100' Gould+ Highland	100' Gould+ Highland	100' Gould + Highland	100' Gould + Highland
Max façade length	N/A	N/A	200'	200'	200'	200'
Traffic Mitigation	$ by Developer	$ by Developer	$ by Developer	$ by Developer	$ by Developer	$ by Developer

Legend

1. Except a building within 150 feet of Highland Avenue and 200 feet of Gould Street is limited to a height of 42 feet or 48 feet if under a pitched roof or recessed from the face of the building in a manner approved by the Planning Board.

2. Except a building within 200 feet of Highland Avenue and 200 feet of Gould Street is limited to 2 1/2 stories and a height of 35 feet.

[3] Except a building within 200 feet of Highland Avenue and 200 feet of Gould Street is limited to 3 stories and a height of 42 feet or 48 feet if under a pitched roof or recessed from the face of the building in a manner appoved by the Planning Board.

[4] Except where building height exceeds 42 feet, in which case the front setback increases to 15 feet, or the building sits on Highland Avenue, Gould Street and/or the layout of Route 95/128, where a 20-foot landscaped vegetative buffer is required.

[5] Except where building height exceeds 42 feet, in which case the side setback is increased to 20 feet for all side setbacks not abutting the MBTA right-of-way.

[6] Except where building height exceeds 42 feet, in which case the rear setback is increased to 20 feet for all rear setbacks not abutting the MBTA right-of-way.

[7] Front setback is 5' from any internal road such as TV Place.

[8] Except where building height exceeds 35 feet, in which case the side setback is increased to 20 feet for all side setbacks not abutting the MBTA right-of-way.

[9] Except where building height exceeds 35 feet, in which case the rear setback is increased to 20 feet for all rear setbacks not abutting the MBTA right-of-way.

Needham Planning Board
Highway Commercial 1
Dimensional Requirements

Dimensional Requirements for Highway Commercial 1 District

Zoning Element	Proposal Within 200 ft. Gould + Highland		Proposal Beyond 200 ft. Gould + Highland	
	By Right	Special Permit	By Right	Special Permit
FAR	1.00	1.35	1.00	1.35
Height	2 1/2 stories (35')	3 stories (48')	4 stories (56')	5 stories (70')
Front Setback	20' [1]	20' [2]	20' [2]	20' [2]
Side Setback	10'	20' [3]	20' [3]	20' [3]
Rear Setback	10'	20' [3]	20' [3]	20' [3]
Min Lot Area (SF)	20,000	20,000	20,000	20,000
Min Lot Frontage (Ft)	100	100	100	100
Max Lot Coverage	65%	65%	65%	65%
Min Open Space	20%	20%	20%	20%
Parking Garage Setback	100' Gould+ Highland	100' Gould+ Highland	100' Gould + Highland	100' Gould + Highland
Max façade length	200'	200'	200'	200'
Traffic Mitigation	$ by Developer	$ by Developer	$ by Developer	$ by Developer

Legend

1 Front setback is 5' from any internal road such as TV Place.

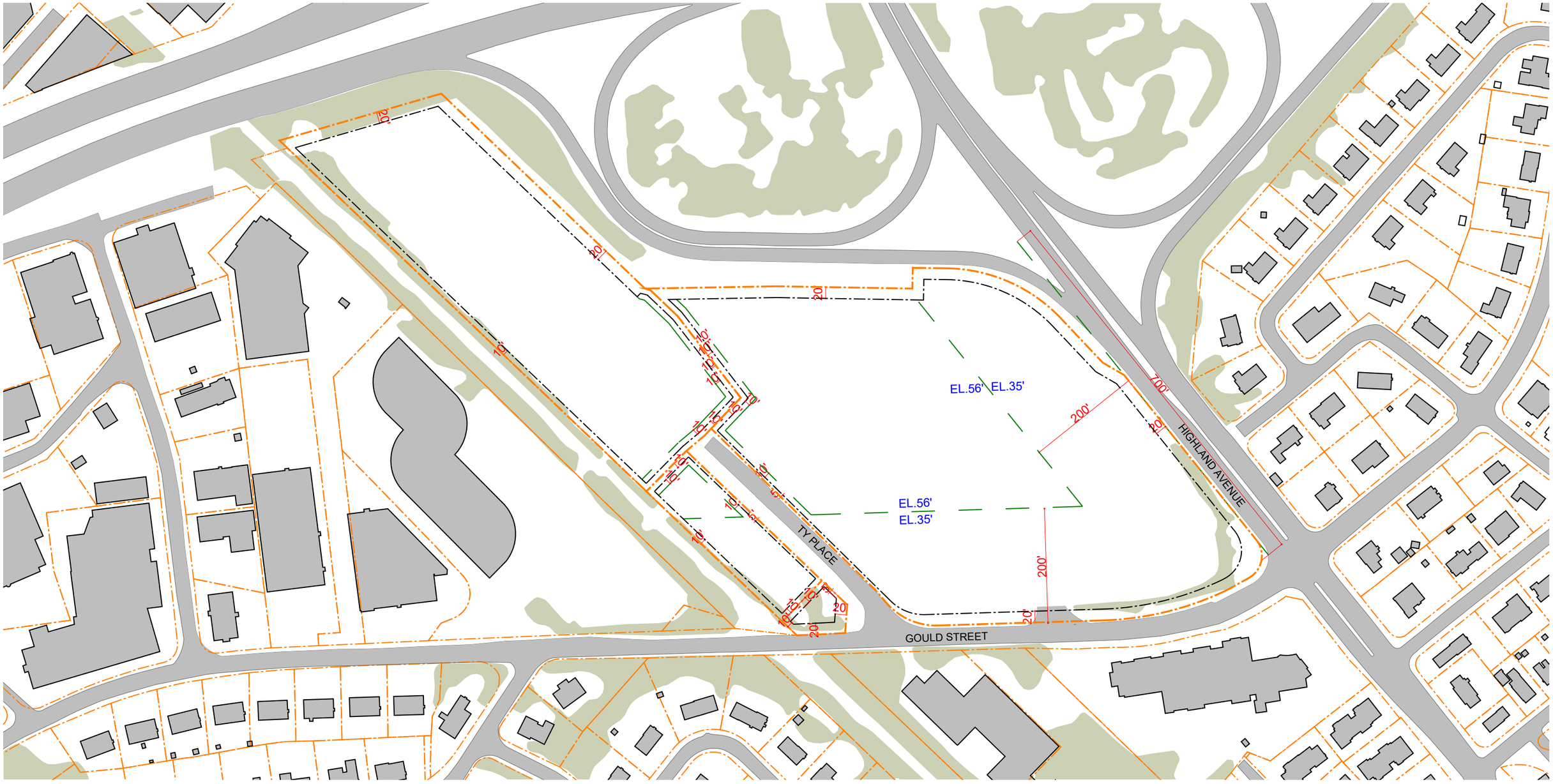
2 Front setback is 15' from any internal road such TV Place.

3 Except along the MBTA right of way where the setback is 10'.

Note: There is a 20' landscape buffer off each of Highland and Gould.

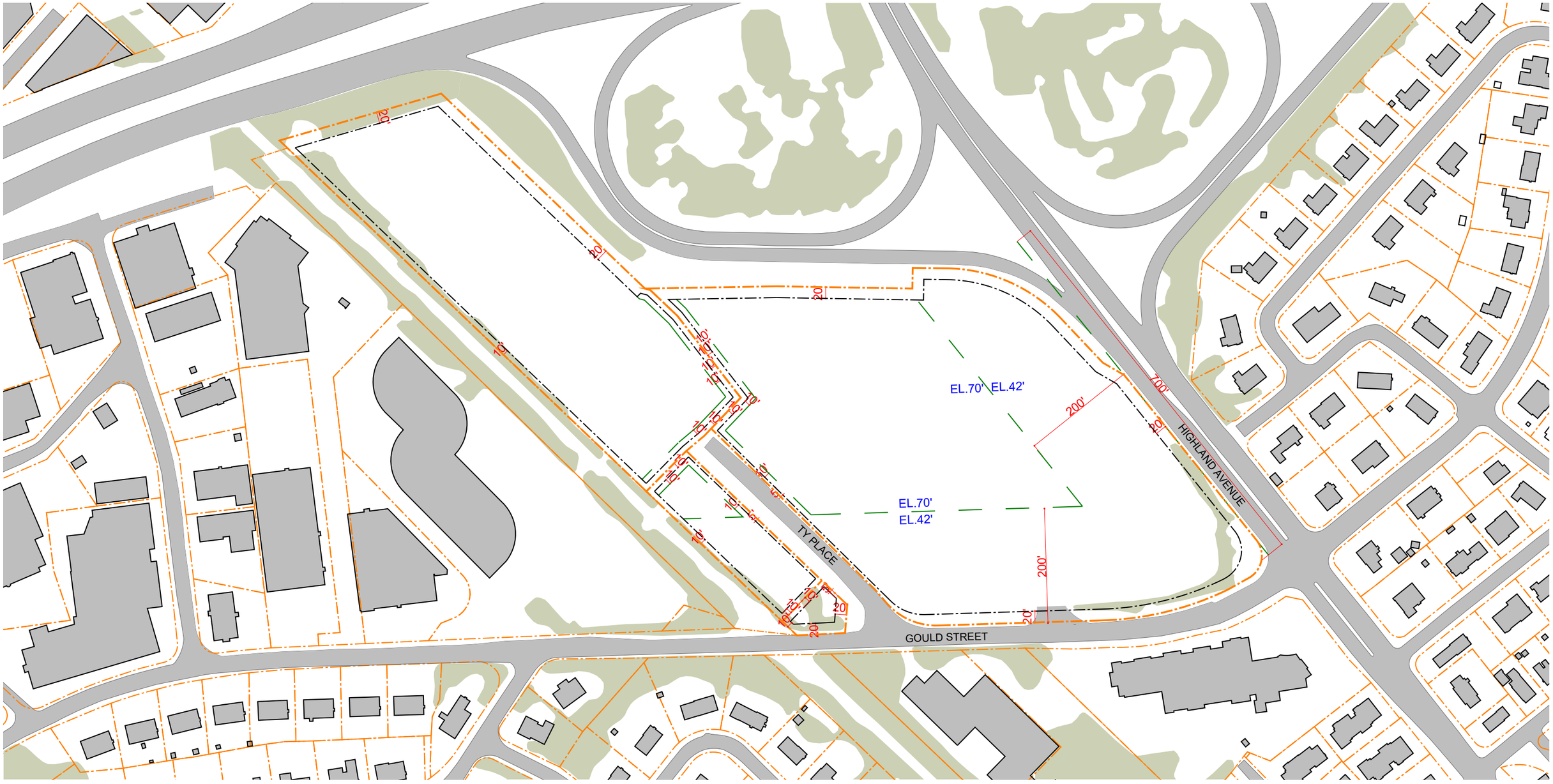
AS OF RIGHT ZONING SETBACKS

BUILDING SETBACKS
PROPERTY LINES



SPECIAL PERMIT ZONING SETBACKS

BUILDING SETBACKS
PROPERTY LINES



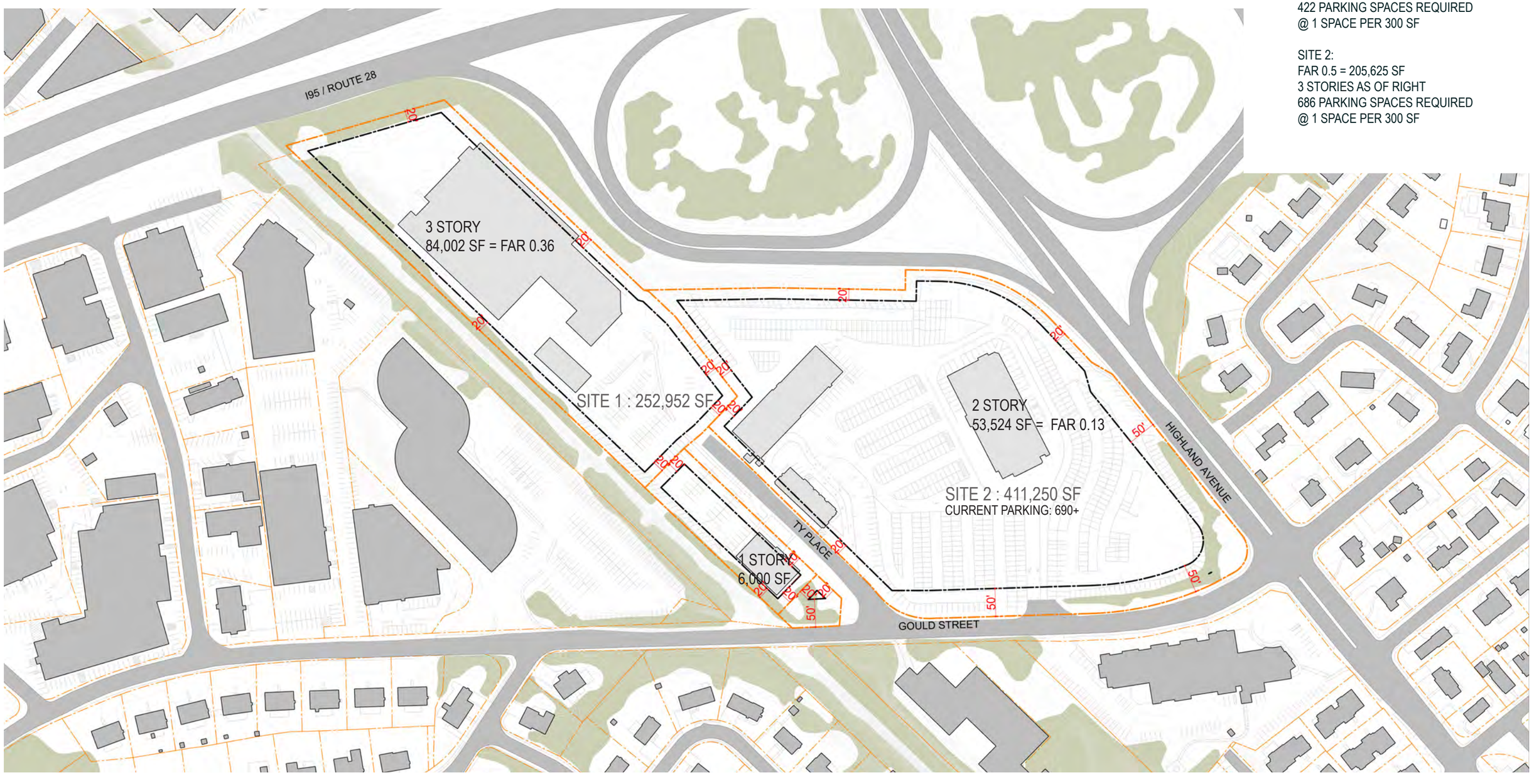
EXISTING SITE PLAN

BUILDING SETBACKS
PROPERTY LINES

EXISTING ZONING REQUIREMENTS

SITE 1:
FAR 0.5 = 126,476 SF
3 STORIES AS OF RIGHT
422 PARKING SPACES REQUIRED
@ 1 SPACE PER 300 SF

SITE 2:
FAR 0.5 = 205,625 SF
3 STORIES AS OF RIGHT
686 PARKING SPACES REQUIRED
@ 1 SPACE PER 300 SF



N

0 20' 40' 80' 160'

As of Right Zoning

FAR = 1.0

- Option 1: Single Building
- Option 2: Multiple Buildings

Special Permit Zoning

FAR = 1.35

- Option 1: Single Building
- Option 2: Multiple Buildings

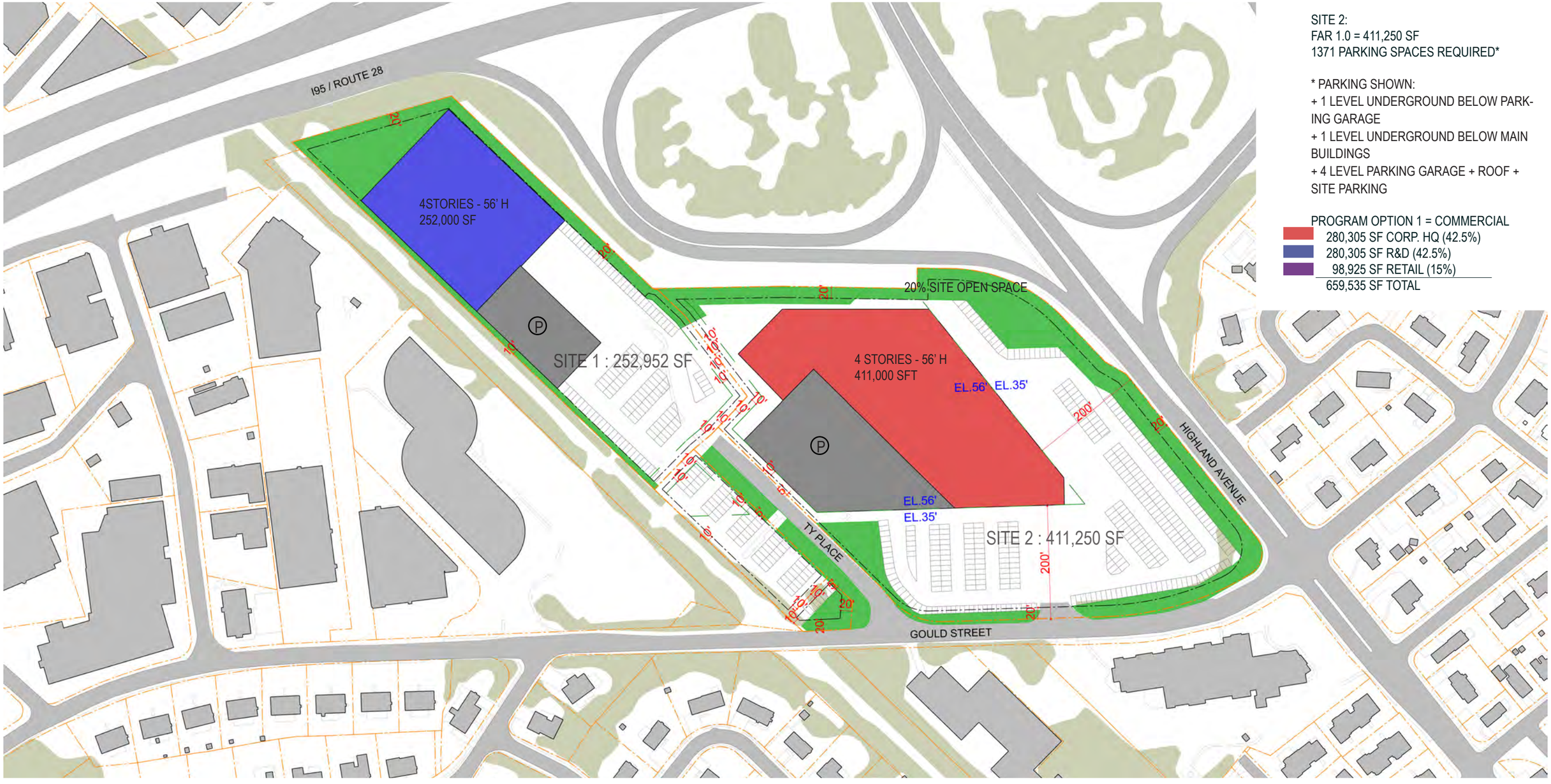
As of Right Zoning

FAR = 1.0

- Option 1: Single Building
- Option 2: Multiple Buildings

AS OF RIGHT ZONING - SITE PLAN - **OPTION 1 (1 BUILDING)**
FAR = 1.0

BUILDING SETBACKS
PROPERTY LINES
HEIGHT LIMIT 56'



AS OF RIGHT ZONING LEGEND

SITE 1:
FAR 1.0 = 252,952 SF
843 PARKING SPACES REQUIRED*

SITE 2:
FAR 1.0 = 411,250 SF
1371 PARKING SPACES REQUIRED*

* PARKING SHOWN:
+ 1 LEVEL UNDERGROUND BELOW PARKING GARAGE
+ 1 LEVEL UNDERGROUND BELOW MAIN BUILDINGS
+ 4 LEVEL PARKING GARAGE + ROOF + SITE PARKING

PROGRAM OPTION 1 = COMMERCIAL
280,305 SF CORP. HQ (42.5%)
280,305 SF R&D (42.5%)
98,925 SF RETAIL (15%)
659,535 SF TOTAL

N

0 20' 40' 80' 160'

AS OF RIGHT ZONING - AERIAL VIEW - **OPTION 1 (1 BUILDING)**

PROGRAM OPTION 1 = COMMERCIAL

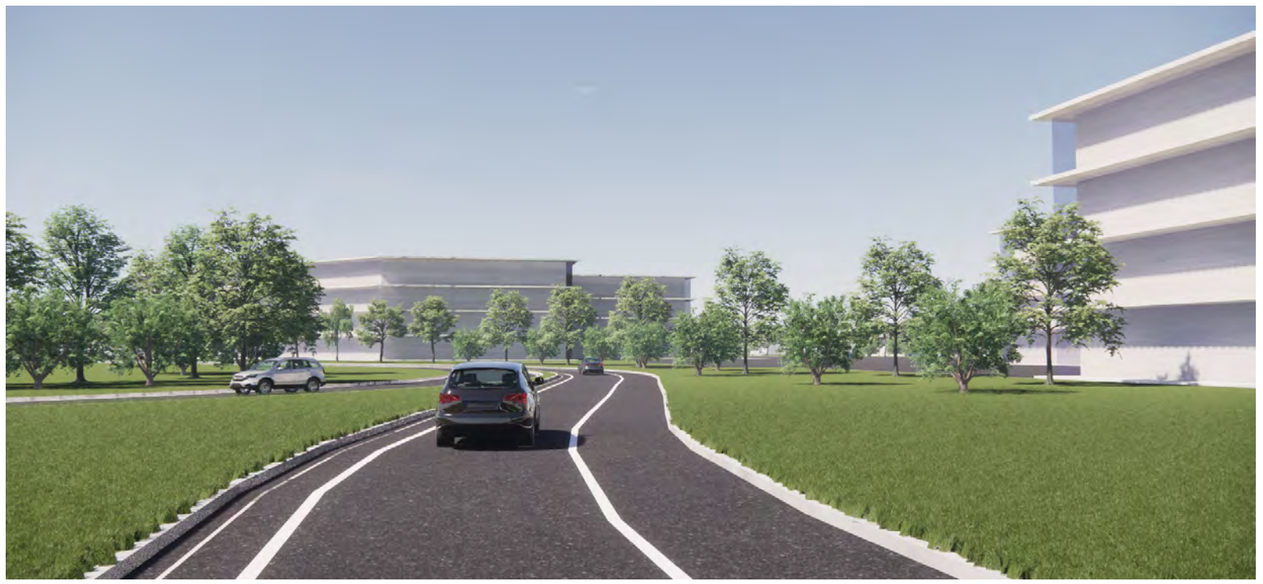
280,305 SF CORP. HQ (42.5%)
280,305 SF R&D (42.5%)
98,925 SF RETAIL (15%)
659,535 SF TOTAL

AS OF RIGHT ZONING - VIEW FROM GOULD STREET TOWARDS HIGHLAND AVE. - **OPTION 1 (1 BUILDING)**

AS OF RIGHT ZONING - VIEW FROM HIGHLAND AVE. TOWARDS NEWTON - **OPTION 1 (1 BUILDING)**

AS OF RIGHT ZONING - VIEW FROM HIGHLAND AVE BRIDGE TOWARDS NEEDHAM - **OPTION 1 (1 BUILDING)**

AS OF RIGHT ZONING - VIEW FROM EXIT 19B - **OPTION 1 (1 BUILDING)**



# AS OF RIGHT ZONING - MASSING SITE PLAN - **OPTION 2 (MIXED USE MF RESIDENTIAL)**
FAR = 1.0

BUILDING SETBACKS
PROPERTY LINES
HEIGHT LIMIT 56'

N

0 20' 40' 80' 160'

AS OF RIGHT ZONING LEGEND

SITE 1:
FAR 1.0 = 252,952 SF
751 PARKING SPACES REQUIRED *

SITE 2:
FAR 1.0 = 411,250 SF
1,199 SPACES REQUIRED *

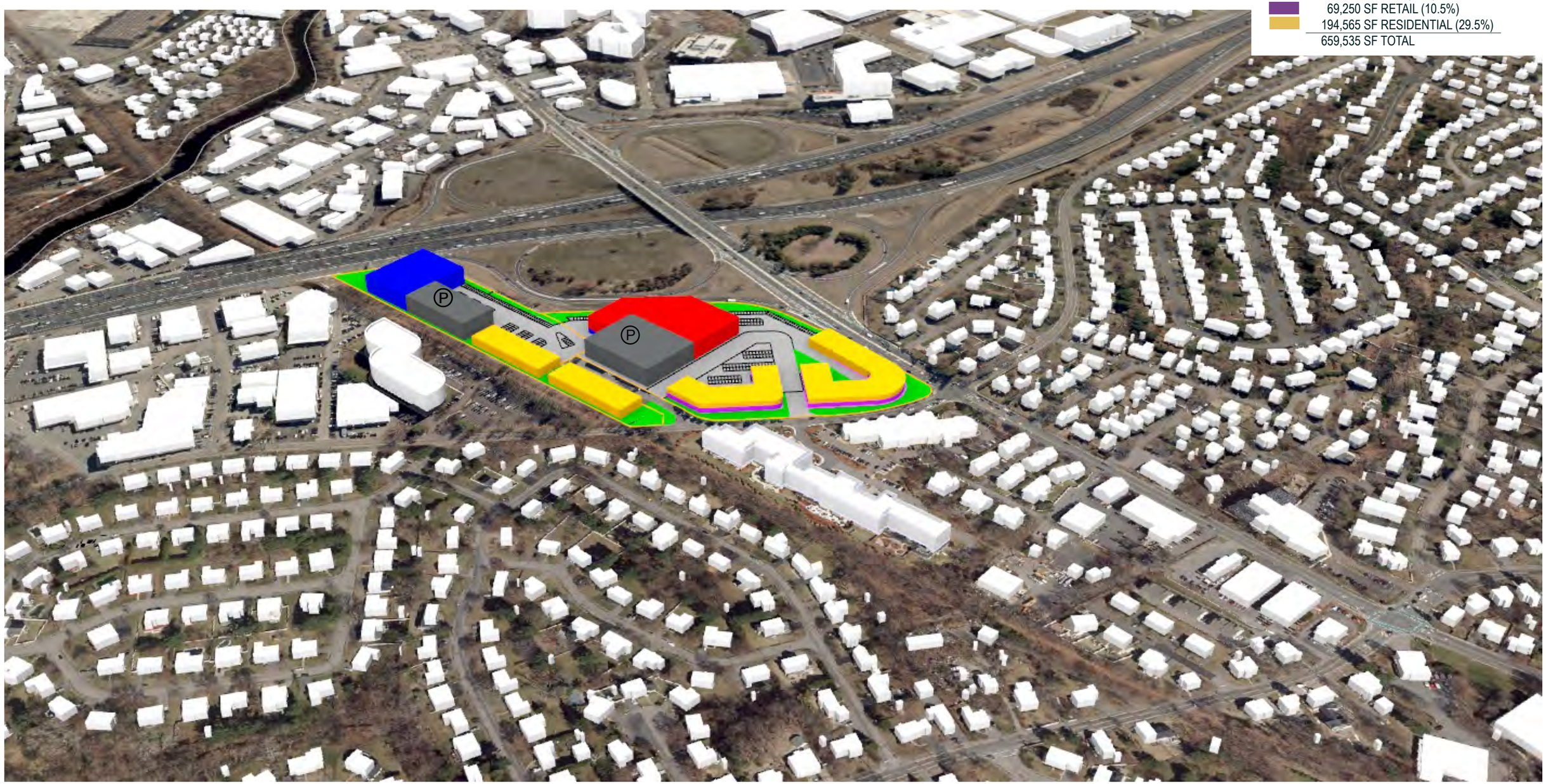
* PARKING SHOWN:
+ 1 LEVEL UNDERGROUND BELOW PARKING GARAGE
+ 1 LEVEL UNDERGROUND BELOW MAIN BUILDINGS
+ 4 LEVEL PARKING GARAGE + ROOF + SITE PARKING
(WITH 1.5 SPACES FOR RESIDENTIAL UNITS AND ONE SPACE PER 300 SF FOR OTHER PROGRAMS)

PROGRAM OPTION 2 = MIXED USE
197,860 SF CORP. HQ (30%)
197,860 SF R&D (30%)
69,250 SF RETAIL (10.5%)
194,565 SF RESIDENTIAL (29.5 %)
659,535 SF TOTAL

AS OF RIGHT ZONING - AERIAL VIEW - **OPTION 2 (MIXED USE MF RESIDENTIAL)**

PROGRAM OPTION 2 = MIXED USE

197,860 SF	CORP. HQ (30%)
197,860 SF	R&D (30%)
69,250 SF	RETAIL (10.5%)
194,565 SF	RESIDENTIAL (29.5%)
659,535 SF	TOTAL



AS OF RIGHT ZONING - VIEW FROM GOULD STREET TOWARDS HIGHLAND AVE. - **OPTION 2 (MIXED USE MF RESIDENTIAL)**

AS OF RIGHT ZONING - VIEW FROM HIGHLAND AVENUE TOWARDS NEWTON - **OPTION 2 (MIXED USE)**

AS OF RIGHT ZONING - VIEW FROM HIGHLAND AVE BRIDGE TOWARDS NEEDHAM - **OPTION 2 (MIXED USE MF RESIDENTIAL)**

AS OF RIGHT ZONING - VIEW FROM EXIT 19B - **OPTION 2 (MIXED USE)**

Special Permit Zoning

FAR = 1.35

- Option 1: Single Building
- Option 2: Multiple Buildings

# SPECIAL PERMIT ZONING - MASSING SITE PLAN - **OPTION 1 (1 BUILDING)**
FAR = 1.35

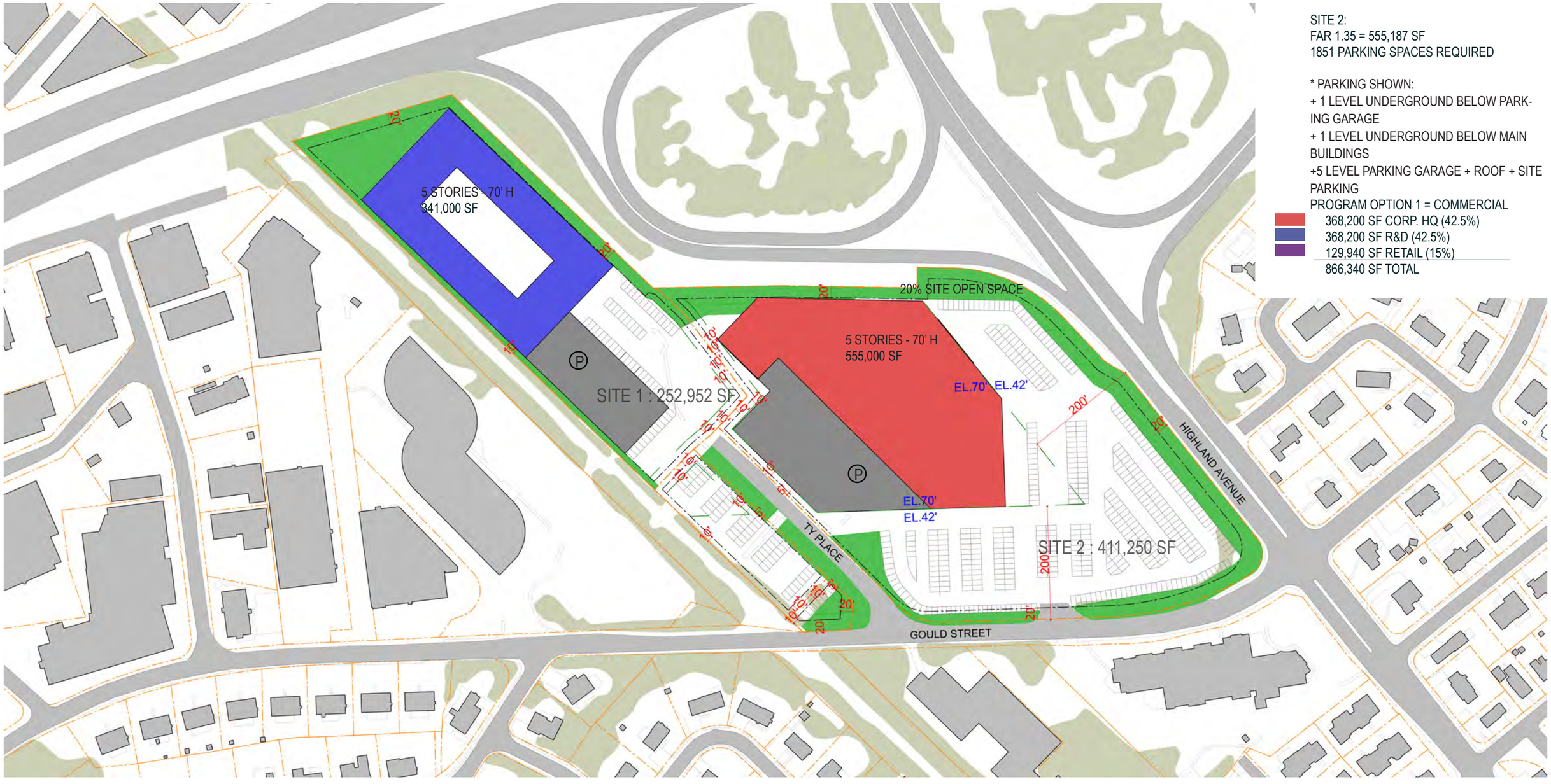
BUILDING SETBACKS
PROPERTY LINES
HEIGHT LIMIT 70'

SPECIAL PERMIT ZONING LEGEND

SITE 1:
FAR 1.35 = 341,485 SF
1138 PARKING SPACES REQUIRED

SITE 2:
FAR 1.35 = 555,187 SF
1851 PARKING SPACES REQUIRED

* PARKING SHOWN:
+ 1 LEVEL UNDERGROUND BELOW PARKING GARAGE
+ 1 LEVEL UNDERGROUND BELOW MAIN BUILDINGS
+5 LEVEL PARKING GARAGE + ROOF + SITE PARKING
PROGRAM OPTION 1 = COMMERCIAL
368,200 SF CORP. HQ (42.5%)
368,200 SF R&D (42.5%)
129,940 SF RETAIL (15%)
866,340 SF TOTAL



N

0 20' 40' 80' 160'

SPECIAL PERMIT ZONING - AERIAL VIEW - **OPTION 1 (1 BUILDING)**

PROGRAM OPTION 1 = COMMERCIAL

368,200 SF CORP. HQ (42.5%)	
368,200 SF R&D (42.5%)	
129,940 SF RETAIL (15%)	
866,340 SF TOTAL	

SPECIAL PERMIT ZONING - VIEW FROM GOULD STREET TOWARDS HIGHLAND AVE. - **OPTION 1 (1 BUILDING)**

SPECIAL PERMIT ZONING - VIEW FROM HIGHLAND AVENUE TOWARDS NEWTON - **OPTION 1 (1 BUILDING)**

SPECIAL PERMIT ZONING - VIEW FROM HIGHLAND AVE BRIDGE TO NEEDHAM - **OPTION 1 (1 BUILDING)**

SPECIAL PERMIT ZONING - VIEW FROM EXIT 19B - **OPTION 1 (1 BUILDING)**

SPECIAL PERMIT - MASSING SITE PLAN - **OPTION 2 (MIXED USE MF RESIDENTIAL)**
FAR = 1.35

BUILDING SETBACKS
PROPERTY LINES
HEIGHT LIMIT 70'

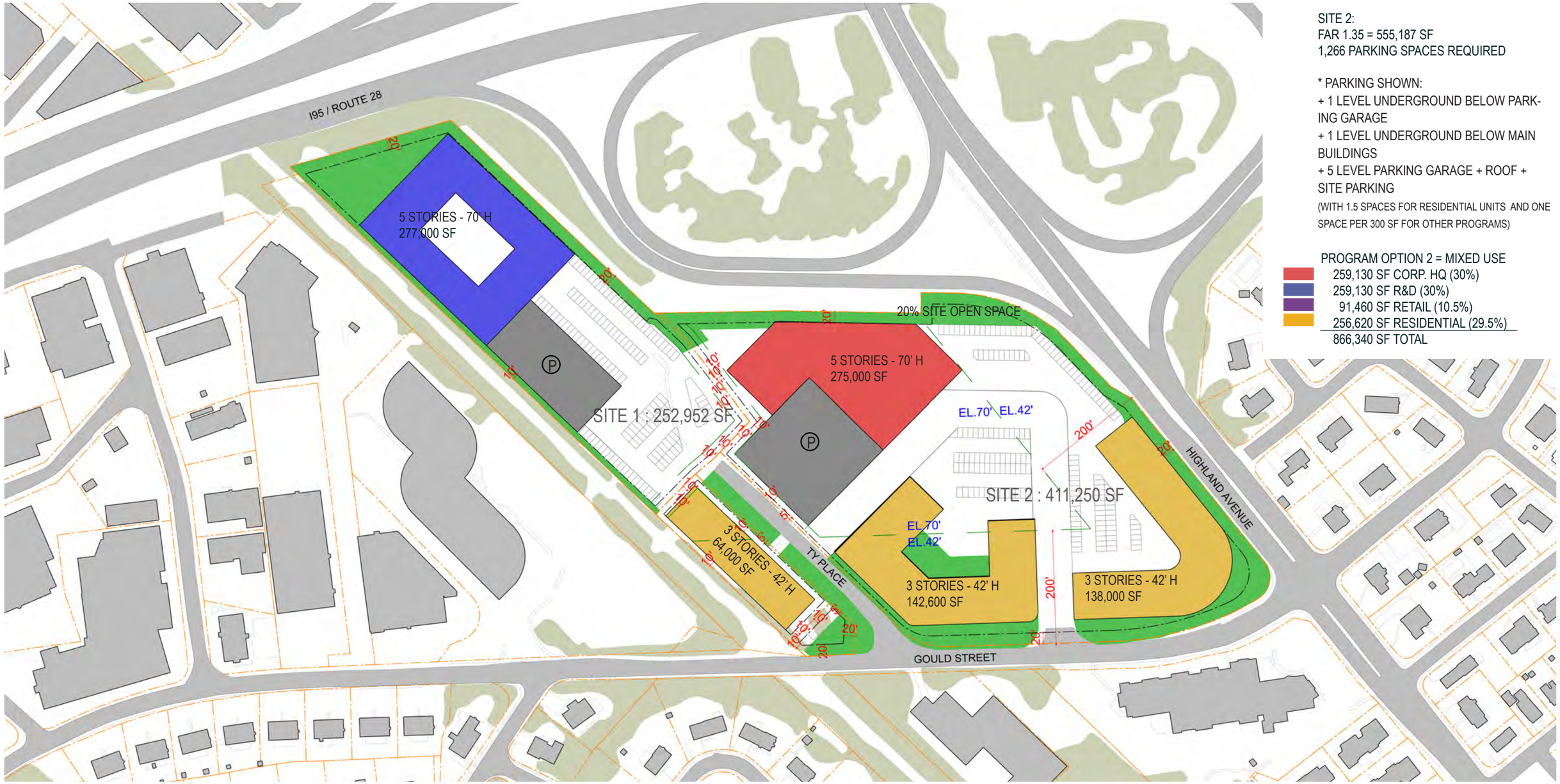
SPECIAL PERMIT ZONING LEGEND

SITE 1:
FAR 1.35 =341,485 SF
966 PARKING SPACES REQUIRED

SITE 2:
FAR 1.35 = 555,187 SF
1,266 PARKING SPACES REQUIRED

* PARKING SHOWN:
+ 1 LEVEL UNDERGROUND BELOW PARKING GARAGE
+ 1 LEVEL UNDERGROUND BELOW MAIN BUILDINGS
+ 5 LEVEL PARKING GARAGE + ROOF + SITE PARKING
(WITH 1.5 SPACES FOR RESIDENTIAL UNITS AND ONE SPACE PER 300 SF FOR OTHER PROGRAMS)

PROGRAM OPTION 2 = MIXED USE
259,130 SF CORP. HQ (30%)
259,130 SF R&D (30%)
91,460 SF RETAIL (10.5%)
256,620 SF RESIDENTIAL (29.5%)
866,340 SF TOTAL



N

0 20' 40' 80' 160'

SPECIAL PERMIT ZONING - AERIAL VIEW - **OPTION 2 (MIXED USE MF RESIDENTIAL)**

PROGRAM OPTION 2 = MIXED USE

259,130 SF CORP. HQ (30%)
259,130 SF R&D (30%)
91,460 SF RETAIL (10.5%)
256,620 SF RESIDENTIAL (29.5%)
866,340 SF TOTAL

SPECIAL PERMIT ZONING - VIEW FROM GOULD STREET TOWARDS HIGHLAND AVE. - **OPTION 2 (MIXED USE MF RESIDENTIAL)**

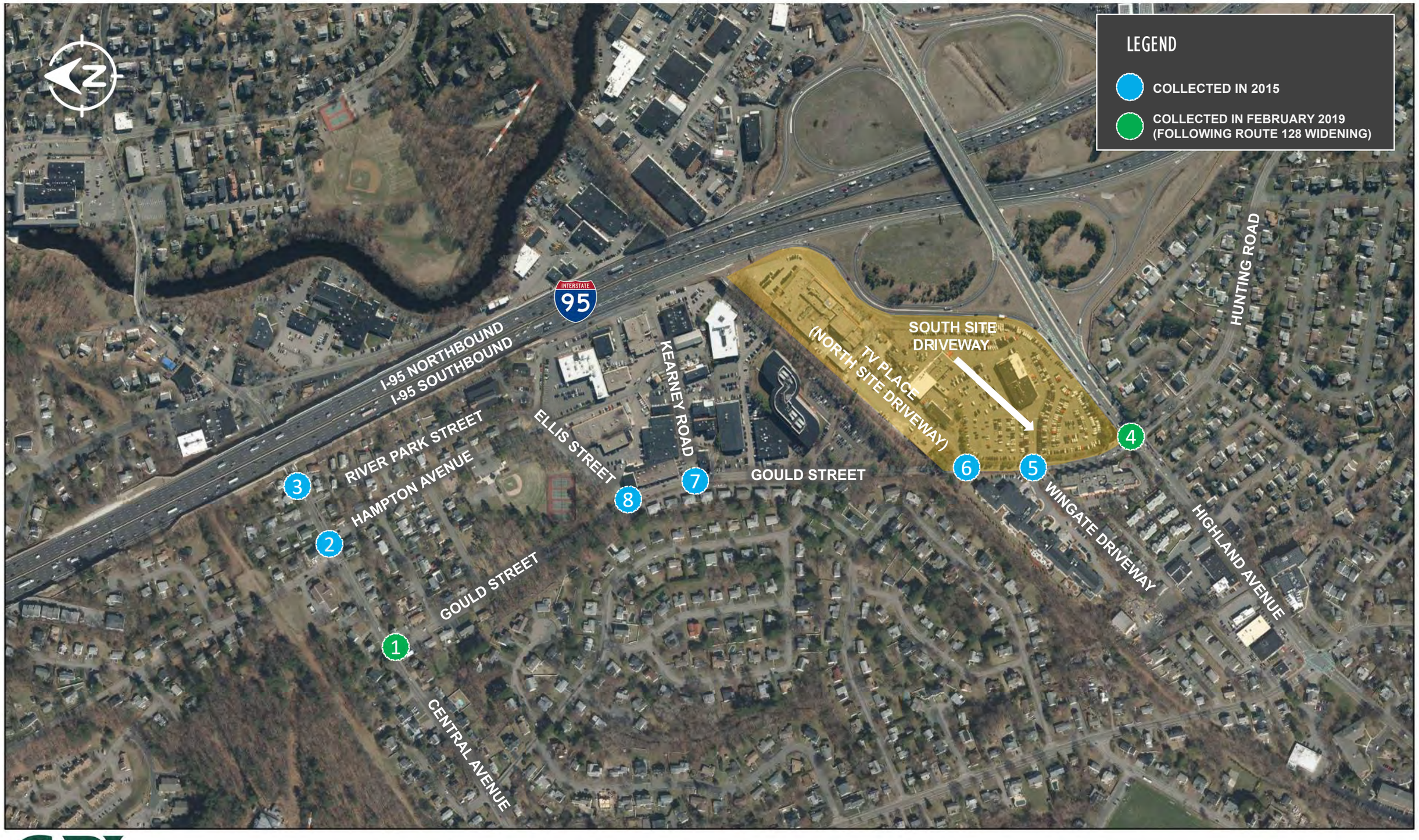
SPECIAL PERMIT - VIEW FROM HIGHLAND AVENUE TOWARDS NEWTON - **OPTION 2 (MIXED USE)**

SPECIAL PERMIT ZONING - VIEW FROM HIGHLAND AVE BRIDGE TOWARDS NEEDHAM - **OPTION 2 (MIXED USE MF RESIDENTIAL)**

SPECIAL PERMIT ZONING - VIEW FROM EXIT 19B - **OPTION 2 (MIXED USE)**

Highway Commercial 1
Needham, Massachusetts

Planning Board Meeting
March 16, 2021



GPI
Greenman-Pedersen, Inc. || 181 Ballardvale Street, Suite 202, Wilmington, MA 01887

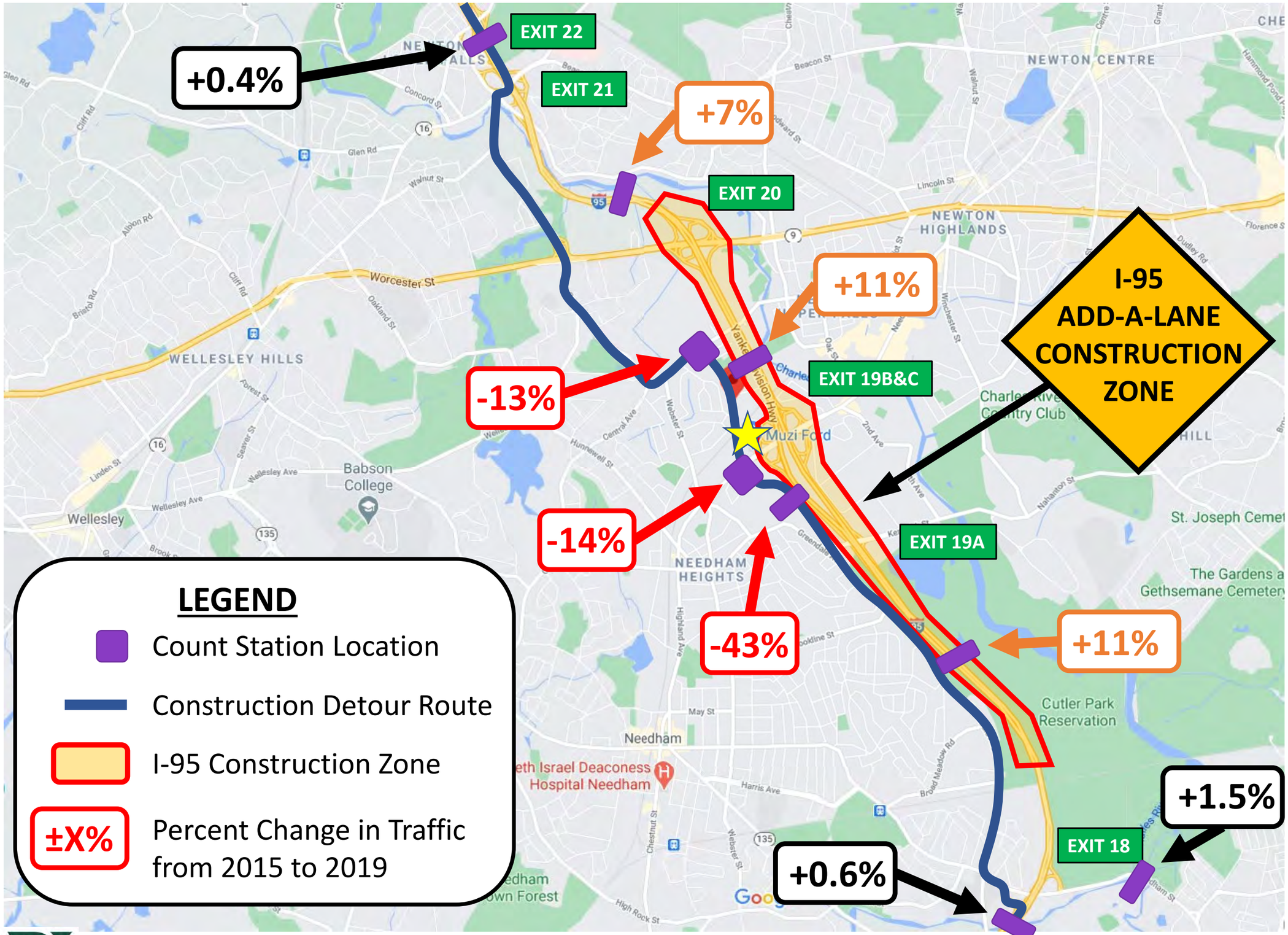
HIGHWAY COMMERCIAL 1 – NEEDHAM, MASSACHUSETTS

STUDY AREA

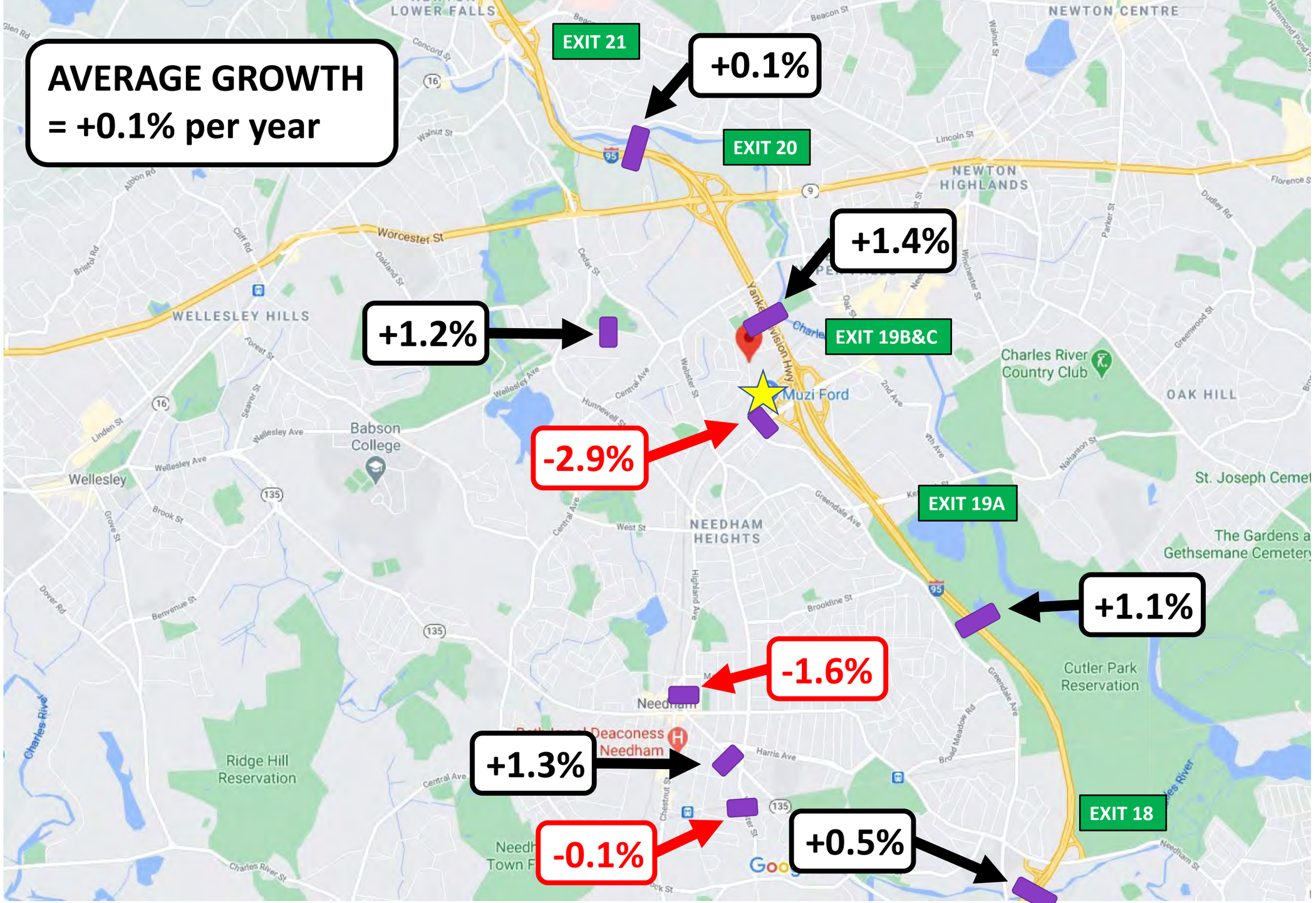
GPI
Greenman-Pedersen, Inc. || 181 Ballardvale Street, Suite 202, Wilmington, MA 01887

HIGHWAY COMMERCIAL 1 – NEEDHAM, MASSACHUSETTS

2015 ROADWAY CONDITIONS



2015 VERSUS 2019 VOLUMES



ANNUAL PERCENTAGE INCREASE
PRE (2013/14) VS POST (2019) ADD-A-LANE

Time Period / Direction	Existing Trips	Proposed Trips	Net Increase
Weekday Daily	1,462	10,402	**8,940**
Weekday AM Peak Hour			
Enter	126	766	**640**
Exit	65	75	**10**
Total	191	841	**650**
Weekday PM Peak Hour			
Enter	33	239	**206**
Exit	103	926	**823**
Total	136	1,165	**1,029**

TRIP GENERATION SUMMARY

GPI

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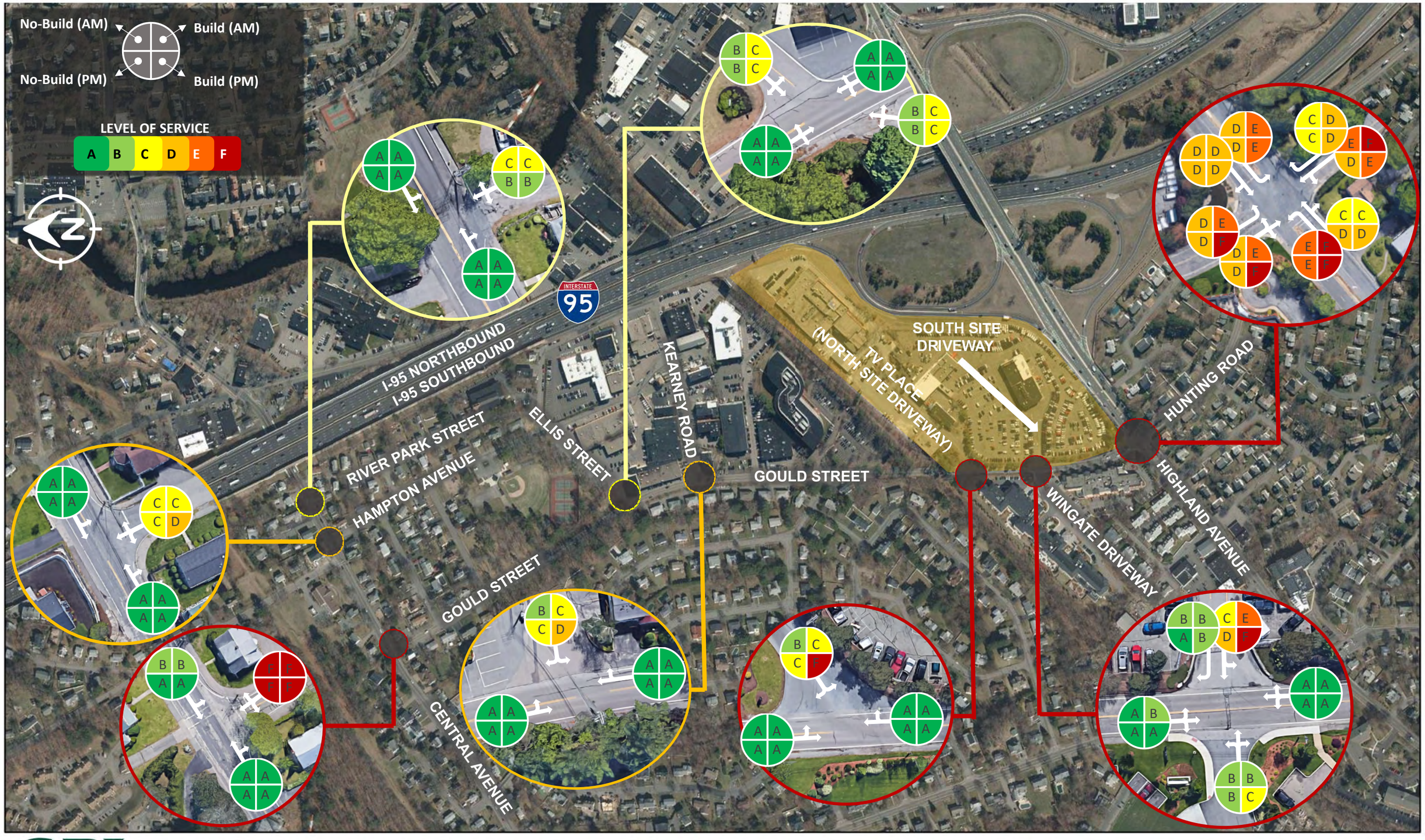
HIGHWAY COMMERCIAL 1 – NEEDHAM, MASSACHUSETTS

TRIP DISTRIBUTION

2030 CONDITIONS WITH NO MITIGATION



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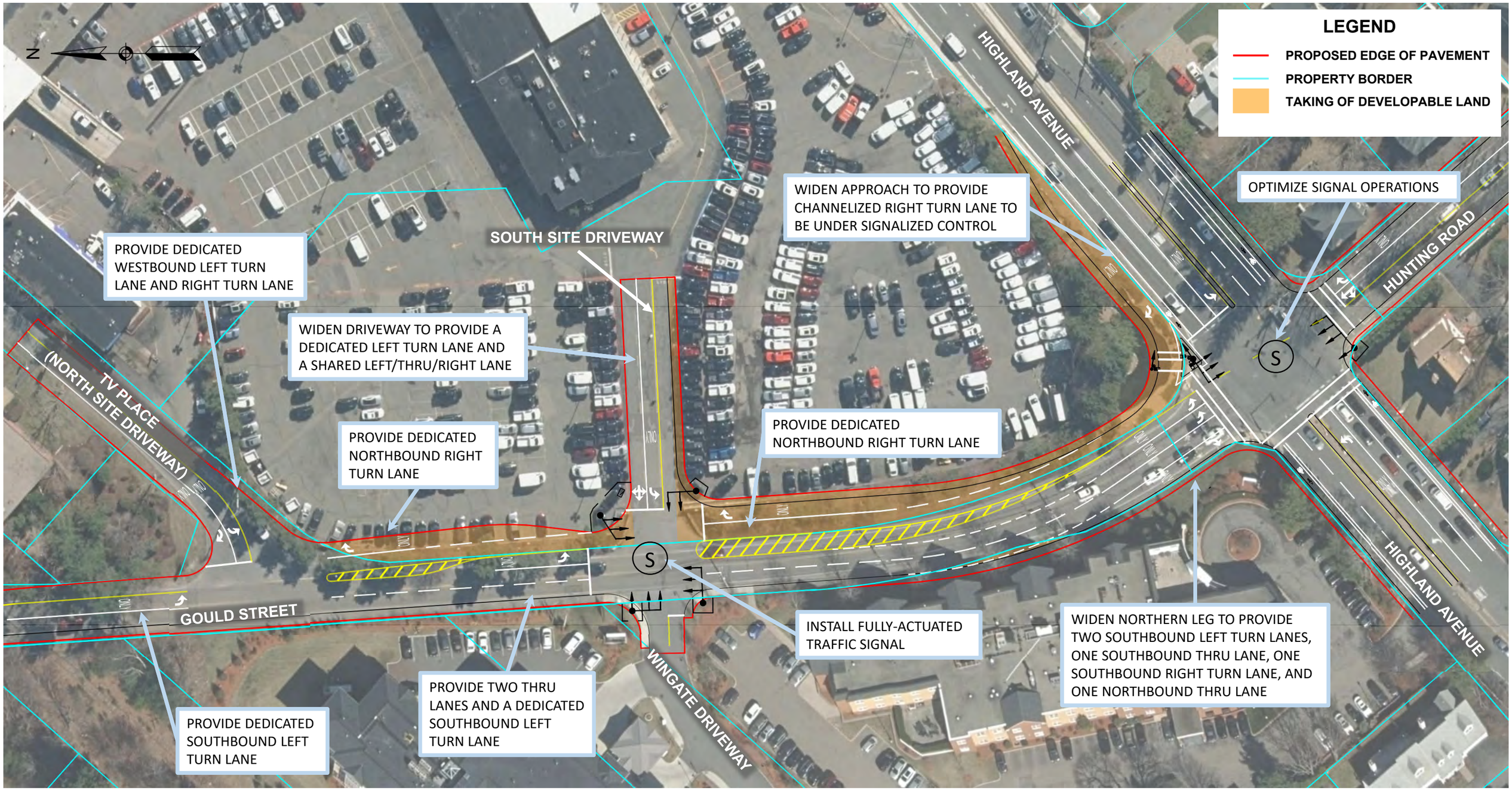
HIGHWAY COMMERCIAL 1 – NEEDHAM, MASSACHUSETTS

LEVEL-OF-SERVICE (LOS) 2030 NO-BUILD VS. BUILD



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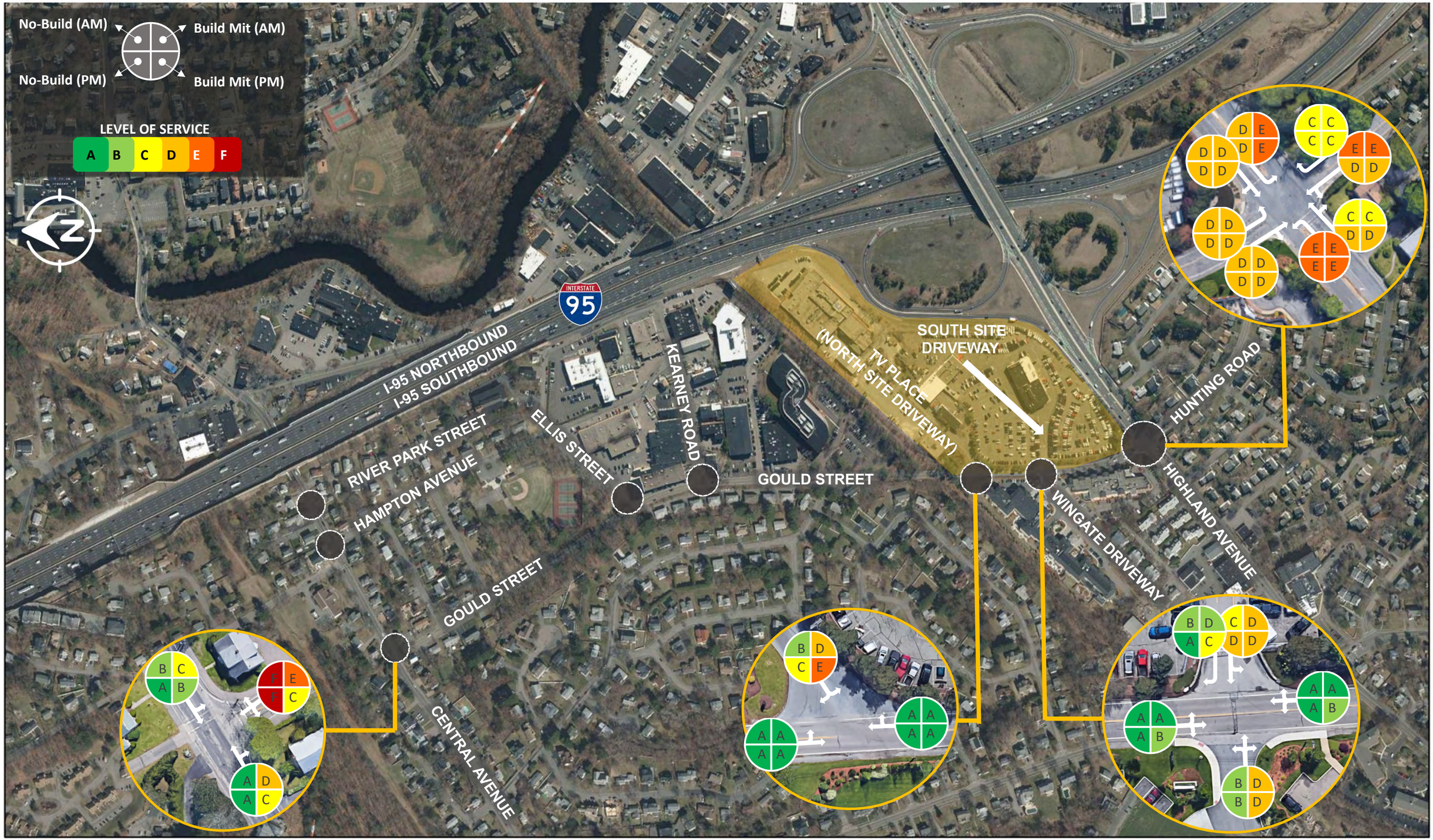
HIGHWAY COMMERCIAL 1 – NEEDHAM, MASSACHUSETTS

CONCEPT PLAN

2030 CONDITIONS WITH MITIGATION



GPI

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HIGHWAY COMMERCIAL 1 – NEEDHAM, MASSACHUSETTS

LEVEL-OF-SERVICE (LOS) 2030 NO-BUILD VS. BUILD MITIGATED

Looking out for Needham

The case for change

Fiscal Impact

ASSESSED VALUE AND NET REVENUE CHANGE, 2021 PROPOSED HIGHWAY COMMERCIAL 1

	Existing Conditions	If Redeveloped at 1.0 FAR for Nonresidential Uses	Gain/Loss at 1.0 FAR Outcome	If Redeveloped at 1.35 FAR for Nonresidential Uses	Gain/Loss at 1.35 FAR Outcome
Assessed Value	$19,087,100	$261,582,100	$242,495,000	$343,604,200	$324,517,100
Net Tax Revenue	$490,500	$6,352,100	$5,861,600	$8,342,400	$7,851,900
	Existing Conditions	**If Redeveloped at 1.0 FAR for Mixed-Use Option**	**Gain/Loss at 1.0 FAR Outcome**	**If Redeveloped at 1.35 FAR for Mixed- Use Option**	**Gain/Loss at 1.35 FAR Outcome**
Assessed Value	$19,087,100	$262,226,000	$243,138,900	$340,356,200	$321,269,100
Net Tax Revenue	$490,500	$4,467,585	$3,977,085	$5,782,800	$5,292,300
	Existing Conditions	**If Redeveloped as Warehouse/TV Studio**	**Gain/Loss**		
Assessed Value	$19,087,100	$35,854,000	$16,766,900		
Net Tax Revenue	$490,500	$743,900	$253,400		

Source: Barrett Planning Group, with data from Town of Needham, Municipal Data Bank and CoStar.

HIGHWAY COMMERCIAL 1 ZONING DISTRICT PLANNING

NEEDHAM, MA

MARCH 16, 2021

PREPARED BY:

STUDIO ENÉE

BARRETT
PLANNING GROUP LLC

March 13, 2021

Lee Newman
Planning Director
500 Dedham Avenue
Needham, MA 02492

Reference: 2021 Fiscal Impact Analysis, Highway Commercial I Rezoning

Dear Lee,

I am submitting our report on the fiscal impact of commercial and mixed-use development options for the proposed Highway I Commercial District. As noted in the report, we find that development in the proposed district would lead to the following fiscal outcome for the Town:

1. At maximum buildout with a floor area ratio (FAR) of 1.0, development in the new district would provide $6,733,100 in tax revenue per year and create demands on municipal services of approximately $ $381,000 per year. For development at this level, the net revenue would be $6,352,100, for a cost-revenue ratio of 0.046.

2. In addition, if development occurs at 1.3 FAR, development in the new district would provide $8,844,400 in tax revenue per year and create demands on municipal services of approximately $502,000 per year. The net revenue would be $8,342,400, for a cost-revenue ratio would be 0.060.

3. As for the mixed-use development options, a project comprised of multiple nonresidential uses (retail, lab space, and offices) and 170 apartments, with a combined total FAR of 1.0, would generate $5,807,600 in taxes per year and create demands on municipal and school services of approximately $1,340,015. The net revenue would be $4,467,585 for a cost-revenue ratio of 0.231.

4. A project comprised of multiple nonresidential uses and 226 apartments, with a combined total FAR of 1.35, would generate $7,508,500 in taxes per year and create demands on municipal and school services of approximately $1,725,700. The net revenue would be $5,782,800 for a cost-revenue ratio of 0.230.

5. Finally, you asked us to evaluate a potential mix of warehouse/distribution space and television studio. We estimate that the Town would receive $922,900 in tax revenue and spend approximately $179,000 for municipal services to meet the demands of these two uses. The net revenue would be $743,900, for a cost-revenue ratio of 0.241.

Under existing conditions, the parcels in the proposed district pay the Town about $490,500 in taxes per year. As a result, the gain in tax revenue from the new nonresidential options or the mixed-use development options will be anywhere from 11 to 18 times what the Town receives today.

Sincerely,

Judith A. Barrett

Judi Barrett
Barrett Planning Group LLC

FISCAL IMPACT ANALYSIS: HIGHWAY COMMERCIAL I

INTRODUCTION

In September 2019, the Needham Planning Department asked Barrett Planning Group to review a potential rezoning of four parcels (15 acres) at Highland Avenue and Gould Street west of the Route 128 highway layout. The Town subsequently decided to study the proposal further before presenting the proposed Highway Commercial I District to Town Meeting. We were asked to update our analysis in February 2021, and to expand it by including other uses not contemplated in the original concept for this district. For the new study, we reviewed and considered the following information:

1. Highway Commercial 1 Zoning District Planning Presentation, February 3, 2021;
2. Property Assessment and Tax Information, provided by the Needham Planning Department;
3. CoStar Office, Industrial, Retail, and Multifamily Market Data and Trends, Newton-Needham-Brookline-Dover Submarkets;
4. Town of Needham, FY 2021 Operating Budget;
5. Department of Revenue, Municipal Data Bank, Misc. Financial Data (Tax Rates, Assessed Values, Revenue Sources, Tax Levy); and
6. Buildout Analysis prepared by John Connery for Needham Planning Department (2015).

SUMMARY

The following chart compares the current assessed values and tax payments for the area included in our analysis to the estimated values and tax revenue of the same area, assuming the parcels are assembled and redeveloped under the proposed Highway Commercial I zoning.

TABLE 1. ASSESSED VALUE AND REVENUE CHANGE, 2021 PROPOSED HIGHWAY COMMERCIAL I

	Existing Conditions	If Redeveloped at 1.0 FAR for Nonresidential Uses	Gain/Loss at 1.0 FAR Outcome	If Redeveloped at 1.35 FAR for Nonresidential Uses	Gain/Loss at 1.35 FAR Outcome
Assessed Value	$19,087,100	$261,582,100	$242,495,000	$343,604,200	$324,517,100
Tax Revenue	$490,500	$6,733,100	$6,242,600	$8,844,400	$8,353,900
	Existing Conditions	**If Redeveloped at 1.0 FAR as Mixed-Use Option**	**Gain/Loss at 1.0 FAR Outcome**	**If Redeveloped at 1.35 FAR as Mixed-Use Option**	**Gain/Loss at 1.35 FAR Outcome**
Assessed Value	$19,087,100	$262,226,000	$243,138,900	$340,356,200	$321,269,100
Tax Revenue	$490,500	$5,807,600	$5,317,100	$7,508,500	$7,018,000
	Existing Conditions	**If Redeveloped at as Warehouse/TV Studio**	**Gain/Loss**		
Assessed Value	$19,087,100	$35,854,000	$16,766,900		
Tax Revenue	$490,500	$922,900	$432,400		

Source: Barrett Planning Group, with data from Town of Needham, Municipal Data Bank, and CoStar.

APPROACH AND METHODOLOGY

Proportional Valuation

Nonresidential development places different demands on municipal services depending on the class of use. For example, retail uses usually demand more from public safety personnel than any other municipal department, but industrial uses tend to require higher expenditures for public works. Food service establishments also require periodic inspections by the health department, and uses ranging from nursing homes and day care centers to performing arts centers require semiannual or more frequent inspections by health, fire, and building authorities. In some towns, nonresidential development of all types places demands on services traditionally thought of as "residential," e.g., public libraries. When a community invests in waterworks and sewer system upgrades, the benefits are often shared by residential and nonresidential ratepayers.

Recognizing that each class of use has both unique needs and needs common to all uses, fiscal impact analysts have developed models to identify, estimate, and assign service costs to various types of development. The most widely used model for estimating the cost to serve nonresidential land uses is known as *proportional valuation*. This two-part model embraces a long-standing fiscal impact principle: the average cost of nonresidential municipal services can be inferred from the relationship between nonresidential real property values and the total value of real property in a community, adjusted for type of community and size of tax base.

TABLE 2. PROPORTIONAL VALUATION ANALYSIS: EXISTING CONDITIONS, NEEDHAM

A	2021 General Fund Operating Budget	$190,247,800	*Town of Needham*
B	Less Education	$81,835,000	*Town of Needham*
C	Less Education Debt	$10,766,800	*Town of Needham*
D	Less Education Fixed Costs	$26,592,400	*Consultant Estimate*
E	Total Municipal	$71,053,600	*Town of Needham*
F	Non-Residential Real Property Value	$1,153,202,700	*Dept. of Revenue*
G	Total Real Property Assessed Value	$10,742,368,800	*Dept. of Revenue*
H	Ratio	0.107	*F/G*
I	Non-Residential Parcels	441	*Dept. of Revenue*
J	Total Parcels	10,211	*Dept. of Revenue*
K	Average Value: Non-Residential Parcel	$2,615,000	*FI*
L	Average Value: All Parcels	$1,052,000	*G/J*
M	Ratio	2.49	*K/L*
N	Refinement Coefficient	0.686	*Consultant (Burchell)*
O	Non-Residential Expenditures	$5,232,600	*Consultant*
P	Residential Expenditures	$185,015,200	*Consultant*

Average Cost Per Capita/Student, Adjusted

After establishing the approximate share of nonresidential expenditures under existing conditions, analysts can use a similar process to estimate the cost of services that will be used by new growth. For our 2019 study of Highway Commercial I, we applied the principles of proportional valuation to estimate the revenue and cost of services impact of new development under that plan. People familiar with that study may remember that a critical step in proportional valuation involves using a *refinement coefficient* to modify the average cost of nonresidential services in order to adjust for significant differences in scale between the proposed project and existing conditions in the tax base as a whole. We repeated the process for this report. However, since the new plan for the district includes options for mixed-use development with housing, the updated study is more complicated.

The development scenarios that could occur under the proposed zoning include multifamily units in mixed-use projects. This means the fiscal impact analysis must also consider the net new cost of residential demands on municipal services and schools. To estimate these costs, we used the following procedures.

The average cost of municipal (non-school) services used by Needham residents is $2,800. This represents the total cost of municipal services, $85,676,600, divided by the Town's estimated 2019 population, 30,970.[1] When we prepare a fiscal impact analysis, our goal is to simulate as much as possible what the Town's *net new cost of services* will be – that is, the *incremental cost* of services associated with growth. Toward that end, we adjusted the average cost of municipal services per capita, just as we modified the average cost for the nonresidential portion of this study. For the residential analysis, we eliminated costs that would not necessarily change just because the Town attracts a modest number of new residents. For example, the Town would not hire more personnel in the Town Manager's office or the management/administrative tiers of other general government offices or the public safety and public works departments just because the Town gained 330-400 new residents. Still, population growth will impose some additional burdens on day-to-day service delivery, and those burdens come with some costs.

To account for these new demands, we assumed the *average variable cost* in municipal departments is approximately 18 percent, so we used 82 percent of the average municipal cost of services to estimate the cost of new growth:

Average cost of new municipal services =	Existing cost of municipal services	X 82%	/ Existing Population
$2,300 =	$85,676,600	$70,254,800	30,970

The cost of new services was multiplied by the new household population assumptions for each mixed-use scenario to arrive at the estimated cost of new demands on town services.

The potential cost of new school services was estimated in a similar way. We consulted the detailed version of Needham's most recent Per Pupil Cost report from the Massachusetts

[1] U.S. Census Bureau, 2015-2019 American Community Survey (ACS) Five-Year Estimates).

Department of Elementary and Secondary Education (DESE) and identified what we assumed would be costs most directly affected by enrollment growth: teachers, instructional support personnel, instructional materials, and pupil services, including transportation. On a per-student basis, the sum of these expenditures is $7,530. Since the most recent report reflects FY 2019 conditions, we adjusted for inflation and non-inflation spending growth with a multiplier of 1.12. This explains how we arrived at the average cost per student for our study, $8,400.

The proportional valuation models for each of the development options the Town asked us to evaluate are presented on the following pages. They are:

1. **A nonresidential project with a maximum floor area ratio (FAR) of 1.0., comprised of:**
- Office: 280,305 sq. ft.
- Research Center/Lab: 280,305 sq. ft.
- Retail: 98,925 sq. ft.
- Total: 659,535 sq. ft.

2. **A nonresidential project with a maximum floor area ratio (FAR) of 1.35., comprised of:**
- Office: 368,200 sq. ft.
- Research Center/Lab: 368,200 sq. ft.
- Retail: 129,940 sq. ft.
- Total: 866,340 sq. ft.

3. **A mixed-use project with a maximum floor area ratio (FAR) of 1.0, comprised of:**
- Office: 197,860 sq. ft.
- Research Center/Lab: 197,860 sq. ft.
- Retail: 69,250 sq. ft.
- Apartments: 170
- Total: 659,535 sq. ft.

4. **A mixed-use project with a maximum floor area ratio (FAR) of 1.35., comprised of:**
- Office: 259,130 sq. ft.
- Research Center/Lab: 259,130 sq. ft.
- Retail: 91,460 sq. ft.
- Apartments: 226
- Total: 866,340 sq. ft.

5. **A warehouse/distribution facility and television studio mix as of right:**
- Warehouse: 158,900 sq. ft.
- TV studio: 90,002
- Total: 248,902 sq. ft.

Part II. Est. Impact of Five Development Scenarios
II.A. Office/Research/Retail Mix @ 1.0 FAR

	NEW PROJECT VALUE (Z)	$261,582,100	NOTES
A	New Value / Total Nonresidential Value	0.23	
B	Refinement Coefficient	0.321	
C	New Nonresidential Service Costs	$381,000	*(A*B*NonResTot)*
D	Est. Nonresidential Tax Revenue	$6,733,100	*Value/1000/*$25.74*
E	New Residential Service Costs		
F	Est. Residential Tax Revenue		
G	Net Revenue	$6,352,100	*D-C*
H	Cost/Revenue Ratio	0.060	*C/D*
	Project Use(s)		
I	Total Sq. Ft.	659,535	*From Town*
J	Office	280,305	*From Town*
K	Research Center	280,305	*From Town*
L	Retail	98,925	*From Town*
M	Warehouse	0	*From Town*
N	Residential (Units)	0	*From Town*
	Rent		
O	Office sq. ft.	$42.00	*CoStar*
P	Research Center sq. ft.	$60.00	*CoStar*
Q	Retail sq. ft.	$36.80	*CoStar*
R	Warehouse sq. ft.	$19.61	*Loopnet*
S	Residential (per unit)	$2,637	*CoStar*
	Income & Value		
T	Gross Nonresidential Income	$32,231,550	*Sq. ft.*rents*
U	Nonresidential Exp. Ratio 39.2%	$13,920,800	*CoStar*
V	Nonresidential NOI	$18,310,750	*T-U*
W	Residential Income	$0	
X	Residential Exp. Ratio 38%	$0	
Y	Residential NOI	$0	
Z	Submarket NonRes. Cap Rate 7%	$261,582,100	*Town; consultant modified*
AA	Submarket Res. Cap Rate 4.50%	$0	
AB	Total Value	$261,582,100	(Z+AA)

Part II. Est. Impact of Five Development Scenarios
II.B. Office/Research/Retail Mix @ 1.35 FAR

	NEW PROJECT VALUE (Z)	$343,604,200	NOTES
A	New Value / Total Nonresidential Value	0.30	
B	Refinement Coefficient	0.322	
C	New Nonresidential Service Costs	$502,000	*(A*B*NonResTot)*
D	Est. Nonresidential Tax Revenue	$8,844,400	*Value/1000/*$25.74*
E	New Residential Service Costs		
F	Est. Residential Tax Revenue		
G	Net Revenue	$8,342,400	*D-C*
H	Cost/Revenue Ratio	0.060	*C/D*
	Project Use(s)		
I	Total Sq. Ft.	866,340	*From Town*
J	Office	368,200	*From Town*
K	Research Center	368,200	*From Town*
L	Retail	129,940	*From Town*
M	Warehouse	0	*From Town*
N	Residential (Units)	0	*From Town*
	Rent		
O	Office	$42.00	*CoStar*
P	Research Center	$60.00	*CoStar*
Q	Retail	$36.80	*CoStar*
R	Warehouse	$19.61	*Loopnet*
S	Residential (Units)	$2,637	*CoStar*
	Income & Value		
T	Gross Nonresidential Income	$42,338,192	*Sq. ft.*rents*
U	Nonresidential Exp. Ratio 39.2%	$18,285,900	*CoStar*
V	Nonresidential NOI	$24,052,292	*T-U*
W	Residential Income	$0	
X	Residential Exp. Ratio 38%	$0	
Y	Residential NOI	$0	
Z	Submarket NonRes. Cap Rate 7%	$343,604,200	*Town; consultant modified*
AA	Submarket Res. Cap Rate 4.50%	$0	
AB	Total Value	$343,604,200	

Part II. Est. Impact of Five Development Scenarios
II.C. Office/Research/Retail/Residential Mix @ 1.0 FAR

	NEW PROJECT VALUE (Z)	$262,226,000	NOTES
A	New Value / Total Nonresidential Value	0.23	
B	Refinement Coefficient	0.289	
C	New Nonresidential Service Costs	$343,900	*(A*B*NonResTot)*
D	Est. Nonresidential Tax Revenue	$4,841,900	*Value/1000/*$25.74*
E	New Residential Service Costs[2]	$996,115	*See Assumptions*
F	Est. Residential Tax Revenue	$965,700	*Value/1000/*$13.03*
G	Net Revenue	$4,467,585	*(D+F)-(C+E)*
H	Cost/Revenue Ratio	0.231	*(C+E)/(D+F)*
	Project Use(s)		
I	Total Sq. Ft.*	659,535	*From Town*
J	Office	197,860	*From Town*
K	Research Center	197,860	*From Town*
L	Retail	69,250	*From Town*
M	Warehouse	0	*From Town*
N	Residential (Units)	170	*From Town*
	Rent		
O	Office	$42.00	*CoStar*
P	Research Center	$60.00	*CoStar*
Q	Retail	$36.80	*CoStar*
R	Warehouse	$19.61	*Loopnet*
S	Residential (Units)	$2,637	*CoStar*
	Income & Value		
T	Gross Nonresidential Income	$23,178,410	*Sq. ft.*rents*
U	Nonresidential Exp. Ratio 39.2%	$10,010,800	*CoStar for exp. ratio*
V	Nonresidential NOI	$13,167,610	*T-U*
W	Residential Income	$5,379,480	*Units * rents*
X	Residential Exp. Ratio 38%	$2,044,200	*CoStar for exp. ratio*
Y	Residential NOI	$3,335,280	W-X
Z	Submarket NonRes. Cap Rate 5.90%	$188,108,700	*CoStar for cap rate*
AA	Submarket Res. Cap Rate 4.50%	$74,117,300	*CoStar for cap rate*
AB	Total Value	$262,226,000	*Z+AA*

[2] 331 residents, 28 students

Part II. Est. Impact of Five Development Scenarios
II.D. Office/Research/Retail/Residential Mix @ 1.35 FAR

	NEW PROJECT VALUE (AB)	$340,356,200	NOTES
A	New Value / Total Nonresidential Value	0.30	
B	Refinement Coefficient	0.26	
C	New Nonresidential Service Costs	$401,500	*(A*B*NonResTot)*
D	Est. Nonresidential Tax Revenue	$6,224,600	*Value/1000/*$25.74*
E	New Residential Service Costs[3]	$1,324,200	*See Assumptions*
F	Est. Residential Tax Revenue	$1,283,900	*Value/1000/*$13.03*
G	Net Revenue	$5,782,800	*(D+F)-(C+E)*
H	Cost/Revenue Ratio	0.230	*(C+E)/(D+F)*
	Project Use(s)		
I	Total Sq. Ft.*	863,010	*From Town*
J	Office	259,130	*From Town*
K	Research Center	259,130	*From Town*
L	Retail	91,460	*From Town*
M	Warehouse	0	*From Town*
N	Residential (Units)	226	*From Town*
	Rent		
O	Office	$42.00	*CoStar*
P	Research Center	$60.00	*CoStar*
Q	Retail	$36.80	*CoStar*
R	Warehouse	$19.61	*Loopnet*
S	Residential (Units)	$2,637	*CoStar*
	Income & Value		
T	Gross Nonresidential Income	$29,796,988	*Sq. ft.*rents*
U	Nonresidential Exp. Ratio 39.2%	$12,869,300	*CoStar for exp. ratio*
V	Nonresidential NOI	$16,927,688	*T-U*
W	Residential Income	$7,151,544	*Units * rents*
X	Residential Exp. Ratio 38%	$2,717,600	*CoStar for exp. ratio*
Y	Residential NOI	$4,433,944	W-X
Z	NonRes Value: NonRes. Cap Rate 7%	$241,824,100	*Town; consultant modified*
AA	ResValue: Submarket Res. Cap Rate 4.50%	$98,532,100	*CoStar for cap rate*
AB	Total Value	$340,356,200	*Z+AA*

[3] 440 residents, 38 students.

Part II. Est. Impact of Five Development Scenarios
II.E. Warehouse/Distribution

	NEW PROJECT VALUE (AB)	$35,854,000	NOTES
A	New Value / Total Nonresidential Value	0.03	
B	Refinement Coefficient	0.55	
C	New Nonresidential Service Costs	$179,000	*(A*B*NonResTot)*
D	Est. Nonresidential Tax Revenue	$922,900	*Value/1000/*$25.74*
E	New Residential Service Costs	N/A	
F	Est. Residential Tax Revenue	N/A	
G	Net Revenue	$743,900	*D-C*
H	Cost/Revenue Ratio	0.241	*C/D*
	Project Use(s)		
I	Total Sq. Ft.	0	*From Town*
J	Office	0	*From Town*
K	Research Center	0	*From Town*
L	Retail	0	*From Town*
M	Warehouse	158,900	*From Town*
M.1	TV Studio (No Change)	90,002	*From Town*
N	Residential (Units)	0	*From Town*
	Rent		
O	Office	$42.00	*CoStar*
P	Research Center	$60.00	*CoStar*
Q	Retail	$36.80	*CoStar*
R	Warehouse	$19.61	*Loopnet*
S	Residential (Units)	$2,637	*CoStar*
	Income & Value		
T	Gross Nonresidential Income	$3,116,000	*Warehouse only*
U	Nonresidential Exp. Ratio 35%	$1,345,800	*CoStar for exp. ratio*
V	Nonresidential NOI	$1,770,200	*T-U*
W	Residential Income	$0	*Units * rents*
X	Residential Exp. Ratio 38%	$0	*CoStar for exp. ratio*
Y	Residential NOI	$0	W-X
Z	Submarket NonRes. Cap Rate 5.50%	$35,854,000	*Warehouse + TV Studio*
AA	Submarket Res. Cap Rate 4.50%		*CoStar for cap rate*
AB	Total Value	$35,854,000	*Z+AA*

MiyaresHarrington

J. Raymond Miyares Thomas J. Harrington Christopher H. Heep Donna M. Brewer Jennie M. Merrill
Rebekah Lacey Bryan Bertram Ivria Glass Fried Alexandra B. Rubin Ethan B. Dively Maurica D. Miller Rian Rossetti

March 15, 2021

BY EMAIL (lnewman@needhamma.gov)
Planning Board
Town of Needham
Public Services Administration Building
500 Dedham Avenue
Needham, MA 02492

Re: Highway Commercial 1 Zoning Bylaw

Dear Planning Board members:

I have reviewed the letter from Attorney Peter Duffy dated March 11, 2021. In this letter, Mr. Duffy argues, among other things, that the Town is prohibited from adopting the proposed Highway Commercial 1 zoning because Town Meeting acted unfavorably on a related zoning proposal less than two (2) years ago. In my opinion, nothing prevents the Town from adopting the Highway Commercial 1 zoning, as currently proposed, at the upcoming spring Annual Town Meeting.

M.G.L. c.40A, §5 states, in pertinent part, as follows:

> No proposed zoning...by-law which has been unfavorably acted upon by a...town meeting shall be considered by the...town meeting within two years after the date of such unfavorable action unless the adoption of such proposed...by-law is recommended in the final report of the planning board.

"[P]roposed ordinances or bylaws are the same for purposes of G.L. c.40A, §5, sixth par., if they share the same fundamental or essential character, with little substantive difference." *Penn v. Town of Barnstable*, 96 Mass. App. Ct. 205, 211 (2019).

There are significant differences between the Highway Commercial 1 zoning by-law that will appear in the warrant for the upcoming Annual Town Meeting and the proposed by-law that was considered at the October 2019 Special Town Meeting. For example, the current proposal would allow for the construction of up to 240 units of multi-family housing, whereas the by-law presented to the October 2019 Special Town Meeting did not include housing as an allowed use.

Nonetheless, it is not necessary to weigh the differences between the two proposals, as the statutory two-year bar is inapplicable for another reason.

As noted above, M.G.L. c.40A, §5, sixth par. states that the two-year bar on reconsideration does not apply if the Planning Board has recommended the by-law in its final report. There is an open question in the case law about *which* planning board recommendation will allow Town Meeting to reconsider a proposed by-law within two years. In *Penn v. Town of Barnstable,* 96 Mass. App. Ct. 205, 210 (2019), the planning board did not recommend the proposed zoning by-law when it was first presented, and it was not adopted by the Town. Then, within the next two years, the planning board voted to recommend a similar proposal and it was successfully adopted (and then challenged by opponents). The trial judge "construed the 'unless' clause of the statute as referring to a planning board's final report on the earlier, defeated proposal." *Id.* at 210 n.9. The parties to the case both disagreed with that position, and on appeal the Appeals Court declined to decide this issue. *Id.*

In any event, with respect to the Highway Commercial 1 Zoning By-law, the Planning Board recommended adoption to the October 2019 Special Town Meeting. Assuming the Planning Board recommends adoption of the new proposed by-law, the open question that exists in the case law is moot. The Planning Board's favorable recommendations in 2019 and 2021 allow the proposed zoning to be considered and adopted at the 2021 spring Annual Town Meeting. M.G.L. c.40A, §5.

Thank you very much, and please let me know if I can answer any questions.

Sincerely,

Christopher H. Heep

cc: K. Fitzpatrick

TECHNICAL MEMORANDUM

REF: NEX-2020218.00

DATE: November 13, 2020

TO: Department of Planning and Community Development
c/o Ms. Lee Newman
500 Dedham Avenue
Needham, MA 02492

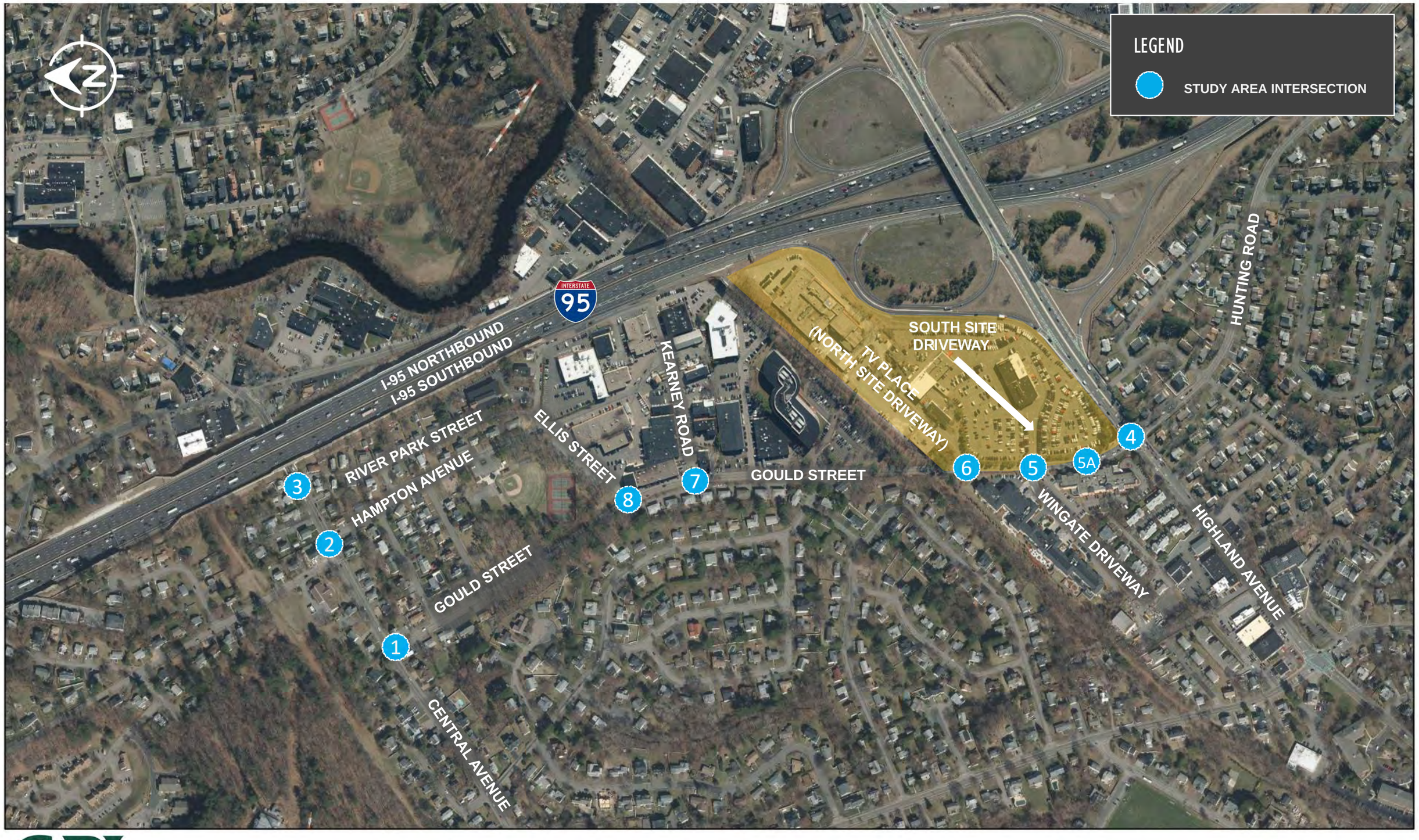
FROM: Ms. Rebecca L. Brown, P.E., Senior Project Manager
Mr. Douglas Halpert, P.E., Project Engineer

RE: Traffic Impact Study
Muzi Motors Redevelopment
Gould Street & Highland Avenue – Needham, Massachusetts

INTRODUCTION

Greenman-Pedersen, Inc. (GPI) has prepared this *Traffic Impact Study* (TIS) for a proposed rezoning and redevelopment of the Muzi Motors and Channel 5 properties on Highland Avenue and Gould Street in Needham, Massachusetts. The site is located on the northeast corner of the Highland Avenue / Gould Street intersection and is currently accessed via a right-in/right-out only driveway on Highland Avenue and two full-access/egress driveways on Gould Street. The property is currently zoned Industrial 1, and the Town of Needham Department of Planning and Community Development is currently evaluating the impacts associated with rezoning this property to Highway Commercial 1. This TIS examines the traffic impacts associated with one potential build-out of the site under the proposed zoning, which would provide a floor area ratio (FAR) of 1.35 and a total of ±866,350 square feet (SF) of development, consisting of approximately ±368,200 SF of corporate headquarter space, ±368,200 SF of research and development (R&D) space, and ±129,950 SF of ancillary retail space. In addition, this TIS identifies the transportation infrastructure improvements that would be required to accommodate the additional traffic generated by such a redevelopment.

The site is bounded by Interstate 95 (Yankee Division Highway) to the east, Highland Avenue to the south, Gould Street to the west, and commercial/office space to the north. The site location in relation to the surrounding roadways is shown on the map on Figure 1.



GPI

Greenman-Pedersen, Inc. || 181 Ballardvale Street, Suite 202, Wilmington, MA 01887

MUZI FORD REDEVELOPMENT – NEEDHAM, MASSACHUSETTS

FIGURE 1 – STUDY AREA

EXISTING CONDITIONS

Study Area

Evaluation of the traffic impacts associated with the proposed project requires an evaluation of existing and projected traffic volumes on the adjacent streets, the volume of traffic expected to be generated by the project, and the impact that this traffic will have on the adjacent streets and nearby intersections. In preparing the TIA for the proposed site, the following intersections have been analyzed and evaluated based on conversations with the Town of Needham Department of Planning and Community Development:

- Central Avenue / Gould Street
- Central Avenue / Hampton Avenue
- Central Avenue / River Park Street
- Highland Avenue / Gould Street / Hunting Road
- Gould Street / Wingate Needham Driveway / Muzi Motors Driveway (South Site Driveway)
- Gould Street / TV Place (North Site Driveway)
- Gould Street / Kearney Road
- Gould Street / Ellis Street

Central Avenue / Gould Street

Gould Street intersects Central Avenue from the south to create a three-way "T-shaped", unsignalized intersection. The Central Avenue eastbound and westbound approaches consist of a single general-purpose lane with directional traffic separated by a striped double-yellow centerline. The Gould Street northbound approach consists of a single general-purpose lane with directional traffic separated by a striped double-yellow centerline. The Central Avenue eastbound and westbound approaches operate under free-flow conditions while the Gould Street northbound approach operates under STOP sign control. Sidewalks are provided along both sides of all approaches with crosswalks provided across the Central Avenue westbound approach and the Gould Street northbound approach. No bicycle accommodations are provided at this intersection.

Central Avenue / Hampton Avenue

Hampton Avenue intersects Central Avenue from the south to create a three-way "T-shaped", unsignalized intersection. The Central Avenue eastbound and westbound approaches consist of a single general-purpose lane with directional traffic separated by a striped double-yellow centerline. The Hampton Avenue northbound approach consists of a single general-purpose lane with directional traffic not separated. The Central Avenue eastbound and westbound approaches operate under free-flow conditions while the Hampton Avenue northbound approach operates under STOP sign control. Sidewalks are provided along both sides of all approaches; however, no crosswalks are provided. No bicycle accommodations are provided at this intersection.

Central Avenue / River Park Street

River Park Street intersects Central Avenue from the south to create a three-way "T-shaped", unsignalized intersection. The Central Avenue eastbound and westbound approaches consist of a single general-purpose lane with directional traffic separated by a striped double-yellow centerline. The River Park Street northbound approach consists of a single general-purpose lane with directional traffic not separated. The Central Avenue eastbound and westbound approaches operate under free-flow conditions while the River Park Street northbound approach operates under STOP sign control. Sidewalks are provided along both sides of Central Avenue. No crosswalks or bicycle accommodations are provided at this intersection.

Highland Avenue / Gould Street / Hunting Road

Gould Street and Hunting Road intersect Highland Avenue from the north and south respectively to create a four-way, signalized intersection. The Highland Avenue eastbound and westbound approaches consist of an exclusive left-turn lane, an exclusive through lane, and a shared through/right-turn lane with directional travel separated by a raised concrete median. The Hunting Road northbound approach consists of a shared left-turn/through lane and an exclusive right-turn lane with directional travel separated by a striped double-yellow centerline. Heavy vehicle restriction signage is posted for Hunting Road. The Gould Street southbound approach consists of an exclusive left-turn lane and a shared left/through/right-turn lane with directional travel separated by a striped double-yellow centerline.

Sidewalks are provided along both sides of all approaches and crosswalks are provided on all approaches except the westbound approach. Bicycle detection with supplemental signage is provided at the Highland Avenue eastbound and westbound approaches.

Gould Street / Wingate Driveway / Site South Driveway

The Wingate Residences driveway and the Project site's southerly driveway (existing Muzi Ford driveway) intersect Gould Street from the east and west respectively to create a four-way, unsignalized intersection. The Wingate driveway eastbound approach consists of a single general-purpose lane with directional travel not separated. The site southerly driveway westbound approach consists of a shared left-turn/through lane and an exclusive right-turn lane with directional travel separated by a striped single-yellow centerline. The Gould Street northbound and southbound approaches consist of a single general-purpose lane with directional travel separated by a striped double-yellow centerline. The Gould Street northbound and southbound approaches operate under free-flowing conditions while the Wingate driveway eastbound approach and the site southerly driveway westbound approach are assumed to operate under STOP control though no signage or pavement markings are provided. Sidewalks are provided along the westerly side of Gould Street and along the northerly side of the Wingate driveway. No crosswalks or bicycle accommodations are provided at this intersection.

Gould Street / TV Place (Site North Driveway)

TV Place (the Project site's northerly driveway) intersects Gould Street from the east to create a three-way "Y-shaped", unsignalized intersection. The TV Place westbound approach consists of a single general-purpose lane with directional travel not separated. The Gould Street northbound and southbound approaches consist of a single general-purpose lane with directional travel separated by a striped double-yellow centerline. The Gould Street northbound and southbound approaches operate under free-flowing conditions while the TV Place westbound approach is assumed to operate under STOP control though no signage or pavement markings are provided. A sidewalk is provided along the westerly side of Gould Street. No crosswalks or bicycle accommodations are provided at this intersection.

Gould Street / Kearney Road

Kearney Road intersects Gould Street from the east to create a three-way "T-shaped", unsignalized intersection. The Kearney Road westbound approach consists of a single general-purpose lane with directional travel not separated. The Gould Street northbound and southbound approaches consist of a single general-purpose lane with directional travel separated by a striped double-yellow centerline. The Gould Street northbound and southbound approaches operate under free-flowing conditions while the Kearney Road westbound approach is assumed to operate under STOP control though no signage or pavement markings are provided. A sidewalk is provided along the westerly side of Gould Street. No crosswalks or bicycle accommodations are provided at this intersection.

Gould Street / Ellis Street / Driveway

The driveway at 99-151 Gould Street and Ellis Street intersect Gould Street from the west and east respectively to create a four-way, unsignalized intersection. The driveway eastbound approach consists of a single general-purpose lane with directional travel not separated. The Ellis Street approach consists of a single general-purpose lane with directional travel separated by a striped single-yellow centerline. The Gould Street northbound and southbound approaches consist of a single general-purpose lane with directional travel separated by a striped double-yellow centerline. The Gould Street northbound and southbound approaches operate under free-flowing conditions while the driveway eastbound approach and the Ellis Street westbound approach are assumed to operate under STOP control though no signage or pavement markings are provided. A sidewalk is provided along the westerly side of Gould Street. No crosswalks or bicycle accommodations are provided at this intersection.

Public Transportation

The Massachusetts Bay Transportation Authority (MBTA) provides public transportation services within the Greater Boston Metropolitan Area, which includes the Town of Needham. The Needham Heights train station is a stop for the MBTA's Needham Commuter Line located approximately 0.8 miles southwest of the proposed site location. The line provides service from South Station in Boston to Needham Heights. The average travel time between South Station / Needham Heights is 40-45 minutes. On a typical weekday, this service runs between 6:05 AM and 10:47 AM for inbound travel, and between 6:47 AM and midnight for outbound travel. On a typical Saturday, this service runs between 8:05 AM and 12:05 AM (Sunday) for inbound travel, and between 7:10 AM and 11:25 PM for outbound travel. No additional service is provided on Sundays.

The fare for the commuter line ranges from $2.40 to $13.25 for adults while seniors and persons with disabilities pay 50% off the regular fare. The range in fare prices is based by zone with the Needham Commuter Line residing between Zone 1A – Zone 2. Children 11 years of age and under ride for free.

The MBTA also provides public transportation services within the vicinity of the project through one of its bus lines. The Bus Line 59 connecting Watertown Square and Needham Junction passes through Highland Avenue and Central to the south and north of the proposed site location, respectively. On a typical weekday, this service runs from 6:20 AM to 8:22 PM, with the average travel time from one end to another of 35 minutes. The fare for MBTA buses ranges from $1.70 with CharlieCard to $2.00 for cash-on-board for adults while seniors, persons with disabilities, and students pay $0.85 per ride. Children 11 years of age and under ride for free. The closest stop to the site is located at Highland Avenue / Avery Square or at Central Avenue / Gould Street.

The Bus Line 59 also provides service to the Newton Heights train station which is approximately 2.5 miles from the Project site and on the MBTA Subway – Green Line D (Riverside). This line provides service from Government Center in Boston to Riverside in Newton. Because the Green Line D partially runs along the roadway with vehicles, the average travel time between Government Center / Riverside is variable. However, the MBTA notes that peak hour headways are 6 minutes and range from 8-11 minutes on off-peak hours. On a typical weekday and Saturday, this service runs between 4:56 AM and 12:49 AM. On a typical Sunday, this service runs between 5:25 AM and 12:49 AM.

The 128 Business Council provides shuttle service throughout the Town of Needham – Needham Shuttle Bus Route. The 128 Business Council provides service to numerous destinations in Needham, including Needham Street, Second Avenue, First Avenue, A Street, B Street, and Kendrick Street which are all located on the easterly side of Interstate 95. Weekday service operates from 7:30 AM to 5:50 PM. This service is offered when requested ahead of time and is available for persons with disabilities. The 128 Business Council is operating fare free until contract-free methods of fare payment is possible.

All public transportation information is provided in the Appendix.

Traffic Volumes

Due to the COVID-19 pandemic, current traffic volumes are lower than typical conditions, and therefore, MassDOT has a restriction on collecting new traffic count data. MassDOT has issued a directive, *Guidance of Traffic Count Data* dated April 2020 that allows for the use of counts collected as long ago as 2015, with application of appropriate adjustments to grow traffic volumes to current year conditions. Therefore, GPI researched previous studies in the area to obtain traffic counts data for the study area intersections.

A Traffic Impact Study[1] was previously prepared by BETA Group, Inc. in 2015 for the rezoning of property along Gould Street and Reservoir Street (herein referred to as *BETA 2015 TIS*). As part of the *BETA 2015 TIS*, manual turning movement counts (TMCs) were collected at the study area intersections in June, October, and December 2015 during the weekday AM peak period (7:00 to 9:00 AM) and weekday PM peak period (4:00 to 6:00 PM) peak periods, and were seasonally adjusted to reflect average-month conditions in accordance with MassDOT guidelines for traffic analysis. The 2015 seasonally adjusted traffic volumes from this study were used to estimate existing traffic-volume conditions at the majority of the study area intersections.

It should be noted that at the time that the traffic volumes were collected in 2015, a widening project was under construction along Route 128 (I-95) (MassDOT Project # 603711), which included reconstruction of the Exit 19 highway ramps. During this time, a significant volume of traffic was being detoured onto Hunting Road to travel to/from I-95. TMCs were collected at the Highland Avenue / Gould Street / Hunting Road intersection in February 2019 during the weekday AM and PM peak periods as part of the *Route 128 Add-a-Lane Post Construction Study*[2]. The volumes collected at this intersection in February 2019 were compared to those collected at the same intersection in 2015 as part of the *BETA 2015 TIS* and were found to be 14 to 15 percent lower in 2019 as compared to 2015. The majority of this reduction was experienced on the Highland Avenue westbound left-turn and Hunting Road northbound right-turn movements and is likely due a redistribution of traffic onto I-95 following completion of the Route 128 / I-95 roadway widening project. As the 2019 counts represent the most-recently collected traffic volumes and were collected after the construction along I-95 was completed, the February 2019 volumes were used to estimate existing traffic volume conditions at the Highland Avenue / Gould Street / Hunting Road intersection.

Annual Adjustment

The MassDOT directive, *Guidance of Traffic Count Data* provides specific annual adjustment factors to apply for each year of count data based on historic traffic growth trends along various classifications of roadways across the Commonwealth of Massachusetts. However, more local data is available to assess traffic growth specific to the study area. As described above, a comparison of the traffic volumes collected at the Highland Avenue / Gould Street / Hunting Road intersection in 2015 versus 2019 indicates that traffic volumes in the area have decreased by 14 to 15 percent since 2015.

In addition, supplemental Automatic Traffic Recorder (ATR) counts were collected at the Central Avenue / Gould Street and Gould Street / Ellis Street intersections in 2019. A comparison of these 2019 counts to the counts collected at the same locations as part of the *BETA 2015 TIS* indicate traffic volumes at the Central Avenue / Gould Street intersection have decreased by 13 to 14 percent. While volumes at the

[1] *Traffic Impact Study: Gould Street – Industrial 1 and Reservoir Street – Industrial Districts, Needham, Massachusetts, Contract No. 16GEN0110D;* prepared by BETA Group, Inc.; December 2015.

[2] *Route 128 Add-a-Lane Post Construction Study, Project File No. 603711, Contract #77875*; prepared by McMahon Associates; November 25, 2019.

Gould Street / Ellis Street intersection increased by 8 percent from 2015 to 2019 during the weekday PM peak hour, the volumes at this location decreased by 3 percent during the weekday AM peak hour.

As the comparison of 2015 to 2019 traffic volumes indicates traffic volumes have been decreasing in this area since 2015, the unadjusted 2015 traffic volumes were utilized to represent 2020 Existing traffic volume conditions in order to provide a conservative (worse case) analysis condition. The February 2019 traffic volumes from the *Route 128 Add-a-Lane Post Construction Study* were utilized to represent 2020 Existing traffic volumes at the Highland Avenue / Gould Street / Hunting Road intersection as these represent the most recently collected traffic volumes.

The traffic volume data and comparison calculations described above are provided in the Appendix. The resulting 2020 Existing traffic-flow networks for the weekday AM and PM peak hours are shown graphically on Figure 2.

FIGURE 2

2020 EXISTING TRAFFIC VOLUMES

Collisions

GPI reviewed collision history data from the Needham Police Department and MassDOT for the most recent five-year period available on file (2015-2019), plus the available data through October 21, 2020. Table 1 provides a summary of the collision patterns within the study area.

In addition to the collision summary, crash occurrence also should be compared to the volume of traffic through a particular intersection or on a particular classification of roadway to determine any significance. Accordingly, the crash rate was calculated for the study area intersections and compared with the statewide and district-wide averages. An intersection crash rate is a measure of the frequency of collisions compared to the volume of traffic through an intersection and is presented in crashes per million entering vehicles (c/mev). For signalized intersections, the statewide average is 0.78 c/mev and the district-wide (District 6) average is 0.71 c/mev. For unsignalized intersections, the statewide and district-wide average is 0.52 c/mev. A comparison of the calculated crash rate to these averages can be used to establish the significance of collision occurrence and whether or not potential safety problems exist. All crash rate worksheets are provided in the Appendix.

The intersection of Highland Avenue / Gould Street / Hunting Road experienced an average of nine collisions per year and a crash above the state and district-wide averages over the five-year analysis period. However, it should be noted that construction of roadway improvements was underway as part of the Route 128 Add-A-Lane project for the majority of the analysis time period and may have impacted the occurrence of collisions at this location.

The remaining study area intersections all experienced fewer than three collisions per year and crash rates lower than the state and district-wide averages, indicating a particular safety issue does not exist.

TABLE 1
Collision Summary

Location	Number of Collisions			Severity [a]				Collision Type [b]							Percent During	
	Total	Average per Year	Crash Rate [c]	PD	PI	F	NR	SS	RE	CM	HO	FO	SV	U	Commuter Peak [d]	Wet/Icy Conditions [e]
Central Avenue at Gould Street	14	2.8	0.47	11	2	--	1	--	2	12	--	--	--	--	43%	14%
Central Avenue at Hampton Avenue	1	0.2	0.04	--	1	--	--	--	1	--	--	--	--	--	0%	0%
Central Avenue at River Park Street	3	0.6	0.12	3	--	--	--	--	2	--	--	1	--	--	0%	67%
Highland Avenue / Gould Street / Hunting Road	46	9.2	0.93	37	7	--	2	15	16	7	--	3	3	2	32%	22%
Gould Street / Wingate Driveway / Muzi Motors Driveway	2	0.4	0.11	--	1	--	1	--	1	--	1	--	--	--	50%	0%
Gould Street / TV Place	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Gould Street / Kearney Road	1	0.2	0.08	1	--	--	--	--	--	--	--	--	1	--	0%	0%
Gould Street / Ellis Street / Driveway	2	0.4	0.20	2	--	--	--	--	--	2	--	--	--	--	0%	50%

Source: MassDOT (2015-October 2020).

[a] PD = property damage only; PI = personal injury; F = fatality, NR = not reported.

[b] SS = sideswipe; RE = rear end; CM = cross movement/angle; HO = head-on; FO = fixed object; SV = single vehicle; U = unknown.

[c] Measured in crashes per million entering vehicles for intersections and in crashes per million vehicle miles traveled for roadway segments.

[d] Percent of vehicle incidents that occurred during the weekday AM (7:00 AM - 9:00 AM) and weekday PM (4:00 PM - 6:00 PM) commuter peak periods.

[e] Represents the percentage of only "known" collisions occurring during inclement weather conditions.

FUTURE CONDITIONS

To estimate the impact of site-generated traffic within the study area, existing traffic volumes were projected to the year 2030, representing a ten-year design horizon. The proposed redevelopment is expected to be completed and fully operational well within this time frame. Traffic volumes on the roadway network at that time will include existing traffic and new traffic due to normal traffic growth. Consideration of these factors resulted in the development of 2030 No-Build traffic volumes, which assume that the proposed redevelopment is not built. The incremental impacts of the proposed project may then be determined by adding site-generated traffic volumes (Build conditions) and making comparisons to the No-Build conditions.

Traffic Growth

To develop the 2030 No-Build forecast volumes, two components of traffic growth were considered. First, an annual growth percentage was determined. Based on correspondence with the Town of Needham Department of Planning and Community Development, a 1.0 percent compounded annual growth was assumed, which is consistent with other recent studies done in the area.

Second, any planned or approved specific developments in the area that would generate a significant volume of traffic on study area roadways within the next five years were considered. There were no significant projects identified and all smaller developments were considered to be included within the background annual growth rate.

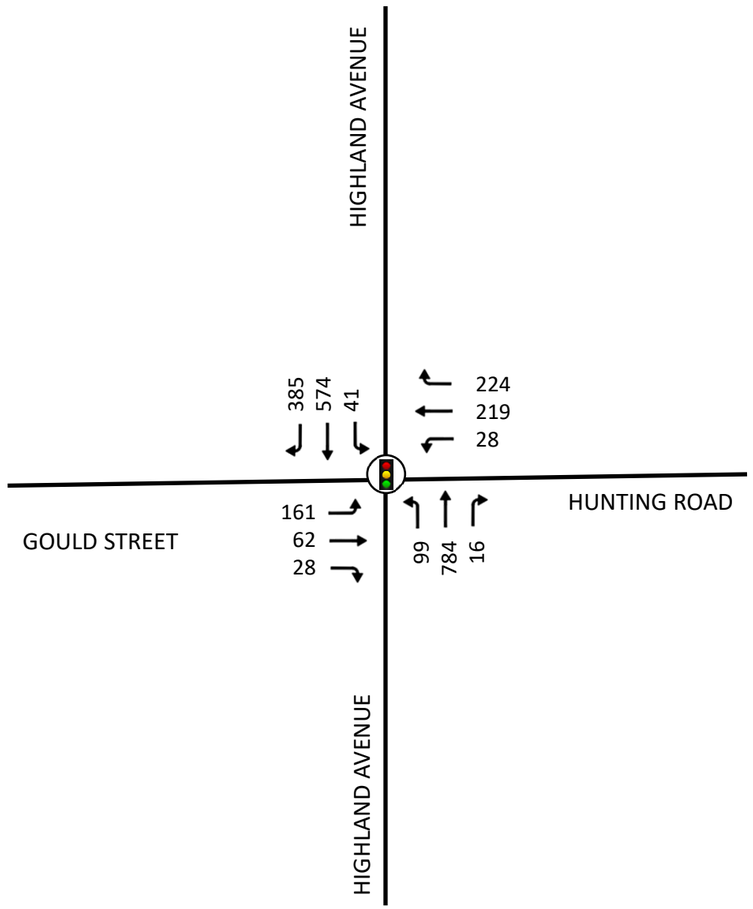
Planned Roadway Improvements

MassDOT issued a noticed to proceed in July 2020 for the Reconstruction of Highland Avenue, Needham Street, & Charles River Bridge (Project #606635), which includes roadway improvements at the Highland Avenue / Gould Street / Hunting Road intersection. This project includes upgrading the traffic control signal equipment, optimizing signal timing, constructing new crosswalks with pedestrian signals, installation of bicycle lanes in both directions along Highland Avenue, and implementation of bicycle detection at the signal. While the number and utilization of the travel lanes on all approaches to the intersection will remain consistent with the existing geometry of the intersection, the lane widths will be reduced to 11 feet to accommodate the bicycle lanes.

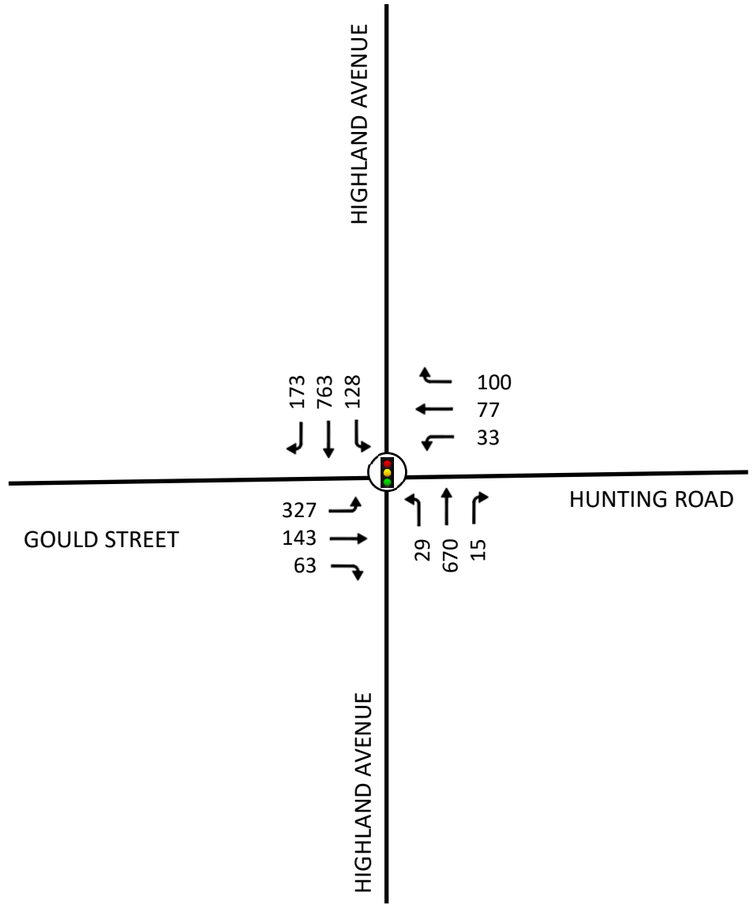
While these improvements are focused on traffic safety and multi-modal accommodations rather than increasing intersection capacity, the work will provide some minor improvements in traffic operations. Since, the construction of these improvements is anticipated to be completed within a three-year period (prior to any planned opening of a new development on the Muzi/Channel5 site), GPI has prepared a sensitivity analysis of the 2023 traffic conditions with the MassDOT improvements in place to evaluate the operational impacts these improvements would have on the intersection. For the purposes of analysis, the 2023 Opening Year for the MassDOT Improvements utilized the latest MassDOT timing plans compared to the 2020 Existing conditions. This analysis condition was analyzed for the Highland Avenue / Gould Street / Hunting Road intersection as it is the only study area intersection directly affected by the listed improvements. As these improvements are anticipated to be completed well within the ten-year design horizon with time for travel patterns to normalize post-construction, these improvements were included in the analysis of 2030 No-Build conditions.

Opening Year and No-Build Conditions

The 2023 Opening Year and 2030 No-Build peak-hour traffic volumes were accordingly developed by applying a 1.0 percent compounded annual traffic growth rate (3.0 percent over three years and 10.5 percent over ten years) to the 2020 Existing traffic volumes. The 2023 Opening Year traffic volumes are shown graphically on Figure 3 for the weekday AM and weekday PM peak hours. The 2030 No-Build traffic volumes are shown graphically on Figure 4 for the weekday AM and weekday PM peak hours.



WEEKDAY AM



WEEKDAY PM

FIGURE 3

2023 OPENING YEAR TRAFFIC VOLUMES

FIGURE 4

2030 NO-BUILD TRAFFIC VOLUMES

Trip Generation

This TIS examines the traffic impacts associated with one potential redevelopment scenario for the site that would consist of approximately 368,200 SF of corporate headquarters space, 368,200 SF of R&D space, and 129,950 SF of ancillary retail space. To estimate the volume of traffic to be generated by the proposed redevelopment, trip-generation rates published by the ITE *Trip Generation Manual* were utilized for Land Use Code (LUC) 714 (Corporate Headquarters), LUC 760 (Research & Development Center), and LUC 820 (Shopping Center), respectively. All trip-generation data are provided in the Appendix.

Existing Trips

Not all of the vehicle trips expected to be generated by the proposed redevelopment represent *new* trips on the study area roadway system. There are existing uses on the site that are currently generating traffic and would be removed as part of the redevelopment. GPI estimate the trips generated by the existing uses on the site based on the TMCs collected at the site driveways.

Internal Capture

Studies have shown that for developments of mixed-use or multi-use sites, it is realistic to assume that there will be some multi-use trips within the site itself. The proposed retail on site is anticipated to consist of a mix of service and retail space that will serve as ancillary uses to the proposed corporate office and R&D space. Therefore, a reduction in the overall trips experienced at the site driveways can be anticipated as a result of multi-use trips that include stops at more than one use on the site. Based on information published in the ITE *Trip Generation Handbook*, it is estimated that multi-use trips account for 24 to 29 percent of the trips generated by the site. The Multi-Use Development Trip Generation and Internal Capture Worksheets are provided in the Appendix.

Pass-by Trips

In addition, studies have shown that for retail developments, a substantial portion of the site-generated vehicle trips are already present in the adjacent passing stream of traffic or are diverted from another route to the proposed site. For example, some vehicles which are already on the roadways may decide to visit the site on their way to another destination. Based on information published in the ITE *Trip Generation Handbook*, the average *pass-by* trip percentage is 34 percent during the weekday PM peak hour and 26 percent during the Saturday midday peak hour for LUC 820 (Shopping Center).

Transit Trips

As described in the *Public Transportation* section of this TIS, both bus and commuter rail services are available in close proximity to the site. Therefore, it is reasonable to expect a reduction in the total number of trips generated by the proposed redevelopment due to the use of public transportation, particularly for employees of the corporate headquarters and R&D space. Based on U.S. Census information, approximately 11.7 percent of residents within the Town of Needham use public transportation to travel to work. In order to provide a conservative (worse case) analysis condition, no credit was applied for the use of public transportation when evaluating the potential traffic impacts associated with the proposed redevelopment. However, GPI encourages the developer and the Town to consider provision of a bus stop at or near the site, as well as other Transportation Demand Management (TDM) measures to reduce the number of single-occupant vehicle trips generated by the development.

Walking and Bicycling Trips

The site is also located in close proximity to multiple residential neighborhoods, as well as other commercial uses that may generate walking and bicycling trips. MassDOT is in the process of constructing bicycle

accommodations along Highland Avenue and sidewalks are provided along Gould Street and Highland Avenue in the area to provide walking and biking to the site. Based on U.S. Census information, approximately 3.5 percent of Needham residents walk or bike to get to work. Therefore, it is reasonable to expect a reduction in the number of trips generated by the redevelopment due to walking and biking. In order to provide a conservative (worse case) analysis condition, no credit has been applied for walking and biking trips. However, GPI recommends that the developer and the Town consider implementing a TDM program that includes measures to encourage walking and biking to the site.

The detailed site-generated trip calculations are included in the Appendix and the results are summarized in Table 2. As shown in Table 2, the proposed redevelopment is expected to generate 620 *additional new* vehicle trips (625 entering and -5 exiting) during the weekday AM peak hour, and 869 *additional new* vehicle trips (126 entering and 743 exiting) during the weekday PM peak hour. It should be noted that the volume of *pass-by* traffic does not reduce the total volume of traffic generated by the redevelopment and the external trips will still be realized as turning movements at the site driveways.

TABLE 2
Trip Generation Summary

Time Period / Direction	Total Trips				External Trips			
	Corporate Office Trips [a]	R&D Trips [b]	Retail Trips [c]	Total Trips [d]	Total External Trips [e]	Existing Trips [f]	Pass-by Trips [g]	New Primary Trips [h]
Weekday Daily	2,730	3,972	7,184	13,886	**10,402**	--	1,414	**8,988**[i]
Weekday AM Peak Hour:								
Enter	458	271	135	864	**766**	126	15	**625**
Exit	35	56	82	173	**75**	65	15	**-5**
Total	493	327	217	1,037	**841**	191	30	**620**
Weekday PM Peak Hour:								
Enter	49	63	317	429	**239**	33	80	**126**
Exit	440	333	343	1,116	**926**	103	80	**743**
Total	489	396	660	1,545	**1,165**	136	160	**869**

[a] ITE LUC 714 (Corporate Headquarters Building) for 368,200 SF.
[b] ITE LUC 760 (Research & Development Center) for 368,200 SF.
[c] ITE LUC 820 (Shopping Center) for 129,500 SF.
[d] Sum of Corporate Office, R&D, and Retail Trips.
[e] Reduction of 25% during the Weekday Daily and Weekday PM and 24% during the Weekday AM peak hours based on ITE *Trip Generation Handbook.*
[f] Based on counts collected at site driveways.
[g] 34 percent of retail trips during the Weekday PM peak hour and 26 percent of retail trips during all other time periods.
[h] External Trips minus Existing Trips and Pass-by Trips
[i] No credit applied for trips generated by the existing uses on site as no daily TMCs collected.

Trip Generation Comparison – Residential Component

The Town of Needham also requested that GPI prepare a trip generation estimate for an alternative development build-out that consists of approximately 226 residential apartment units, ±259,130 SF of corporate office space, ±259,130 SF of R&D space, and ±91,460 SF of ancillary retail space. GPI utilized ITE trip rates for LUC 221 (Multi-Family Housing (Mid-Rise)), LUC 714 (Corporate Headquarters Building), LUC 760 (Research & Development Center), and LUC 820 (Shopping Center). Similar adjustments were applied for internal capture and pass-by trips were applied to the residential alternative build-out as to the non-residential build-out described above. The detailed trip generation calculation worksheets are included in the Appendix and the resulting trip generation is summarized in Table 3. As shown in Table 3, the proposed residential alternative build-out is anticipated to generate 129 to 292 fewer external vehicle trips than the proposed office/R&D build-out.

TABLE 3
Trip Generation Comparison – Residential Build-Out

Time Period / Direction	Alternative 1 [a] (no Residential)			Alternative 2 [b] (226 units Residential)			Net Difference [c]		
	Total Trips	Pass-By Trips	New Primary Trips	Total Trips	Pass-By Trips	New Primary Trips	Total Trips	Pass-By Trips	New Primary Trips
Weekday Daily	10,402	1,414	8,988	8,064	988	7,066	**-2,338**	**-416**	**-1,922**
Weekday AM Peak Hour:									
Enter	766	15	751	597	15	582	**-169**	**0**	**-169**
Exit	75	15	60	115	15	100	**40**	**0**	**40**
Total	841	30	811	712	30	682	**-129**	**0**	**-129**
Weekday PM Peak Hour:									
Enter	239	80	159	200	56	144	**-39**	**-24**	**-15**
Exit	926	80	846	673	56	617	**-253**	**-24**	**-229**
Total	1,165	160	1,005	873	112	761	**-292**	**-48**	**-244**

[a] Total External Trips from Table 2.

[b] ITE LUC 221 (Multi-Family Housing (Mid-Rise)) for 226 units, LUC 714 (Corporate Headquarters Building) for 259,130 SF, LUC 760 (Research & Development Center) for 259,130 SF, and LUC 820 (Shopping Center) for 91,460 SF with reductions applied for internal capture.

[b] Alternative 2 trips minus Alternative 1 trips.

Trip Distribution

Having estimated project-generated vehicle trips, the next step is to determine the distribution of project traffic and assign these trips to the local roadway network. The directional distribution of site traffic is dependent on expected travel routes to and from the site and existing travel patterns. In addition, GPI prepared a Journey-to-Work model using U.S. Census data on the place of residency for employees working in the surrounding area in Needham to estimate the trip distribution for the proposed corporate headquarters and R&D space. GPI also developed a gravity based on building density within a 10-mile radius of the site to estimate the distribution of trips generated by the proposed retail uses. The detailed trip distribution models are included in the Appendix and all resulted in similar trip distribution patterns. Table 4 summarizes the resulting trip distribution percentages through the study area intersections.

TABLE 4
Trip Distribution Summary

Roadway	To/From Direction	Trip Distribution Percentage
Highland Avenue	East	40%
	West	10%
Central Avenue	East	15%
	West	15%
Hunting Road	South	20%
Total		**100%**

Removal of Existing Trips

As previously noted, there are existing uses on the site, including the Muzi Motors and Channel 5, which are currently generating traffic. These uses would be removed from the site as part of the redevelopment. Therefore, the trips generated by these uses will be removed from the existing roadway network as part of the redevelopment. GPI estimate the Removal of Existing Trips based on the TMCs collected at the existing driveways in 2015 and balancing through the adjacent intersections. The resulting Removal of Existing Trips traffic-flow network is graphically shown in Figure 5.

Build Traffic Volumes

Based on the traffic generation and distribution estimates for this project, the traffic volumes associated with the proposed redevelopment were assigned to the roadway network. The site-generated traffic networks are shown on Figures 6 and 7 for the weekday AM and PM peak hours, respectively. The 2030 Build peak-hour traffic-volume networks were then development by adding the site-generated traffic volumes to 2030 No-Build traffic volumes and removing the trips generated by the existing uses on site. The 2030 Build weekday AM and PM peak hour traffic volumes are illustrated on Figure 8. The 2030 Build With Mitigation weekday AM and PM peak hour traffic volumes are illustrated on Figure 9.

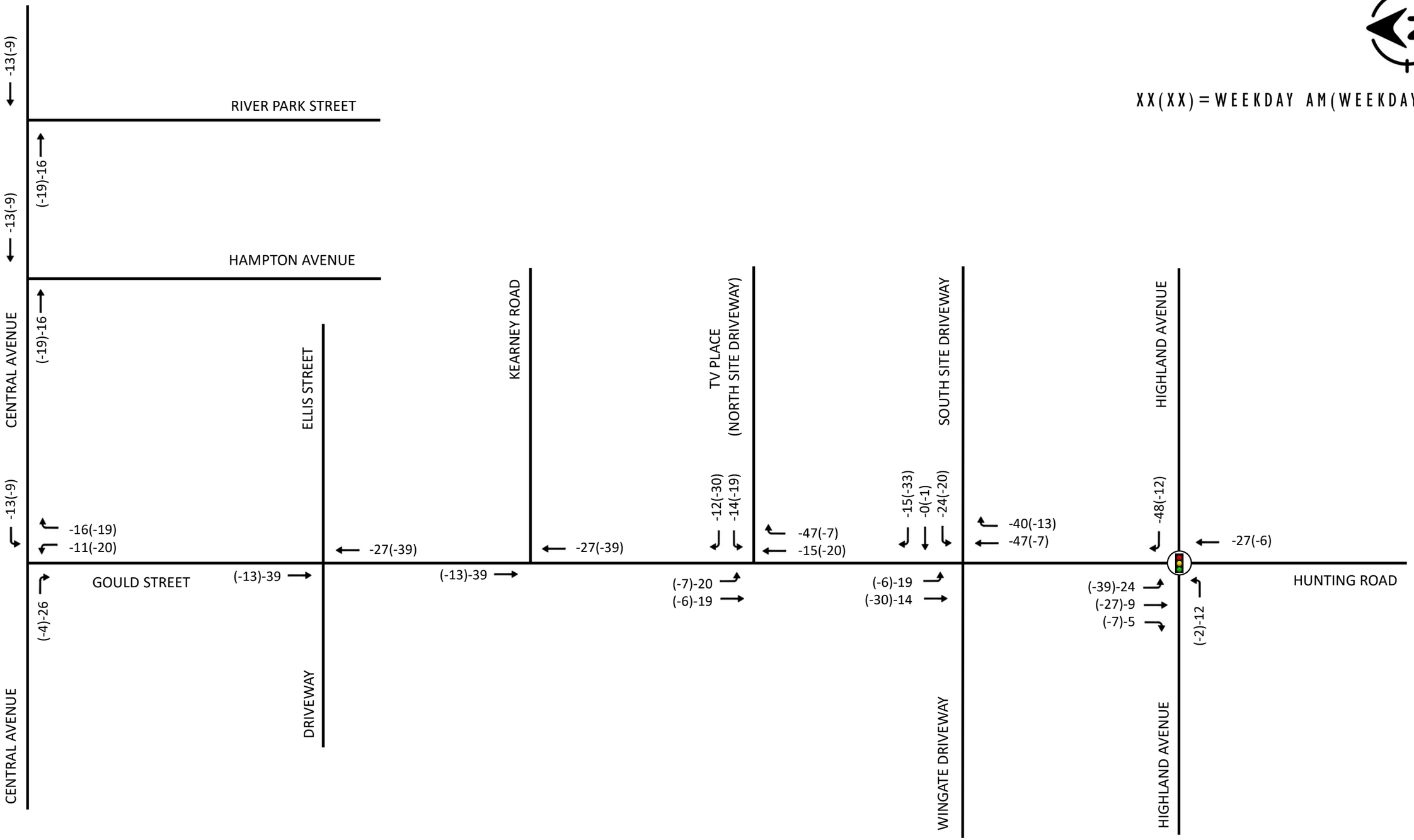


FIGURE 5

REMOVAL OF EXISTING TRIPS

XX(XX) = TOTAL PRIMARY TRIPS(RETAIL PASS-BY TRIPS)

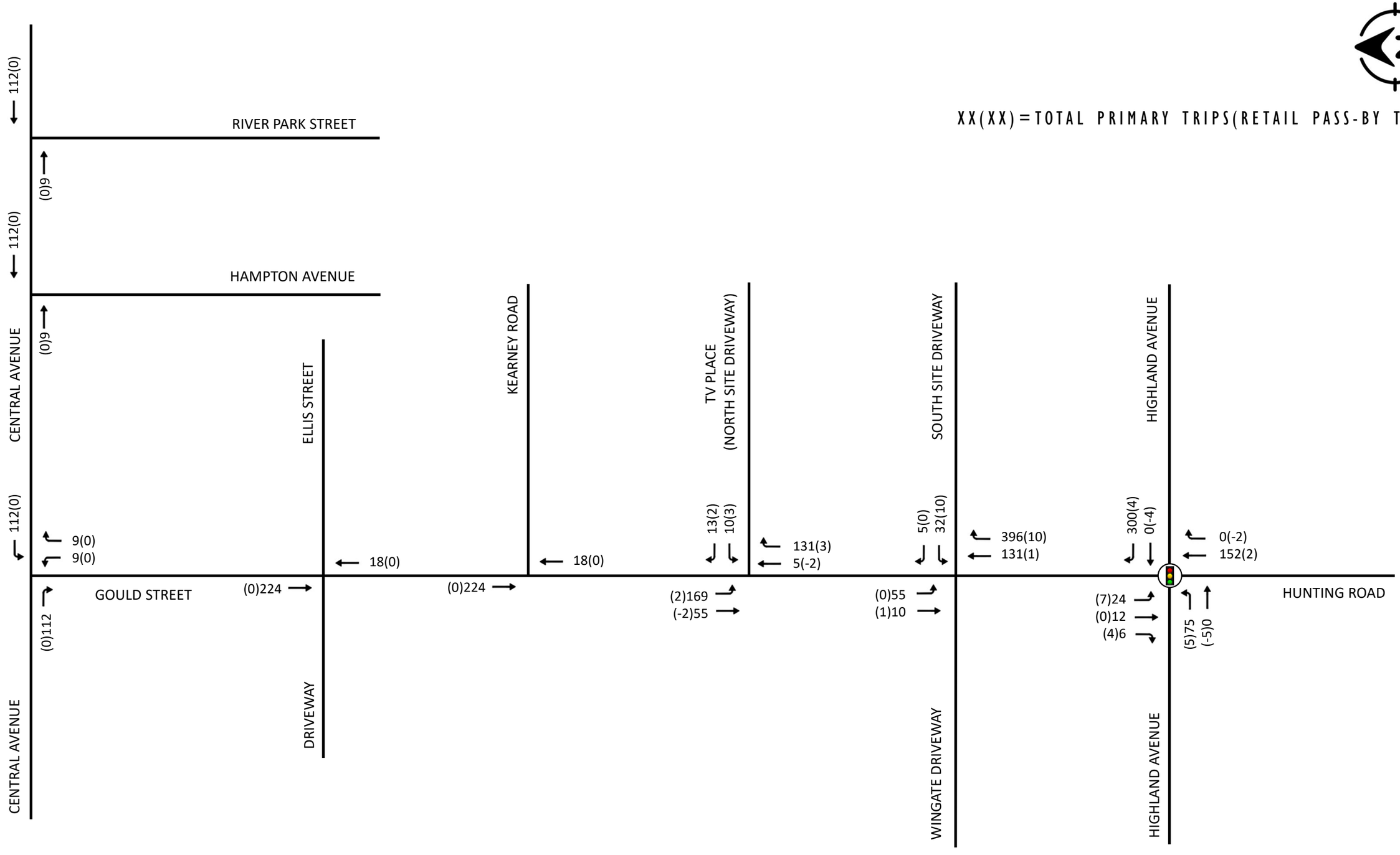


FIGURE 6

SITE-GENERATED VEHICLE TRIPS
WEEKDAY AM PEAK HOUR

XX(XX) = TOTAL PRIMARY TRIPS(RETAIL PASS-BY TRIPS)

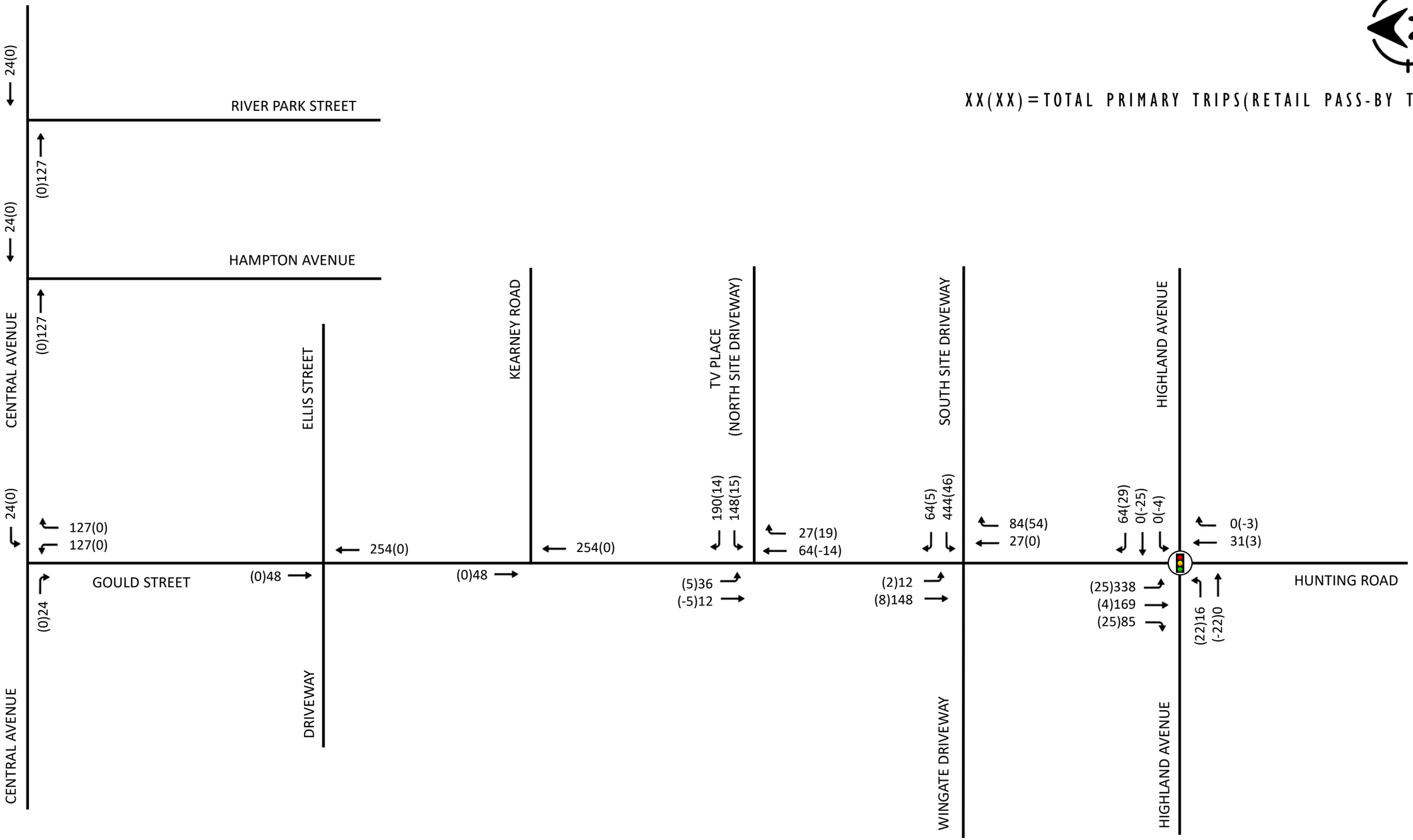


FIGURE 7

SITE-GENERATED VEHICLE TRIPS
WEEKDAY PM PEAK HOUR

FIGURE 8

2030 BUILD TRAFFIC VOLUMES

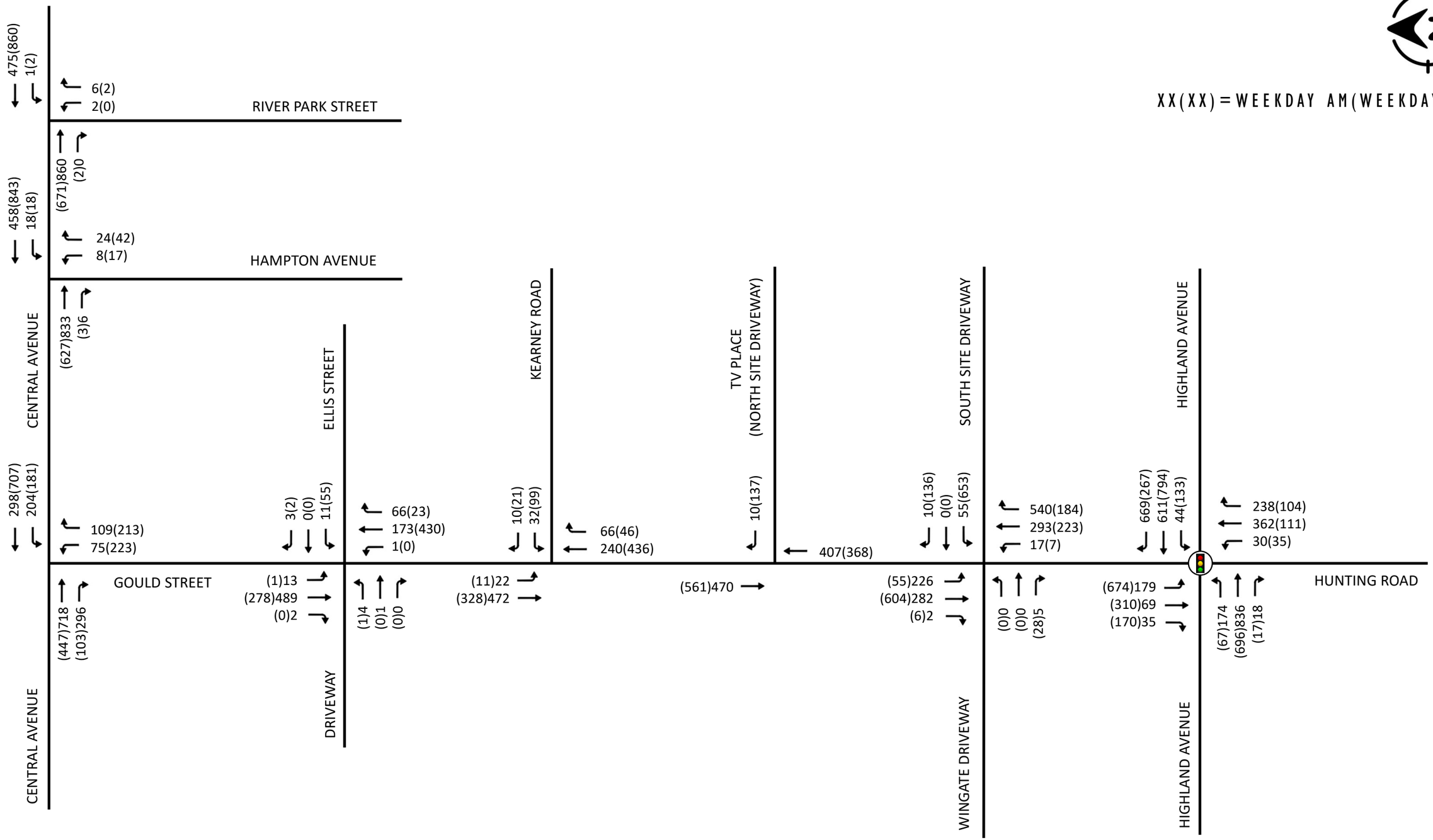


FIGURE 9

2030 BUILD WITH MITIGATION TRAFFIC VOLUMES – ALTERNATIVE 2 (CONSOLIDATED DRIVEWAYS)

CAPACITY AND QUEUE ANALYSIS

Capacity and queue analyses were conducted at all study area locations under 2020 Existing, 2030 No-Build, and 2030 Build traffic-volume conditions. The impact of site-generated traffic can be measured by comparing 2030 No-Build conditions to 2030 Build conditions.

An additional sensitivity analysis was performed for the Highland Avenue / Gould Street / Hunting Road intersection to evaluate the operations in the 2023 Opening Year for the MassDOT Improvements compared to the 2020 Existing conditions to assess what impact these improvements would have on the intersection.

Methodology

The capacity analysis methodology is based on the concepts and procedures in the *Highway Capacity Manual* (HCM)[3] and is described in the Appendix. The TIAS utilizes the HCM 2000 methodology at the signalized intersections due to the fact that *HCM 2010 methodology does not support exclusive ped or hold phases.* HCM 6 methodology was used at all unsignalized intersections as it represents the most recently approved analysis methodology.

For signalized intersections, the maximum back of queue during a typical (average) signal cycle and a 95th percentile signal cycle were calculated for each lane group during the peak periods studied. The back of queue is the length of a backup of vehicles from the stop line of a signalized intersection to the last vehicle in the queue that is required to stop, regardless of the signal indication. The length of this queue depends on a number of factors including signal timing, vehicle arrival patterns, and the saturation flow rate. For unsignalized intersections, the 95th percentile queue represents the length of queue of the critical minor-street movement that is not expected to be exceeded 95 percent of the time during the analysis period (typically one hour). In this case, the queue length is a function of the capacity of the movement and the movement's degree of saturation.

Analysis Results

The results of the level-of-service (LOS) and queue analyses are shown in Table 5 and are discussed below. Capacity and queue analyses were conducted at the study area intersections utilizing *Synchro* software.[4] The capacity and queue analysis worksheets for all conditions are provided in the Appendix.

Central Avenue / Gould Street

Traffic exiting Gould Street onto Central Avenue currently experiences long delays and queues that will be exacerbated as traffic volumes continue to grow in the area. This movement currently operates well over capacity, with a V/C ratio of 2.54 during the weekday PM peak hour.

Limited right-of-way exists to widen either Central Avenue or Gould Street to provide additional capacity. In addition, utilities, stone walls, and homes are located close to the roadway, further limiting the ability for widening. Since the potential developer of the Muzi/Channel 5 property would not have the power to acquire right-of-way, the following options could potentially be implemented to mitigate the project impacts, however, operations under the 2030 Build will still be worse than the 2030 No Build.

[3] *Highway Capacity Manual 2000*, Transportation Research Board; Washington, D.C.; 2000.

[4] *Synchro plus SimTraffic 10*; Trafficware LLC.; Sugar Land, TX; 2017.

- The traffic volumes through this intersection currently exceed the warranting conditions for installation of a traffic signal. Therefore, regardless of the Muzi/Channel 5 site redevelopment, the Town may wish to consider installation of a fully-actuated traffic-control signal at this intersection to reduce existing delay and mitigate the impacts of the proposed redevelopment. It is anticipated that the installation of traffic signal equipment at the intersection may require approximately 695 SF for signal easements from adjacent properties, approximately 250 SF for sidewalk easements, the relocation of a utility pole at the southeast corner of the intersection, and the potential acquisition of the #152 Central Avenue property. With the potential redevelopment of the site, this may present an opportunity to work with the site developer to share the costs of construction.

- In addition, GPI recommends minor roadway widening and restriping along Central Avenue to provide an 11-foot westbound left-turn lane, an 11-foot westbound through lane, and a 12-foot eastbound shared through/right-turn lane, with 5.5-foot sidewalks in either direction. Construction of these improvements will eliminate the existing 5-foot bicycle accommodating shoulders. However, any further widening to maintain the shoulders would require the acquisition of right-of-way and potential complete property takings that would be outside of the developer's capacity to construct.

With implementation of the improvements described above, all movements at this intersection will operate at acceptable levels of service (LOS D or better) during the weekday PM peak hour. Although traffic exiting Gould Street will continue to operate at LOS F during the weekday AM peak hour, the V/C ratio will be reduced below 1.00, indicating there will be adequate capacity to accommodate the anticipated traffic volumes. In addition, the volume of traffic on this movement is low during the weekday AM peak hour.

Additional widening to provide dedicated turning lanes on Gould Street or Central Avenue eastbound is required to further reduce the delay on this approach in the morning. This widening would necessitate acquisition of additional right-of-way, as well as significant relocation of utilities near the intersection. Therefore, the Town should consider developing a Town-funded project to implement additional turning lanes as a means of increasing capacity at this location to accommodate existing traffic volumes and future development in the surrounding area. The Town can request a fair-share contribution toward the design and/or construction of these improvements from the developer, proportional to the percentage increase in trips generated by the project through the intersection. The proposed conceptual improvements are illustrated in Figure 10.

Central Avenue / Hampton Avenue

All movements at the Central Avenue / Hampton Avenue intersection are anticipated to operate at acceptable levels of service (LOS D or better) under all analysis scenarios. In addition, all volume-to-capacity (V/C) ratios will be less than 1.00, indicating there will be adequate capacity to accommodate the anticipated traffic volumes, and queues are not expected to exceed two vehicles on any given approach. The additional traffic generated by the proposed redevelopment is not expected to increase delay on any given movement by more than 5 seconds per vehicle or increase queues by more than one vehicle.

Central Avenue / River Park Street

All movements at the Central Avenue / River Park Street intersection are anticipated to operate at acceptable levels of service (LOS C or better) under all analysis scenarios. In addition, all volume-to-capacity (V/C) ratios will be less than 1.00, indicating there will be adequate capacity to accommodate the anticipated traffic volumes, and queues are not expected to exceed one vehicle on any given approach. The additional traffic generated by the proposed redevelopment is not expected to increase delay on any given movement by more than one second per vehicle and will not measurably impact the queues on any approach.

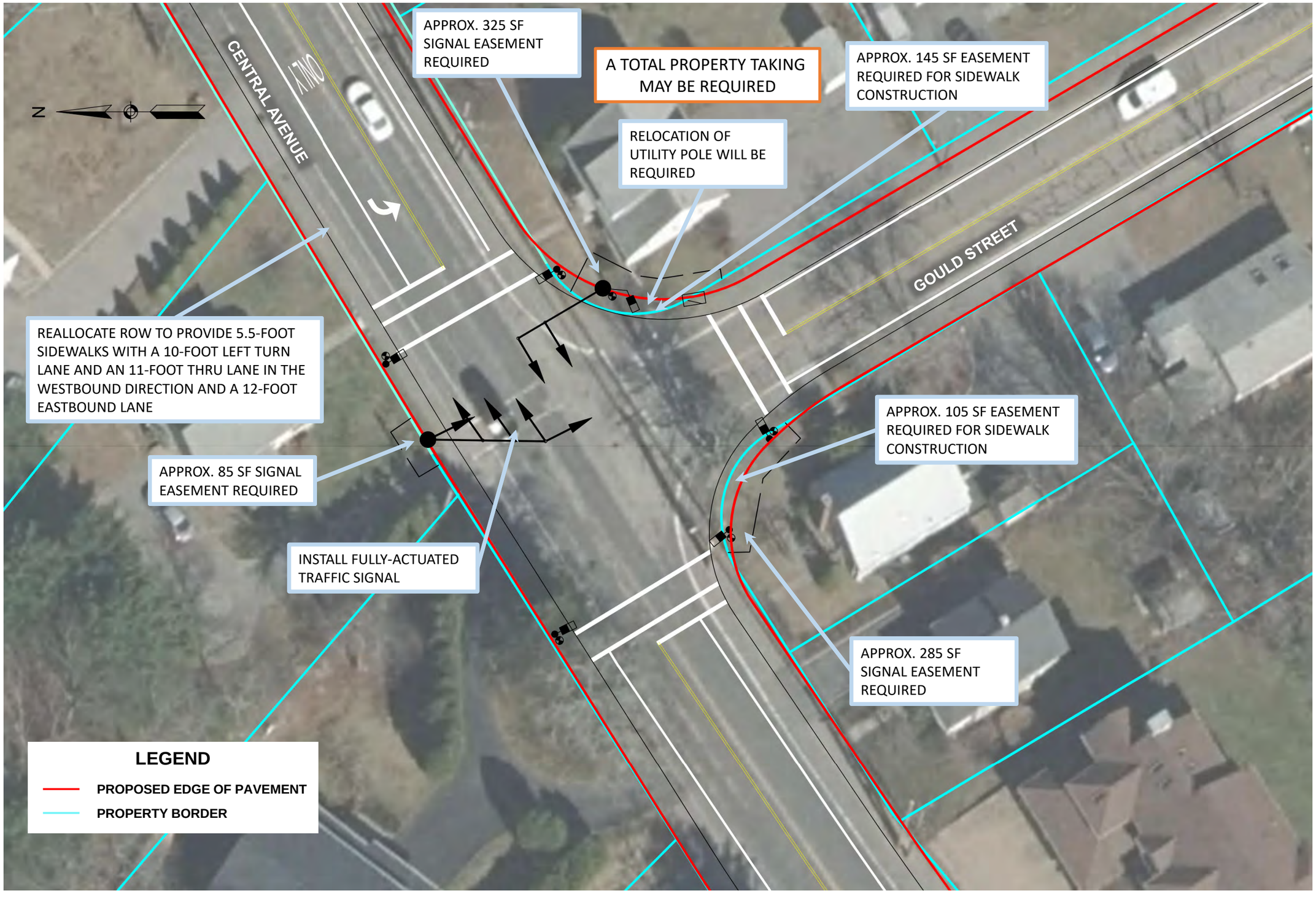


FIGURE 10

CONCEPT PLAN FOR GOULD STREET AT CENTRAL AVENUE

Highland Avenue / Gould Street / Hunting Road

All movements at the Highland Avenue / Gould Street / Hunting Road intersection currently operate under capacity (V/C less than 1.00) and at LOS E or better. A roadway improvement project is underway by MassDOT to enhance intersection safety and pedestrian and bicycle accommodations, and optimize the operation of the intersection. While this project is not expected to significantly increase the capacity of the intersection as no additional lanes are being added, the project will reallocate the green time at the traffic signal to optimize the intersection operations. As shown in the analysis of the 2023 with MassDOT Improvements conditions, the proposed improvements will result in slight decreases in the overall intersection delay and decreases in delay on individual movements of up to 21 seconds. MassDOT's project will also improve the level-of-service to LOS D or better for nearly all movements.

All movements at this intersection are anticipated to operate under capacity (V/C less than 1.00) and at LOS E or better under 2030 No-Build conditions. Although the MassDOT improvements have been included in the analysis of the 2020 No-Build condition, the 2030 No-Build conditions do not reflect any improvement in operations from the MassDOT improvements as the 1 percent background growth will utilize the limited additional capacity created by the signal timing optimization.

With the additional traffic generated by the proposed redevelopment, the overall intersection will operate over capacity at LOS F with several movements operating at LOS E or F. To mitigate the impacts of the proposed redevelopment, GPI recommends widening of Highland Avenue to provide a dedicated right-turn lane from Highland Avenue westbound onto Gould Street, which would be channelized and signalized as part of the intersection. Construction of this lane would go beyond the improvements currently proposed by MassDOT and will require the removal of the existing garden on the northeast corner of the intersection. This would require analysis of the weaving condition between the I-95 SB Off-Ramp and the channelized right-turn to ensure proper spacing exists between the intersections to provide an efficient and safe weaving condition. In addition, GPI recommends widening the Gould Street southbound approach to provide two dedicated left-turn lanes, a through lane, and a dedicated right-turn lane. Note that all widening along Gould Street and Highland Avenue would occur along the site-side of the roadway, which will likely require a significant donation of property from the developer and may impact the square footage of the areas used for trip generation.

As described in the following section of the TIS, installation of a traffic control signal is recommended at the Gould Street / Wingate Driveway / South Site Driveway intersection to facilitate traffic exiting the site. In order to manage queues and traffic flows between the intersections, GPI recommends implementing a coordinated signal system between these two intersections.

With implementation of the improvements described above, the operations of the Highland Avenue / Gould Street / Hunting Road intersection will be restored to nearly No-Build conditions during the weekday AM peak hour and better than No-Build conditions during the weekday PM peak hour. All movements will operate below capacity at LOS E or better.

Gould Street / Wingate Driveway / South Site Driveway

All movements at the Gould Street / Wingate Driveway / South Site Driveway intersection currently operate at acceptable levels of service (LOS D or better), with queues not exceeding two vehicles. With the additional traffic generated by the proposed redevelopment, traffic exiting the South Site Driveway is expected to operate at LOS F with a V/C ratio well over 1.00 and long queues, particularly during the weekday PM peak hour. GPI evaluated two options to mitigate the impacts of the proposed redevelopment at this location. Under both alternatives, the volume of traffic through the intersection is anticipated to exceed the warranting conditions for installation of a traffic control signal based on Warrant 1 – Eight Hour Volume Warrant, Warrant 2 – Four Hour Volume Warrant, and Warrant 3 – Peak Hour. Detail signal warrant analysis worksheets are provided in the Appendix. Therefore, GPI recommends installation of a fully-

actuated traffic control signal at this intersection at mitigation for the proposed redevelopment. Due to the proximity of this intersection to the existing signalized intersection of Highland Avenue / Gould Street / Hunting Road, GPI recommends implementation of a coordinated signal system. Additional improvements as part of each mitigation alternative are described below.

Alternative 1 consists of maintaining two full-access/egress driveways to the site at approximately the same locations as exist today. As part of this alternative, the South Site Driveway would be widened to provide an exclusive left-turn lane and a shared left/through/right-turn lane. Gould Street northbound would be widened to provide a shared left-turn/through lane and a dedicated right-turn lane entering the site. Gould Street southbound would also be widened to provide two general purpose travel lanes. The inside lane would transition of a left-turn lane at the Highland Avenue / Gould Street / Hunting Road intersection. With implementation of this alternative, all movements at the Gould Street / Wingate Driveway / South Site Driveway intersection would operate at acceptable levels of service (LOS D or better). GPI evaluated an option to maintain a single through lane on Gould Street southbound with Alternative 1. However, the queues on Gould Street southbound would extend over 650 feet, which would block traffic exiting the North Site Driveway and create additional back-ups into the site. With two southbound travel lanes, the queue on Gould Street will remain less than 250 feet, which is less than the distance between the two site driveways. It is anticipated that the installation of traffic signal equipment at the Highland Avenue / Gould Street / Hunting Road intersection and the need for roadway widening to provide additional turn lanes and sidewalk construction will require the acquisition of approximately 13,050 SF of the Muzi Motors property, which would reduce the total square footage available to be developed. In addition, a 725 SF signal easement will be required for the location of new traffic signal equipment on the site. The proposed conceptual improvements for Alternative 1 are illustrated in Figure 11.

Alternative 2 consists of consolidating the driveways into a single, signalized driveway at approximately the location of the Gould Street / Wingate Driveway / South Site Driveway intersection. A right-out-only movement would be maintained at northerly end of the site. As part of this alternative, the South Site Driveway would be widened to provide an exclusive left-turn lane and a shared left/through/right-turn lane. Gould Street northbound would be widened to provide a shared left-turn/through lane and a dedicated channelized right-turn lane entering the site. Gould Street southbound would also be widened to provide an exclusive left-turn lane and a shared through/right-turn lane. With implementation of this alternative, all movements at the Gould Street / Wingate Driveway / South Site Driveway intersection would operate at acceptable levels of service (LOS D or better). It is anticipated that the installation of traffic signal equipment at the Highland Avenue / Gould Street / Hunting Road intersection and the need for roadway widening to provide additional turn lanes and sidewalk construction will require the acquisition of approximately 9,250 SF of the Muzi Motors property, which would reduce the total square footage available to be developed. In addition, a 665 SF signal easement will be required for the location of new traffic signal equipment on the site. The proposed conceptual improvements for Alternative 2 are illustrated in Figure 12.

Gould Street / TV Place (North Site Driveway)

All movements at the Gould Street / TV Place (North Site Driveway) intersection currently operate at LOS C or better with queues not exceeding one vehicle. With the additional traffic generated by the proposed redevelopment, traffic exiting TV Place (North Site Driveway) is expected to operate at LOS F with long queues and delays, and V/C ratios exceeding 1.00, indicating there will be inadequate capacity to accommodate the anticipated traffic volumes generated by the proposed redevelopment. GPI evaluated two options to mitigate the impacts of the proposed redevelopment at this location.

Alternative 1 consists of maintaining full access and egress that the North Site Driveway while widening the driveway to provide separate left- and right-turn lanes, and widening Gould Street to provide dedicated left- and right-turn lanes entering the site. With this alternative, the North Site Driveway will still operate at LOS E during the weekday PM peak hour. However, the V/C ratio will be below 1.00, indicating there will be adequate capacity to accommodate the anticipated traffic volumes, and queues will be reduced to five

vehicles. All other movements through the intersection will operate at LOS B or better will implementation of this alternative. It is anticipated that the need for roadway widening will require the acquisition of approximately 3,750 SF of the Muzi Motors property which would reduce the total square footage available to be developed. The proposed conceptual improvements for Alternative 1 are illustrated in Figure 11.

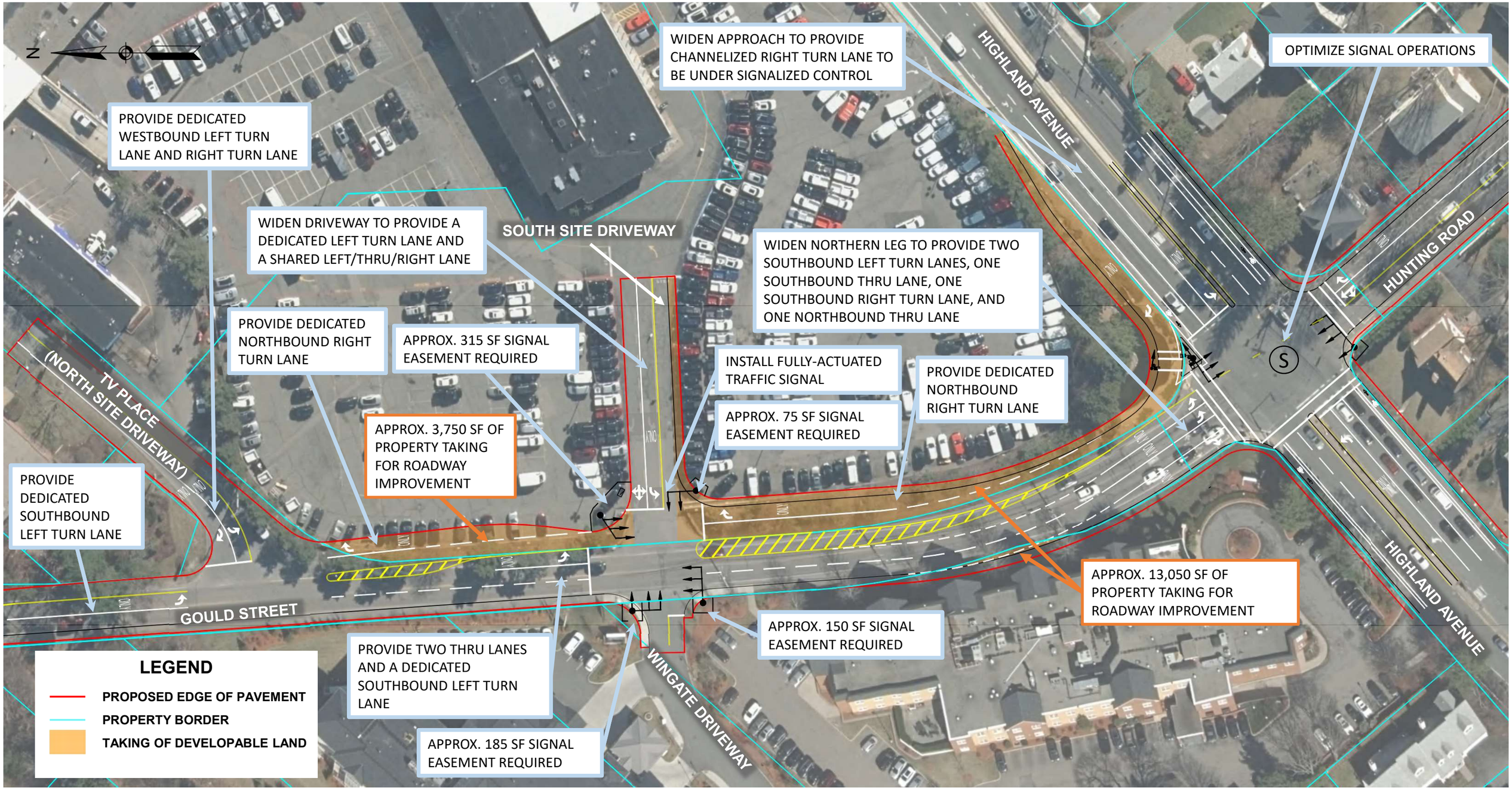
Alternative 2 consists of consolidating the site driveways to force all left-turn movements to occur a single signalized access point at the Gould Street / Wingate Driveway / South Site Driveway intersection. With this alternative, a right-out-only driveway would be provided at the northerly end of the site to alleviate some congestion at the Gould Street / Wingate Driveway / South Site Driveway intersection and allow a second means of egress. With this alternative, all movements at the Gould Street / North Site Driveway intersection would operate at LOS B or better with queues not exceeding two vehicles. It is not anticipated that property acquisition will be required at this intersection as part of Alternative 2. The proposed conceptual improvements for Alternative 2 are illustrated in Figure 12.

Gould Street / Kearney Road

All movements at the Gould Street / Kearney Road intersection are anticipated to operate at acceptable levels of service (LOS D or better) under all analysis scenarios. In addition, all volume-to-capacity (V/C) ratios will be less than 1.00, indicating there will be adequate capacity to accommodate the anticipated traffic volumes, and queues are not expected to exceed two vehicles on any given approach. The additional traffic generated by the proposed redevelopment is not expected to increase delay on any given movement by more than ten seconds per vehicle or increase queues on any given approach by more than one vehicle.

Gould Street / Ellis Street

All movements at the Gould Street / Kearney Road intersection are anticipated to operate at acceptable levels of service (LOS C or better) under all analysis scenarios. In addition, all volume-to-capacity (V/C) ratios will be less than 1.00, indicating there will be adequate capacity to accommodate the anticipated traffic volumes, and queues are not expected to exceed one vehicle on any given approach. The additional traffic generated by the proposed redevelopment is not expected to increase delay on any given movement by more than eight seconds per vehicle and will not measurably impact the queues on any approach.



GPI
Greenman-Pedersen, Inc. || 181 Ballardvale Street, Suite 202, Wilmington, MA 01887
MUZI FORD REDEVELOPMENT– NEEDHAM, MASSACHUSETTS

FIGURE 11

CONCEPT PLAN – ALTERNATIVE I

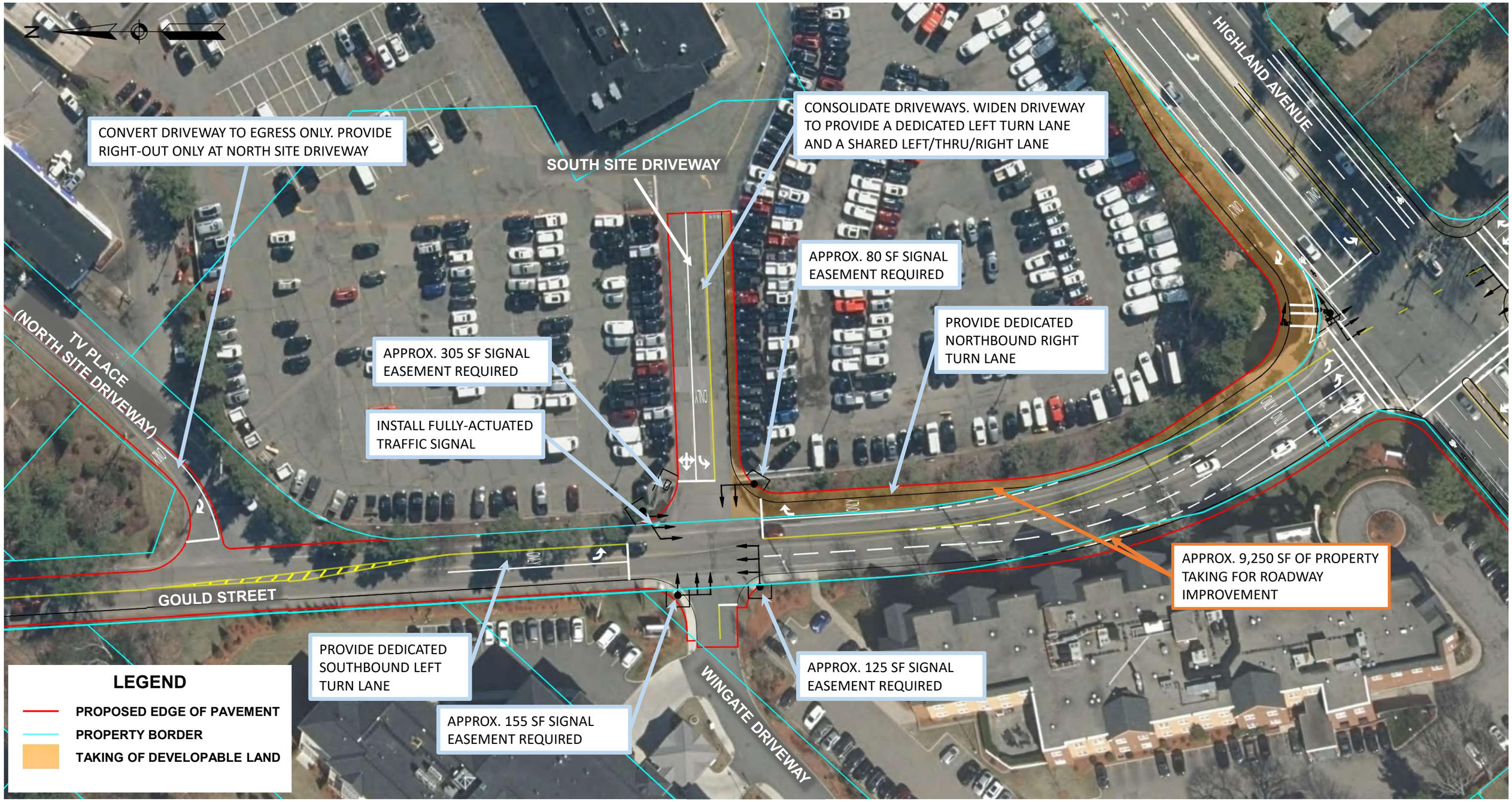


FIGURE 12

CONCEPT PLAN – ALTERNATIVE 2

TABLE 5
Intersection Capacity Analysis Summary

Intersection/Peak Hour/Lane Group	2020 Existing				2030 No-Build				2030 Build				2030 Build Mitigated Alt 1				2030 Build Mitigated Alt 2			
	V/C [a]	Del. [b]	LOS [c]	Queue [d]	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue
Central Avenue at Gould Street																				
Weekday AM:																				
Central Avenue EB approach	-	-	-	-	-	-	-	-	-	-	-	-	0.97	36.4	D	517/867				
Central Avenue WB approach	0.15	10.8	B	--/<25	0.17	11.5	B	--/<25	0.36	14.2	B	--/40	-	-	-	-				
Central Avenue WB left	-	-	-	-	-	-	-	-	-	-	-	-	0.92	65.7	E	78/215	Same as Alternative 1			
Central Avenue WB through	-	-	-	-	-	-	-	-	-	-	-	-	0.23	2.6	A	36/56				
Gould Street NB approach	1.02	110.7	F	--/240	1.12	151.7	F	--/258	1.85	484.0	F	--/403	0.86	73.6	E	78/208				
Overall Intersection	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.95**	**38.0**	**D**	**--/--**				
Weekday PM:																				
Central Avenue EB approach	-	-	-	-	-	-	-	-	-	-	-	-	0.83	29.6	C	261/422				
Central Avenue WB approach	0.18	9.5	A	--/<25	0.18	9.4	A	--/<25	0.20	9.6	A	--/<25	-	-	-	-				
Central Avenue WB left	-	-	-	-	-	-	-	-	-	-	-	-	0.66	18.8	B	48/132	Same as Alternative 1			
Central Avenue WB through	-	-	-	-	-	-	-	-	-	-	-	-	0.77	16.7	B	287/475				
Gould Street NB approach	2.54	769.9	F	--/728	1.94	509.1	F	--/480	>2.00	>999.9	F	--/>999	0.83	34.8	C	195/375				
Overall Intersection	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.85**	**24.9**	**C**	**--/--**				
Central Avenue at Hampton Avenue																				
Weekday AM:																				
Central Avenue WB approach	0.02	9.5	A	--/<25	0.03	10.0	A	--/<25	0.03	9.9	A	--/<25	N/A				N/A			
Hampton Avenue NB approach	0.13	18.6	C	--/<25	0.13	21.0	C	--/<25	0.14	22.0	C	--/<25								
Weekday PM:																				
Central Avenue WB approach	0.02	8.5	A	--/<25	0.02	8.7	A	--/<25	0.02	9.2	A	--/<25	N/A				N/A			
Hampton Avenue NB approach	0.25	19.9	C	--/25	0.23	21.9	C	--/<25	0.28	26.6	D	--/28								
Central Avenue at River Park Street																				
Weekday AM:																				
Central Avenue WB approach	0.00	9.5	A	--/<25	0.00	9.9	A	--/<25	0.00	9.9	A	--/<25	N/A				N/A			
River Park Street NB approach	0.04	18.4	C	--/<25	0.04	20.2	C	--/<25	0.04	20.9	C	--/<25								
Weekday PM:																				
Central Avenue WB approach	0.00	8.5	A	--/<25	0.00	8.7	A	--/<25	0.00	9.2	A	--/<25	N/A				N/A			
River Park Street NB approach	0.02	11.8	B	--/<25	0.00	12.3	B	--/<25	0.01	13.8	B	--/<25								

[a] Volume-to-capacity ratio.

[b] Average control delay in seconds per vehicle.

[c] Level of service.

[d] Average/95th percentile queue length in feet per lane (assuming 25 feet per vehicle).

TABLE 5 (continued)
Intersection Capacity Analysis Summary

Intersection/Peak Hour/Lane Group	2020 Existing				2023 With MassDOT Improvements				2030 No-Build				2030 Build				2030 Build Mitigated Alt 1				2030 Build Mitigated Alt 2			
	V/C [a]	Del. [b]	LOS [c]	Queue [d]	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue
Highland Avenue at Gould Street / Hunting Road																								
Weekday AM:																								
Highland Avenue EB left	0.73	65.4	E	75/183	0.69	56.3	E	70/216	0.76	65.7	E	80/233	1.43	288.9	F	206/400	0.89	71.8	E	107/227	0.89	71.8	E	107/227
Highland Avenue EB through/right	0.69	32.9	C	272/354	0.67	28.5	C	247/406	0.70	29.3	C	280/448	0.61	26.1	C	286/448	0.74	26.6	C	256/396	0.74	26.6	C	256/396
Highland Avenue WB left	0.38	51.9	D	30/71	0.36	47.0	D	29/80	0.39	49.0	D	33/84	0.42	56.1	E	38/83	0.73	71.1	E	27/63	0.73	71.1	E	27/63
Highland Avenue WB through/right	0.84	40.8	D	314/396	0.83	35.8	D	291/456	0.86	37.6	D	333/507	0.91	41.0	D	466/738	-	-	-	-	-	-	-	-
Highland Avenue WB through	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.70	31.1	C	184/291	0.70	31.1	C	184/291
Highland Avenue WB right	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.94	50.1	D	161/627	0.97	57.9	E	172/638
Hunting Road NB left/through	0.78	54.0	D	193/354	0.76	48.6	D	170/433	0.86	61.5	E	197/476	1.44	269.7	F	469/757	0.96	66.3	E	240/425	0.96	66.3	E	240/425
Hunting Road NB right	0.30	30.7	C	49/125	0.33	31.0	C	32/96	0.40	33.7	C	46/115	0.48	41.5	D	70/126	0.31	25.4	C	<25/58	0.31	25.4	C	<25/58
Gould Street SB left	0.43	39.6	D	92/172	0.65	48.3	D	91/192	0.68	51.5	D	103/205	0.74	63.4	E	127/214	0.67	49.8	D	55/112	0.67	49.4	D	56/114
Gould Street SB left/through/right	0.38	39.1	D	85/164	0.59	45.5	D	84/183	0.62	48.1	D	95/195	0.68	57.6	E	117/204	-	-	-	-	-	-	-	-
Gould Street SB through	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.46	45.5	D	41/95	0.46	45.1	D	41/96
Gould Street SB right	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.02	27.4	C	<25/<25	0.02	27.4	C	<25/<25
Overall Intersection	**0.74**	**39.7**	**D**	**--/--**	**0.80**	**36.4**	**D**	**--/--**	**0.85**	**39.4**	**D**	**--/--**	**1.08**	**79.7**	**F**	**--/--**	**1.00**	**41.6**	**D**	**--/--**	**1.02**	**43.2**	**D**	**--/--**
Weekday PM:																								
Highland Avenue EB left	0.62	73.5	E	<25/57	0.50	52.8	D	<25/64	0.53	57.4	E	27/67	0.74	81.6	F	60/132	0.70	57.4	E	41/96	0.70	57.4	E	41/96
Highland Avenue EB through/right	0.65	36.2	D	247/333	0.68	32.9	C	246/395	0.72	35.6	D	285/434	0.66	36.4	D	285/418	0.84	37.7	D	222/366	0.84	37.7	D	222/366
Highland Avenue WB left	0.70	59.8	E	109/175	0.65	50.0	D	100/190	0.70	55.0	D	116/205	0.74	65.7	E	118/200	0.76	53.7	D	80/167	0.76	53.7	D	80/167
Highland Avenue WB through/right	0.81	35.1	D	377/450	0.79	30.9	C	343/570	0.85	35.0	D	404/653	0.92	46.5	D	472/708	-	-	-	-	-	-	-	-
Highland Avenue WB through	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.86	36.2	D	248/400	0.86	36.2	D	248/400
Highland Avenue WB right	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.17	9.4	A	<25/<25	0.19	9.4	A	<25/<25
Hunting Road NB left/through	0.72	64.2	E	96/184	0.59	47.9	D	86/168	0.63	52.0	D	99/178	0.75	66.1	E	130/216	0.77	53.7	D	88/180	0.77	53.7	D	88/180
Hunting Road NB right	0.07	33.9	C	<25/41	0.08	31.6	C	<25/26	0.12	33.5	C	<25/32	0.11	37.9	D	<25/31	0.07	27.3	C	<25/<25	0.07	27.3	C	<25/<25
Gould Street SB left	0.61	37.6	D	210/327	0.79	49.8	D	211/415	0.82	53.8	D	245/466	1.60	329.1	F	798/>999	0.89	44.3	D	141/357	0.89	43.6	D	194/349
Gould Street SB left/through/right	0.57	36.5	D	198/311	0.76	47.2	D	200/391	0.79	50.9	D	232/445	1.57	317.0	F	780/>999	-	-	-	-	-	-	-	-
Gould Street SB through	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.75	40.8	D	126/348	0.75	39.4	D	163/313
Gould Street SB right	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.10	36.2	D	<25/42	0.10	35.8	D	<25/39
Overall Intersection	**0.77**	**38.8**	**D**	**--/--**	**0.82**	**37.2**	**D**	**--/--**	**0.87**	**40.8**	**D**	**--/--**	**1.15**	**140.9**	**F**	**--/--**	**0.94**	**38.1**	**D**	**--/--**	**0.94**	**37.8**	**D**	**--/--**

[a] Volume-to-capacity ratio.
[b] Average control delay in seconds per vehicle.
[c] Level of service.
[d] Average/95th percentile queue length in feet per lane (assuming 25 feet per vehicle).

TABLE 5 (continued)
Intersection Capacity Analysis Summary

Intersection/Peak Hour/Lane Group	2020 Existing				2030 No-Build				2030 Build				2030 Build Mitigated Alt 1				2030 Build Mitigated Alt 2			
	V/C [a]	Del. [b]	LOS [c]	Queue [d]	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue
Gould Street at Wingate Driveway / Site South Driveway																				
Weekday AM:																				
Wingate Driveway EB	0.01	10.1	B	--/<25	0.01	10.1	B	--/<25	0.01	10.0	B	--/<25	0.00	43.9	D	<25/<25	0.00	43.9	D	<25/<25
Site Driveway WB left/through	0.08	17.9	C	--/<25	0.09	18.6	C	--/<25	0.30	38.2	E	--/30	-	-	-	-	-	-	-	-
Site Driveway WB right	0.02	10.4	B	--/<25	0.03	10.6	B	--/<25	0.01	13.1	B	--/<25	-	-	-	-	-	-	-	-
Site Driveway WB left	-	-	-	-	-	-	-	-	-	-	-	-	0.30	43.0	D	<25/41	0.30	41.1	D	<25/50
Site Driveway WB left/through/right	-	-	-	-	-	-	-	-	-	-	-	-	0.02	40.5	D	<25/<25	0.02	39.0	D	<25/<25
Gould Street NB approach	0.02	8.0	A	--/<25	0.02	8.0	A	--/<25	0.02	8.0	A	--/<25	-	-	-	-	-	-	-	-
Gould Street NB left/through	-	-	-	-	-	-	-	-	-	-	-	-	0.34	3.0	A	49/117	0.25	3.1	A	33/74
Gould Street NB right	-	-	-	-	-	-	-	-	-	-	-	-	0.28	3.9	A	<25/<25	0.37	6.3	A	<25/28
Gould Street SB approach	0.02	8.1	A	--/<25	0.02	8.2	A	--/<25	0.08	10.2	B	--/<25	0.17	3.0	A	<25/56	-	-	-	-
Gould Street SB left	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.332	4.8	A	25/99
Gould Street SB through/right	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.22	3.8	A	29/101
Overall Intersection	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.34**	**4.9**	**A**	**--/--**	**0.36**	**6.5**	**A**	**--/--**
Weekday PM:																				
Wingate Driveway EB	0.08	13.7	B	--/<25	0.07	13.8	B	--/<25	0.08	15.7	C	--/<25	0.02	41.6	D	<25/<25	0.02	41.6	D	<25/<25
Site Driveway WB left/through	0.21	26.6	D	--/<25	0.19	27.4	D	--/<25	>2.00	>999.9	F	--/>999	-	-	-	-	-	-	-	-
Site Driveway WB right	0.03	9.7	A	--/<25	0.03	9.9	A	--/<25	0.11	11.0	B	--/<25	-	-	-	-	-	-	-	-
Site Driveway WB left	-	-	-	-	-	-	-	-	-	-	-	-	0.72	36.1	D	167/232	0.85	41.9	D	234/404
Site Driveway WB left/through/right	-	-	-	-	-	-	-	-	-	-	-	-	0.68	34.4	C	150/214	0.77	35.1	D	201/331
Gould Street NB approach	0.01	9.0	A	--/<25	0.01	9.1	A	--/<25	0.01	9.6	A	--/<25	-	-	-	-	-	-	-	-
Gould Street NB left/through	-	-	-	-	-	-	-	-	-	-	-	-	0.31	11.3	B	77/179	0.28	13.8	B	77/114
Gould Street NB right	-	-	-	-	-	-	-	-	-	-	-	-	0.09	9.1	A	<25/<25	0.13	18.0	B	<25/<25
Gould Street SB approach	0.00	7.8	A	--/<25	0.01	7.8	A	--/<25	0.01	8.3	A	--/<25	0.48	13.9	B	161/255	-	-	-	-
Gould Street SB left	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12	13.1	B	<25/44
Gould Street SB through/right	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.73	23.8	C	324/481
Overall Intersection	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**0.53**	**20.2**	**C**	**--/--**	**0.74**	**28.1**	**C**	**--/--**

[a] Volume-to-capacity ratio.
[b] Average control delay in seconds per vehicle.
[c] Level of service.
[d] Average/95th percentile queue length in feet per lane (assuming 25 feet per vehicle).

TABLE 5 (continued)
Intersection Capacity Analysis Summary

Intersection/Peak Hour/Lane Group	2020 Existing				2030 No-Build				2030 Build				2030 Build Mitigated Alt 1				2030 Build Mitigated Alt 2			
	V/C [a]	Del. [b]	LOS [c]	Queue [d]	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue	V/C	Del.	LOS	Queue
Gould Street at TV Place																				
Weekday AM:																				
TV Place WB approach	0.08	13.3	B	--/<25	0.07	14.0	B	--/<25	0.12	20.8	C	--/<25	-	-	-	-	-	-	-	-
TV Place WB left	-	-	-	-	-	-	-	-	-	-	-	-	0.08	26.2	D	--/<25	-	-	-	-
TV Place WB right	-	-	-	-	-	-	-	-	-	-	-	-	0.03	10.9	B	--/<25	0.02	10.9	B	--/<25
Gould Street SB approach	0.02	8.2	A	--/<25	0.02	8.4	A	--/<25	0.19	9.4	A	--/<25	0.19	9.4	A	--/<25	-	-	-	-
Weekday PM:																				
TV Place WB approach	0.15	16.8	C	--/<25	0.13	15.1	C	--/<25	1.02	82.3	F	--/315	-	-	-	-	-	-	-	-
TV Place WB left	-	-	-	-	-	-	-	-	-	-	-	-	0.66	41.2	E	--/108	-	-	-	-
TV Place WB right	-	-	-	-	-	-	-	-	-	-	-	-	0.31	12.2	B	--/33	0.23	12.1	B	--/<25
Gould Street SB approach	0.01	7.9	A	--/<25	0.01	7.9	A	--/<25	0.04	8.1	A	--/<25	0.04	8.1	A	--/<25	-	-	-	-
Gould Street at Kearney Road																				
Weekday AM:																				
Kearney Road WB approach	0.11	13.9	B	--/<25	0.10	14.0	B	--/<25	0.13	16.7	C	--/<25	N/A				N/A			
Gould Street SB approach	0.02	7.9	A	--/<25	0.02	8.0	A	--/<25	0.02	8.0	A	--/<25								
Weekday PM:																				
Kearney Road WB approach	0.30	16.5	C	--/33	0.27	15.0	C	--/28	0.38	22.0	D	--/45	N/A				N/A			
Gould Street SB approach	0.01	7.8	A	--/<25	0.01	7.8	A	--/<25	0.01	8.5	A	--/<25								
Gould Street at Ellis Street																				
Weekday AM:																				
Driveway EB approach	0.02	14.7	B	--/<25	0.01	14.4	B	--/<25	0.02	17.6	C	--/<25	N/A				N/A			
Ellis Street WB approach	0.05	13.8	B	--/<25	0.04	13.6	B	--/<25	0.05	16.3	C	--/<25								
Gould Street NB approach	0.00	8.0	A	--/<25	0.00	8.0	A	--/<25	0.00	8.6	A	--/<25								
Gould Street SB approach	0.01	7.8	A	--/<25	0.01	7.8	A	--/<25	0.01	7.8	A	--/<25								
Weekday PM:																				
Driveway EB approach	0.01	13.7	B	--/<25	0.00	12.7	B	--/<25	0.00	16.8	C	--/<25	N/A				N/A			
Ellis Street WB approach	0.16	15.0	C	--/<25	0.13	13.7	B	--/<25	0.22	19.3	C	--/<25								
Gould Street NB approach	0.00	0.0	A	--/<25	0.00	0.0	A	--/<25	0.00	0.0	A	--/<25								
Gould Street SB approach	0.00	7.8	A	--/<25	0.00	7.8	A	--/<25	0.00	8.3	A	--/<25								

[a] Volume-to-capacity ratio.
[b] Average control delay in seconds per vehicle.
[c] Level of service.
[d] Average/95th percentile queue length in feet per lane (assuming 25 feet per vehicle).

CONCLUSIONS

Existing and future conditions in the study area have been described, analyzed, and evaluated with respect to traffic operations and the impact of the proposed redevelopment. Conclusions of this effort are presented below.

- The existing site currently contains Muzi Motors and Channel 5. Access to the site is currently provided via a right-in/right-out driveway on Highland Avenue and two full-access/egress driveways on Gould Street. As part of the redevelopment, the existing uses on site would be razed to construct approximately 368,200 SF of corporate headquarters space, 368,200 SF of R&D space, and 129,950 SF of retail space. The right-in/right-out driveway on Highland Avenue would be closed as part of the redevelopment, and the two driveways on Gould Street would be maintained in some fashion or possibly combined to form a new signalized intersection.

- The proposed redevelopment is expected to generate 620 *additional new* vehicle trips (625 entering and -5 exiting) during the weekday AM peak hour, and 869 *additional new* vehicle trips (126 entering and 743 exiting) during the weekday PM peak hour.

- The Town of Needham also requested that GPI prepare a trip generation estimate for an alternative development build-out that consists of approximately 226 residential apartment units, ±259,130 SF of corporate office space, ±259,130 SF of R&D space, and ±91,460 SF of ancillary retail space. The proposed residential alternative build-out is anticipated to generate 129 to 292 fewer external vehicle trips than the proposed office/R&D build-out.

- While no credit was applied for public transit, walking, or biking trips to/from the site, GPI recommends that the developer implement a comprehensive Transportation Demand Management (TDM) program to encourage the use of public transit, walking and biking, and reduce single-occupancy vehicle trips to the site.

- ***Central Avenue / Gould Street –*** Traffic exiting Gould Street onto Central Avenue currently experiences long delays and queues that will be exacerbated as traffic volumes continue to grow in the area. This movement currently operates well over capacity, with a V/C ratio of 2.54 during the weekday PM peak hour. Limited right-of-way exists to widen either Central Avenue or Gould Street to provide additional capacity. In addition, utilities, stone walls, and homes are located close to the roadway, further limiting the ability for widening. Since the potential developer of the Muzi/Channel 5 property would not have the power to acquire right-of-way, the following options could potentially be implemented to mitigate the project impacts, however, operations under the 2030 Build will still be worse than the 2030 No Build.

    - The traffic volumes through this intersection currently exceed the warranting conditions for installation of a traffic signal. Therefore, regardless of the Muzi/Channel 5 site redevelopment, the Town may wish to consider installation of a fully-actuated traffic-control signal at this intersection to reduce existing delay and mitigate the impacts of the proposed redevelopment. The installation of traffic signal equipment at the intersection may require signal easements from adjacent properties. It is anticipated that the installation of traffic signal equipment at the intersection may require approximately 695 SF for signal easements from adjacent properties, approximately 250 SF for sidewalk easements, the relocation of a utility pole at the southeast corner of the intersection, and the potential acquisition of the #152 Central Avenue property. With the potential redevelopment of the site, this may present an opportunity to work with the site developer to share the costs of construction.

- In addition, GPI recommends minor roadway widening and restriping along Central Avenue to provide an 11-foot westbound left-turn lane, an 11-foot westbound through lane, and a 12-foot eastbound shared through/right-turn lane, with 5.5-foot sidewalks in either direction. Construction of these improvements will eliminate the existing 5-foot bicycle accommodating shoulders. However, any further widening to maintain the shoulders would require the acquisition of right-of-way and potential complete property takings that would be outside of the developer's capacity to construct.

With implementation of the improvements described above, all movements at this intersection will operate at acceptable levels of service (LOS D or better) during the weekday PM peak hour. Although traffic exiting Gould Street will continue to operate at LOS F during the weekday AM peak hour, the V/C ratio will be reduced below 1.00, indicating there will be adequate capacity to accommodate the anticipated traffic volumes. In addition, the volume of traffic on this movement is low during the weekday AM peak hour.

Additional widening to provide dedicated turning lanes on Gould Street or Central Avenue eastbound is required to further reduce the delay on this approach in the morning. This widening would necessitate acquisition of additional right-of-way, as well as significant relocation of utilities near the intersection. Therefore, the Town should consider developing a Town-funded project to implement additional turning lanes as a means of increasing capacity at this location to accommodate existing traffic volumes and future development in the surrounding area. The Town can request a fair-share contribution toward the design and/or construction of these improvements from the developer, proportional to the percentage increase in trips generated by the project through the intersection.

- ***Highland Avenue / Gould Street / Hunting Road*** – All movements at the Highland Avenue / Gould Street / Hunting Road intersection currently operate under capacity (V/C less than 1.00) and at LOS E or better. A roadway improvement project is underway by MassDOT to enhance intersection safety and pedestrian and bicycle accommodations, and optimize the operation of the intersection. While this project is not expected to significantly increase the capacity of the intersection as no additional lanes are being added, the project will reallocate the green time at the traffic signal to optimize the intersection operations. As shown in the analysis of the 2023 with MassDOT Improvements conditions, the proposed improvements will result in slight decreases in the overall intersection delay and decreases in delay on individual movements of up to 21 seconds. MassDOT's project will also improve the level-of-service to LOS D or better for nearly all movements.

  All movements at this intersection are anticipated to operate under capacity (V/C less than 1.00) and at LOS E or better under 2030 No-Build conditions. Although the MassDOT improvements have been included in the analysis of the 2020 No-Build condition, the 2030 No-Build conditions do not reflect any improvement in operations from the MassDOT improvements as the 1 percent background growth will utilize the limited additional capacity created by the signal timing optimization. With the additional traffic generated by the proposed redevelopment, the overall intersection will operate over capacity at LOS F with several movements operating at LOS E or F. To mitigate the impacts of the proposed redevelopment, GPI recommends widening of Highland Avenue to provide a dedicated right-turn lane from Highland Avenue westbound onto Gould Street, which would be channelized and signalized as part of the intersection. This would require analysis of the weaving condition between the I-95 SB Off-Ramp and the channelized right-turn to ensure proper spacing exists between the intersections to provide an efficient and safe weaving condition. In addition, GPI recommends widening the Gould Street southbound approach to provide two dedicated left-turn lanes, a through lane, and a dedicated right-turn lane. Note that all widening along Gould Street and Highland Avenue would occur along the site-side of the roadway, which will likely require a significant donation of property from the developer and may impact the square

footage of the areas used for trip generation. In order to manage queues and traffic flows between this intersection and the South Site Driveway, GPI recommends implementing a coordinated signal system between these two intersections. With implementation of the improvements described above, the operations of the Highland Avenue / Gould Street / Hunting Road intersection will be restored to nearly No-Build conditions during the weekday AM peak hour and better than No-Build conditions during the weekday PM peak hour. All movements will operate below capacity at LOS E or better.

- ***Gould Street / Site Driveway Intersections*** – Under the existing geometric configuration of the two site driveways, traffic exiting both site driveways is expected to operate over capacity at LOS F with long delays and queues, particularly during the weekday PM peak hour. GPI evaluated the impacts of implementing two alternative mitigation scenarios to reduce the delay and queues at the site driveways. Alternative 1 involves maintaining both full-access/egress driveways and providing enhancements at both driveways to improve traffic operations. Alternative 2 consists of consolidating the driveways into a single, signalized driveway at approximately the location of the South Site Driveway and providing a right-out-only driveway at the northerly end of the site. With either of these alternatives, the traffic volumes through the Gould Street / Wingate Driveway / South Site Driveway intersection would exceed the warranting conditions for installation of a traffic signal. Therefore, GPI recommends installation of a fully-actuated traffic-control signal, which would operate as part of a coordinated signal system with the existing signal at Highland Avenue / Gould Street / Hunting Road. The geometric enhancements included as part of each alternative are described below.

  - **Alternative 1 (Maintain Two Driveways):**
    - *Gould Street / Wingate Driveway / South Site Driveway*
      - Widen South Site Driveway to provide exclusive left-turn lane and shared left/through/right-lane;
      - Widen Gould Street northbound to provide a shared left-turn/through lane and an exclusive right-turn lane;
      - Widen Gould Street southbound to provide two general purpose travel lanes; and
      - It is anticipated that the installation of traffic signal equipment at the Highland Avenue / Gould Street / Hunting Road intersection and the need for roadway widening to provide additional turn lanes and sidewalk construction will require the acquisition of approximately 13,050 SF of the Muzi Motors property which inter would reduce the total square footage available to be developed.
      - A 725 SF signal easement will be required on the site for the placement of traffic signal equipment.
    - *Gould Street / TV Place (North Site Driveway)*
      - Widen North Site Driveway to provide exclusive left-turn lane and exclusive right-turn lane;
      - Widen Gould Street northbound to provide a through lane and an exclusive right-turn lane;
      - Widen Gould Street southbound to provide an exclusive left-turn lane and a through lane; and
      - It is anticipated that the need for roadway widening will require the acquisition of approximately 3,750 SF of the Muzi Motors property which inter would reduce the total square footage available to be developed.

- **Alternative 2 (Consolidate Driveways):**
  - *Gould Street / Wingate Driveway / South Site Driveway*
    - Widen South Site Driveway to provide exclusive left-turn lane and shared left/through/right-lane;
    - Widen Gould Street northbound to provide a shared left-turn/through lane and an exclusive channelized right-turn lane;
    - Widen Gould Street southbound to provide an exclusive left-turn lane and a shared through/right-turn lane; and
    - It is anticipated that the installation of traffic signal equipment at the Highland Avenue / Gould Street / Hunting Road intersection and the need for roadway widening to provide additional turn lanes and sidewalk construction will require the acquisition of approximately 9,250 SF of the Muzi Motors property which inter would reduce the total square footage available to be developed.
    - A 665 SF signal easement will be required on the site for the placement of traffic signal equipment.
  - *Gould Street / TV Place (North Site Driveway)*
    - Reconstruct the North Site Driveway to a right-out-only driveway with a single channelized lane to enforce the turn restriction; and
    - It is not anticipated that property acquisition will be required at this intersection as part of Alternative 2.

  With implementation of either Alternative 1 or 2, all movements at the Gould Street / Wingate Driveway / South Site Driveway will operate at acceptable levels of service (LOS D or better) during the weekday AM and PM peak hours. While all movements at the Gould Street / North Site Driveway intersection will operate at LOS B or better under Alternative 2 (Consolidated Driveways), traffic exiting the North Site Driveway will operate at LOS E during the weekday PM peak hour under Alternative 1 (Maintain Two Driveways). In addition, less than 250 feet of vehicle stacking separates the two intersections and queues on Gould Street southbound may occasionally extend from the signalized intersection of Gould Street / Wingate Driveway / South Site Driveway beyond the North Site Driveway, resulting in additional difficulty and delay exiting this driveway. Therefore, GPI recommends consolidation of the two driveways into a single, signalized location as described by Alternative 2.

- All movements at the remaining study area intersections are anticipated to operate at acceptable levels of service (LOS D or better) with queues not exceeding two vehicles under all analysis conditions. The additional traffic generated by the proposed redevelopment is not anticipated to increase delay on any movement through any of these intersections by more than ten seconds per vehicle or increase queues by more than one vehicle. This level of traffic impact does not warrant any project-specific mitigation.

- APPENDIX

- ***Public Transportation Information***
- ***Traffic Count Data***
- ***Crash Rate Worksheets***
- ***Trip Generation Calculations***
- ***Trip Generation Comparison – Residential Build-Out***
- ***Trip Distribution Calculations***
- ***Signal Warrant Analysis Worksheets***
- ***Capacity Analysis Methodology***
- ***Capacity and Queue Analysis Worksheets***

PUBLIC TRANSPORTATION INFORMATION

NEEDHAM LINE

Summer 2020 schedule, effective June 22, 2020

Monday to Friday

Inbound to Boston

ZONE	STATION	TRAIN #	AM						PM								
	Bikes Allowed		600	7602	7606	608	610	612	614	616	618	7620	7622	7624	626	628	630
2	Needham Heights	♿	6:05	7:00	7:53	8:45	10:05	11:05	12:50	2:50	3:55	5:08	5:58	6:47	7:50	8:37	10:02
2	Needham Center	♿	6:09	7:04	7:57	8:49	10:09	11:09	12:54	2:54	3:59	f 5:12	6:02	6:51	7:54	8:41	10:06
2	Needham Junction	♿	6:14	7:09	8:02	8:54	10:13	11:13	12:58	2:58	4:03	-	6:06	6:55	7:58	8:45	10:10
2	Hersey	♿	6:17	7:12	8:05	8:57	10:16	11:16	1:01	3:01	-	-	-	6:58	8:03	8:48	10:13
1	West Roxbury	♿	6:23	7:18	8:11	9:03	10:21	11:21	1:06	3:06	4:09	5:24	6:14	7:07	8:08	8:53	10:23
1	Highland	♿	6:26	7:21	8:14	9:06	10:23	11:23	1:08	3:08	-	5:26	-	7:09	8:10	8:55	10:25
1	Bellevue	♿	6:30	7:25	8:17	9:10	10:25	11:25	1:10	3:10	-	5:28	-	7:11	8:12	8:57	10:27
1	Roslindale Village	♿	6:33	7:28	8:20	9:13	10:28	11:28	1:13	3:13	-	5:31	-	7:14	8:15	9:00	10:30
1A	Forest Hills	♿	6:36	7:31	8:24	9:16	10:31	11:31	1:16	3:16	-	5:34	-	7:19	8:18	9:03	10:33
1A	Ruggles	♿	L 6:41	L 7:36	L 8:29	L 9:21	L 10:36	L 11:36	L 1:21	-	-	-	-	-	L 8:23	L 9:08	L 10:38
1A	Back Bay	♿	L 6:45	L 7:40	L 8:33	L 9:25	L 10:40	L 11:40	L 1:25	L 3:24	L 4:25	L 5:48	L 6:31	L 7:27	L 8:27	L 9:12	L 10:42
1A	South Station	♿	6:50	7:45	8:39	9:30	10:45	11:45	1:30	3:29	4:30	5:53	6:36	7:32	8:32	9:17	10:47

Trains in purple box indicate peak period trains.

Monday to Friday

Outbound from Boston

ZONE	STATION	TRAIN #	AM					PM									
	Bikes Allowed		7601	7603	605	607	609	611	613	615	7617	7619	623	625	627	629	631
1A	South Station	♿	6:47	7:42	9:05	9:53	11:50	1:52	3:00	4:05	4:53	5:42	6:36	7:30	8:50	9:50	11:20
1A	Back Bay	♿	6:52	7:47	9:10	9:58	11:55	1:57	3:05	4:10	4:58	5:47	6:41	7:35	8:55	9:55	11:25
1A	Ruggles	♿	-	-	-	10:02	11:59	2:01	3:09	4:14	5:02	5:51	6:45	7:39	8:59	9:59	11:29
1A	Forest Hills	♿	6:59	-	9:18	10:08	12:05	2:07	3:15	4:20	5:08	5:57	6:51	7:45	9:05	10:05	11:35
1	Roslindale Village	♿	7:02	-	9:21	10:11	12:08	2:10	3:18	4:25	5:13	6:02	6:56	7:48	9:08	10:08	11:38
1	Bellevue	♿	7:05	-	9:24	10:14	12:11	2:13	3:21	4:28	5:16	6:06	6:59	7:51	9:11	10:11	11:41
1	Highland	♿	7:07	-	9:26	10:16	12:13	2:15	3:23	4:30	5:18	6:08	7:01	7:53	9:13	10:13	11:43
1	West Roxbury	♿	7:09	8:01	9:29	10:18	12:15	2:17	3:25	4:32	5:20	6:10	7:03	7:55	9:15	10:15	11:45
2	Hersey	♿	7:19	-	9:34	10:25	12:20	2:22	3:30	4:37	5:26	6:16	7:08	8:00	9:20	10:20	11:50
2	Needham Junction	♿	7:22	8:17	9:36	10:28	12:23	2:25	3:34	4:41	5:30	6:20	7:12	8:03	9:23	10:23	11:53
2	Needham Center	♿	7:25	L 8:20	9:39	10:31	12:26	2:28	3:37	4:44	5:33	6:23	7:15	8:06	9:26	10:26	11:56
2	Needham Heights	♿	7:31	8:24	9:43	10:35	12:30	2:33	3:42	4:49	5:38	6:29	7:20	8:10	9:30	10:30	12:00

Trains in purple box indicate peak period trains.

Saturday (NO SERVICE ON SUNDAY)

Inbound to Boston

ZONE	STATION	TRAIN #	AM		PM						
	Bikes Allowed		1602	1604	1606	1608	1610	1612	1614	1616	1618
2	Needham Heights	♿	8:05	10:05	12:05	2:05	4:05	6:05	8:05	10:05	11:40
2	Needham Center	♿	8:10	10:10	12:10	2:10	4:10	6:10	8:10	10:10	-
2	Needham Junction	♿	8:13	10:13	12:13	2:13	4:13	6:13	8:13	10:13	-
2	Hersey	♿	8:16	10:16	12:16	2:16	4:16	6:16	8:16	10:16	-
1	West Roxbury	♿	8:21	10:21	12:21	2:21	4:21	6:21	8:21	10:21	-
1	Highland	♿	8:23	10:23	12:23	2:23	4:23	6:23	8:23	10:23	-
1	Bellevue	♿	8:25	10:25	12:25	2:25	4:25	6:25	8:25	10:25	-
1	Roslindale Village	♿	8:27	10:27	12:27	2:27	4:27	6:27	8:27	10:27	-
1A	Forest Hills	♿	8:31	10:31	12:31	2:31	4:31	6:31	8:31	10:31	-
1A	Ruggles	♿	L 8:35	L 10:35	L 12:35	L 2:35	L 4:35	L 6:35	L 8:35	L 10:35	-
1A	Back Bay	♿	L 8:39	L 10:39	L 12:39	L 2:39	L 4:39	L 6:39	L 8:39	L 10:39	L 12:00
1A	South Station	♿	8:44	10:44	12:44	2:44	4:44	6:44	8:44	10:44	12:05

Saturday (NO SERVICE ON SUNDAY)

Outbound from Boston

ZONE	STATION	TRAIN #	AM			PM					
	Bikes Allowed		1601	1603	1605	1607	1609	1611	1613	1615	1617
1A	South Station	♿	7:10	9:10	11:10	1:10	3:10	5:10	7:10	9:10	10:45
1A	Back Bay	♿	7:15	9:15	11:15	1:15	3:15	5:15	7:15	9:15	10:50
1A	Ruggles	♿	7:18	9:18	11:18	1:18	3:18	5:18	7:18	9:18	10:54
1A	Forest Hills	♿	7:24	9:24	11:24	1:24	3:24	5:24	7:24	9:24	11:00
1	Roslindale Village	♿	7:28	9:28	11:28	1:28	3:28	5:28	7:28	9:28	11:03
1	Bellevue	♿	7:30	9:30	11:30	1:30	3:30	5:30	7:30	9:30	11:06
1	Highland	♿	7:33	9:33	11:33	1:33	3:33	5:33	7:33	9:33	11:08
1	West Roxbury	♿	7:35	9:35	11:35	1:35	3:35	5:35	7:35	9:35	11:10
2	Hersey	♿	7:39	9:39	11:39	1:39	3:39	5:39	7:39	9:39	11:15
2	Needham Junction	♿	7:42	9:42	11:42	1:42	3:42	5:42	7:42	9:42	11:18
2	Needham Center	♿	7:46	9:46	11:46	1:46	3:46	5:46	7:46	9:46	11:21
2	Needham Heights	♿	7:50	9:50	11:50	1:50	3:50	5:50	7:50	9:50	11:25

Keep in Mind:

This schedule will be effective from June 22, 2020 and will replace the schedule of October 21, 2019

Presidents' Day and 4th of July operate on a **Saturday service schedule.**

New Year's Day, Memorial Day, Labor Day, Thanksgiving Day, and Christmas Day operate on a **Sunday service schedule**.

For all other holiday schedules, please check MBTA.com/holidays or call 617-222-3200.

For the latest information regarding weekend disruptions, visit MBTA.com/weekend.

For additional service to Ruggles Station, refer to the Providence and Franklin Line schedules for particular trains.

Times in purple with "f" indicate a flag stop: Passengers must tell the conductor that they wish to leave. Passengers waiting to board must be visible on the platform for the train to stop.

Times in blue indicate an early departure (L stop): The train may leave ahead of schedule at these stops.

Bikes: Bicycles are allowed on trains with the bicycle symbol shown below the train number.

High level platform and bridge plate available. Visit mbta.com/accessibility for more information.

mbta.com/ridesafer

Face coverings are required

Buy tickets with mTicket

Wash hands before and after riding

Socially distance whenever possible

Massachusetts Bay Transportation Authority

KEOLIS

Visit MBTA.com

Customer Service 617-222-3200

Download the Commuter Rail App

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AD062220V1

Needham

Connecting Newton Highlands Green Line station to the Needham Crossing area

Temporary Schedule Effective Date: 06-08-2020

Seating limited for physical distancing.

Follow protocols below to request an assigned seat.

This shuttle operates **Monday-Friday only**.

All times are approximate. **Arrive 5+ minutes early**.

For an accessible (lift-equipped) bus, contact us 24+ hours in advance.

AM

BUS NUMBER	001
DEPART CORNER OF LINCOLN & WALNUT Newton Highlands Pickup Location	**see below**
ARRIVE 320 NEEDHAM ST The Bulfinch Companies	**see below**
ARRIVE 152 SECOND AVE Atrius Health	**see below**
ARRIVE 254 SECOND AVE 254 Second Ave	**see below**
ARRIVE 75 SECOND AVE The Bulfinch Companies	**see below**
ARRIVE 50 CABOT ST Direct Federal Credit Union	**see below**
ARRIVE 200 FIRST AVE Homewood Suites	**see below**
ARRIVE 250 FIRST AVE The Bulfinch Companies	**see below**

BUS NUMBER	001
ARRIVE 189 B ST NBC Universal	**see below**
ARRIVE 89 A ST MCPF-Needham, LLC	**see below**
ARRIVE 110 A ST Intex	**see below**
ARRIVE 63 KENDRICK ST Charles River Place	**see below**
ARRIVE 117 KENDRICK ST The Bulfinch Companies	**see below**
ARRIVE 140 KENDRICK ST Boston Properties	**see below**

Needham

Connecting Newton Highlands Green Line station to the Needham Crossing area

Temporary Schedule Effective Date: 06-08-2020

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Follow protocols below to request an assigned seat.

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All times are approximate. **Arrive 5+ minutes early**.

For an accessible (lift-equipped) bus, contact us 24+ hours in advance.

PM

BUS NUMBER	001
DEPART 63 KENDRICK ST Charles River Place	**see below**
DEPART 117 KENDRICK ST The Bulfinch Companies	**see below**
DEPART 140 KENDRICK ST Boston Properties	**see below**
DEPART 89 A ST MCPF-Needham, LLC	**see below**
DEPART 189 B ST NBC Universal	**see below**
DEPART 110 A ST Intex	**see below**
DEPART 250 FIRST AVE The Bulfinch Companies	**see below**
DEPART 200 FIRST AVE Homewood Suites	**see below**

BUS NUMBER	001
DEPART 50 CABOT ST Direct Federal Credit Union	see below
DEPART 75 SECOND AVE The Bulfinch Companies	see below
DEPART 152 SECOND AVE Atrius Health	see below
DEPART 254 SECOND AVE 254 Second Ave	see below
DEPART 320 NEEDHAM ST The Bulfinch Companies	see below
ARRIVE NEWTON HIGHLANDS	see below

A.M. Departures

from Newton Highlands

7:30 AM	*last drop-off no later than*	**8:00 AM**
8:50 AM	*last drop-off no later than*	**9:25 AM**

Exact arrival times depend upon the stops needed by that day's riders.

No advance reservation needed for A.M. travel. The Shuttle Driver will assign you a seat immediately prior to departure from Newton Highlands.

P.M. Pickups

returning to Newton Highlands

trip begins	**4:00 PM**	*arrives at Alewife by approximately*	**4:30 PM**
trip begins	**5:15 PM**	*arrives at Alewife by approximately*	**5:50 PM**

Each afternoon/evening, shuttles will only stop at those sites for which riders have requested a pickup.

You can request pickup at one of these times between 5:00 AM EST and 12:00 PM (noon) EST.

In order to submit your request, fill out the form below. (This form is also available **here**.)

After you submit your request, you will receive an email from the 128BC team confirming your pickup time.

Download this temporary schedule and all Safe Shuttle Rider Protocols applicable to the Needham Shuttle (also listed below).

Request P.M. Pickup

Each afternoon/evening, 128 Business Council shuttles on multi-stop routes will only stop at those pickup sites for which riders have requested a pickup. **Evening pickup requests can only be made for the current day between 5:00 A.M. EST and 12:00 P.M. EST.** You do not need to use this form for A.M. travel.

How does the seat request process work?

What if I need to change my reservation?

Note: You cannot reserve more than one seat for a single evening. If you submit this request form multiple times in the same day, we will honor the last request submitted.

Shuttle Route (required)

Each shuttle is limited to eight riders to provide for safe physical distancing on board. If requests exceed this capacity, we will assign seats based on the order in which requests were received and may need to contact you about an alternate pickup time.

We need your contact information to follow up with you about your pickup request.

Rider Name (required)

Email (required)

Mobile Phone Number

Member Company

SUBMIT

COVID-19 Protocols

General Protocols

- **All 128BC/The Grid services will be fare-free until further notice.** We are working on developing contact-free methods of fare payment that will be safe for our riders and operators.
- **If telework is an option, consider staying home.** We can **work with your employer** to develop an office-wide telework plan, as well as other health & safety protocols.
- **If you are ill, definitely stay home.** Your Driver cannot assign a seat on the shuttle to anyone clearly displaying COVID-19 symptoms, including repeated coughing, difficulty breathing, blue lips or face, repeated shaking, or vomiting. You can find a complete list of symptoms associated with COVID-19 **here**.
- **Wear a mask to protect those around you**, including our drivers and other shuttle riders. You must wear a mask even if you feel healthy, as those with COVID-19 may experience little to no symptoms while still shedding infectious respiratory droplets.
- **Make sure your mask fits properly.** Your mask should fit snugly over the bridge of your nose and extend down under your chin, covering your mouth and nose completely. (**What does a properly fitting mask look like?**)
- **Do not let your mask hang below your nose, and do not wear it around your neck.** If you need to remove your mask, take it off completely and place it into a clean bag or container, isolated from other items. Improper use of a mask creates risk for cross-contamination.
- **Do not eat or drink in the waiting area or on the shuttle**, as this would require you to remove or compromise your mask.
- **Wash your hands frequently** throughout the day. Hand sanitizer is also available inside the entrance of each shuttle.

Morning Protocols

- **Needham Shuttle riders do not need to request a ride in the morning.** A seat will be assigned to you before you board the shuttle.
- **Head to the shuttle stop located on Walnut Street** after you arrive at Newton Highlands. The boarding area is curbside in front of a small park.
- **Find the bright green 6-foot distance sidewalk decals.** Feel feel to move around as needed to avoid foot traffic on Walnut Street, but return to one of these decals when you see your shuttle approaching.
- **Do not try to board early.** Your driver needs to exit the shuttle and assign each rider a seat prior to inviting each rider to board.
- **Remain standing on your green sidewalk decal as you check in with the driver.** The driver will ask for your destination and initials in order to create each trip's seat assignment list.
- **When invited by the Driver, go straight to your assigned seat.** If you are heading to the *last* stop, you will be asked to board first and assigned a seat at the back of the bus. If you are heading to the *first* stop, you will be asked to board last and assigned a seat at the front of the bus. (**What does the seating layout look like?**)
- **Do not stand up until it's your turn to exit.** We are working hard to maximize the space between riders and minimize riders having to pass one another in close quarters. Do your part by staying in your assigned seat and exercising patience when exiting the vehicle. (**Need help visualizing these boarding patterns?**)
- **Let the riders in front of you exit the bus first** when the shuttle pulls into your stop. The rider in the highest numbered seat (closest to the front) should exit first.
- **Allow more than 6 feet of space in the aisle** when following others off the vehicle. (**How far is 6 feet?**)

Evening Protocols

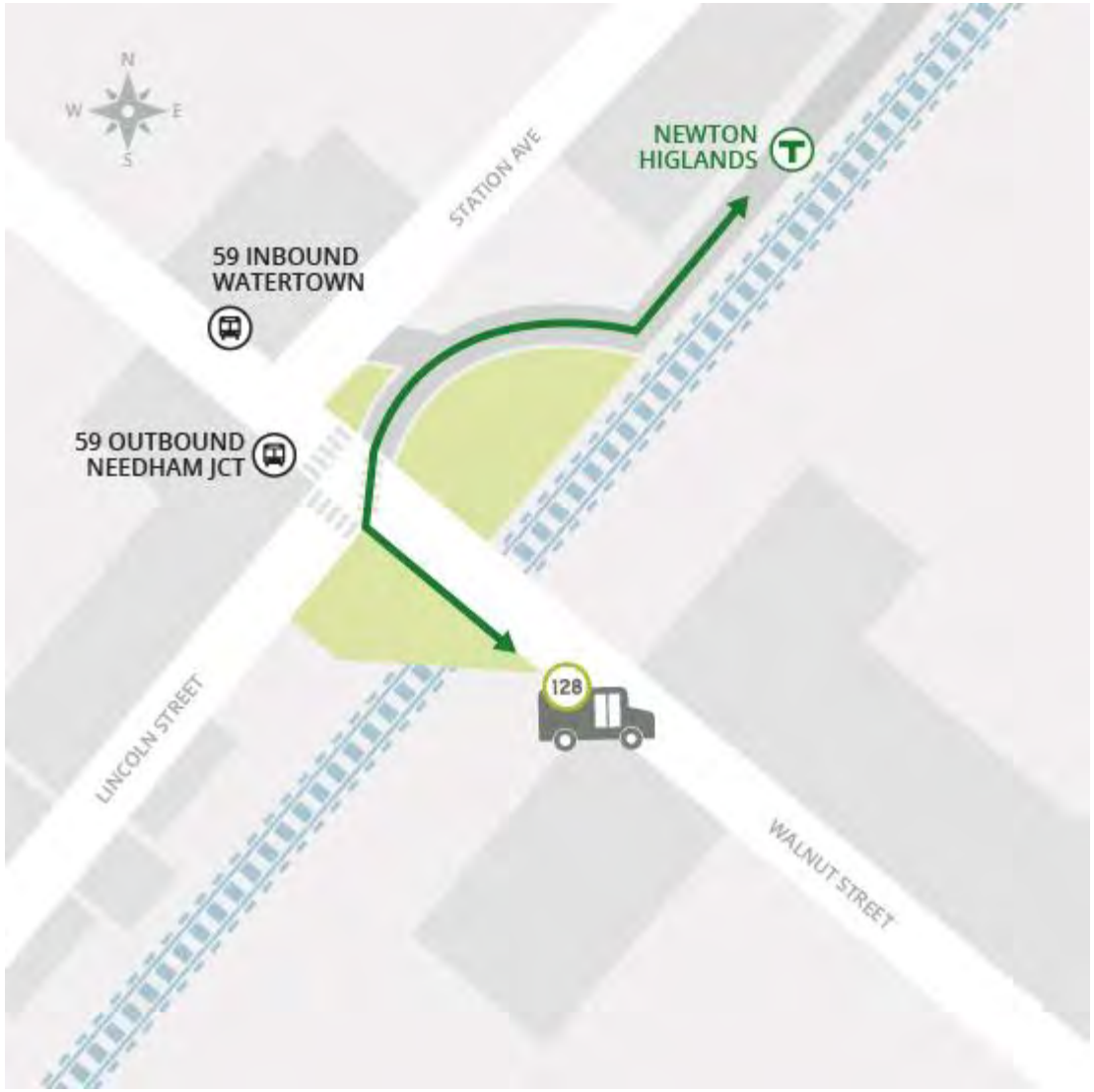
- **Do not forget to request a seat by 12:00 PM EST.** Each afternoon/evening, shuttles will

only stop at those sites for which riders have requested a pickup. **Afternoon/evening pickup requests** for the current day's pickups can be made beginning at 5:00 AM EST.

- **Arrive at least 5 minutes early** to the shuttle waiting area. Give yourself plenty of time so that you don't have to rush.
- **Maintain at least a 6-foot distance** from other waiting riders. For reference, six feet is a little more than the length of a bicycle and a little less than the length of a full-size bed. We can also work with your employer to demarcate 6-foot waiting areas as part of **creating a worksite health & safety plan**.
- **Do not approach the bus until the driver opens the door.** Once the driver opens the door, approach the bus one at a time, and exercise patience to avoid crowding other riders.
- **Go immediately to the lowest-numbered available seat**, as far to the back of the shuttle as possible. This will ensure that seats further forward are available to riders at later stops, eliminating the need for riders to pass one another in close quarters.
- **Do not stand up until it's your turn to exit.** We are working hard to maximize the space between riders and minimize riders having to pass one another in close quarters. Do your part by staying in your seat and exercising patience when exiting the vehicle.
- **Let the riders in front of you exit the bus first** when the shuttle pulls into the station. The rider in the highest numbered seat (closest to the front) should exit first.
- **Allow more than 6 feet of space in the aisle** when following others off the vehicle.

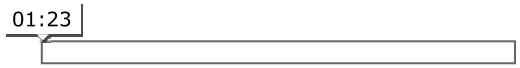
Learn more about all of our Safe Shuttle protocols.

Station Pickup Location



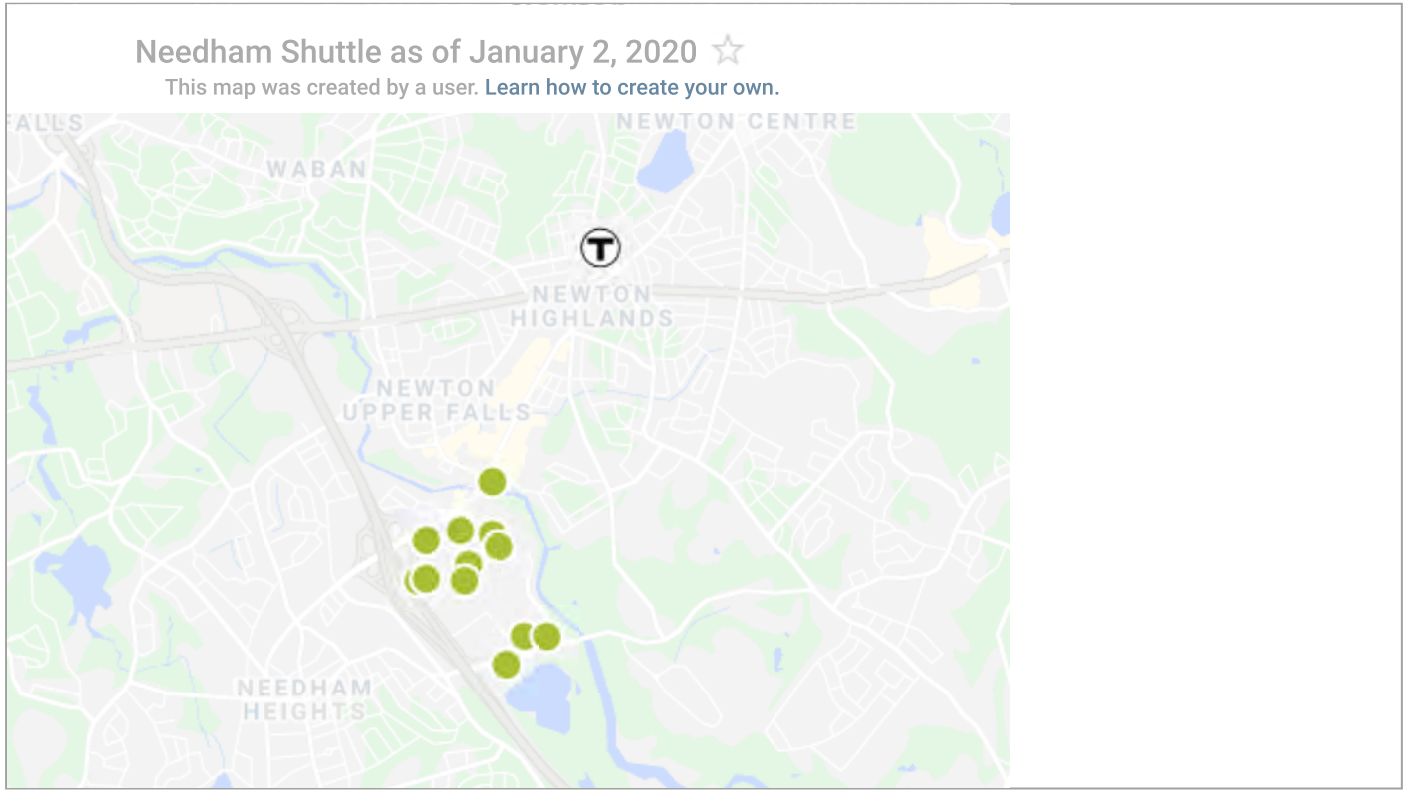
Newton Highlands Station Pickup Location – 128 Business Council

from **Unlock the Grid**

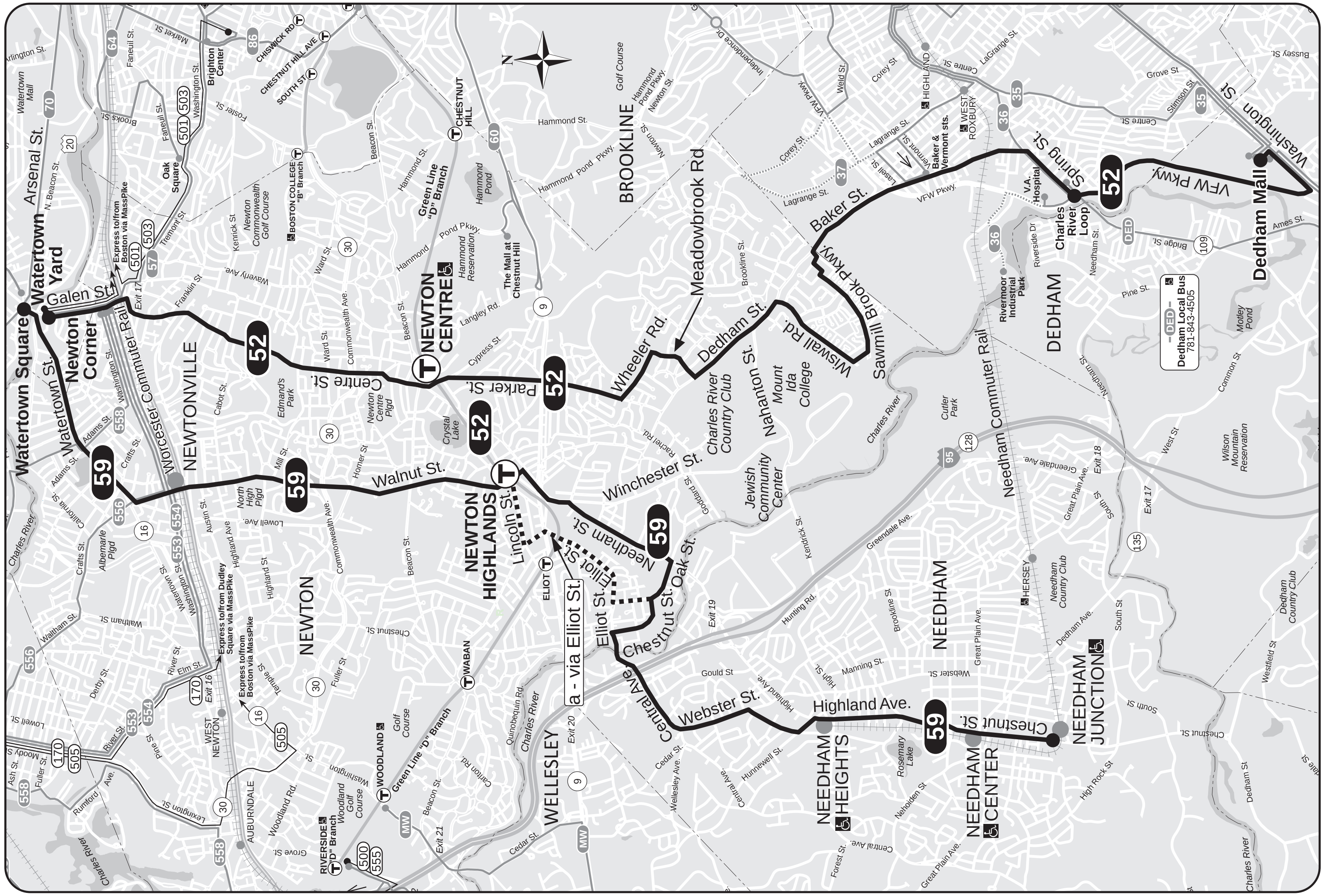


Service Area Map

All of the stops currently served by **Needham Shuttle** are shown in green below.
Click on any stop icon for address, member company, and route information.



Route 52 Dedham Mall - Watertown Yard
Route 59 Needham Junction - Watertown Square



Schedule Change

52•59

Effective August 30, 2020

52 Dedham Mall - Watertown Yard

59 Needham Junction-Watertown Square

Serving

- Newton Centre
- Oak Hill
- Newton Corner
- Jewish Community Center
- BC Law School
- Needham Center
- Needham Heights
- Newton Highlands
- Newtonville
- Green Line
- Needham Commuter Rail
- Worcester Commuter Rail

Massachusetts Bay Transportation Authority

massDOT Massachusetts Department of Transportation

Information 617-222-3200 • 1-800-392-6100
(TTY) 617-222-5146 • www.mbta.com

52 Weekday

Inbound				Outbound			
Leave Dedham Mall	Lv/Arrive Charles River	Arrive Newton Center	Arrive Watertown Yard	Leave Watertown Yard	Arrive Newton Center	Arrive Charles River	Arrive Dedham Mall
.....	6:15A	6:34A	6:45A	**7:00A**	**7:11A**	**7:38A**	**.....**
.....	6:45	7:08	7:22	**8:40**	**8:54**	**9:14**	**9:22A**
.....	7:45	8:12	8:29				
				s 2:57P	**3:11P**	**3:35P**	**3:45P**
.....	**2:36P**	**3:01P**	**3:18P**	**4:48**	**5:04**	**5:30**	**5:40**
4:00P	**4:04**	**4:28**	**4:41**	**6:35**	**6:44**	**7:06**	**.....**
5:50	**5:54**	**6:16**	**6:28**				

s - Does NOT run during school vacation

No Route 52 service on Saturday or Sunday

Route 52
Dedham Mall - Watertown Yard

59 Weekday

Inbound			Outbound		
Leave Needham Junction	Arrive Newton Highlands	Arrive Watertown Square	Leave Watertown Square	Arrive Newton Highlands	Arrive Needham Junction
6:20A	6:38A	6:55A	6:05A	6:18A	6:37A
6:50	7:09	7:30	6:35	6:48	7:07
a7:20	7:41	8:02	7:05	7:25	7:44
7:55	8:17	8:39	7:35	7:55	8:15
a 8:25	8:51	9:10	8:10	8:30	8:50
9:00	9:19	9:36	8:45	9:04	9:24
9:35	9:54	10:11	9:25	9:44	10:04
10:10	10:29	10:46	10:05	10:22	10:42
10:55	11:14	11:31	10:55	11:12	11:33
11:45	**12:04P**	**12:21P**	11:45	**12:02P**	**12:23P**
12:35P	**12:54**	**1:11**	**12:35P**	**12:52**	**1:13**
1:25	**1:44**	**2:01**	**1:25**	**1:42**	**2:03**
2:15	**2:34**	**2:51**	**2:10**	**2:27**	**2:52**
3:10	**3:33**	**3:56**	**3:00**	**3:20**	**3:45**
4:00	**4:22**	**4:44**	**3:50**	**4:10**	**4:35**
4:50	**5:13**	**5:33**	**a 4:30**	**4:50**	**5:14**
5:25	**5:48**	**6:08**	**5:05**	**5:28**	**5:53**
6:05	**6:28**	**6:46**	**a 5:45**	**6:08**	**6:32**
6:40	**6:58**	**7:16**	**6:25**	**6:42**	**7:05**
7:15	**7:31**	**7:46**	**7:00**	**7:16**	**7:39**
7:50	**8:07**	**8:22**			

a - Via Elliot St.

Route 59
Needham Junction- Watertown Square

59 Saturday

Inbound			Outbound		
Leave Needham Junction	Arrive Newton Highlands	Arrive Watertown Square	Leave Watertown Square	Arrive Newton Highlands	Arrive Needham Junction
7:05A	7:23A	7:36A	6:20A	6:35A	6:49A
8:35	8:55	9:10	7:50	8:05	8:22
10:05	10:28	10:45	9:20	9:35	9:56
11:36	**12:01P**	**12:18P**	10:50	11:05	11:30
1:10P	**1:35P**	**1:50P**	**12:22P**	**12:37P**	**1:02P**
2:40	**3:02**	**3:17**	**1:55**	**2:10**	**2:31**
4:10	**4:31**	**4:46**	**3:25**	**3:40**	**3:59**
5:40	**6:01**	**6:15**	**4:55**	**5:10**	**5:29**
7:05	**7:25**	**7:39**	**6:25**	**6:40**	**6:57**

59 Sunday

Inbound			Outbound		
Leave Needham Junction	Arrive Newton Highlands	Arrive Watertown Square	Leave Watertown Square	Arrive Newton Highlands	Arrive Needham Junction
7:50A	8:07A	8:20A	7:05A	7:17A	7:33A
9:20	9:39	9:53	8:35	8:47	9:05
10:50	11:09	11:23	10:05	10:18	10:38
			11:35	11:48	12:08
12:20P	**12:40P**	**12:56P**			
1:50	**2:08**	**2:24**	**1:05P**	**1:18P**	**1:38P**
3:20	**3:39**	**3:56**	**2:35**	**2:48**	**3:08**
4:50	**5:09**	**5:25**	**4:05**	**4:18**	**4:38**
6:20	**6:39**	**6:55**	**5:35**	**5:49**	**6:09**

All buses are accessible to persons with disabilities

Fare	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
CharlieCard	$1.70	$1.70	$2.40	$2.40
CharlieTicket	$2.00	$2.00	$2.90	$4.90
Cash-on-Board	$2.00	$4.00	$2.90	$4.90
Student/Youth*	$0.85	$0.85	$1.10	$1.10
Senior/TAP**	$0.85	$0.85	$1.10	$1.10

VALID PASSES: LinkPass ($90.00/mo.); Local Bus ($55/mo.); *Student/Youth LinkPass ($30.00/mo.); **Senior/TAP LinkPass ($30/mo.); and express bus, commuter rail, and boat passes.
FREE FARES: Children 11 and under ride free when accompanied by an adult; Blind Access CharlieCard holders ride free and if using a guide, the guide rides free.
* Requires Student CharlieCard or Youth CharlieCard. Student CharlieCards are available to students through participating middle schools and high schools. Youth CharlieCards are available through community partners in the Boston metro area. Visit www.mbta.com/youthpass for details.
** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities.

Fall 2020 & Winter 2021 Holidays
9/7/20: Sunday; 10/12/20 & 11/11/20: Weekday
11/26/20, 12/25/20, & 1/1/21: Sun; 1/18/21 & 2/15/21: Sat

Fares

PRICE PER TRIP	Local Bus	Bus + Bus	Rapid Transit	Bus + Rapid Transit
CharlieCard	$1.70	$1.70	$2.40	$2.40
CharlieTicket	$2.00	$2.00	$2.90	$4.90***
Cash-on-Board	$2.00	$4.00	$2.90	$4.90***
Student/Youth*	$0.85	$0.85	$1.10	$1.10
Senior/TAP**	$0.85	$0.85	$1.10	$1.10
UNLIMITED TRIP PASSES				
1-Day	$12.75	$12.75	$12.75	$12.75
7-Day	$22.50	$22.50	$22.50	$22.50
Monthly	$55.00	$55.00	$90.00	$90.00
Senior/TAP Monthly	$30.00/month for unlimited travel on Local Bus and Rapid Transit			

VALID PASSES: LinkPass ($84.50/mo.); Student /Youth LinkPass* ($30/mo.) ; Senior/TAP LinkPass* ($30/mo.); and express bus, commuter rail, and boat passes.

FREE FARES: Children 11 and under ride free when accompanied by an adult; Blind Access CharlieCard holders ride free: if using a guide, the guide rides free

* Requires Student CharlieCard or Youth CharlieCard. Student CharlieCards are available to students through participating middle schools and high schools. Youth CharlieCards are available through community partners in the Boston metro area. Visit www.mbta.com/youthpass for details.

** Requires Senior/TAP CharlieCard, available to Medicare cardholders, seniors 65+, and persons with disabilities.

*** For Silver Line SL4 or SL5 pay $2.75. Also see "transfers."

TRANSFERS
If paying with a CharlieTicket or CharlieCard, discounted transfers that are available are automatic — just use the same ticket or card throughout your trip. If paying with cash onboard a vehicle, free transfers are only allowed between rapid transit lines and inside paid platform areas at gated stations.

SCHEDULES
Schedules are available at the following stations: Park Street, Airport, Malden, Harvard, Haymarket (Green Line Level), Back Bay and Downtown Crossing (Orange Line Level) or see station personnel. Schedules also available at the Transportation Building (10 Park Plaza), 45 High St, and online at mbta.com.

For real-time subway and bus tracking, download the Transit app on any smartphone.

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Rapid Transit

Effective August 30, 2020

Massachusetts Bay Transportation Authority
massDOT Massachusetts Department of Transportation

Information 617-222-3200 • 1-800-392-6100
(TTY) 617-222-5146 • www.mbta.com

Rapid Transit Line	Weekday				Saturday			Sunday		
	First Trip	Peak	Off Peak	Last Trip	First Trip	Arriving Every	Last Trip	First Trip	Arriving Every	Last Trip
Red Line										
Alewife	5:24 AM	9	12-16	12:20 AM	5:24 AM	12-16	12:20 AM	6:08AM	12-16	12:20 AM
Braintree	5:08 AM	mins	mins	12:17 AM	5:09 AM	mins	12:17 AM	6:00AM	mins	12:17 AM
Alewife	5:16 AM	9	12-16	w 12:27 AM	5:16 AM	12-16	w 12:27 AM	6:00AM	12-16	w 12:27 AM
Ashmont	5:16 AM	mins	mins	w 12:30 AM	5:16 AM	mins	w 12:30 AM	6:00AM	mins	w 12:30 AM
"M" Ashmont	5:17 AM	5	8-12 Day	w 1:05 AM	5:15 AM	8-12 Day	w 1:05 AM	6:03AM	8-12 Day	w 1:05 AM
Mattapan	5:05 AM	mins	26 Late	12:53 AM	5:05 AM	26 Early/Late	12:53 AM	5:51AM	26 Early/Late	12:53 AM
Blue Line										
Wonderland	5:13 AM	5	9-13	12:28 AM	5:25 AM	9-13	12:28 AM	5:58AM	9-13	12:28 AM
Orient Heights	5:14 AM	mins	mins	12:33 AM	5:13 AM	mins	12:33 AM	6:03AM	mins	12:33 AM
Bowdoin	5:30 AM			w 1:00 AM	5:29 AM		w 1:00 AM	6:21AM		w 1:00 AM
Orange Line										
Oak Grove	5:16 AM	6	9-11	w 12:30 AM	5:16 AM	9-11	w 12:30 AM	6:00AM	9-11	w 12:30 AM
Forest Hills	5:16 AM	mins	mins	w 12:28 AM	5:16 AM	mins	w 12:28 AM	6:00AM	mins	w 12:28 AM
Green Line*										
B Boston College	5:01 AM	5-6	7-9	12:10 AM	4:45 AM [2]	7-8	12:09 AM	5:20AM [2]	9	12:10 AM
Park Street	5:45 AM	mins	mins	w 12:52 AM	5:40 AM	mins	w 12:52 AM	6:12AM	mins	w 12:52 AM
C Cleveland Circle	4:57 AM [1]	6-8	9-11	12:07 AM	4:50 AM [2]	9-10	12:10 AM	5:30AM [2]	10	12:10 AM
North Station	5:48 AM	mins	mins	w 12:46 AM	5:30 AM	mins	w 12:46 AM	6:06AM	mins	w 12:46 AM
D Riverside	4:56 AM	6	8-11	12:05 AM	4:55 AM	8-9	12:02 AM	5:25AM	11-12	12:05 AM
Government Ctr.	5:45 AM	mins	mins	w 12:49 AM	5:38 AM	mins	w 12:49 AM	6:10AM	mins	w 12:49 AM
E Lechmere *	5:00 AM [4]	6-7	8-10	12:30 AM	5:01 AM	10	12:30 AM	5:35AM	12	12:30 AM
Heath Street	5:45 AM	mins	mins	12:47 AM [3]	5:39 AM	mins	12:47 AM [3]	6:15AM	mins	12:47 AM [3]
Silver Line										
SL1 Logan Airport	5:38 AM	7-12	10-12	f 1:03 AM	5:48 AM	10-12	1:15 AM	5:50AM	10-12	f 1:12 AM
South Station	5:40 AM	mins	mins	w 1:02 AM	5:45 AM	mins	w 12:59 AM	6:12AM	mins	w 1:00 AM
SL2 Design Center	6:07 AM	6	14-16	12:37 AM	6:03 AM	14-16	12:35 AM	6:51AM	14-16	12:51 AM
South Station	5:44 AM	mins	mins	12:50 AM	5:47 AM	mins	12:45 AM	6:35AM	mins	12:36 AM
	4:55 AM	6-11	8-13	f 1:05 AM	5:30 AM	8-13	1:22 AM	6:26AM	8-13	f 1:25 AM
SL3 Chelsea Station	4:20 AM	mins	mins	w 12:35 AM	4:56 AM	mins	w 12:55 AM	5:53AM	mins	w 12:55 AM
South Station										
SL4 Nubian Station	5:20 AM	6-11	6-11	12:20 AM	5:23 AM	13-20	12:20 AM	6:02AM	13-20	12:20 AM
South Station	5:38 AM	mins	mins	12:37 AM	5:40 AM	mins	12:40 AM	6:20AM	mins	12:40 AM
SL5 Nubian Station	5:15 AM	11-14	13-20	12:51 AM	5:19 AM	6-11	12:43 AM	6:00AM	6-11	12:25 AM
Downtown Xing	5:32 AM	mins	mins	w 1:07 AM	5:34 AM	mins	w 1:00 AM	6:16AM	mins	w 12:47 AM

Peak Service:
Weekdays 7 AM - 9 AM, 4 PM - 6:30 PM

Green Line Notes:

New and ongoing infrastucture projects may result in diversions on some branches at various times.

See GL service changes at mbta.com/GLwork

View service alerts at mbta.com/alerts

* E trains start/end at North Station for Green Line Extension work – shuttles provided between North Station and Lechmere.

More: mbta.com/GLEwork

1 - The first two C train AM northbound trips run through to Lechmere Station on weekdays.

2 - The first B and second C train AM northbound trips run through to Lechmere Station on weekends.

3 - On weekdays the 12:27 AM trip (weekends the 12:32 AM trip) from Heath St is the last connecting train to other lines downtown. The 12:37AM and 12:47AM trips (weekends the 12:47AM trip) from Heath St. runs in service to Lechmere with no guaranteed connections.

4 - Early morning service from Lechmere to Riverside departs Lechmere at 5:00 AM.

f - After exiting Ted Williams Tunnel bus will only service World Trade Center and South Station stops.

w - Last trips wait at some stations, primarily in the Downtown area, for connecting service. Departure times are approximate.

Fall 2020 & Winter 2021 Holidays
9/7/20: Sunday; 10/12/20 & 11/11/20: Weekday
11/26/20, 12/25/20, & 1/1/21: Sun; 1/18/21 & 2/15/21: Sat

TRAFFIC-COUNT DATA

Count Dates: Wednesday, October 21, 2015
Wednesday, December 9, 2015

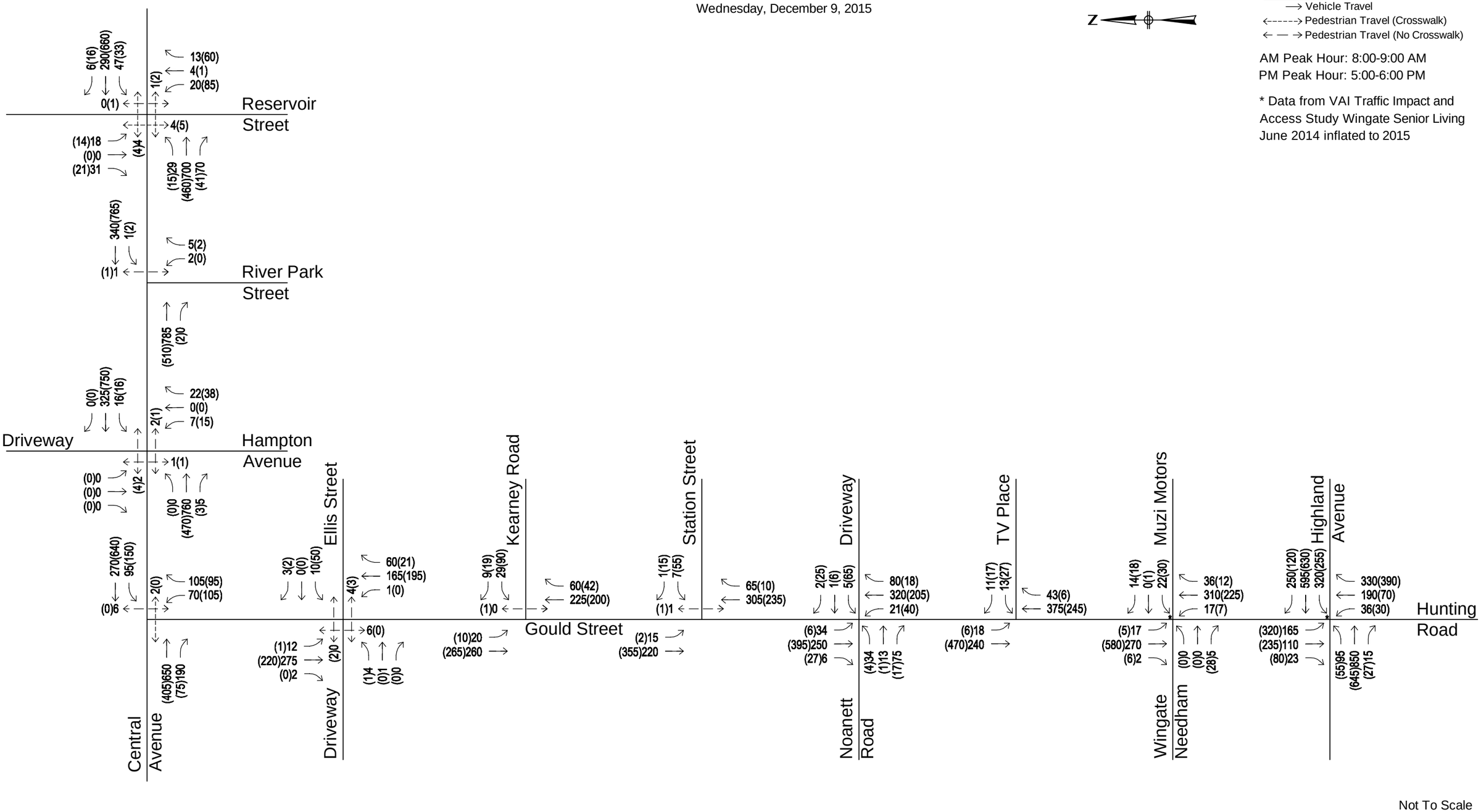
N

Legend:

⟶ Vehicle Travel
<------> Pedestrian Travel (Crosswalk)
← — → Pedestrian Travel (No Crosswalk)

AM Peak Hour: 8:00-9:00 AM
PM Peak Hour: 5:00-6:00 PM

* Data from VAI Traffic Impact and Access Study Wingate Senior Living June 2014 inflated to 2015



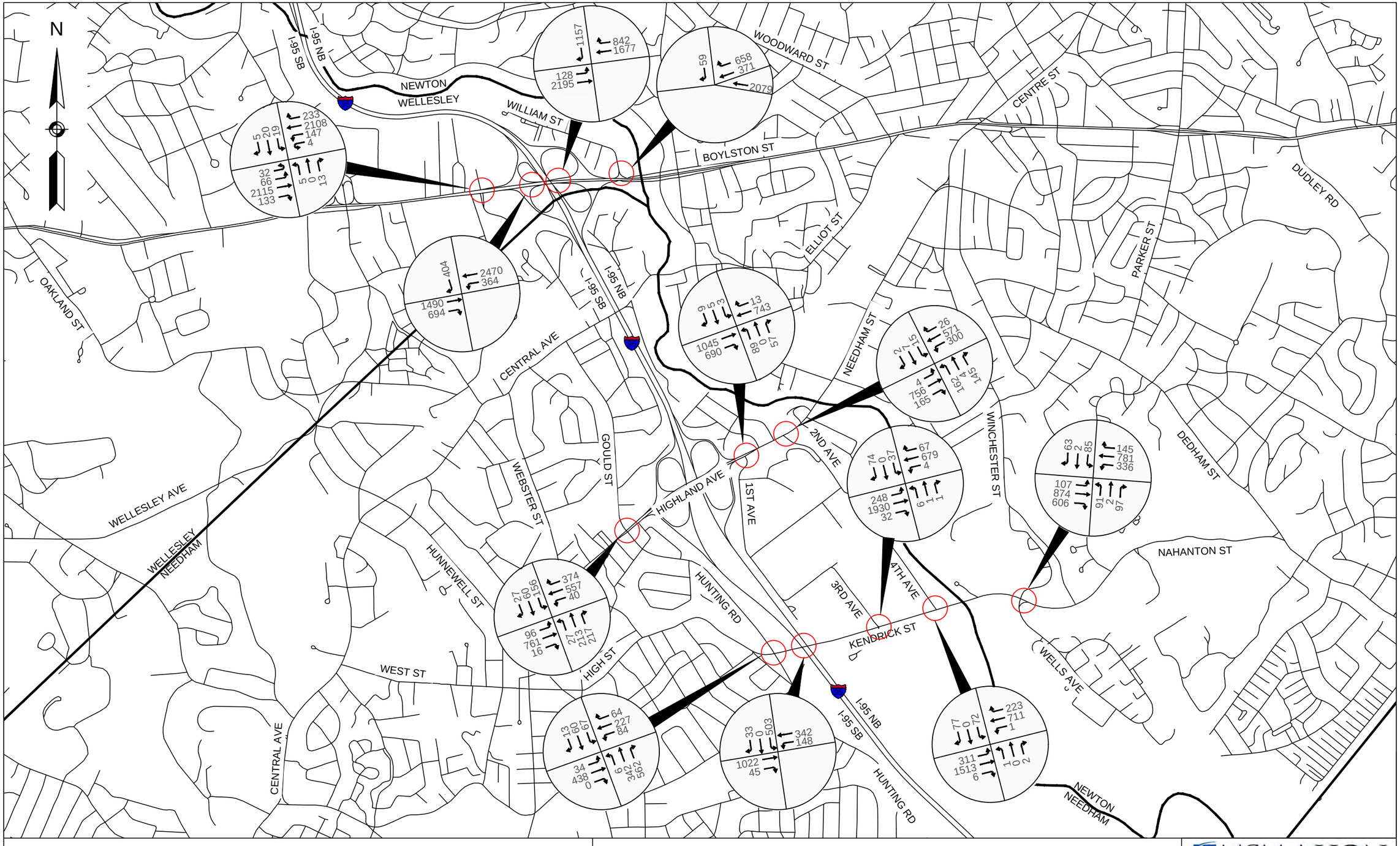
Not To Scale

BETA
www.BETA-Inc.com

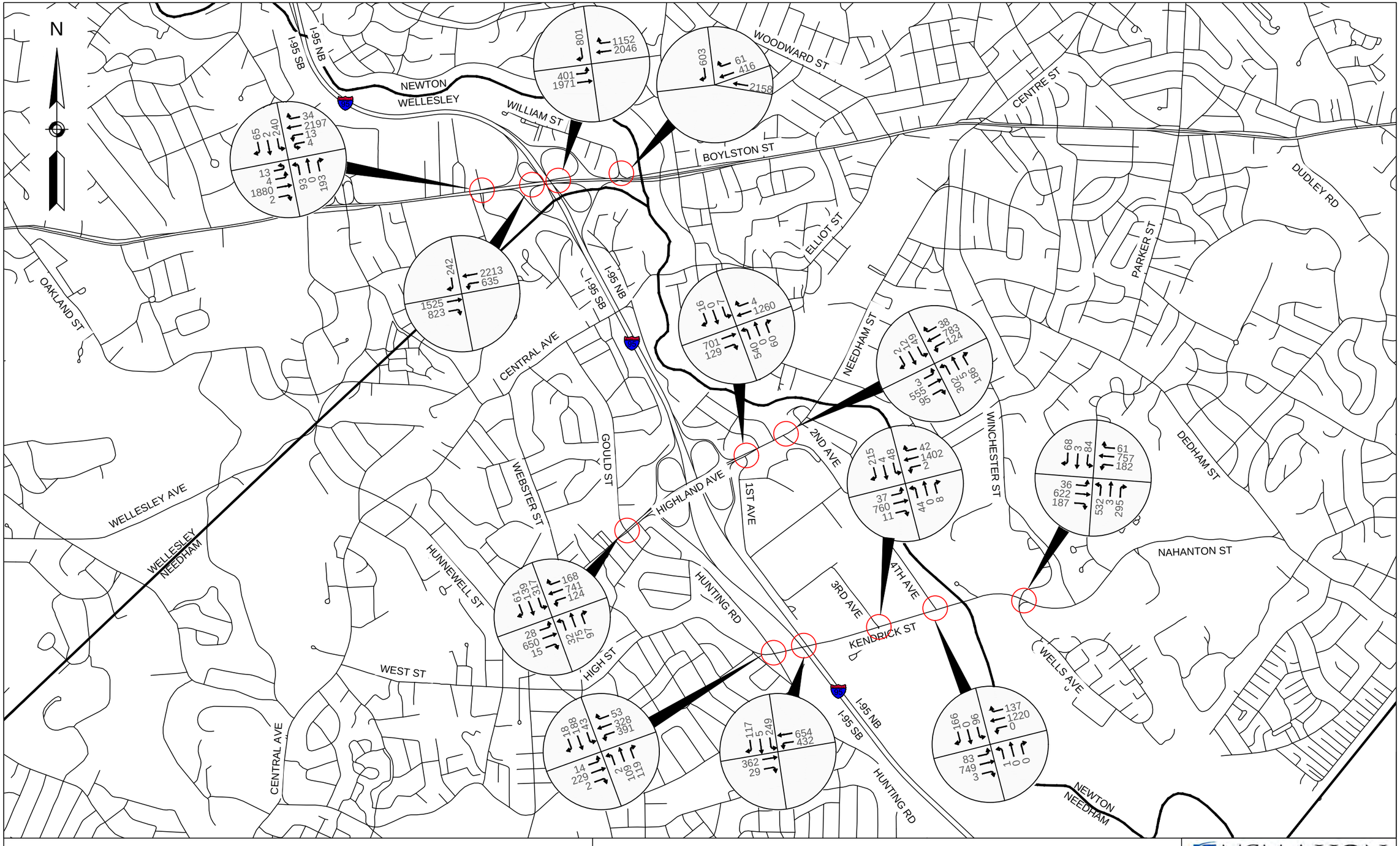
TRAFFIC IMPACT STUDY GOULD AND RESERVOIR INDUSTRIAL DISTRICT
Needham, MA

Figure 2
Study Area Intersection
AM(PM) Peak Hour Volumes
2015 Existing

O:\5100s\5178 - Needham - Gould St Traffic\Drawing Files\Miscellaneous\5178 TMC.dwg Dec 18,2015 8:32am



2019 POST CONSTRUCTION WEEKDAY MORNING PEAK HOUR TRAFFIC VOLUMES	ROUTE 128 ADD-A-LANE AFTER STUDY NEEDHAM, MASSACHUSETTS	McMAHON TRANSPORTATION ENGINEERS & PLANNERS

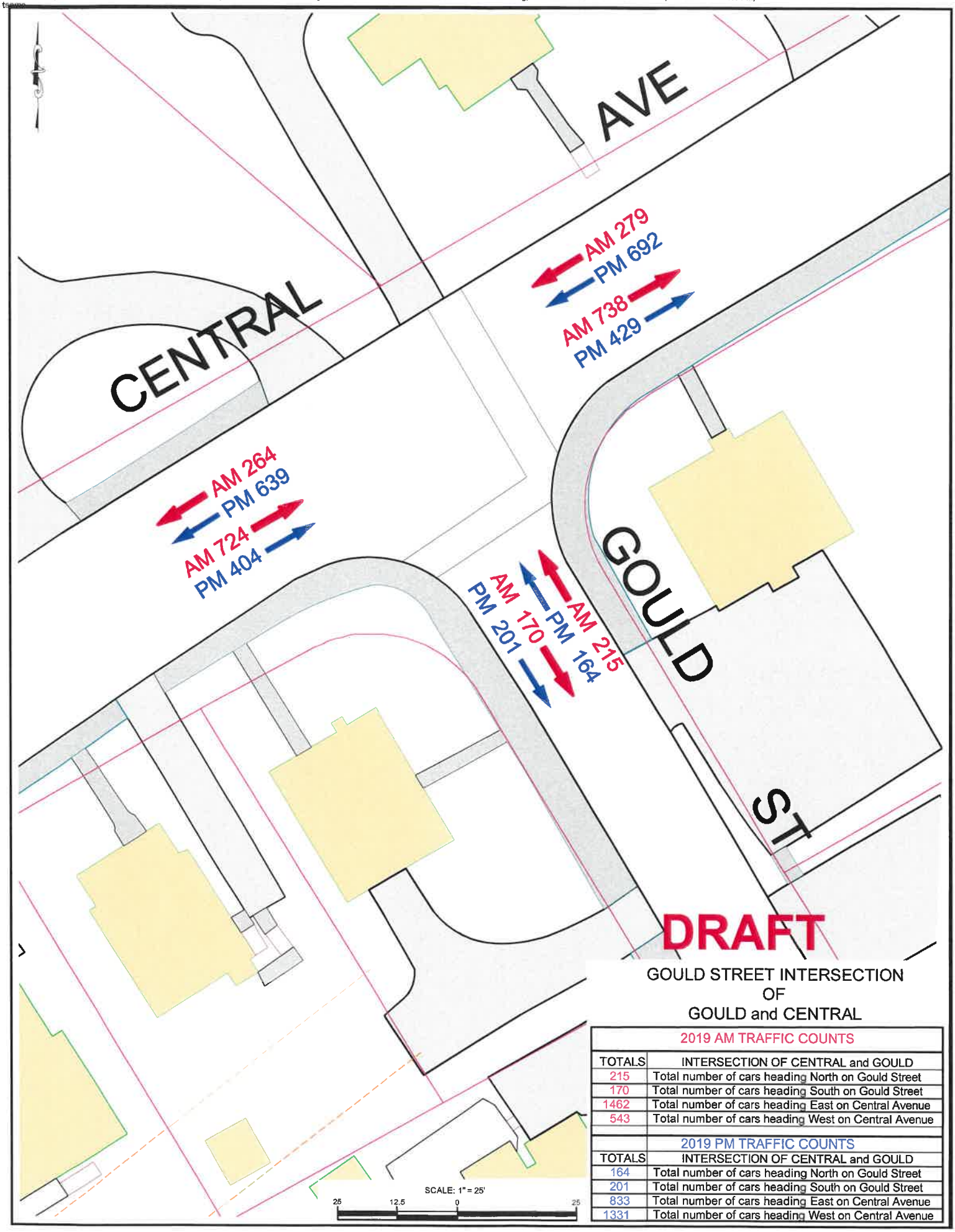


2019 POST CONSTRUCTION WEEKDAY AFTERNOON
PEAK HOUR TRAFFIC VOLUMES

ROUTE 128 ADD-A-LANE AFTER STUDY
NEEDHAM, MASSACHUSETTS

McMAHON
TRANSPORTATION ENGINEERS & PLANNERS

T:\Engineering\DPW Eng Branches\CAD-Drafting\CadProjects\Gould Street\Drafting\Gould St at Central Ave and Ellis St Traffic Counts.dwg, Central-AM-PM Traffic Count-8.5 x11, 2/24/2020 12:01:43 PM,

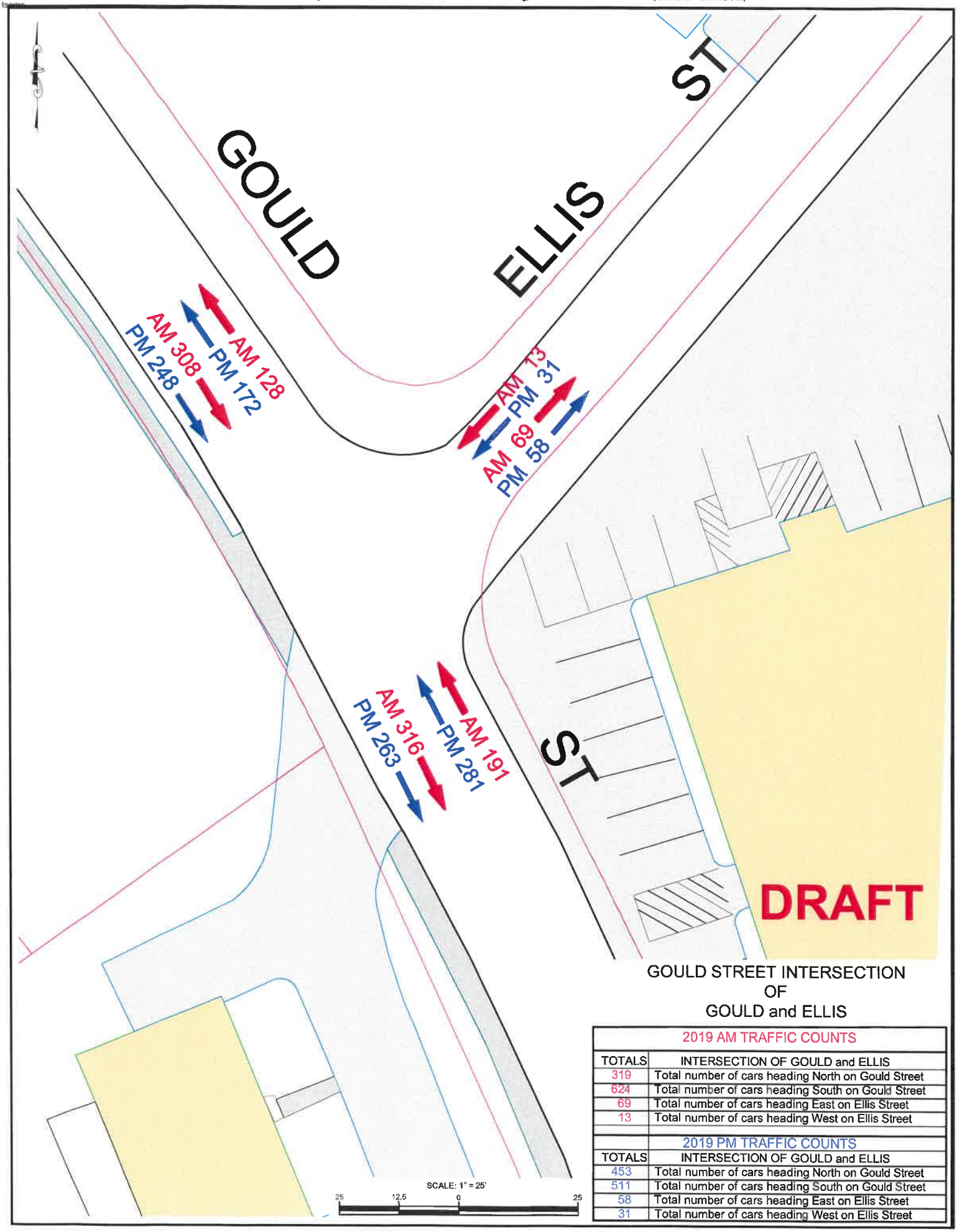


GOULD STREET INTERSECTION
OF
GOULD and CENTRAL

2019 AM TRAFFIC COUNTS	
TOTALS	INTERSECTION OF CENTRAL and GOULD
215	Total number of cars heading North on Gould Street
170	Total number of cars heading South on Gould Street
1462	Total number of cars heading East on Central Avenue
543	Total number of cars heading West on Central Avenue

	2019 PM TRAFFIC COUNTS
TOTALS	INTERSECTION OF CENTRAL and GOULD
164	Total number of cars heading North on Gould Street
201	Total number of cars heading South on Gould Street
833	Total number of cars heading East on Central Avenue
1331	Total number of cars heading West on Central Avenue

T:\Engineering\DPW Eng Branches\CAD-Drafting\CadProjects\Gould Street\Drafting\Gould St at Central Ave and Ellis St Traffic Counts.dwg, Ellis-AM-PM Traffic Count-8.5 x11, 2/24/2020 12:03:02 PM,



GOULD STREET INTERSECTION
OF
GOULD and ELLIS

2019 AM TRAFFIC COUNTS	
TOTALS	INTERSECTION OF GOULD and ELLIS
319	Total number of cars heading North on Gould Street
624	Total number of cars heading South on Gould Street
69	Total number of cars heading East on Ellis Street
13	Total number of cars heading West on Ellis Street

2019 PM TRAFFIC COUNTS	
TOTALS	INTERSECTION OF GOULD and ELLIS
453	Total number of cars heading North on Gould Street
511	Total number of cars heading South on Gould Street
58	Total number of cars heading East on Ellis Street
31	Total number of cars heading West on Ellis Street

CRASH RATE WORKSHEETS

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Needham COUNT DATE : 2015 grown to 2020

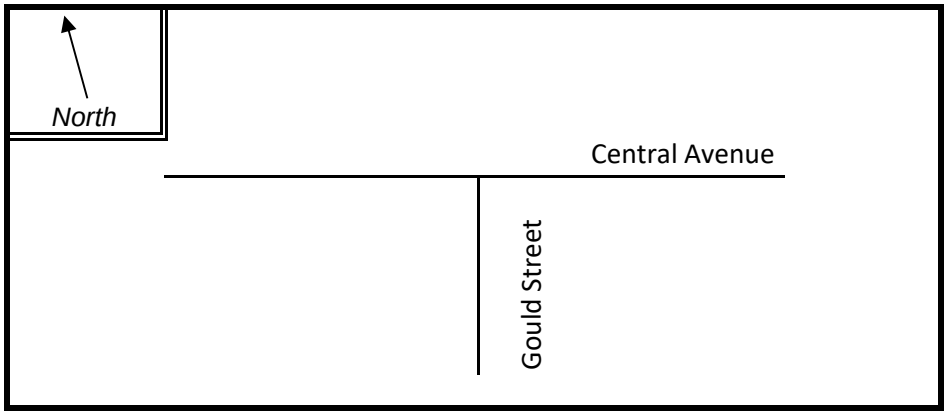
DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Central Avenue

MINOR STREET(S) : Gould Street

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM/PM) :	480	790	200			**1,470**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**16,333**

TOTAL # OF CRASHES :	14	# OF YEARS :	5	AVERAGE # OF CRASHES PER YEAR (**A**) :	**2.80**

CRASH RATE CALCULATION : **0.47**

$$\text{RATE} = \frac{(A * 1{,}000{,}000)}{(V * 365)}$$

Comments : K-value based on MassDOT default value

Project Title & Date: NEX-2020218.00 - Muzi Motors Redevelopment - Needham, MA

MassDOT Crash Data
Central Avenue / Gould Street

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway	Near Intersection Roadway
02/05/2015	Thursday	Not Reported	Closed	7:29 AM	2	D1: (Unknown) / D2: (Unknown)		Daylight	Rear-end	Snow	0	0	No controls	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: W / V2: Not Reported	Snow/ Sleet, hail (freezing rain or drizzle)	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AV / GOULD ST	
06/20/2015	Saturday	Property damage only (none injured)	Closed	8:59 AM	2	D1: (No improper driving) / D2: (Failed to yield right of way),(Distracted)	D1: External distraction (outside the vehicle)	Daylight	Angle	Dry	0	0	Stop signs	V1: Travelling straight ahead / V2: Turning right	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: N / V2: E	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	152	CENTRAL AVE	
09/03/2015	Thursday	Non-fatal injury	Closed	1:35 PM	2	D1: (No improper driving) / D2: (Failed to yield right of way)		Daylight	Angle	Dry	0	3	Stop signs	V1: Travelling straight ahead / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	152	CENTRAL AVENUE	
05/11/2017	Thursday	Property damage only (none injured)	Closed	10:42 AM	2	D1: (Failed to yield right of way) / D2: (No improper driving)		Daylight	Angle	Dry	0	0	Stop signs	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: E	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AVE / GOULD ST	
05/11/2017	Thursday	Property damage only (none injured)	Closed	12:59 PM	2	D1: (No improper driving) / D2: (No improper driving)		Daylight	Rear-end	Dry	0	0	Stop signs	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AVE / GOULD ST	
05/26/2017	Friday	Property damage only (none injured)	Closed	4:44 PM	2	D1: (Disregarded traffic signs, signals, road markings) / D2: (No improper driving)		Daylight	Angle	Wet	0	0	Stop signs	V1: Turning right / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: E	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	152	CENTRAL AVE	
05/27/2017	Saturday	Non-fatal injury	Closed	12:16 PM	2	D1: (Failed to yield right of way) / D2: (No improper driving)		Daylight	Angle	Dry	0	1	Stop signs	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AVE / GOULD ST	
09/25/2017	Monday	Property damage only (none injured)	Closed	12:36 PM	2	D1: (Inattention) / D2: (No improper driving)		Daylight	Angle	Dry	0	0	Stop signs	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: N / V2: E	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AVE / GOULD ST	

MassDOT Crash Data
Central Avenue / Gould Street

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway	Near Intersection Roadway
12/06/2017	Wednesday	Property damage only (none injured)	Closed	4:58 PM	2	D1: (Failed to yield right of way) / D2: (No improper driving)		Dark - lighted roadway	Angle	Dry	0	0	Stop signs	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: S	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AVE / GOULD ST	
07/11/2018	Wednesday	Property damage only (none injured)	Open	4:16 PM	2	D1: (No improper driving) / D2: (Failed to yield right of way),(Inattention)		Daylight	Angle	Dry	0	0	Stop signs	V1: Travelling straight ahead / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AVE / GOULD ST	
07/24/2018	Tuesday	Property damage only (none injured)	Open	4:15 PM	2	D1: (No improper driving) / D2: (Failed to yield right of way)		Daylight	Angle	Dry	0	0	Stop signs	V1: Travelling straight ahead / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AVE / GOULD ST	
09/05/2018	Wednesday	Property damage only (none injured)	Open	5:21 PM	2	D1: (Unknown) / D2: (Failed to yield right of way)		Daylight	Angle	Dry	0	0	Stop signs	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	152	CENTRAL AVE	GOULD ST
06/07/2019	Friday	Property damage only (none injured)	Open	10:25 AM	2	D1: (No improper driving) / D2: (Failed to yield right of way)		Daylight	Angle		0	0	Stop signs	V1: Travelling straight ahead / V2: Turning left	V1:(Passenger car) / V2:(Unknown heavy truck, cannot classify)	V1: N / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AVENUE / GOULD STREET	
07/15/2019	Monday	Property damage only (none injured)	Open	12:45 PM	2	D1: (No improper driving) / D2: (Inattention)		Daylight	Angle	Dry	0	0	No controls	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: E / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		GOULD ST / CENTRAL AVE	

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Needham COUNT DATE : 2015 grown to 2020

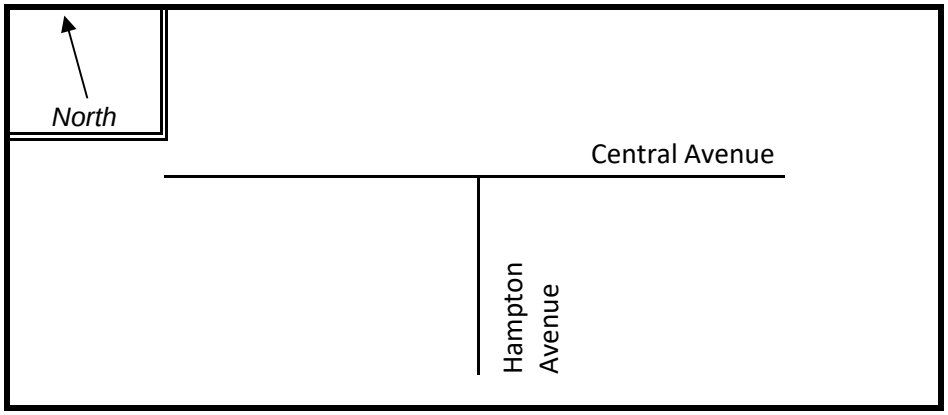
DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Central Avenue

MINOR STREET(S) : Hampton Avenue

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM/PM) :	473	766	53			**1,292**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **14,356**

TOTAL # OF CRASHES : 1 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.20**

CRASH RATE CALCULATION : **0.04** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : K-value based on MassDOT default value

Project Title & Date: NEX-2020218.00 - Muzi Motors Redevelopment - Needham, MA

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Needham COUNT DATE : 2015 grown to 2020

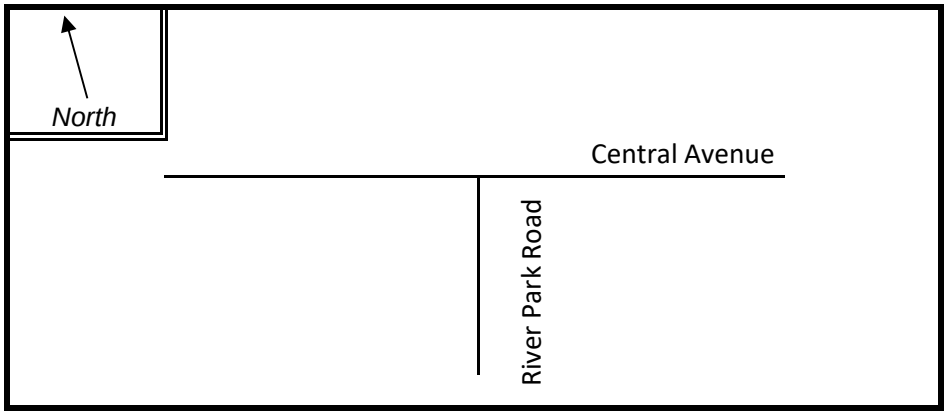
DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Central Avenue

MINOR STREET(S) : River Park Road

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM/PM) :	512	767	2			**1,281**

" K " FACTOR :	**0.090**	INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME :	**14,233**

TOTAL # OF CRASHES :	3	# OF YEARS :	5	AVERAGE # OF CRASHES PER YEAR (**A**) :	**0.60**

CRASH RATE CALCULATION : **0.12** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : K-value based on MassDOT default value

Project Title & Date: NEX-2020218.00 - Muzi Motors Redevelopment - Needham, MA

MassDOT Crash Data
Central Avenue / Hampton Avenue
Central Avenue / River Park Street

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway	Near Intersection Roadway
Central Avenue / Hampton Avenue																							
05/30/2019	Thursday	Non-fatal injury	Open	9:13 AM	2	D1: (Followed too closely) / D2: (No improper driving)		Daylight	Rear-end		0	2	No controls	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Passenger car)	V1: W / V2: W	Cloudy	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	110	CENTRAL AVE	HAMPTON AVE
Central Avenue / River Park Street																							
01/26/2015	Monday	Property damage only (none injured)	Closed	9:50 AM	2	D1: (Followed too closely) / D2: (No improper driving)		Daylight	Rear-end	Dry	0	0	No controls	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Cloudy/ Cloudy	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		CENTRAL AVE / RIVER PARK ST	
08/04/2015	Tuesday	Property damage only (none injured)	Closed	7:04 PM	3	D1: (No improper driving) / D2: (No improper driving) / D3: (No improper driving)		Other	Rear-end	Wet	0	0	No controls	V1: Travelling straight ahead / V2: Travelling straight ahead / V3: Travelling straight ahead	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility)) / V3:(Light truck(van, mini-van, pickup, sport utility))	V1: S / V2: S / V3: S	Rain/ Severe crosswinds	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic) V3:(Collision with motor vehicle in traffic)	89	CENTRAL AVE	
04/04/2016	Monday	Property damage only (none injured)	Closed	1:12 PM	1	D1: (No improper driving)		Daylight	Single vehicle crash	Snow	0	0	No controls	V1: Travelling straight ahead	V1:(Passenger car)	V1: W	Snow/ Sleet, hail (freezing rain or drizzle)	No hit and run	No, school bus not involved	V1:(Collision with tree)	89	CENTRAL AVE	

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Needham COUNT DATE : 2015 grown to 2020

DISTRICT : 6 UNSIGNALIZED : SIGNALIZED : X

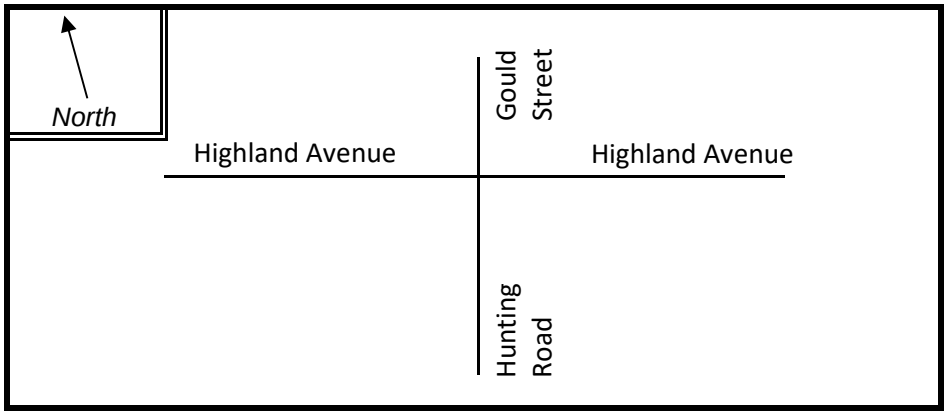
~ INTERSECTION DATA ~

MAJOR STREET : Highland Avenue

MINOR STREET(S) : Gould Street

Hunting Road

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM/PM) :	693	1,033	204	517		**2,447**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **27,189**

TOTAL # OF CRASHES : 46 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **9.20**

CRASH RATE CALCULATION : **0.93** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : K-value based on MassDOT default value

Project Title & Date: NEX-2020218.00 - Muzi Motors Redevelopment - Needham, MA

MassDOT Crash Data
Highland Avenue / Gould Street / Hunting Road

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway	Near Intersection Roadway
01/10/2015	Saturday	Property damage only (none injured)	Closed	10:16 PM	3	D1: (Other improper action) / D2: (No improper driving) / D3: (No improper driving)		Dark - lighted roadway	Rear-end	Sand, mud, dirt, oil, gravel	0	0	Traffic control signal	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic / V3: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car) / V3:(Light truck(van, mini-van, pickup, sport utility))	V1: N / V2: N / V3: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic) V3:(Collision with motor vehicle in traffic)		HIGHLAND AVE / HUNTING RD	
02/16/2015	Monday	Property damage only (none injured)	Closed	2:01 PM	2	D1: (No improper driving) / D2: (Followed too closely)		Daylight	Rear-end	Wet	0	0	Traffic control signal	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: S / V2: Not Reported	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		HIGHLAND AVE / GOULD ST	
08/05/2015	Wednesday	Property damage only (none injured)	Closed	11:03 AM	2	D1: (Followed too closely) / D2: (No improper driving)		Daylight	Rear-end	Dry	0	0	No controls	V1: Entering traffic lane / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: W / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with other movable object) V2:(Collision with other movable object)	557	HIGHLAND AVENUE	
08/18/2015	Tuesday	Property damage only (none injured)	Closed	12:02 PM	2	D1: (No improper driving) / D2: (Disregarded traffic signs, signals, road markings)		Daylight	Angle	Dry	0	0	Traffic control signal	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Bus (seats for 9-15 people, including driver))	V1: S / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		GOULD STREET / HIGHLAND AVENUE	
10/28/2015	Wednesday	Property damage only (none injured)	Closed	1:15 PM	2	D1: (No improper driving) / D2: (Distracted),(Inattention)		Daylight	Rear-end	Dry	0	0	No controls	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	
10/28/2015	Wednesday	Property damage only (none injured)	Closed	5:22 PM	2	D1: (Unknown) / D2: (No improper driving)		Dusk	Rear-end	Wet	0	0	No controls	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Rain/Other	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	501	HIGHLAND AVE	
11/05/2015	Thursday	Property damage only (none injured)	Closed	6:00 PM	2	D1: (Inattention),(Followed too closely) / D2: (No improper driving)	D1: Other activity (searching, eating, personal hygiene, etc.)	Dark - lighted roadway	Rear-end	Dry	0	0	No controls	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: E	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	580	HIGHLAND AVE	
12/09/2015	Wednesday	Property damage only (none injured)	Closed	8:41 AM	2	D1: (Unknown) / D2: (No improper driving)		Daylight	Sideswipe, same direction	Dry	0	0	No controls	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Single-unit truck (2-axle, 6-tires))	V1: W / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVENUE	

MassDOT Crash Data
Highland Avenue / Gould Street / Hunting Road

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway	Near Intersection Roadway
01/11/2016	Monday	Property damage only (none injured)	Closed	3:31 PM	2	D1: (No improper driving) / D2: (Other improper action)		Daylight	Unknown	Dry	0	0	No controls	V1: Travelling straight ahead / V2: Changing lanes	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: E	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	557	HIGHLAND AVENUE	
01/27/2016	Wednesday	Not Reported	Closed	6:42 PM	1	D1: (Failure to keep in proper lane or running off road),(Inattention)		Dark - lighted roadway	Single vehicle crash	Dry	0	0	No controls	V1: Changing lanes	V1:(Passenger car)	V1: S	Clear	No hit and run	No, school bus not involved	V1:(Collision with curb),(Collision with guardrail)	557	HIGHLAND AVE	
04/05/2016	Tuesday	Property damage only (none injured)	Closed	11:22 AM	2	D1: (No improper driving) / D2: (Inattention)		Daylight	Angle	Dry	0	0	Traffic control signal	V1: Turning left / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		HIGHLAND AVE / GOULD ST	
07/13/2016	Wednesday	Non-fatal injury	Closed	9:09 PM	1	D1: (Swerving or avoiding due to wind, slippery surface, vehicle, object, non-motorist in roadway, etc)		Dark - lighted roadway	Single vehicle crash	Dry	0	1	Traffic control signal	V1: Turning left	V1:(Passenger car)	V1: S	Clear	No hit and run	No, school bus not involved	V1:(Collision with utility pole)	580	HIGHLAND AVE	
08/24/2016	Wednesday	Property damage only (none injured)	Closed	4:14 PM	2	D1: (No improper driving) / D2: (No improper driving)		Daylight	Rear-end	Dry	0	0	Traffic control signal	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	
09/24/2016	Saturday	Property damage only (none injured)	Closed	1:58 PM	1	D1: (No improper driving)		Unknown	Unknown	Dry	0	0	Unknown	V1: Unknown	V1:(Passenger car)	V1: E	Clear	No hit and run	No, school bus not involved		557	HIGHLAND AVE	
10/23/2016	Sunday	Property damage only (none injured)	Closed	3:34 PM	2	D1: (Disregarded traffic signs, signals, road markings) / D2: (No improper driving)		Daylight	Single vehicle crash	Dry	0	0	Traffic control signal	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: E / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	
11/11/2016	Friday	Property damage only (none injured)	Closed	1:49 PM	2	D1: (No improper driving) / D2: (No improper driving)		Daylight	Sideswipe, same direction	Dry	0	0	Traffic control signal	V1: Turning left / V2: Turning left	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: S / V2: Not Reported	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		HIGHLAND AVE / GOULD ST	

MassDOT Crash Data
Highland Avenue / Gould Street / Hunting Road

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway	Near Intersection Roadway
11/19/2016	Saturday	Property damage only (none injured)	Closed	3:55 PM	1	D1: (No improper driving)	D1: External distraction (outside the vehicle)	Daylight	Single vehicle crash	Dry	0	0	No controls	V1: Travelling straight ahead	V1:(Passenger car)	V1: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	
11/30/2016	Wednesday	Non-fatal injury	Closed	12:46 PM	2	D1: (No improper driving) / D2: (Failed to yield right of way),(Disregarded traffic signs, signals, road markings)		Daylight	Angle	Dry	0	1	Yield signs	V1: Travelling straight ahead / V2: Entering traffic lane	V1:(Truck/trailer) / V2:(Passenger car)	V1: W / V2: S	Cloudy	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	501	HIGHLAND AVENUE	
03/01/2017	Wednesday	Property damage only (none injured)	Closed	1:31 PM	2	D1: (Disregarded traffic signs, signals, road markings) / D2: (No improper driving)		Daylight	Sideswipe, same direction	Dry	0	0	Traffic control signal	V1: Overtaking/ passing / V2: Turning right	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	580	HIGHLAND AVE	HUNTING RD
04/22/2017	Saturday	Property damage only (none injured)	Closed	4:01 PM	2	D1: (Inattention) / D2: (No improper driving)		Daylight	Rear-end	Dry	0	0	Stop signs	V1: Entering traffic lane / V2: Entering traffic lane	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Cloudy	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	HIGHLAND AVE
05/09/2017	Tuesday	Non-fatal injury	Closed	5:26 PM	2	D1: (Followed too closely) / D2: (No improper driving)		Daylight	Rear-end	Dry	0	1	No controls	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: E / V2: E	Cloudy	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVENUE	
10/03/2017	Tuesday	Property damage only (none injured)	Closed	7:00 PM	2	D1: (Inattention) / D2: (No improper driving)		Dark - lighted roadway	Rear-end	Dry	0	0	Yield signs	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	
11/18/2017	Saturday	Property damage only (none injured)	Closed	10:55 PM	2	D1: (No improper driving) / D2: (Inattention)	D1: Manually operating an electronic device	Dark - lighted roadway	Angle	Wet	0	0	Traffic control signal	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: S	Rain	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	GOULD ST
11/22/2017	Wednesday	Property damage only (none injured)	Closed	5:32 PM	2	D1: (Other improper action) / D2: (No improper driving)	D1: Other activity (searching, eating, personal hygiene, etc.)	Dark - lighted roadway	Rear-end	Wet	0	0	Traffic control signal	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: S / V2: S	Rain	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	557	HIGHLAND AVE	

MassDOT Crash Data
Highland Avenue / Gould Street / Hunting Road

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway	Near Intersection Roadway
03/22/2018	Thursday	Property damage only (none injured)	Open	4:40 PM	2	D1: (No improper driving) / D2: (Failed to yield right of way)		Daylight	Sideswipe, same direction	Wet	0	0	No controls	V1: Travelling straight ahead / V2: Turning right	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Passenger car)	V1: S / V2: S	Cloudy	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	
05/04/2018	Friday	Property damage only (none injured)	Open	6:00 PM	2	D1: (No improper driving) / D2: (Distracted)	D1: External distraction (outside the vehicle)	Daylight	Rear-end	Dry	0	0	Traffic control signal	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: E	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	
06/27/2018	Wednesday	Non-fatal injury	Open	7:23 AM	2	D1: (No improper driving) / D2: (Disregarded traffic signs, signals, road markings)		Daylight	Angle	Dry	0	1	Traffic control signal	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	580	HIGHLAND AVE	
07/13/2018	Friday	Non-fatal injury	Open	5:59 PM	2	D1: (Unknown) / D2: (No improper driving)		Dusk	Rear-end	Dry	0	1	Traffic control signal	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: N / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		HUNTING RD / HIGHLAND AVE	
07/17/2018	Tuesday	Property damage only (none injured)	Open	2:03 AM	1	D1: (Inattention)		Dark - lighted roadway	Single vehicle crash	Dry	0	0	Traffic control signal	V1: Travelling straight ahead	V1:(Single-unit truck (3-or-more axles))	V1: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with overhead sign support),(Collision with highway traffic sign post)	589	HIGHLAND AVE	
07/26/2018	Thursday	Property damage only (none injured)	Open	8:20 AM	2	D1: (Failure to keep in proper lane or running off road) / D2: (No improper driving)		Daylight	Sideswipe, same direction	Dry	0	0	Traffic control signal	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: E	Cloudy	Yes, hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		HIGHLAND AVE / GOULD ST	
08/15/2018	Wednesday	Property damage only (none injured)	Open	9:00 PM	2	D1: (No improper driving) / D2: (Inattention)		Dark - lighted roadway	Rear-end	Dry	0	0	Traffic control signal	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	596	HIGHLAND AVE	
12/12/2018	Wednesday	Property damage only (none injured)	Open	12:11 PM	1	D1: (No improper driving)		Daylight	Sideswipe, same direction	Dry	0	0	Traffic control signal	V1: Turning left	V1:(Passenger car)	V1: S	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic)		HIGHLAND AVE / GOULD ST	

MassDOT Crash Data
Highland Avenue / Gould Street / Hunting Road

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway	Near Intersection Roadway
02/05/2019	Tuesday	Property damage only (none injured)	Open	7:21 PM	1	D1: (No improper driving)		Dark - lighted roadway	Sideswipe, same direction		0	0	Traffic control signal	V1: Travelling straight ahead	V1:(Passenger car)	V1: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic)	589	HIGHLAND AVE	
03/23/2019	Saturday	Property damage only (none injured)	Open	11:04 AM	2	D1: (Unknown) / D2: (Unknown)		Daylight	Sideswipe, same direction	Dry	0	0	Traffic control signal	V1: Turning left / V2: Turning left	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Passenger car)	V1: S / V2: S	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		HIGHLAND AVE / GOULD ST	
04/30/2019	Tuesday	Non-fatal injury	Open	4:49 AM	2	D1: (Unknown) / D2: (Unknown)		Dark - lighted roadway	Angle	Wet	0	1	Traffic control signal	V1: Turning right / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: N	Rain	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		HIGHLAND AVE / GOULD ST	
07/31/2019	Wednesday	Unknown	Open	4:35 PM	1	D1: (No improper driving)		Daylight	Sideswipe, same direction	Wet	0	0	Traffic control signal	V1: Travelling straight ahead	V1:(Passenger car)	V1: W	Clear	Yes, hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic)		HUNTING RD / HIGHLAND AVE	
08/03/2019	Saturday	Property damage only (none injured)	Open	2:55 PM	2	D1: (No improper driving) / D2: (Unknown)		Daylight	Angle	Dry	0	0	Traffic control signal	V1: Turning left / V2: Turning right	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		GOULD ST / HIGHLAND AVE	
12/09/2019	Monday	Property damage only (none injured)	Open	11:10 AM	2	D1: (Failure to keep in proper lane or running off road) / D2: (No improper driving)		Daylight	Sideswipe, same direction	Wet	0	0	Traffic control signal	V1: Turning left / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: E / V2: E	Rain/ Cloudy	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)		HIGHLAND AVE / HUNTING RD	

MassDOT Crash Data
Highland Avenue / Gould Street / Hunting Road

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway	Near Intersection Roadway
06/12/2015	Friday	Non-fatal injury	Closed	11:00 AM	2	D1: (Failed to yield right of way) / D2: (No improper driving)		Daylight	Sideswipe, same direction	Dry	0	2	Not reported	V1: Turning right / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Tractor/ semi-trailer)	V1: W / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	500	HIGHLAND AVENUE	
09/07/2016	Wednesday	Property damage only (none injured)	Closed	11:04 AM	2	D1: (Failure to keep in proper lane or running off road) / D2: (No improper driving)		Daylight	Sideswipe, same direction	Dry	0	0	No controls	V1: Changing lanes / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	500	HIGHLAND AVE	
11/08/2016	Tuesday	Property damage only (none injured)	Closed	4:12 PM	1	D1: (Glare)		Daylight	Single vehicle crash	Dry	0	0	No controls	V1: Travelling straight ahead	V1:(Passenger car)	V1: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with impact attenuator/ crash cushion)	500	HIGHLAND AVE	
01/03/2017	Tuesday	Property damage only (none injured)	Closed	5:30 PM	2	D1: (Failure to keep in proper lane or running off road),(Inattention) / D2: (No improper driving)		Dark - lighted roadway	Sideswipe, same direction	Wet	0	0	No controls	V1: Changing lanes / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Rain	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	500	HIGHLAND AVE	
06/27/2017	Tuesday	Property damage only (none injured)	Closed	9:14 AM	2	D1: (Followed too closely) / D2: (No improper driving)		Daylight	Rear-end	Dry	0	0	No controls	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Cloudy	No hit and run	No, school bus not involved	V1:(Collision with other movable object) V2:(Collision with other movable object)	500	HIGHLAND AVE	
12/07/2017	Thursday	Property damage only (none injured)	Closed	7:29 PM	2	D1: (No improper driving) / D2: (Failure to keep in proper lane or running off road)		Dark - lighted roadway	Sideswipe, same direction	Dry	0	0	Traffic control signal	V1: Turning left / V2: Turning left	V1:(Passenger car) / V2:(Passenger car)	V1: S / V2: S	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	500	HIGHLAND AVE	
03/09/2019	Saturday	Property damage only (none injured)	Open	4:23 PM	2	D1: (No improper driving) / D2: (Inattention),(Followed too closely)	D1: Other activity (searching, eating, personal hygiene, etc.)	Daylight	Rear-end	Dry	0	0	Yield signs	V1: Slowing or stopped in traffic / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: W / V2: W	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	500	HIGHLAND AVE	
09/04/2019	Wednesday	Property damage only (none injured)	Open	5:18 PM	2	D1: (Unknown) / D2: (Unknown)		Daylight	Sideswipe, same direction	Dry	0	0	Traffic control signal	V1: Turning left / V2: Travelling straight ahead	V1:(Light truck(van, mini-van, pickup, sport utility)) / V2:(Passenger car)	V1: W / V2: W	Cloudy	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	500	HIGHLAND AVE	

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Needham COUNT DATE : 2015 grown to 2020

DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

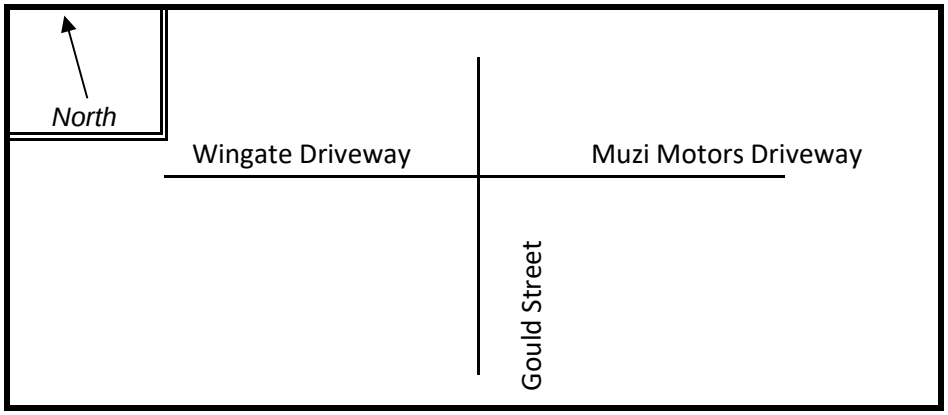
~ INTERSECTION DATA ~

MAJOR STREET : Gould Street

MINOR STREET(S) : Muzi Motors Driveway

Wingate Driveway

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM/PM) :	28	49	244	591		**912**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **10,133**

TOTAL # OF CRASHES : 2 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.40**

CRASH RATE CALCULATION : **0.11** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : K-value based on MassDOT default value

Project Title & Date: NEX-2020218.00 - Muzi Motors Redevelopment - Needham, MA

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Needham COUNT DATE : 2015 grown to 2020

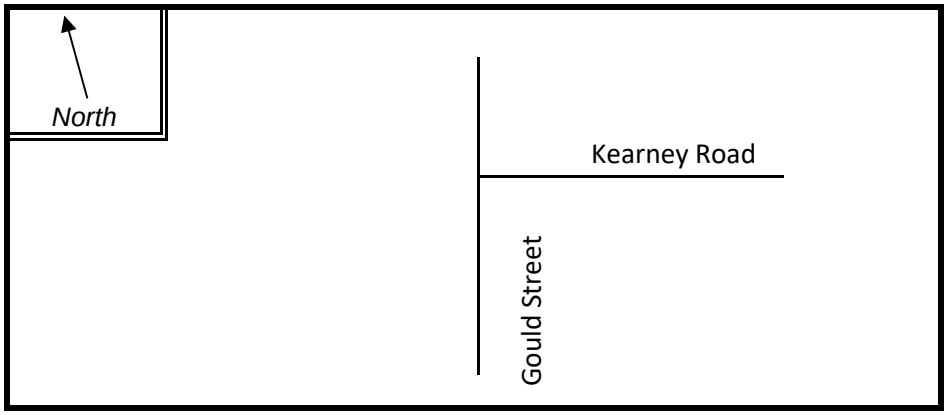
DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : Gould Street

MINOR STREET(S) : Kearney Road

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM/PM) :		109	242	275		**626**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **6,956**

TOTAL # OF CRASHES : 1 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.20**

CRASH RATE CALCULATION : **0.08** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : K-value based on MassDOT default value

Project Title & Date: NEX-2020218.00 - Muzi Motors Redevelopment - Needham, MA

INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Needham COUNT DATE : 2015 grown to 2020

DISTRICT : 6 UNSIGNALIZED : X SIGNALIZED :

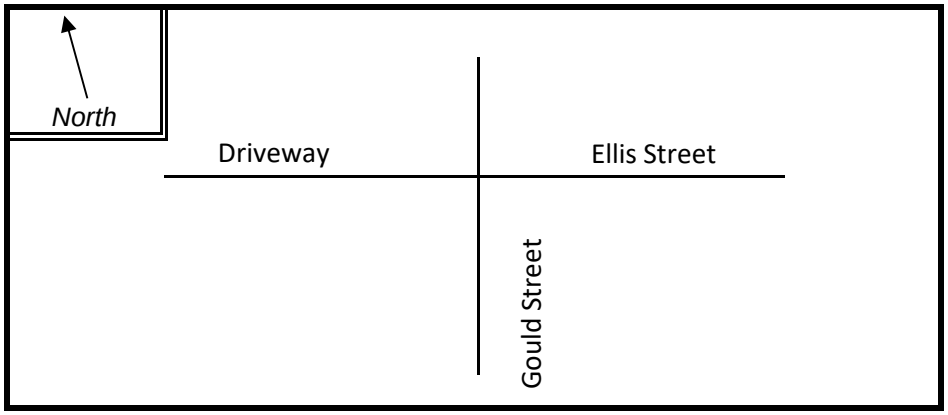
~ INTERSECTION DATA ~

MAJOR STREET : Gould Street

MINOR STREET(S) : Ellis Street

Driveway

INTERSECTION DIAGRAM (Label Approaches)



PEAK HOUR VOLUMES

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	EB	WB	NB	SB		
PEAK HOURLY VOLUMES (AM/PM) :	1	52	216	221		**490**

" K " FACTOR : **0.090** INTERSECTION ADT (**V**) = TOTAL DAILY APPROACH VOLUME : **5,444**

TOTAL # OF CRASHES : 2 # OF YEARS : 5 AVERAGE # OF CRASHES PER YEAR (**A**) : **0.40**

CRASH RATE CALCULATION : **0.20** RATE = $\frac{(A * 1{,}000{,}000)}{(V * 365)}$

Comments : K-value based on MassDOT default value

Project Title & Date: NEX-2020218.00 - Muzi Motors Redevelopment - Needham, MA

MassDOT Crash Data
Gould Street / Wingate Driveway / Muzi Motors Driveway
Gould Street / Kearney Road
Gould Street / Ellis Street / Driveway

Crash Date	Day of Week	Crash Severity	Crash Status	Crash Time	Number of Vehicles	Driver Contributing Circumstances (All Drivers)	Driver Distracted By (All Vehicles)	Light Conditions	Manner of Collision	Road Surface Condition	Total Fatalities	Total Non-Fatal Injuries	Traffic Control Device Type	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Configuration (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Weather Conditions	Hit and Run	School Bus Related	Vehicle Sequence of Events (All Vehicles)	Street Number	Roadway
Gould Steet / Wingate Driveway / Muzi Motors Driveway																						
04/07/2018	Saturday	Unknown	Open	12:17 PM	2	D1: (No improper driving) / D2: (Unknown)		Daylight	Head-on	Dry	0	0	No controls	V1: Entering traffic lane / V2: Unknown	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: S	Clear/ Cloudy	No hit and run	No, school bus not involved	V1:(Collision with unknown movable object) V2:(Collision with motor vehicle in traffic)	235	GOULD ST
09/04/2018	Tuesday	Non-fatal injury	Open	8:49 AM	2	D1: (No improper driving) / D2: (No improper driving)		Daylight	Rear-end	Dry	0	1	No controls	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1:(Passenger car) / V2:(Light truck(van, mini-van, pickup, sport utility))	V1: N / V2: N	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	235	GOULD ST
No collisions at Gould Street / TV Place																						
Gould Steet / Kearney Road																						
03/05/2018	Monday	Property damage only (none injured)	Open	2:03 PM	3	D1: (Operating vehicle in erratic, reckless, careless, negligent or aggressive manner)		Daylight	Single vehicle crash	Dry	0	0	No controls	V1: Travelling straight ahead / V2: Parked / V3: Not reported	V1:(Passenger car) / V2:(Passenger car) / V3:(Passenger car)	V1: S / V2: Not Reported / V3: Not Reported	Cloudy	No hit and run	No, school bus not involved	V1:(Collision with parked motor vehicle)	110	GOULD ST
Gould Steet / Ellis Street / Driveway																						
02/05/2016	Friday	Property damage only (none injured)	Closed	12:14 PM	2	D1: (No improper driving) / D2: (Failed to yield right of way)		Daylight	Angle	Snow	0	0	No controls	V1: Travelling straight ahead / V2: Travelling straight ahead	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: W	Snow	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	99	GOULD ST
04/14/2018	Saturday	Property damage only (none injured)	Open	11:31 AM	2	D1: (Unknown) / D2: (Unknown)		Daylight	Angle	Dry	0	0	Stop signs	V1: Turning right / V2: Turning right	V1:(Passenger car) / V2:(Passenger car)	V1: N / V2: E	Clear	No hit and run	No, school bus not involved	V1:(Collision with motor vehicle in traffic) V2:(Collision with motor vehicle in traffic)	99	GOULD ST

TRIP-GENERATION CALCULATIONS

Size	Units	Land Use
866,342	SF	-
	Units	LUC 221
368,195	SF	LUC 714
368,195	SF	LUC 760
129,951	SF	LUC 820

	Pass-By Rates				
	LUC 221	LUC 714	LUC 760	LUC 820	TOTAL
Weekday Daily	0%	0%	0%	26%	-
Weekday AM	0%	0%	0%	26%	-
Weekday PM	0%	0%	0%	34%	-
Saturday Daily	0%	0%	0%	26%	-
Saturday Midday	0%	0%	0%	26%	-

		Total Trips					External Trips					Pass-By Trips					New Primary Trips				
		LUC 221	LUC 714	LUC 760	LUC 820	TOTAL	LUC 221	LUC 714	LUC 760	LUC 820	TOTAL	LUC 221	LUC 714	LUC 760	LUC 820	TOTAL	LUC 221	LUC 714	LUC 760	LUC 820	TOTAL
Weekday Daily	Entering		1,365	1,986	3,592	6,943	0	956	1,390	2,855	5,201	0	0	0	707	707	0	956	1,390	2,148	4,494
	Exiting		1,365	1,986	3,592	6,943	0	1,065	1,549	2,587	5,201	0	0	0	707	707	0	1,065	1,549	1,880	4,494
	Total	0	2,730	3,972	7,184	13,886	0	2,021	2,939	5,442	10,402	0	0	0	1,414	1,414	0	2,021	2,939	4,028	8,988
Weekday AM Peak Hour	Entering		458	271	135	864	0	432	256	78	766	0	0	0	15	15	0	432	256	63	751
	Exiting		35	56	82	173	0	13	21	41	75	0	0	0	15	15	0	13	21	26	60
	Total	0	493	327	217	1,037	0	445	277	119	841	0	0	0	30	30	0	445	277	89	811
Weekday PM Peak Hour	Entering		49	63	317	429	0	34	43	162	239	0	0	0	80	80	0	34	43	82	159
	Exiting		440	333	343	1,116	0	352	266	308	926	0	0	0	80	80	0	352	266	228	846
	Total	0	489	396	660	1,545	0	386	309	470	1,165	0	0	0	160	160	0	386	309	310	1,005
Saturday Daily	Entering		331	286	5,242	5,859	0	258	223	5,106	5,587	0	0	0	1,328	1,328	0	258	223	3,778	4,259
	Exiting		331	286	5,242	5,859	0	258	223	5,106	5,587	0	0	0	1,328	1,328	0	258	223	3,778	4,259
	Total	0	662	572	10,484	11,718	0	516	446	10,212	11,174	0	0	0	2,656	2,656	0	516	446	7,556	8,518
Saturday Midday Peak Hour	Entering		16	44	396	456	0	10	27	383	420	0	0	0	94	94	0	10	27	289	326
	Exiting		21	44	365	430	0	17	35	342	394	0	0	0	94	94	0	17	35	248	300
	Total	0	37	88	761	886	0	27	62	725	814	0	0	0	188	188	0	27	62	537	626

Institute of Transportation Engineers (ITE)

Land Use Code (LUC) 714 - Corporate Headquarters Building

General Urban/Suburban

Average Vehicle Trips Ends vs: 1000 Sq. Feet Gross Floor Area
Independent Variable (X): 368.195

AVERAGE WEEKDAY DAILY

T = 6.16 * (X) + 462.50
T = 6.16 * 368.195 + 462.50
T = 2730.58
T = 2,730 vehicle trips
with 50% (1,365 vpd) entering and 14% (1,365 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF GENERATOR

Ln T = 0.88 Ln (X) + 1.00
Ln T = 0.88 Ln(368.195) + 1.00
Ln T = 6.20
T = 492.54
T = 493 vehicle trips
with 93% (458 vph) entering and 7% (35 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF GENERATOR

Ln T = 0.95 Ln (X) + 0.58
Ln T = 0.95 Ln(368.195) + 0.58
Ln T = 6.19
T = 489.40
T = 489 vehicle trips
with 10% (49 vph) entering and 90% (440 vph) exiting.

SATURDAY DAILY

$$\frac{\text{ITE LUC 710 Saturday Daily Trip Rate}}{\text{ITE LUC 710 Weekday Daily Trip Rate}} = \frac{\text{ITE LUC 714 Saturday Daily Trip Rate}}{\text{ITE LUC 714 Weekday Daily Trip Rate}}$$

$$\frac{2.21}{9.74} = \frac{(Y)}{7.95} = 1.80$$

T = Y * 368.195
T = 662.75
T = 662 vehicle trips
with 50% (331 vpd) entering and 50% (331 vpd) exiting.

(same distribution split as ITE LUC 710 during the Saturday Daily)

SATURDAY PEAK HOUR OF GENERATOR

T = 0.10 * (X)
T = 0.10 * 368.195
T = 36.82
T = 37 vehicle trips
with 44% (16 vph) entering and 56% (21 vph) exiting.

Institute of Transportation Engineers (ITE)

Land Use Code (LUC) 760 - Research and Development Center

General Urban/Suburban

Average Vehicle Trips Ends vs: 1000 Sq. Feet Gross Floor Area
Independent Variable (X): 368.195

AVERAGE WEEKDAY DAILY

T = 10.23 * (X) + 204.68
T = 10.23 * 368.195 + 204.68
T = 3971.31
T = 3,972 vehicle trips
with 50% (1,986 vpd) entering and 50% (1,986 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF GENERATOR

Ln T = 0.88 Ln (X) + 0.59
Ln T = 0.88 Ln(368.195) + 0.59
Ln T = 5.79
T = 326.88
T = 327 vehicle trips
with 83% (271 vph) entering and 17% (56 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF GENERATOR

T = 1.04 * (X) +12.86
T = 1.04 * 368.195 + 12.86
T = 395.78
T = 396 vehicle trips
with 16% (63 vph) entering and 84% (333 vph) exiting.

SATURDAY DAILY

T = 1.25 * (X) + 112.04
T = 1.25 * 368.195 + 112.04
T = 572.28
T = 572 vehicle trips
with 50% (286 vpd) entering and 50% (286 vpd) exiting.

SATURDAY PEAK HOUR OF GENERATOR

T = 0.24 * (X)
T = 0.24 * 368.195
T = 88.37
T = 88 vehicle trips
with 50% (44 vph) entering and % (44 vph) exiting.

(same distribution split as ITE LUC 760 during the Saturday Daily)

Institute of Transportation Engineers (ITE)

Land Use Code (LUC) 820 - Shopping Center

General Urban/Suburban

Average Vehicle Trips Ends vs: 1000 Sq. Ft. Gross Floor Area
Independent Variable (X): 129.951

AVERAGE WEEKDAY DAILY

Ln(T) = 0.68 Ln (X) + 5.57
Ln(T) = 0.68 Ln (129.951) + 5.57
Ln(T) = 8.88
T = 7184.40
T = 7,184 vehicle trips
with 50% (3,592 vph) entering and 50% (3,592 vph) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.50 * (X) + 151.78
T = 0.50 * (129.951) + 151.78
T = 216.76
T = 217 vehicle trips
with 62% (135 vph) entering and 38% (82 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln T = 0.74 Ln (X) + 2.89
Ln T = 0.74 Ln(129.951) + 2.89
Ln T = 6.49
T = 659.64
T = 660 vehicle trips
with 48% (317 vph) entering and 52% (343 vph) exiting.

SATURDAY DAILY

Ln T = 0.62 Ln (X) + 6.24
Ln T = 0.62 Ln(129.951) + 6.24
Ln T = 9.26
T = 10484.34
T = 10,484 vehicle trips
with 50% (5,242 vpd) entering and 50% (5,242 vpd) exiting.

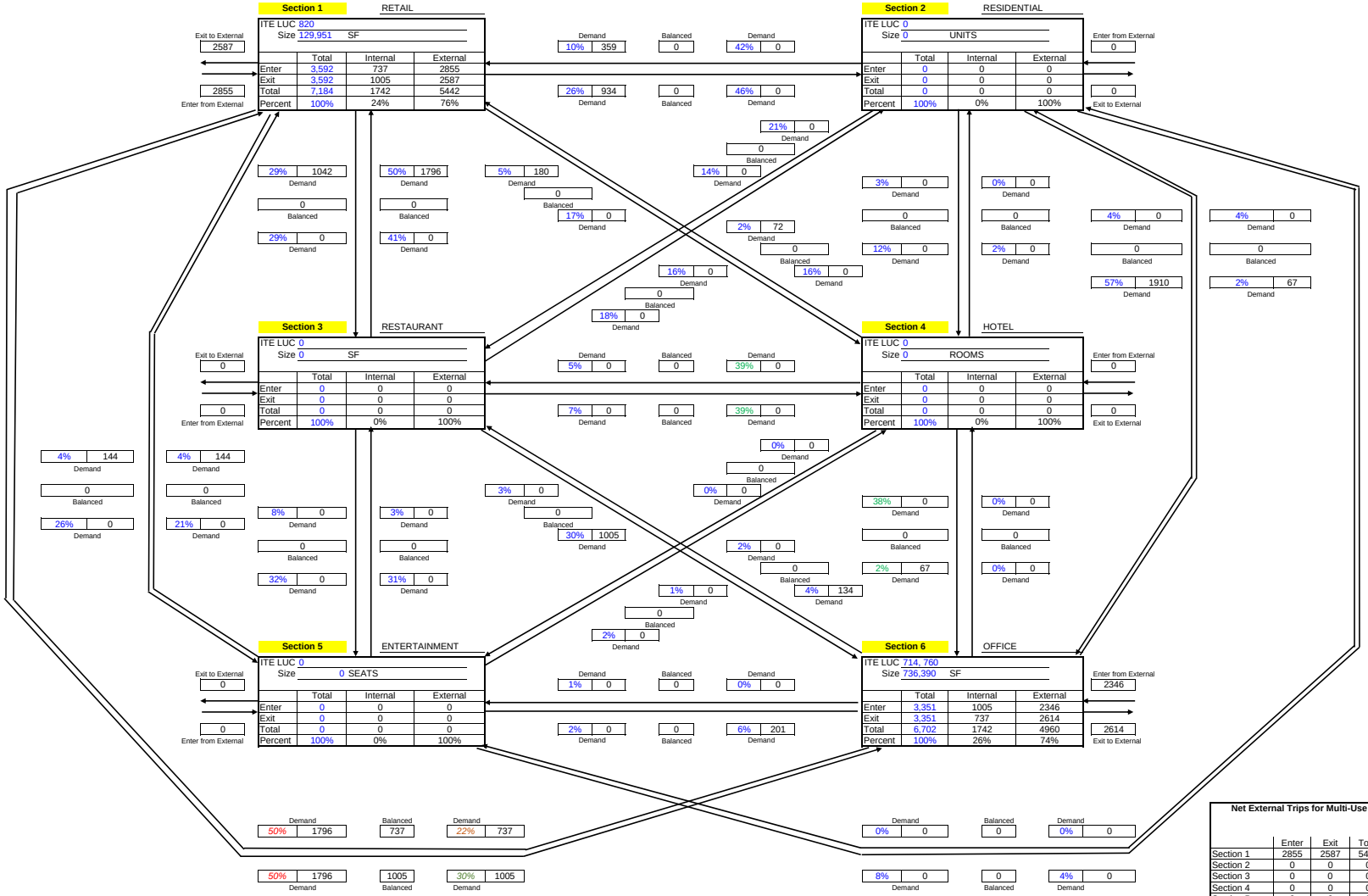
SATURDAY PEAK HOUR OF GENERATOR

Ln T = 0.79 Ln (X) + 2.79
Ln T = 0.79 Ln(129.951) + 2.79
Ln T = 6.64
T = 761.32
T = 761 vehicle trips
with 52% (396 vpd) entering and 48% (365 vpd) exiting.

Analyst: Douglas Halpert, P.E.
Date: September 22, 2020

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt: Muzi Ford Traffic Study - Needham, MA
Time Period: Weekday Daily



Net External Trips for Multi-Use Development

	Enter	Exit	Total	Single-Use Trip Gen Est.	
Section 1	2855	2587	5442	7184	
Section 2	0	0	0	0	
Section 3	0	0	0	0	
Section 4	0	0	0	0	
Section 5	0	0	0	0	
Section 6	2346	2614	4960	6702	*Internal Capture*
TOTAL	5201	5201	10402	13886	**25%**

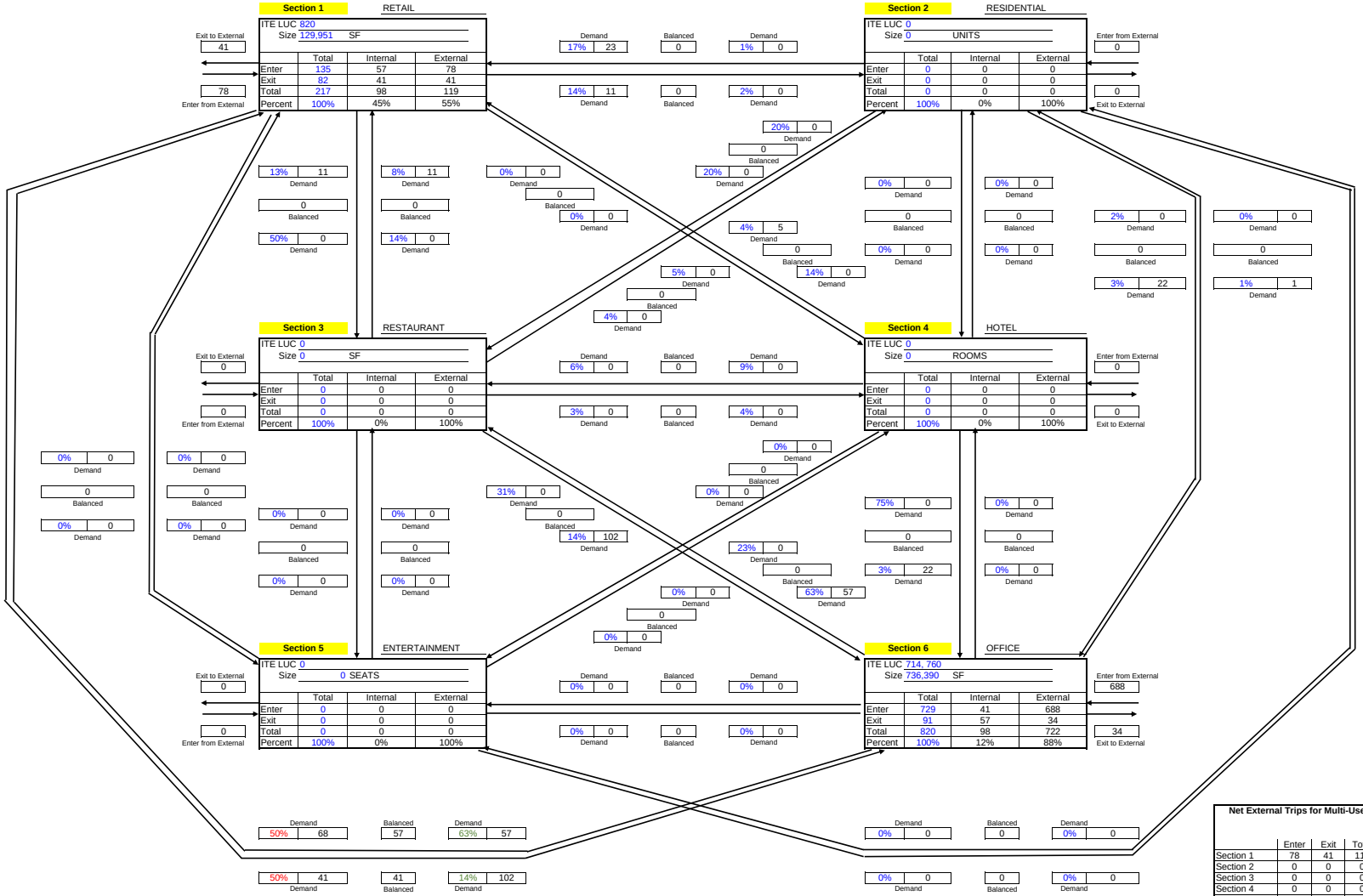
Based on Weekday PM from ITE Trip Generation Handbook, 3rd Edition, August 2014.
Based on an average of Weekday AM or PM from ITE Trip Generation Handbook, 3rd Edition, August 2014.

Retail will serve as ancillary use to other commercial/office uses on site. Internal Capture will be dependent upon demand to/from office uses and has been capped at 50% of retail.

Analyst: Douglas Halpert, P.E.
Date: September 22, 2020

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt: Muzi Ford Traffic Study - Needham, MA
Time Period: Weekday AM



Net External Trips for Multi-Use Development

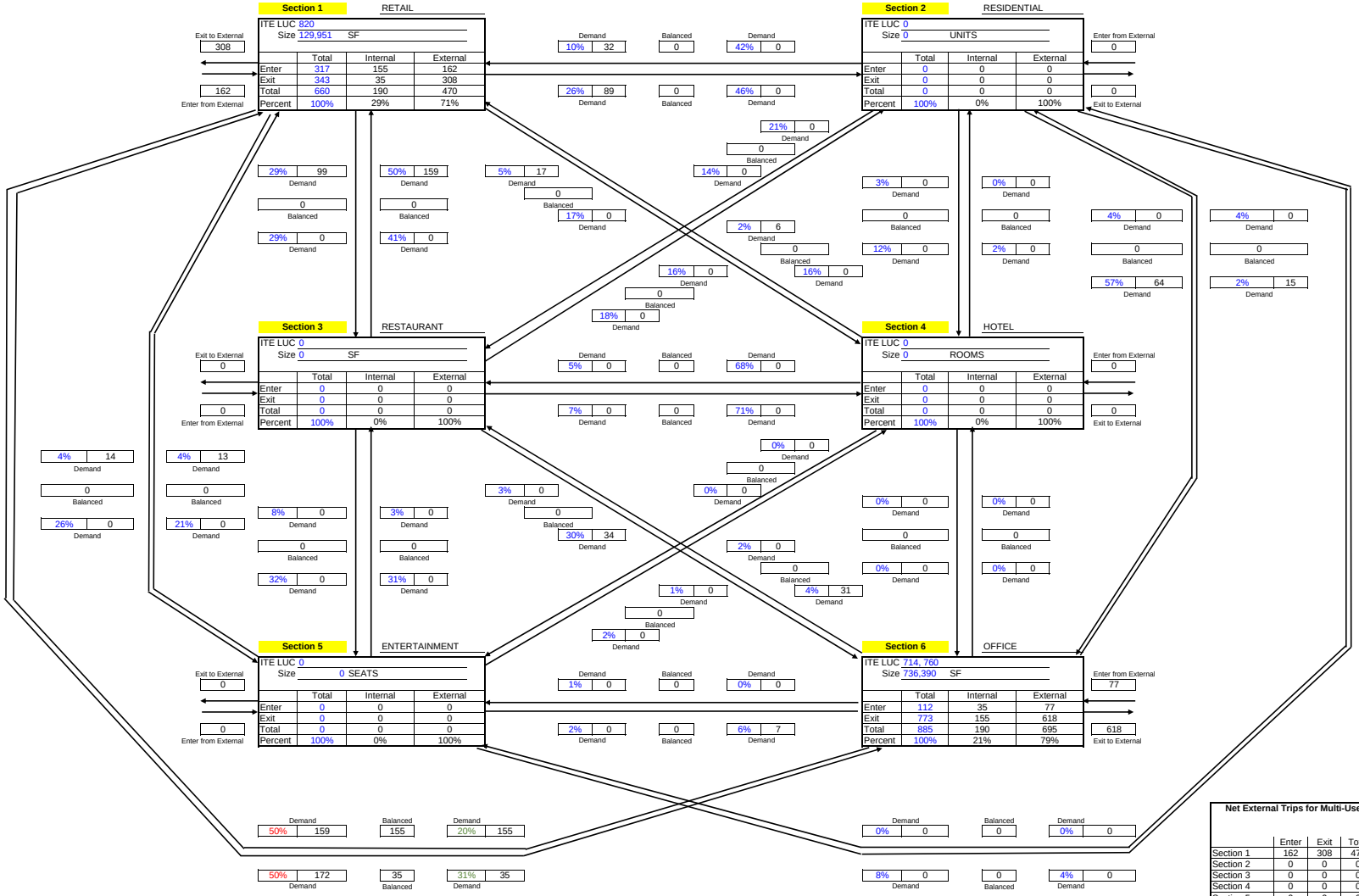
	Enter	Exit	Total	Single-Use Trip Gen Est.	
Section 1	78	41	119	217	
Section 2	0	0	0	0	
Section 3	0	0	0	0	
Section 4	0	0	0	0	
Section 5	0	0	0	0	
Section 6	688	34	722	820	*Internal Capture*
TOTAL	766	75	841	1037	**19%**

Based on ITE Trip Generation Handbook, 3rd Edition, August 2014.

Analyst: Douglas Halpert, P.E.
Date: September 22, 2020

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt: Muzi Ford Traffic Study - Needham, MA
Time Period: Weekday PM



Net External Trips for Multi-Use Development

	Enter	Exit	Total	Single-Use Trip Gen Est.	
Section 1	162	308	470	660	
Section 2	0	0	0	0	
Section 3	0	0	0	0	
Section 4	0	0	0	0	
Section 5	0	0	0	0	
Section 6	77	618	695	885	*Internal Capture*
TOTAL	239	926	1165	1545	**25%**

Based on ITE Trip Generation Handbook, 3rd Edition, August 2014.

Retail will serve as ancillary use to other commercial/office uses on site. Internal Capture will be dependent upon demand to/from office uses and has been capped at 50% of retail.

TRIP-GENERATION COMPARISON – RESIDENTIAL BUILD-OUT

Trip Generation Comparison Summary - Residential Alternative Build-Out

		Total External Trips		
		Alternative 1 (no Residential)	Alternative 2 (226 units Residential)	Net Difference
Weekday Daily	Entering	5,201	4,032	-1,169
	Exiting	5,201	4,032	-1,169
	Total	10,402	8,064	-2,338
Weekday AM Peak Hour	Entering	766	597	-169
	Exiting	75	115	40
	Total	841	712	-129
Weekday PM Peak Hour	Entering	239	200	-39
	Exiting	926	673	-253
	Total	1,165	873	-292
Saturday Daily	Entering	5,587	4,614	-973
	Exiting	5,587	4,614	-973
	Total	11,174	9,228	-1,946
Saturday Midday Peak Hour	Entering	420	329	-91
	Exiting	394	312	-82
	Total	814	641	-173

Size	Units	Land Use
866,342	SF	-
226	Units	LUC 221
259,132	SF	LUC 714
259,132	SF	LUC 760
91,458	SF	LUC 820

	Pass-By Rates				
	LUC 221	LUC 714	LUC 760	LUC 820	TOTAL
Weekday Daily	0%	0%	0%	26%	-
Weekday AM	0%	0%	0%	26%	-
Weekday PM	0%	0%	0%	34%	-
Saturday Daily	0%	0%	0%	26%	-
Saturday Midday	0%	0%	0%	26%	-

		Total Trips					External Trips					Pass-By Trips					New Primary Trips				
		LUC 221	LUC 714	LUC 760	LUC 820	TOTAL	LUC 221	LUC 714	LUC 760	LUC 820	TOTAL	LUC 221	LUC 714	LUC 760	LUC 820	TOTAL	LUC 221	LUC 714	LUC 760	LUC 820	TOTAL
Weekday Daily	Entering	615	1,029	1,428	2,829	5,901	307	710	985	2,030	4,032	0	0	0	499	499	307	710	985	1,531	3,533
	Exiting	615	1,029	1,428	2,829	5,901	332	792	1,099	1,809	4,032	0	0	0	499	499	332	792	1,099	1,310	3,533
	Total	1,230	2,058	2,856	5,658	11,802	639	1,502	2,084	3,839	8,064	0	0	0	998	998	639	1,502	2,084	2,841	7,066
Weekday AM Peak Hour	Entering	20	337	199	123	679	20	312	185	80	597	0	0	0	15	15	20	312	185	65	582
	Exiting	56	25	41	75	197	54	9	15	37	115	0	0	0	15	15	54	9	15	22	100
	Total	76	362	240	198	876	74	321	200	117	712	0	0	0	30	30	74	321	200	87	682
Weekday PM Peak Hour	Entering	59	35	45	244	383	30	23	30	117	200	0	0	0	56	56	30	23	30	61	144
	Exiting	38	316	237	265	856	20	251	189	213	673	0	0	0	56	56	20	251	189	157	617
	Total	97	351	282	509	1,239	50	274	219	330	873	0	0	0	112	112	50	274	219	218	761
Saturday Daily	Entering	555	233	218	4,216	5,222	367	176	165	3,906	4,614	0	0	0	1,019	1,019	367	176	165	2,887	3,595
	Exiting	555	233	218	4,216	5,222	333	179	168	3,934	4,614	0	0	0	1,019	1,019	333	179	168	2,915	3,595
	Total	1,110	466	436	8,432	10,444	700	355	333	7,840	9,228	0	0	0	2,038	2,038	700	355	333	5,802	7,190
Saturday Midday Peak Hour	Entering	50	11	31	300	392	31	7	18	273	329	0	0	0	67	67	31	7	18	206	262
	Exiting	52	15	31	277	375	33	12	25	242	312	0	0	0	67	67	33	12	25	175	245
	Total	102	26	62	577	767	64	19	43	515	641	0	0	0	134	134	64	19	43	381	507

Institute of Transportation Engineers (ITE)

Land Use Code (LUC) 221 - Multifamily Housing (Mid-Rise)

General Urban/Suburban

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 226

AVERAGE WEEKDAY DAILY

T = 5.45 * (X) - 1.75
T = 5.45 * 226 - 1.75
T = 1229.95
T = 1,230 vehicle trips
with 50% (615 vpd) entering and 50% (615 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln(T) = 0.98 Ln (X) - 0.98
Ln(T) = 0.98 Ln (226) - 0.98
Ln(T) = 4.33
T = 76.11
T = 76 vehicle trips
with 26% (20 vph) entering and 74% (56 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln T = 0.96 Ln (X) - 0.63
Ln T = 0.96 Ln(226) - 0.63
Ln T = 4.57
T = 96.90
T = 97 vehicle trips
with 61% (59 vph) entering and 39% (38 vph) exiting.

SATURDAY DAILY

T = 4.91 * (X)
T = 4.91 * 226
T = 1109.66
T = 1,110 vehicle trips
with 50% (555 vpd) entering and 50% (555 vpd) exiting.

SATURDAY PEAK HOUR OF GENERATOR

T = 0.42 * (X) + 6.73
T = 0.42 * 226 + 6.73
T = 101.65
T = 102 vehicle trips
with 49% (50 vpd) entering and 51% (52 vpd) exiting.

Institute of Transportation Engineers (ITE)

Land Use Code (LUC) 714 - Corporate Headquarters Building

General Urban/Suburban

Average Vehicle Trips Ends vs: 1000 Sq. Feet Gross Floor Area
Independent Variable (X): 259.132

AVERAGE WEEKDAY DAILY

T = 6.16 * (X) + 462.50
T = 6.16 * 259.132 + 462.50
T = 2058.75
T = 2,058 vehicle trips
with 50% (1,029 vpd) entering and 14% (1,029 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF GENERATOR

Ln T = 0.88 Ln (X) + 1.00
Ln T = 0.88 Ln(259.132) + 1.00
Ln T = 5.89
T = 361.57
T = 362 vehicle trips
with 93% (337 vph) entering and 7% (25 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF GENERATOR

Ln T = 0.95 Ln (X) + 0.58
Ln T = 0.95 Ln(259.132) + 0.58
Ln T = 5.86
T = 350.54
T = 351 vehicle trips
with 10% (35 vph) entering and 90% (316 vph) exiting.

SATURDAY DAILY

$$\frac{\text{ITE LUC 710 Saturday Daily Trip Rate}}{\text{ITE LUC 710 Weekday Daily Trip Rate}} = \frac{\text{ITE LUC 714 Saturday Daily Trip Rate}}{\text{ITE LUC 714 Weekday Daily Trip Rate}}$$

$$\frac{2.21}{9.74} = \frac{(Y)}{7.95} = 1.80$$

T = Y * 259.132
T = 466.44
T = 466 vehicle trips
with 50% (233 vpd) entering and 50% (233 vpd) exiting.

(same distribution split as ITE LUC 710 during the Saturday Daily)

SATURDAY PEAK HOUR OF GENERATOR

T = 0.10 * (X)
T = 0.10 * 259.132
T = 25.91
T = 26 vehicle trips
with 44% (11 vph) entering and 56% (15 vph) exiting.

Institute of Transportation Engineers (ITE)

Land Use Code (LUC) 760 - Research and Development Center

General Urban/Suburban

Average Vehicle Trips Ends vs: 1000 Sq. Feet Gross Floor Area
Independent Variable (X): 259.132

AVERAGE WEEKDAY DAILY

T = 10.23 * (X) + 204.68
T = 10.23 * 259.132 + 204.68
T = 2855.60
T = 2,856 vehicle trips
with 50% (1,428 vpd) entering and 50% (1,428 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF GENERATOR

Ln T = 0.88 Ln (X) + 0.59
Ln T = 0.88 Ln(259.132) + 0.59
Ln T = 5.48
T = 239.96
T = 240 vehicle trips
with 83% (199 vph) entering and 17% (41 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF GENERATOR

T = 1.04 * (X) +12.86
T = 1.04 * 259.132 + 12.86
T = 282.36
T = 282 vehicle trips
with 16% (45 vph) entering and 84% (237 vph) exiting.

SATURDAY DAILY

T = 1.25 * (X) + 112.04
T = 1.25 * 259.132 + 112.04
T = 435.96
T = 436 vehicle trips
with 50% (218 vpd) entering and 50% (218 vpd) exiting.

SATURDAY PEAK HOUR OF GENERATOR

T = 0.24 * (X)
T = 0.24 * 259.132
T = 62.19
T = 62 vehicle trips
with 50% (31 vph) entering and % (31 vph) exiting.

(same distribution split as ITE LUC 760 during the Saturday Daily)

Institute of Transportation Engineers (ITE)

Land Use Code (LUC) 820 - Shopping Center

General Urban/Suburban

Average Vehicle Trips Ends vs: 1000 Sq. Ft. Gross Floor Area
Independent Variable (X): 91.458

AVERAGE WEEKDAY DAILY

Ln(T) = 0.68 Ln (X) + 5.57
Ln(T) = 0.68 Ln (91.458) + 5.57
Ln(T) = 8.64
T = 5657.84
T = 5,658 vehicle trips
with 50% (2,829 vph) entering and 50% (2,829 vph) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 0.50 * (X) + 151.78
T = 0.50 * (91.458) + 151.78
T = 197.51
T = 198 vehicle trips
with 62% (123 vph) entering and 38% (75 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

Ln T = 0.74 Ln (X) + 2.89
Ln T = 0.74 Ln(91.458) + 2.89
Ln T = 6.23
T = 508.65
T = 509 vehicle trips
with 48% (244 vph) entering and 52% (265 vph) exiting.

SATURDAY DAILY

Ln T = 0.62 Ln (X) + 6.24
Ln T = 0.62 Ln(91.458) + 6.24
Ln T = 9.04
T = 8432.47
T = 8,432 vehicle trips
with 50% (4,216 vpd) entering and 50% (4,216 vpd) exiting.

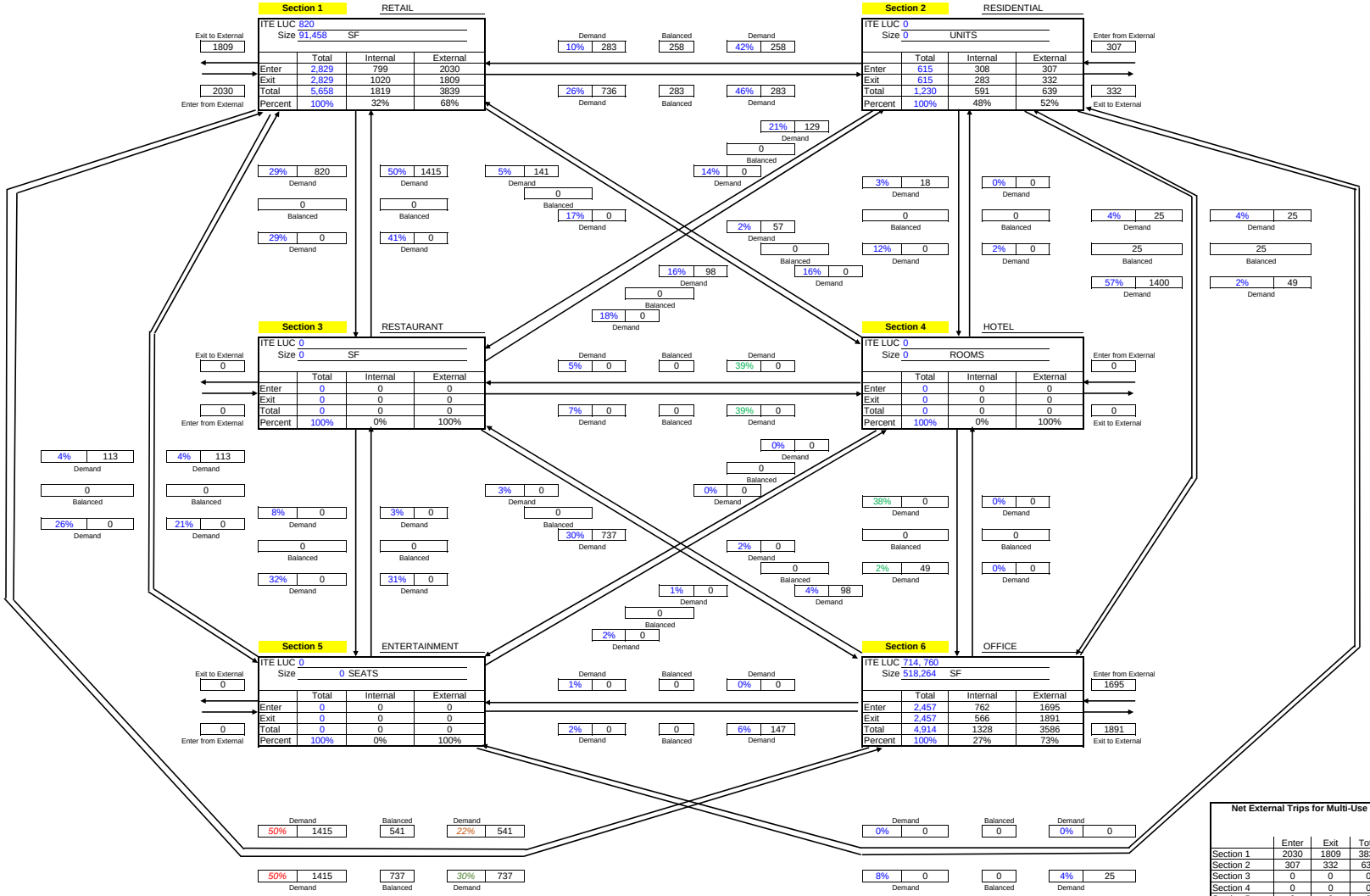
SATURDAY PEAK HOUR OF GENERATOR

Ln T = 0.79 Ln (X) + 2.79
Ln T = 0.79 Ln(91.458) + 2.79
Ln T = 6.36
T = 576.83
T = 577 vehicle trips
with 52% (300 vpd) entering and 48% (277 vpd) exiting.

Analyst: Douglas Halpert, P.E.
Date: September 22, 2020

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt: Muzi Ford Traffic Study - Needham, MA
Time Period: Weekday Daily



Net External Trips for Multi-Use Development

	Enter	Exit	Total	Single-Use Trip Gen Est.	
Section 1	2030	1809	3839	5658	
Section 2	307	332	639	1230	
Section 3	0	0	0	0	
Section 4	0	0	0	0	
Section 5	0	0	0	0	
Section 6	1695	1891	3586	4914	*Internal Capture*
TOTAL	4032	4032	8064	11802	**32%**

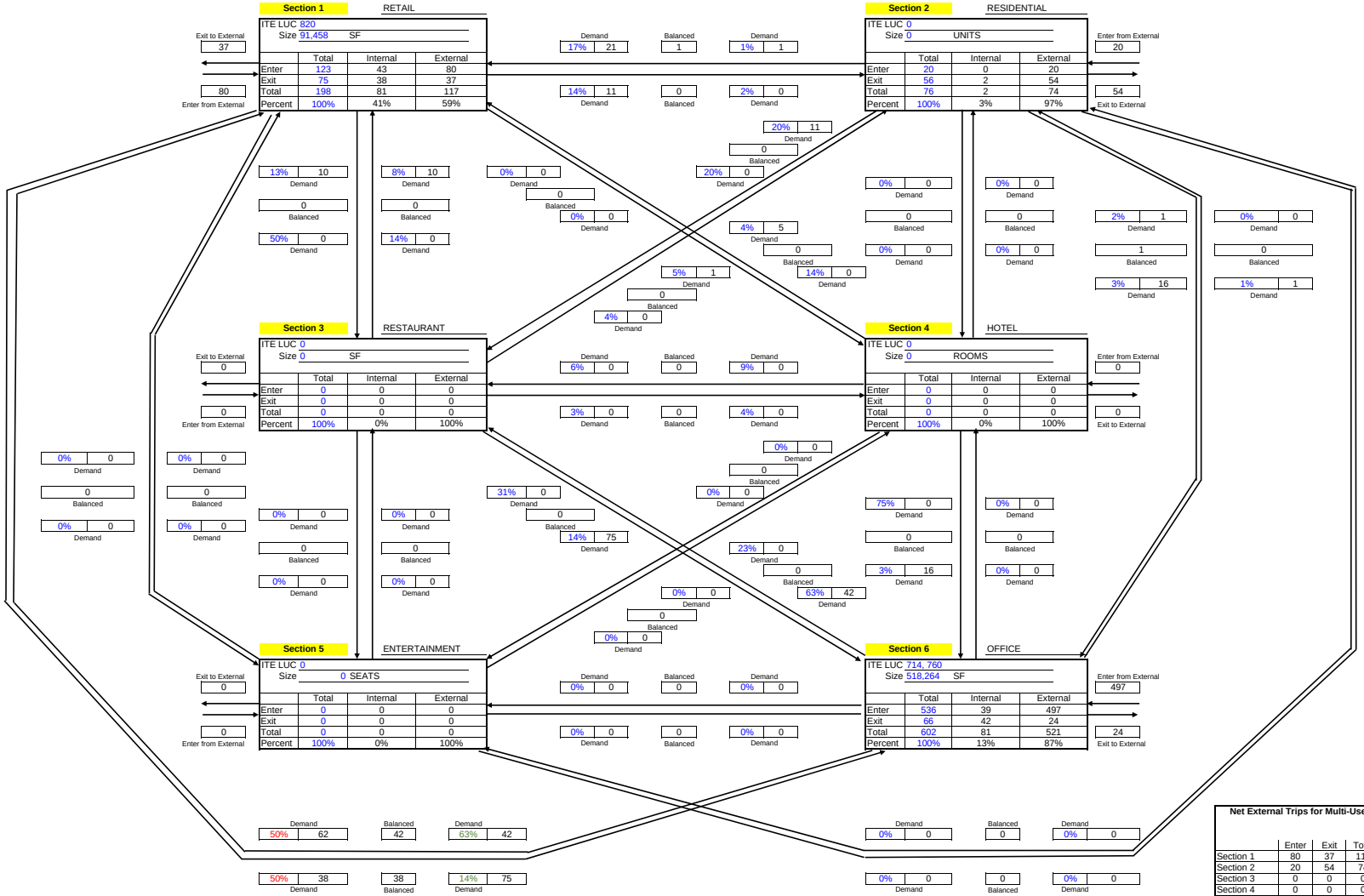
Based on Weekday PM from ITE Trip Generation Handbook, 3rd Edition, August 2014.
Based on an average of Weekday AM or PM from ITE Trip Generation Handbook, 3rd Edition, August 2014.

Retail will serve as ancillary use to other commercial/office uses on site. Internal Capture will be dependent upon demand to/from office uses and has been capped at 50% of retail.

Analyst: Douglas Halpert, P.E.
Date: September 22, 2020

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt: Muzi Ford Traffic Study - Needham, MA
Time Period: Weekday AM



Net External Trips for Multi-Use Development

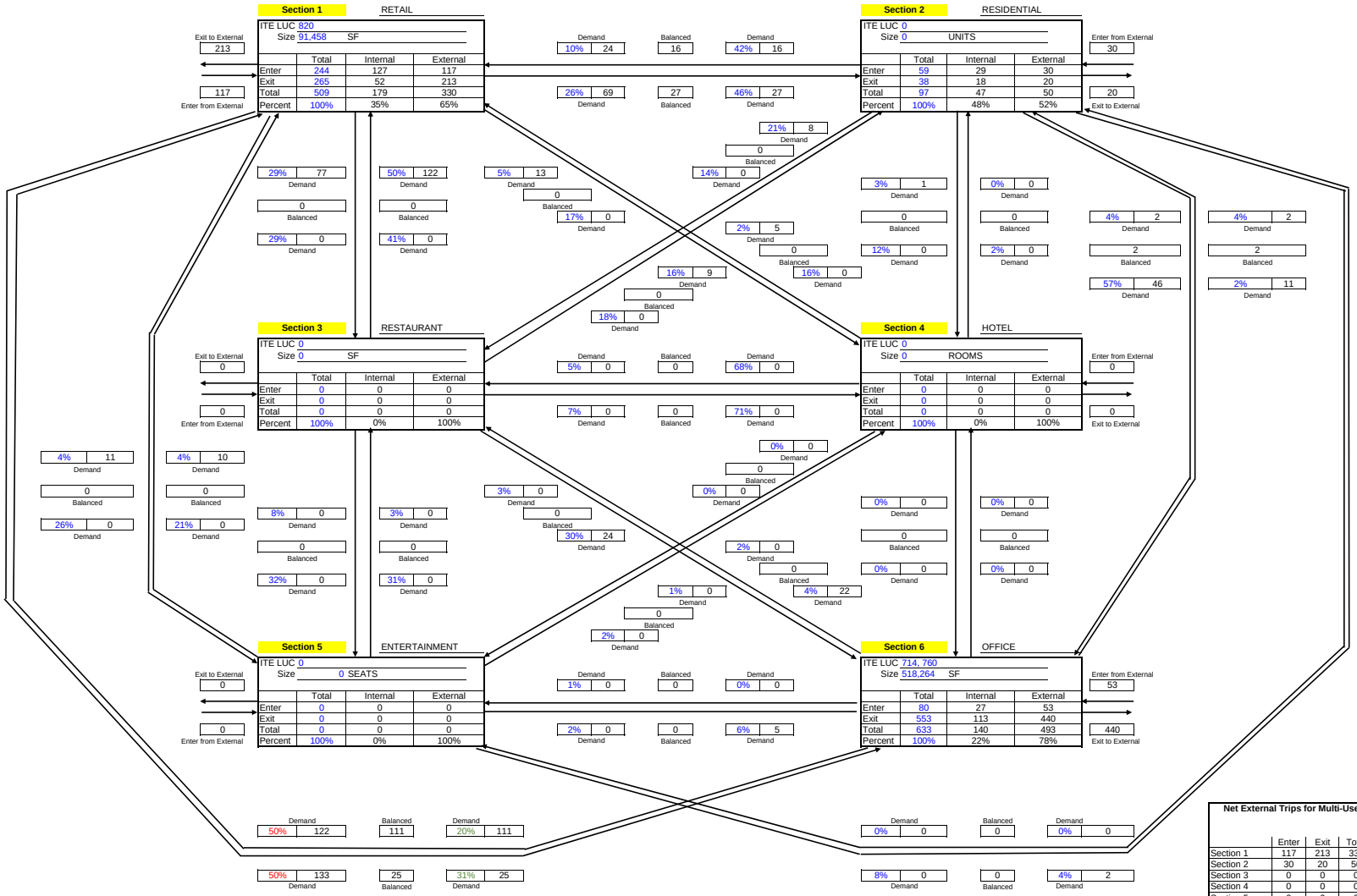
	Enter	Exit	Total	Single-Use Trip Gen Est.	
Section 1	80	37	117	198	
Section 2	20	54	74	76	
Section 3	0	0	0	0	
Section 4	0	0	0	0	
Section 5	0	0	0	0	
Section 6	497	24	521	602	*Internal Capture*
TOTAL	597	115	712	876	**19%**

Based on ITE Trip Generation Handbook, 3rd Edition, August 2014.

Analyst: Douglas Halpert, P.E.
Date: September 22, 2020

MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY

Name of Dvlpt: Muzi Ford Traffic Study - Needham, MA
Time Period: Weekday PM



Net External Trips for Multi-Use Development

	Enter	Exit	Total	Single-Use Trip Gen Est.	
Section 1	117	213	330	509	
Section 2	30	20	50	97	
Section 3	0	0	0	0	
Section 4	0	0	0	0	
Section 5	0	0	0	0	
Section 6	53	440	493	633	*Internal Capture*
TOTAL	200	673	873	1239	**30%**

Based on ITE Trip Generation Handbook, 3rd Edition, August 2014.

Retail will serve as ancillary use to other commercial/office uses on site. Internal Capture will be dependent upon demand to/from office uses and has been capped at 50% of retail.

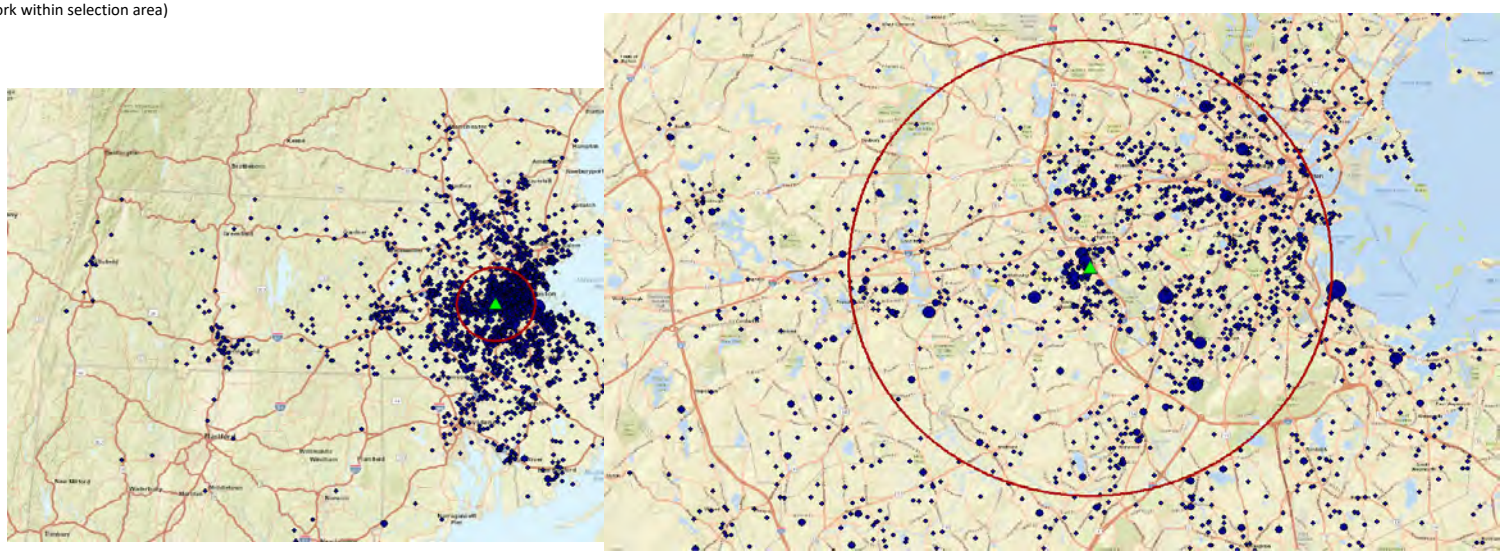
TRIP-DISTRIBUTION CALCULATIONS

	Existing Travel Patterns (Entering/Exiting Gould St)				BETA Gould Industrial Distribution				Building Density Model	Journey to Work (Office)	
	AM		PM		AM		PM		AM/PM	AM/PM	Use in TIAS++
Direction	Trips	% Distribution	Trips	% Distribution	Trips	% Distribution	Trips	% Distribution	% Distribution	% Distribution	% Distribution
Highland E	530	**38%**	485	**40%**	636	**32%**	580	**33%**	**48%**	**54%**	**40%**
Central E	200	**14%**	245	**20%**	280	**14%**	339	**19%**	**14%**	**9%**	**15%**
Central W	260	**19%**	180	**15%**	360	**18%**	260	**15%**	**15%**	**15%**	**15%**
Highland W	123	**9%**	89	**7%**	233	**12%**	151	**9%**	**2%**	**2%**	**10%**
Hunting S	273	**20%**	214	**18%**	492	**25%**	416	**24%**	**22%**	**21%**	**20%**
Total	1386	**100%**	1213	**100%**	2001	**100%**	1746	**100%**	**100%**	**100%**	**100%**

Work to Home Data

(Depicts home Locations of people who work within selection area)

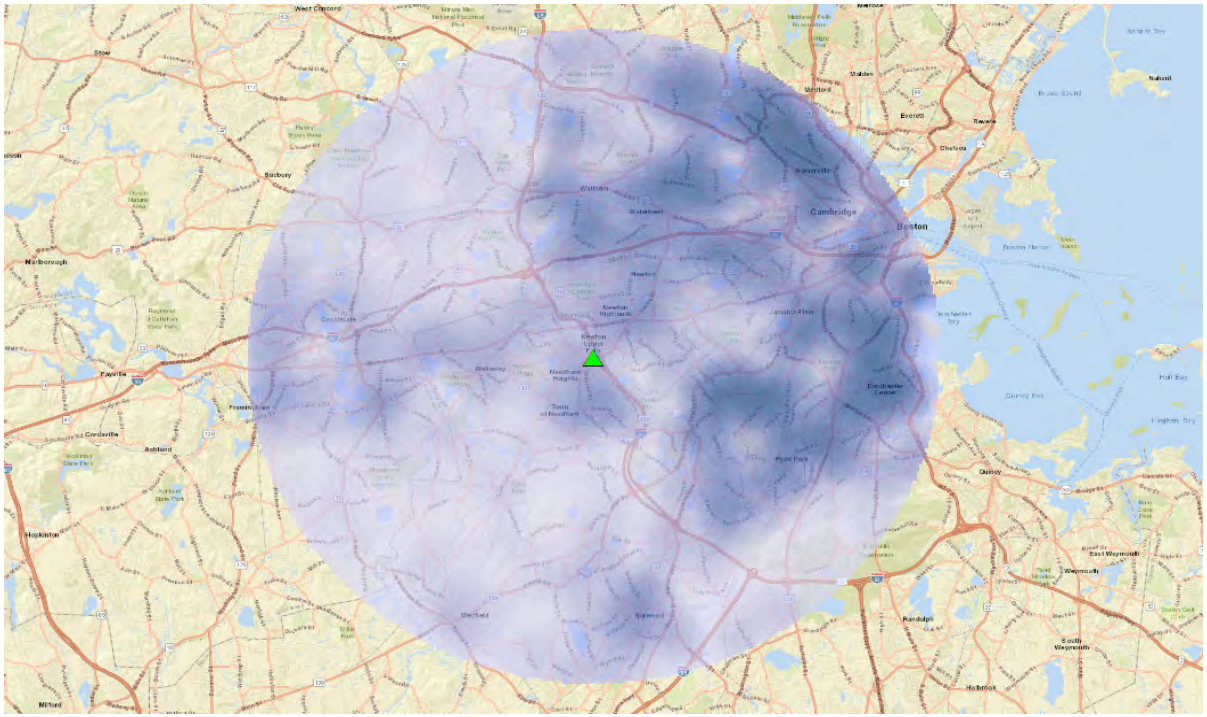
	# of Workers	Percentage
I-95 N	1446	51%
I -95 S	937	33%
Central E	98	3%
Central W	136	5%
Highland E	29	1%
Highland W	43	2%
Hunting S	122	4%
Total	**2811**	**100%**



Structures

(Depicts structures located within a 10 mile buffer of the site)

	# of Structi	Percentage
I-95 N	181265	52%
I -95 S	71236	20%
Central E	29578	8%
Central W	15355	4%
Highland E	7084	2%
Highland W	5360	2%
Hunting S	40054	11%
Total	**349932**	**100%**



SIGNAL WARRANT ANALYSIS WORKSHEETS

Raw Counts

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
6:00	0	343	67	42	111	0	25	0	40	0	0	0
7:00	**0**	**711**	**139**	**87**	**229**	**0**	**45**	**0**	**71**	**0**	**0**	**0**
8:00	0	650	190	93	272	0	72	0	104	0	0	0
9:00	0	539	105	66	174	0	42	0	66	0	0	0
10:00	0	480	94	59	155	0	47	0	75	0	0	0
11:00	0	458	89	56	147	0	71	0	65	0	0	0
12:00	0	475	90	176	752	0	71	0	65	0	0	0
13:00	0	461	88	171	730	0	74	0	68	0	0	0
14:00	0	477	91	177	754	0	71	0	65	0	0	0
15:00	0	583	111	216	923	0	68	0	62	0	0	0
16:00	0	369	77	197	614	0	135	0	122	0	0	0
17:00	**0**	**405**	**77**	**150**	**641**	**0**	**105**	**0**	**96**	**0**	**0**	**0**
18:00	0	407	77	151	643	0	90	0	82	0	0	0
19:00	0	345	66	128	546	0	63	0	58	0	0	0

From Raw 2015 TMCs in BETA Study
Ratio applied to AM Peak Hour counts on Highland Avenue
Ratio applied to PM Peak Hour counts on Highland Avenue

Highland Avenue Counts*

EB	WB	TOTAL
432	336	768
895	**600**	**1,495**
872	612	1,484
679	556	1,235
604	632	1,236
576	619	1,195
603	623	1,226
585	648	1,233
605	616	1,221
740	591	1,331
649	740	1,389
514	**916**	**1,430**
516	781	1,297
438	549	987

*Based on MassDOT Count Station 6697 for 3/8/2017

Seasonal Adjustment to Average Month Conditions (Percentage) = 0.0%

Seasonally Adjusted Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	711	139	87	229	0	45	0	71	0	0	0
8:00	0	650	190	93	272	0	72	0	104	0	0	0
9:00	0	539	105	66	174	0	42	0	66	0	0	0
10:00	0	480	94	59	155	0	47	0	75	0	0	0
11:00	0	458	89	56	147	0	71	0	65	0	0	0
12:00	0	475	90	176	752	0	71	0	65	0	0	0
13:00	0	461	88	171	730	0	74	0	68	0	0	0
14:00	0	477	91	177	754	0	71	0	65	0	0	0
15:00	0	583	111	216	923	0	68	0	62	0	0	0
16:00	0	369	77	197	614	0	135	0	122	0	0	0
17:00	0	405	77	150	641	0	105	0	96	0	0	0
18:00	0	407	77	151	643	0	90	0	82	0	0	0
19:00	0	345	66	128	546	0	63	0	58	0	0	0

Historical Growth Rate (Percentage) = 10.40%

Historic Growth Rate Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	785	153	96	253	0	50	0	78	0	0	0
8:00	0	718	210	103	300	0	79	0	115	0	0	0
9:00	0	595	116	73	192	0	46	0	73	0	0	0
10:00	0	530	104	65	171	0	52	0	83	0	0	0
11:00	0	506	98	62	162	0	78	0	72	0	0	0
12:00	0	524	99	194	830	0	78	0	72	0	0	0
13:00	0	509	97	189	806	0	82	0	75	0	0	0
14:00	0	527	100	195	832	0	78	0	72	0	0	0
15:00	0	644	123	238	1,019	0	75	0	68	0	0	0
16:00	0	407	85	217	678	0	149	0	135	0	0	0
17:00	0	447	85	166	708	0	116	0	106	0	0	0
18:00	0	449	85	167	710	0	99	0	91	0	0	0
19:00	0	381	73	141	603	0	70	0	64	0	0	0

No-Build Adjusted Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	785	153	96	253	0	50	0	78	0	0	0
8:00	0	718	210	103	300	0	79	0	115	0	0	0
9:00	0	595	116	73	192	0	46	0	73	0	0	0
10:00	0	530	104	65	171	0	52	0	83	0	0	0
11:00	0	506	98	62	162	0	78	0	72	0	0	0
12:00	0	524	99	194	830	0	78	0	72	0	0	0
13:00	0	509	97	189	806	0	82	0	75	0	0	0
14:00	0	527	100	195	832	0	78	0	72	0	0	0
15:00	0	644	123	238	1,019	0	75	0	68	0	0	0
16:00	0	407	85	217	678	0	149	0	135	0	0	0
17:00	0	447	85	166	708	0	116	0	106	0	0	0
18:00	0	449	85	167	710	0	99	0	91	0	0	0
19:00	0	381	73	141	603	0	70	0	64	0	0	0

Retail Site Generated Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT	% of Peak Hour Volumes Enter	% of Peak Hour Volumes Exit
7:00	0	0	2	2	0	0	3	0	3	0	0	0	1.4	0.9
8:00	0	0	9	9	0	0	4	0	4	0	0	0	2.6	1.5
9:00	0	0	6	6	0	0	9	0	9	0	0	0	4.7	2.5
10:00	0	0	9	9	0	0	15	0	15	0	0	0	7.1	4.1
11:00	0	0	13	13	0	0	25	0	25	0	0	0	9.7	6.8
12:00	0	0	14	14	0	0	34	0	34	0	0	0	10.6	9.4
13:00	0	0	12	12	0	0	34	0	34	0	0	0	9.2	9.5
14:00	0	0	12	12	0	0	33	0	33	0	0	0	8.9	9.2
15:00	0	0	11	11	0	0	33	0	33	0	0	0	8.5	9.0
16:00	0	0	12	12	0	0	34	0	34	0	0	0	8.9	9.4
17:00	0	0	12	12	0	0	34	0	34	0	0	0	9.2	9.4
18:00	0	0	10	10	0	0	31	0	31	0	0	0	7.6	8.5
19:00	0	0	7	7	0	0	25	0	25	0	0	0	5.3	6.9

Office / R&D Site Generated Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT	% of Peak Hour Volumes Enter	% of Peak Hour Volumes Exit
7:00	0	0	17	17	0	0	7	0	7	0	0	0	13.1	1.9
8:00	0	0	103	103	0	0	9	0	9	0	0	0	14.4	3.5
9:00	0	0	8	8	0	0	16	0	16	0	0	0	6.4	4.3
10:00	0	0	7	7	0	0	21	0	21	0	0	0	5.4	5.9
11:00	0	0	8	8	0	0	37	0	37	0	0	0	6.2	10.3
12:00	0	0	13	13	0	0	38	0	38	0	0	0	10.2	10.4
13:00	0	0	12	12	0	0	24	0	24	0	0	0	9.0	6.7
14:00	0	0	11	11	0	0	24	0	24	0	0	0	8.2	6.5
15:00	0	0	10	10	0	0	31	0	31	0	0	0	7.4	8.5
16:00	0	0	7	7	0	0	55	0	55	0	0	0	5.5	15.2
17:00	0	0	12	12	0	0	93	0	93	0	0	0	4.2	15.6
18:00	0	0	2	2	0	0	10	0	10	0	0	0	1.7	2.9
19:00	0	0	1	1	0	0	8	0	8	0	0	0	0.9	2.2

Build Adjusted Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	785	172	115	253	0	60	0	88	0	0	0
8:00	0	718	322	215	300	0	92	0	128	0	0	0
9:00	0	595	130	87	192	0	71	0	98	0	0	0
10:00	0	530	120	81	171	0	88	0	119	0	0	0
11:00	0	506	119	83	162	0	140	0	134	0	0	0
12:00	0	524	126	221	830	0	150	0	144	0	0	0
13:00	0	509	121	213	806	0	140	0	133	0	0	0
14:00	0	527	123	218	832	0	135	0	129	0	0	0
15:00	0	644	144	259	1,019	0	139	0	132	0	0	0
16:00	0	407	104	236	678	0	238	0	224	0	0	0
17:00	0	447	109	190	708	0	243	0	233	0	0	0
18:00	0	449	97	179	710	0	140	0	132	0	0	0
19:00	0	381	81	149	603	0	103	0	97	0	0	0

Traffic Control Signal Warrant Analyses

(Based on MUTCD-2009 Edition)

Intersection: Central Avenue at Gould Street

Pop. <10,000? (Y/N): N | Count Date: 10/21/2015 | Analysis Date: 10/04/20

Speed (in mph): 35 mph | Analysis Year: 2030 Build | Analyst: RLB

Adjustment Factor: 1 Raw counts

	Is Major?* (Y/N)	#Lanes* (one way)
EB	Y	1
WB	Y	1
NB	N	1
SB	N	1

Major Lanes: 1 Enter the higher number of lanes for the major street approach

Minor Lanes: 1 Enter the number of lanes for the minor street approach you want to analyze

*Note: If intersection is a "T" intersection, leave cells blank for the non-existent approach

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	785	172	115	253	0	60	0	88	0	0	0
8:00	0	718	322	215	300	0	92	0	128	0	0	0
9:00	0	595	130	87	192	0	71	0	98	0	0	0
10:00	0	530	120	81	171	0	88	0	119	0	0	0
11:00	0	506	119	83	162	0	140	0	134	0	0	0
12:00	0	524	126	221	830	0	150	0	144	0	0	0
13:00	0	509	121	213	806	0	140	0	133	0	0	0
14:00	0	527	123	218	832	0	135	0	129	0	0	0
15:00	0	644	144	259	1,019	0	139	0	132	0	0	0
16:00	0	407	104	236	678	0	238	0	224	0	0	0
17:00	0	447	109	190	708	0	243	0	233	0	0	0
18:00	0	449	97	179	710	0	140	0	132	0	0	0
19:00	0	381	81	149	603	0	103	0	97	0	0	0

Time	Σ EB	Σ WB	Σ NB	Σ SB	Σ Major	Σ Minor	Σ Max Minor	W1 A	W1 B	W1combo	W2	W3
7:00	957	368	148	0	1325	148	148	N	Y	Y	Y	Y
8:00	1039	515	220	0	1554	220	220	Y	Y	Y	Y	Y
9:00	725	279	169	0	1004	169	169	Y	Y	Y	Y	N
10:00	650	252	207	0	902	207	207	Y	Y	Y	Y	N
11:00	625	245	274	0	870	274	274	Y	Y	Y	Y	Y
12:00	651	1052	294	0	1702	294	294	Y	Y	Y	Y	Y
13:00	630	1019	273	0	1649	273	273	Y	Y	Y	Y	Y
14:00	650	1051	264	0	1701	264	264	Y	Y	Y	Y	Y
15:00	787	1278	272	0	2066	272	272	Y	Y	Y	Y	Y
16:00	511	914	462	0	1426	462	462	Y	Y	Y	Y	Y
17:00	556	897	476	0	1453	476	476	Y	Y	Y	Y	Y
18:00	546	889	272	0	1435	272	272	Y	Y	Y	Y	Y
19:00	462	752	200	0	1214	200	200	Y	Y	Y	Y	Y
								12 of 8	**13 of 8**	**13 of 8**	**13 of 4**	**11 of 1**

Warrant Analyses

Warrant 1: Condition A Minimum Vehicular Volume Warrant is Met

Warrant 1: Condition B Interruption of Continuous Traffic Warrant is Met

Warrant 1: Combination of Warrants 1A and 1B is Met

Warrant 2: Four-Hour Warrant is Met

Warrant 3: One-Hour Warrant is Met

Raw Counts

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
6:00	0	0	0	0	0	0	0	158	0	0	113	0
7:00	0	0	0	0	0	0	0	236	0	0	181	0
8:00	0	0	0	0	0	0	0	305	0	0	218	0
9:00	0	0	0	0	0	0	0	254	0	0	181	0
10:00	0	0	0	0	0	0	0	254	0	0	182	0
11:00	0	0	0	0	0	0	0	246	0	0	176	0
12:00	0	0	0	0	0	0	0	206	0	0	291	0
13:00	0	0	0	0	0	0	0	207	0	0	293	0
14:00	0	0	0	0	0	0	0	205	0	0	290	0
15:00	0	0	0	0	0	0	0	223	0	0	316	0
16:00	0	0	0	0	0	0	0	233	0	0	330	0
17:00	0	0	0	0	0	0	0	233	0	0	356	0
18:00	0	0	0	0	0	0	0	218	0	0	308	0
19:00	0	0	0	0	0	0	0	166	0	0	234	0

From Raw 2015 TMCs in BETA Study
Ratio applied to AM Peak Hour counts on Highland Avenue
Ratio applied to PM Peak Hour counts on Highland Avenue

Highland Avenue Counts*

EB	WB	TOTAL
432	336	768
895	600	1,495
872	612	1,484
679	556	1,235
604	632	1,236
576	619	1,195
603	623	1,226
585	648	1,233
605	616	1,221
740	591	1,331
649	740	1,389
514	916	1,430
516	781	1,297
438	549	987

*Based on MassDOT Count Station 6697 for 3/8/2017

Seasonal Adjustment to Average Month Conditions (Percentage) = 0.0%

Seasonally Adjusted Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	0	0	0	0	0	0	236	0	0	181	0
8:00	0	0	0	0	0	0	0	305	0	0	218	0
9:00	0	0	0	0	0	0	0	254	0	0	181	0
10:00	0	0	0	0	0	0	0	254	0	0	182	0
11:00	0	0	0	0	0	0	0	246	0	0	176	0
12:00	0	0	0	0	0	0	0	206	0	0	291	0
13:00	0	0	0	0	0	0	0	207	0	0	293	0
14:00	0	0	0	0	0	0	0	205	0	0	290	0
15:00	0	0	0	0	0	0	0	223	0	0	316	0
16:00	0	0	0	0	0	0	0	233	0	0	330	0
17:00	0	0	0	0	0	0	0	233	0	0	356	0
18:00	0	0	0	0	0	0	0	218	0	0	308	0
19:00	0	0	0	0	0	0	0	166	0	0	234	0

Historical Growth Rate (Percentage) = 10.40%

Historic Growth Rate Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	0	0	0	0	0	0	261	0	0	200	0
8:00	0	0	0	0	0	0	0	337	0	0	241	0
9:00	0	0	0	0	0	0	0	280	0	0	200	0
10:00	0	0	0	0	0	0	0	280	0	0	201	0
11:00	0	0	0	0	0	0	0	272	0	0	194	0
12:00	0	0	0	0	0	0	0	227	0	0	321	0
13:00	0	0	0	0	0	0	0	229	0	0	323	0
14:00	0	0	0	0	0	0	0	226	0	0	320	0
15:00	0	0	0	0	0	0	0	246	0	0	349	0
16:00	0	0	0	0	0	0	0	257	0	0	364	0
17:00	0	0	0	0	0	0	0	257	0	0	393	0
18:00	0	0	0	0	0	0	0	241	0	0	340	0
19:00	0	0	0	0	0	0	0	183	0	0	258	0

No-Build Adjusted Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	0	0	0	0	0	0	261	0	0	200	0
8:00	0	0	0	0	0	0	0	337	0	0	241	0
9:00	0	0	0	0	0	0	0	280	0	0	200	0
10:00	0	0	0	0	0	0	0	280	0	0	201	0
11:00	0	0	0	0	0	0	0	272	0	0	194	0
12:00	0	0	0	0	0	0	0	227	0	0	321	0
13:00	0	0	0	0	0	0	0	229	0	0	323	0
14:00	0	0	0	0	0	0	0	226	0	0	320	0
15:00	0	0	0	0	0	0	0	246	0	0	349	0
16:00	0	0	0	0	0	0	0	257	0	0	364	0
17:00	0	0	0	0	0	0	0	257	0	0	393	0
18:00	0	0	0	0	0	0	0	241	0	0	340	0
19:00	0	0	0	0	0	0	0	183	0	0	258	0

Retail Site Generated Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT	% of Peak Hour Volumes Enter	% of Peak Hour Volumes Exit
7:00	0	0	0	16	0	2	0	2	15	1	5	0	1.4	0.9
8:00	0	0	0	24	0	2	0	12	44	4	5	0	2.6	1.5
9:00	0	0	0	44	0	6	0	7	50	4	13	0	4.7	2.5
10:00	0	0	0	72	0	10	0	11	76	6	21	0	7.1	4.1
11:00	0	0	0	120	0	16	0	15	103	8	35	0	9.7	6.8
12:00	0	0	0	166	0	22	0	16	113	9	48	0	10.6	9.4
13:00	0	0	0	168	0	22	0	14	98	8	49	0	9.2	9.5
14:00	0	0	0	162	0	22	0	14	95	8	47	0	8.9	9.2
15:00	0	0	0	159	0	21	0	13	91	7	46	0	8.5	9.0
16:00	0	0	0	166	0	22	0	14	95	8	48	0	8.9	9.4
17:00	0	0	0	166	0	22	0	14	98	8	48	0	9.2	9.4
18:00	0	0	0	150	0	20	0	12	81	7	43	0	7.6	8.5
19:00	0	0	0	122	0	16	0	8	56	5	35	0	5.3	6.9

Office / R&D Site Generated Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT	% of Peak Hour Volumes Enter	% of Peak Hour Volumes Exit
7:00	0	0	0	34	0	4	0	20	140	11	10	0	13.1	1.9
8:00	0	0	0	18	0	3	0	120	362	51	6	0	14.4	3.5
9:00	0	0	0	76	0	10	0	10	68	6	22	0	6.4	4.3
10:00	0	0	0	104	0	14	0	8	58	5	30	0	5.4	5.9
11:00	0	0	0	182	0	24	0	9	66	5	53	0	6.2	10.3
12:00	0	0	0	184	0	24	0	16	109	9	53	0	10.2	10.4
13:00	0	0	0	118	0	16	0	14	96	8	34	0	9.0	6.7
14:00	0	0	0	115	0	15	0	12	87	7	33	0	8.2	6.5
15:00	0	0	0	150	0	20	0	11	79	6	43	0	7.4	8.5
16:00	0	0	0	268	0	36	0	8	59	5	78	0	5.5	15.2
17:00	0	0	0	324	0	47	0	13	40	6	108	0	4.2	15.6
18:00	0	0	0	51	0	7	0	3	18	1	15	0	1.7	2.9
19:00	0	0	0	39	0	5	0	1	10	1	11	0	0.9	2.2

Build Adjusted Volumes

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	0	0	50	0	6	0	283	155	12	215	0
8:00	0	0	0	42	0	5	0	469	406	55	252	0
9:00	0	0	0	120	0	16	0	297	118	10	235	0
10:00	0	0	0	176	0	24	0	299	134	11	252	0
11:00	0	0	0	302	0	40	0	296	169	13	282	0
12:00	0	0	0	350	0	46	0	259	222	18	422	0
13:00	0	0	0	286	0	38	0	257	194	16	406	0
14:00	0	0	0	277	0	37	0	252	182	15	400	0
15:00	0	0	0	309	0	41	0	270	170	13	438	0
16:00	0	0	0	434	0	58	0	279	154	13	490	0
17:00	0	0	0	490	0	69	0	284	138	14	549	0
18:00	0	0	0	201	0	27	0	256	99	8	398	0
19:00	0	0	0	161	0	21	0	192	66	6	304	0

Traffic Control Signal Warrant Analyses

(Based on MUTCD-2009 Edition)

Intersection:	Gould Street at South Site Driveway				
Pop. <10,000? (Y/N)	N	Count Date:	12/1/2015	Analysis Date:	10/04/20
Speed (in mph):	35 mph	Analysis Year:	2030 Build	Analyst:	RLB
		Adjustment Factor:	1	Raw counts	

	Is Major?* (Y/N)	#Lanes* (one way)
EB	N	1
WB	N	2
NB	Y	2
SB	Y	1

Major Lanes: 2 — Enter the higher number of lanes for the major street approach

Minor Lanes: 2 — Enter the number of lanes for the minor street approach you want to analyze

*Note: If intersection is a "T" intersection, leave cells blank for the non-existent approach

Time	EB LT	EB TH	EB RT	WB LT	WB TH	WB RT	NB LT	NB TH	NB RT	SB LT	SB TH	SB RT
7:00	0	0	0	50	0	6	0	283	155	12	215	0
8:00	0	0	0	42	0	5	0	469	406	55	252	0
9:00	0	0	0	120	0	16	0	297	118	10	235	0
10:00	0	0	0	176	0	24	0	299	134	11	252	0
11:00	0	0	0	302	0	40	0	296	169	13	282	0
12:00	0	0	0	350	0	46	0	259	222	18	422	0
13:00	0	0	0	286	0	38	0	257	194	16	406	0
14:00	0	0	0	277	0	37	0	252	182	15	400	0
15:00	0	0	0	309	0	41	0	270	170	13	438	0
16:00	0	0	0	434	0	58	0	279	154	13	490	0
17:00	0	0	0	490	0	69	0	284	138	14	549	0
18:00	0	0	0	201	0	27	0	256	99	8	398	0
19:00	0	0	0	161	0	21	0	192	66	6	304	0

Time	Σ EB	Σ WB	Σ NB	Σ SB	Σ Major	Σ Minor	Σ Max Minor	W1 A	W1 B	W1combo	W2	W3
7:00	0	56	438	227	664	56	56	N	N	N	N	N
8:00	0	47	875	307	1181	47	47	N	N	N	N	N
9:00	0	136	415	245	660	136	136	N	N	N	N	N
10:00	0	200	433	263	696	200	200	Y	N	N	N	N
11:00	0	342	465	295	760	342	342	Y	N	Y	Y	N
12:00	0	396	481	440	922	396	396	Y	Y	Y	Y	N
13:00	0	324	451	422	873	324	324	Y	N	Y	Y	N
14:00	0	314	434	415	849	314	314	Y	N	Y	Y	N
15:00	0	350	440	451	891	350	350	Y	N	Y	Y	N
16:00	0	492	433	503	937	492	492	Y	Y	Y	Y	Y
17:00	0	559	422	563	985	559	559	Y	Y	Y	Y	Y
18:00	0	228	355	406	761	228	228	Y	N	Y	N	N
19:00	0	182	258	310	569	182	182	N	N	N	N	N
								9 of 8	**3 of 8**	**8 of 8**	**7 of 4**	**2 of 1**

Warrant Analyses

Warrant 1: Condition A Minimum Vehicular Volume Warrant is Met
Warrant 1: Condition B Interruption of Continuous Traffic Warrant is Not Met
Warrant 1: Combination of Warrants 1A and 1B is Met
Warrant 2: Four-Hour Warrant is Met
Warrant 3: One-Hour Warrant is Met

CAPACITY ANALYSIS METHODOLOGY

CAPACITY ANALYSIS METHODOLOGY

A primary result of capacity analysis is the assignment of levels of service to traffic facilities under various traffic flow conditions. The capacity analysis methodology is based on the concepts and procedures in the *Highway Capacity Manual* (HCM).[5] The concept of level of service (LOS) is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with LOS A representing the best operating conditions and LOS F the worst. Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year. A description of the operating condition under each level of service is provided below:

- *LOS A* describes conditions with little to no delay to motorists.
- *LOS B* represents a desirable level with relatively low delay to motorists.
- *LOS C* describes conditions with average delays to motorists.
- *LOS D* describes operations where the influence of congestion becomes more noticeable. Delays are still within an acceptable range.
- *LOS E* represents operating conditions with high delay values. This level is considered by many agencies to be the limit of acceptable delay.
- *LOS F* is considered to be unacceptable to most drivers with high delay values that often occur, when arrival flow rates exceed the capacity of the intersection.

Unsignalized Intersections

Levels of service for unsignalized intersections are calculated using the operational analysis methodology of the HCM. The procedure accounts for lane configuration on both the minor and major street approaches, conflicting traffic stream volumes, and the type of intersection control (STOP, YIELD, or all-way STOP control). The definition of level of service for unsignalized intersections is a function of average *control* delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The level-of-service criteria for unsignalized intersections are shown in Table A-1.

Signalized Intersections

Levels of service for signalized intersections are also calculated using the operational analysis methodology of the HCM. The methodology for signalized intersections assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on average *control* delay. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Table A-1 summarizes the relationship between level of service and average control delay.

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[5] *Highway Capacity Manual 2000*, Transportation Research Board; Washington, D.C.; 2000.

TABLE A-1
Level-of-Service Criteria for Intersections

Level of Service	Unsignalized Intersection Criteria Average Control Delay (Seconds per Vehicle)	Signalized Intersection Criteria Average Control Delay (Seconds per Vehicle)
A	≤10	≤10
B	>10 and ≤15	>10 and ≤20
C	>15 and ≤25	>20 and ≤35
D	>25 and ≤35	>35 and ≤55
E	>35 and ≤50	>55 and ≤80
F	>50	>80

Source *Highway Capacity Manual 2000*, Transportation Research Board; Washington, D.C.; 2000. Pages 10-16 and 17-2.

For signalized intersections, this delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to the entire intersection. For unsignalized intersections, this delay criterion may be applied in assigning level-of-service designations to individual lane groups or to individual intersection approaches.

CAPACITY AND QUEUE ANALYSIS WORKSHEETS

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	650	190	95	270	70	105
Future Volume (vph)	650	190	95	270	70	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.970				0.919	
Flt Protected				0.987	0.980	
Satd. Flow (prot)	1807	0	0	1802	1652	0
Flt Permitted				0.987	0.980	
Satd. Flow (perm)	1807	0	0	1802	1652	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1354			549	1225	
Travel Time (s)	30.8			12.5	27.8	
Confl. Peds. (#/hr)		2	2		2	2
Peak Hour Factor	0.93	0.93	0.89	0.89	0.76	0.76
Heavy Vehicles (%)	2%	2%	7%	3%	3%	4%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	17.3					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	650	190	95	270	70	105
Future Vol, veh/h	650	190	95	270	70	105
Conflicting Peds, #/hr	0	2	2	0	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	89	89	76	76
Heavy Vehicles, %	2	2	7	3	3	4
Mvmt Flow	699	204	107	303	92	138

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	905	0	1322	805
Stage 1	-	-	-	-	803	-
Stage 2	-	-	-	-	519	-
Critical Hdwy	-	-	4.17	-	6.43	6.24
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.263	-	3.527	3.336
Pot Cap-1 Maneuver	-	-	731	-	172	379
Stage 1	-	-	-	-	439	-
Stage 2	-	-	-	-	595	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	730	-	141	378
Mov Cap-2 Maneuver	-	-	-	-	141	-
Stage 1	-	-	-	-	438	-
Stage 2	-	-	-	-	489	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.8	110.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	226	-	-	730	-
HCM Lane V/C Ratio	1.019	-	-	0.146	-
HCM Control Delay (s)	110.7	-	-	10.8	0
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	9.6	-	-	0.5	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	760	5	16	325	7	22
Future Volume (vph)	760	5	16	325	7	22
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.999				0.899	
Flt Protected				0.998	0.988	
Satd. Flow (prot)	1859	0	0	1810	1688	0
Flt Permitted				0.998	0.988	
Satd. Flow (perm)	1859	0	0	1810	1688	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	549			284	522	
Travel Time (s)	12.5			6.5	17.8	
Confl. Peds. (#/hr)		3	2		3	2
Peak Hour Factor	0.93	0.93	0.89	0.89	0.73	0.73
Heavy Vehicles (%)	2%	20%	0%	5%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	760	5	16	325	7	22
Future Vol, veh/h	760	5	16	325	7	22
Conflicting Peds, #/hr	0	3	2	0	3	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	89	89	73	73
Heavy Vehicles, %	2	20	0	5	0	0
Mvmt Flow	817	5	18	365	10	30

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	825	0	1227	825
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	404	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	814	-	199	376
Stage 1	-	-	-	-	435	-
Stage 2	-	-	-	-	679	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	812	-	192	374
Mov Cap-2 Maneuver	-	-	-	-	192	-
Stage 1	-	-	-	-	434	-
Stage 2	-	-	-	-	658	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	18.6
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	304	-	-	812	-
HCM Lane V/C Ratio	0.131	-	-	0.022	-
HCM Control Delay (s)	18.6	-	-	9.5	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	785	0	1	340	2	5
Future Volume (vph)	785	0	1	340	2	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt					0.899	
Flt Protected					0.988	
Satd. Flow (prot)	1863	0	0	1827	1467	0
Flt Permitted					0.988	
Satd. Flow (perm)	1863	0	0	1827	1467	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	284			471	517	
Travel Time (s)	6.5			10.7	17.6	
Confl. Peds. (#/hr)			1			1
Peak Hour Factor	0.93	0.93	0.91	0.91	0.58	0.58
Heavy Vehicles (%)	2%	0%	0%	4%	0%	20%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	785	0	1	340	2	5
Future Vol, veh/h	785	0	1	340	2	5
Conflicting Peds, #/hr	0	0	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	93	93	91	91	58	58
Heavy Vehicles, %	2	0	0	4	0	20
Mvmt Flow	844	0	1	374	3	9

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	845	0	1221	846
Stage 1	-	-	-	-	845	-
Stage 2	-	-	-	-	376	-
Critical Hdwy	-	-	4.1	-	6.4	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.48
Pot Cap-1 Maneuver	-	-	800	-	200	337
Stage 1	-	-	-	-	425	-
Stage 2	-	-	-	-	699	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	799	-	199	336
Mov Cap-2 Maneuver	-	-	-	-	199	-
Stage 1	-	-	-	-	425	-
Stage 2	-	-	-	-	698	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	18.4
HCM LOS			C

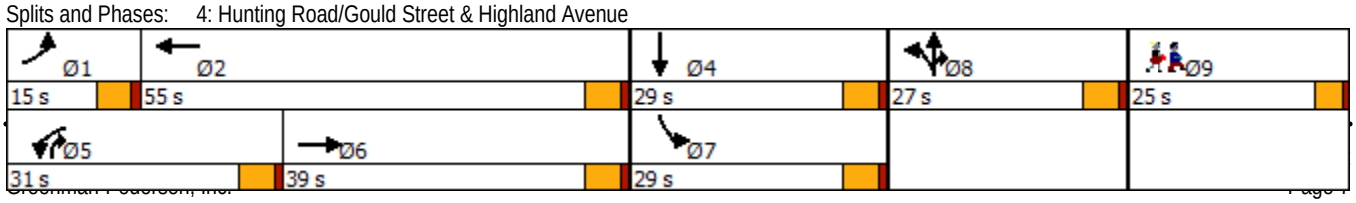
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	281	-	-	799	-
HCM Lane V/C Ratio	0.043	-	-	0.001	-
HCM Control Delay (s)	18.4	-	-	9.5	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	96	761	16	40	557	374	27	213	217	156	60	27
Future Volume (vph)	96	761	16	40	557	374	27	213	217	156	60	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	11	11	10	10	11	11
Storage Length (ft)	200		250	250		0	0		100	100		0
Storage Lanes	1		1	1		0	0		1	1		0
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.997			0.940				0.850		0.967	
Flt Protected	0.950			0.950				0.994		0.950	0.986	
Satd. Flow (prot)	1636	3411	0	1668	3222	0	0	1810	1492	1510	1620	0
Flt Permitted	0.950			0.950				0.994		0.950	0.000	
Satd. Flow (perm)	1636	3411	0	1668	3222	0	0	1810	1492	1510	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			115				158		8	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			463	
Travel Time (s)		30.7			30.1			15.5			10.5	
Peak Hour Factor	0.93	0.93	0.93	0.95	0.95	0.95	0.88	0.88	0.88	0.89	0.89	0.89
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	0%
Shared Lane Traffic (%)										22%		
Turn Type	Prot	NA		Prot	NA		Split	NA	pt+ov	Prot	NA	
Protected Phases	1	6		5	2		8	8	5 8	7	4	
Permitted Phases												
Detector Phase	1	6		5	2		8	8	5 8	7	4	
Switch Phase												
Minimum Initial (s)	4.0	10.0		6.0	20.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	9.0	15.0		11.0	25.0		11.0	11.0		11.0	11.0	
Total Split (s)	15.0	39.0		31.0	55.0		27.0	27.0		29.0	29.0	
Total Split (%)	9.9%	25.8%		20.5%	36.4%		17.9%	17.9%		19.2%	19.2%	
Maximum Green (s)	10.0	34.0		26.0	50.0		22.0	22.0		24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	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)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												

Intersection Summary

Area Type: Other
Cycle Length: 151
Actuated Cycle Length: 114.7
Natural Cycle: 105
Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Hunting Road/Gould Street & Highland Avenue



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	6.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	17%
Maximum Green (s)	21.0
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	6.0
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	0

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	103	835	42	980	273	247	136	136
v/c Ratio	0.72	0.69	0.38	0.85	0.78	0.44	0.43	0.39
Control Delay	80.1	34.9	62.4	38.7	62.0	14.9	45.9	42.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.1	34.9	62.4	38.7	62.0	14.9	45.9	42.2
Queue Length 50th (ft)	75	272	30	314	193	49	92	85
Queue Length 95th (ft)	#183	354	71	396	#354	125	172	164
Internal Link Dist (ft)		1272		1244	601			383
Turn Bay Length (ft)	200		250			100	100	
Base Capacity (vph)	143	1210	379	1474	348	776	317	346
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	0.72	0.69	0.11	0.66	0.78	0.32	0.43	0.39

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	96	761	16	40	557	374	27	213	217	156	60	27
Future Volume (vph)	96	761	16	40	557	374	27	213	217	156	60	27
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	11	11	11	10	10	11	11
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	0.94			1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.99	
Satd. Flow (prot)	1636	3411		1668	3221			1810	1492	1510	1619	
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.00	
Satd. Flow (perm)	1636	3411		1668	3221			1810	1492	1510	0	
Peak-hour factor, PHF	0.93	0.93	0.93	0.95	0.95	0.95	0.88	0.88	0.88	0.89	0.89	0.89
Adj. Flow (vph)	103	818	17	42	586	394	31	242	247	175	67	30
RTOR Reduction (vph)	0	1	0	0	76	0	0	0	110	0	6	0
Lane Group Flow (vph)	103	834	0	42	904	0	0	273	137	136	130	0
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	0%
Turn Type	Prot	NA		Prot	NA		Split	NA	pt+ov	Prot	NA	
Protected Phases	1	6		5	2		8	8	5 8	7	4	
Permitted Phases												
Actuated Green, G (s)	10.0	40.7		7.7	38.4			22.1	34.8	24.1	24.1	
Effective Green, g (s)	10.0	40.7		7.7	38.4			22.1	34.8	24.1	24.1	
Actuated g/C Ratio	0.09	0.36		0.07	0.34			0.19	0.30	0.21	0.21	
Clearance Time (s)	5.0	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	2.0	
Lane Grp Cap (vph)	142	1211		112	1079			349	453	317	340	
v/s Ratio Prot	c0.06	0.24		0.03	c0.28			c0.15	0.09	c0.09	0.08	
v/s Ratio Perm												
v/c Ratio	0.73	0.69		0.38	0.84			0.78	0.30	0.43	0.38	
Uniform Delay, d1	51.0	31.5		51.1	35.2			44.0	30.6	39.3	38.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	14.4	1.3		0.8	5.5			10.1	0.1	0.3	0.3	
Delay (s)	65.4	32.9		51.9	40.8			54.0	30.7	39.6	39.1	
Level of Service	E	C		D	D			D	C	D	D	
Approach Delay (s)		36.4			41.2			43.0			39.4	
Approach LOS		D			D			D			D	

Intersection Summary

HCM 2000 Control Delay	39.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	114.6	Sum of lost time (s)	24.0
Intersection Capacity Utilization	68.8%	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
Lane Configurations												
Traffic Volume (vph)	0	0	5	22	0	14	17	310	36	17	270	2
Future Volume (vph)	0	0	5	22	0	14	17	310	36	17	270	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850		0.987			0.999	
Flt Protected					0.950			0.998			0.997	
Satd. Flow (prot)	0	1611	0	0	1770	1583	0	1835	0	0	1855	0
Flt Permitted					0.950			0.998			0.997	
Satd. Flow (perm)	0	1611	0	0	1770	1583	0	1835	0	0	1855	0
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			463			307	
Travel Time (s)		14.7			16.0			10.5			7.0	
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 (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	5	22	0	14	17	310	36	17	270	2
Future Vol, veh/h	0	0	5	22	0	14	17	310	36	17	270	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	63	63	90	90	90	90	90	90	83	83	83
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	8	24	0	16	19	344	40	20	325	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	776	788	326	772	769	364	327	0	0	384	0	0
Stage 1	366	366	-	402	402	-	-	-	-	-	-	-
Stage 2	410	422	-	370	367	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	315	323	715	317	332	681	1233	-	-	1174	-	-
Stage 1	653	623	-	625	600	-	-	-	-	-	-	-
Stage 2	619	588	-	650	622	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	298	310	715	304	318	681	1233	-	-	1174	-	-
Mov Cap-2 Maneuver	298	310	-	304	318	-	-	-	-	-	-	-
Stage 1	640	610	-	613	588	-	-	-	-	-	-	-
Stage 2	593	576	-	629	609	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.1	15	0.4	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1233	-	-	715	304	681	1174	-	-
HCM Lane V/C Ratio	0.015	-	-	0.011	0.08	0.023	0.017	-	-
HCM Control Delay (s)	8	0	-	10.1	17.9	10.4	8.1	0	-
HCM Lane LOS	A	A	-	B	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0.1	0.1	-	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	13	11	375	43	18	240
Future Volume (vph)	13	11	375	43	18	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.939		0.986			
Flt Protected	0.973					0.996
Satd. Flow (prot)	1736	0	1837	0	0	1841
Flt Permitted	0.973					0.996
Satd. Flow (perm)	1736	0	1837	0	0	1841
Link Speed (mph)	20		30			30
Link Distance (ft)	474		307			641
Travel Time (s)	16.2		7.0			14.6
Peak Hour Factor	0.60	0.60	0.95	0.95	0.91	0.91
Heavy Vehicles (%)	0%	0%	2%	2%	0%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	11	375	43	18	240
Future Vol, veh/h	13	11	375	43	18	240
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	-	-	-	-	-
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	22	18	395	45	20	264

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	722	418	0	0	440	0
Stage 1	418	-	-	-	-	-
Stage 2	304	-	-	-	-	-
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	397	639	-	-	1131	-
Stage 1	669	-	-	-	-	-
Stage 2	753	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	389	639	-	-	1131	-
Mov Cap-2 Maneuver	389	-	-	-	-	-
Stage 1	669	-	-	-	-	-
Stage 2	737	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.3	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	474	1131	-
HCM Lane V/C Ratio	-	-	0.084	0.017	-
HCM Control Delay (s)	-	-	13.3	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	29	9	225	60	20	260
Future Volume (vph)	29	9	225	60	20	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.969		0.971			
Flt Protected	0.963					0.996
Satd. Flow (prot)	1600	0	1805	0	0	1808
Flt Permitted	0.963					0.996
Satd. Flow (perm)	1600	0	1805	0	0	1808
Link Speed (mph)	25		30			30
Link Distance (ft)	562		255			293
Travel Time (s)	15.3		5.8			6.7
Peak Hour Factor	0.79	0.79	0.90	0.90	0.80	0.80
Heavy Vehicles (%)	14%	0%	2%	3%	0%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	29	9	225	60	20	260
Future Vol, veh/h	29	9	225	60	20	260
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	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	79	79	90	90	80	80
Heavy Vehicles, %	14	0	2	3	0	5
Mvmt Flow	37	11	250	67	25	325

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	659	284	0	0	317	0
Stage 1	284	-	-	-	-	-
Stage 2	375	-	-	-	-	-
Critical Hdwy	6.54	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.54	-	-	-	-	-
Critical Hdwy Stg 2	5.54	-	-	-	-	-
Follow-up Hdwy	3.626	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	410	760	-	-	1255	-
Stage 1	737	-	-	-	-	-
Stage 2	669	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	400	760	-	-	1255	-
Mov Cap-2 Maneuver	400	-	-	-	-	-
Stage 1	737	-	-	-	-	-
Stage 2	653	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.9	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	451	1255	-
HCM Lane V/C Ratio	-	-	0.107	0.02	-
HCM Control Delay (s)	-	-	13.9	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	1	0	10	0	3	1	165	60	12	275	2
Future Volume (vph)	4	1	0	10	0	3	1	165	60	12	275	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.966			0.964			0.999	
Flt Protected		0.964			0.964						0.998	
Satd. Flow (prot)	0	1832	0	0	1646	0	0	1783	0	0	1825	0
Flt Permitted		0.964			0.964						0.998	
Satd. Flow (perm)	0	1832	0	0	1646	0	0	1783	0	0	1825	0
Link Speed (mph)		20			25			30			30	
Link Distance (ft)		246			436			293			1225	
Travel Time (s)		8.4			11.9			6.7			27.8	
Confl. Peds. (#/hr)	10		6			4	10		4			6
Peak Hour Factor	0.63	0.63	0.63	0.65	0.65	0.65	0.82	0.82	0.82	0.81	0.81	0.81
Heavy Vehicles (%)	0%	0%	0%	10%	2%	0%	2%	3%	2%	0%	4%	2%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	1	0	10	0	3	1	165	60	12	275	2
Future Vol, veh/h	4	1	0	10	0	3	1	165	60	12	275	2
Conflicting Peds, #/hr	10	0	6	0	0	4	10	0	4	0	0	6
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	63	63	63	65	65	65	82	82	82	81	81	81
Heavy Vehicles, %	0	0	0	10	2	0	2	3	2	0	4	2
Mvmt Flow	6	2	0	15	0	5	1	201	73	15	340	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	633	661	357	622	626	252	352	0	0	278	0	0
Stage 1	381	381	-	244	244	-	-	-	-	-	-	-
Stage 2	252	280	-	378	382	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.2	6.52	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.2	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.2	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.59	4.018	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	395	385	692	388	401	792	1207	-	-	1296	-	-
Stage 1	645	617	-	742	704	-	-	-	-	-	-	-
Stage 2	757	683	-	628	613	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	381	374	681	379	389	781	1196	-	-	1291	-	-
Mov Cap-2 Maneuver	381	374	-	379	389	-	-	-	-	-	-	-
Stage 1	638	602	-	738	700	-	-	-	-	-	-	-
Stage 2	745	680	-	614	598	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.7	13.8	0	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1196	-	-	380	430	1291	-	-
HCM Lane V/C Ratio	0.001	-	-	0.021	0.047	0.011	-	-
HCM Control Delay (s)	8	0	-	14.7	13.8	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	405	75	150	640	105	95
Future Volume (vph)	405	75	150	640	105	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.979				0.936	
Flt Protected				0.991	0.974	
Satd. Flow (prot)	1845	0	0	1849	1700	0
Flt Permitted				0.991	0.974	
Satd. Flow (perm)	1845	0	0	1849	1700	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1354			549	1225	
Travel Time (s)	30.8			12.5	27.8	
Confl. Peds. (#/hr)			6			6
Peak Hour Factor	0.90	0.90	0.82	0.82	0.61	0.61
Heavy Vehicles (%)	1%	0%	1%	2%	0%	4%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	139.3					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	405	75	150	640	105	95
Future Vol, veh/h	405	75	150	640	105	95
Conflicting Peds, #/hr	0	0	6	0	0	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	82	82	61	61
Heavy Vehicles, %	1	0	1	2	0	4
Mvmt Flow	450	83	183	780	172	156

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	539	0	1644	504
Stage 1	-	-	-	-	498	-
Stage 2	-	-	-	-	1146	-
Critical Hdwy	-	-	4.11	-	6.4	6.24
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.209	-	3.5	3.336
Pot Cap-1 Maneuver	-	-	1034	-	~ 111	564
Stage 1	-	-	-	-	615	-
Stage 2	-	-	-	-	306	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1028	-	~ 76	558
Mov Cap-2 Maneuver	-	-	-	-	~ 76	-
Stage 1	-	-	-	-	611	-
Stage 2	-	-	-	-	210	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	$ 769.9
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	129	-	-	1028	-
HCM Lane V/C Ratio	2.542	-	-	0.178	-
HCM Control Delay (s)	$ 769.9	-	-	9.3	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	29.1	-	-	0.6	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	470	3	16	750	15	38
Future Volume (vph)	470	3	16	750	15	38
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.999				0.903	
Flt Protected				0.999	0.986	
Satd. Flow (prot)	1861	0	0	1877	1656	0
Flt Permitted				0.999	0.986	
Satd. Flow (perm)	1861	0	0	1877	1656	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	549			284	522	
Travel Time (s)	12.5			6.5	17.8	
Confl. Peds. (#/hr)		2	1		2	1
Peak Hour Factor	0.96	0.96	0.87	0.87	0.66	0.66
Heavy Vehicles (%)	2%	0%	6%	1%	0%	3%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	1.2					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	470	3	16	750	15	38
Future Vol, veh/h	470	3	16	750	15	38
Conflicting Peds, #/hr	0	2	1	0	2	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	87	87	66	66
Heavy Vehicles, %	2	0	6	1	0	3
Mvmt Flow	490	3	18	862	23	58

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	495	0	1394	495
Stage 1	-	-	-	-	494	-
Stage 2	-	-	-	-	900	-
Critical Hdwy	-	-	4.16	-	6.4	6.23
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.254	-	3.5	3.327
Pot Cap-1 Maneuver	-	-	1048	-	158	573
Stage 1	-	-	-	-	617	-
Stage 2	-	-	-	-	400	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1046	-	152	571
Mov Cap-2 Maneuver	-	-	-	-	152	-
Stage 1	-	-	-	-	616	-
Stage 2	-	-	-	-	386	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	19.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	321	-	-	1046	-
HCM Lane V/C Ratio	0.25	-	-	0.018	-
HCM Control Delay (s)	19.9	-	-	8.5	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	1	-	-	0.1	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	510	2	2	765	0	2
Future Volume (vph)	510	2	2	765	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	1863	0	0	1881	1644	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1881	1644	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	284			471	517	
Travel Time (s)	6.5			10.7	17.6	
Confl. Peds. (#/hr)			1			1
Peak Hour Factor	0.94	0.94	0.87	0.87	0.25	0.25
Heavy Vehicles (%)	2%	0%	0%	1%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	510	2	2	765	0	2
Future Vol, veh/h	510	2	2	765	0	2
Conflicting Peds, #/hr	0	0	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	94	94	87	87	25	25
Heavy Vehicles, %	2	0	0	1	0	0
Mvmt Flow	543	2	2	879	0	8

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	546	0	1428	546
Stage 1	-	-	-	-	545	-
Stage 2	-	-	-	-	883	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1033	-	150	541
Stage 1	-	-	-	-	585	-
Stage 2	-	-	-	-	408	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1032	-	149	540
Mov Cap-2 Maneuver	-	-	-	-	149	-
Stage 1	-	-	-	-	584	-
Stage 2	-	-	-	-	406	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	11.8
HCM LOS			B

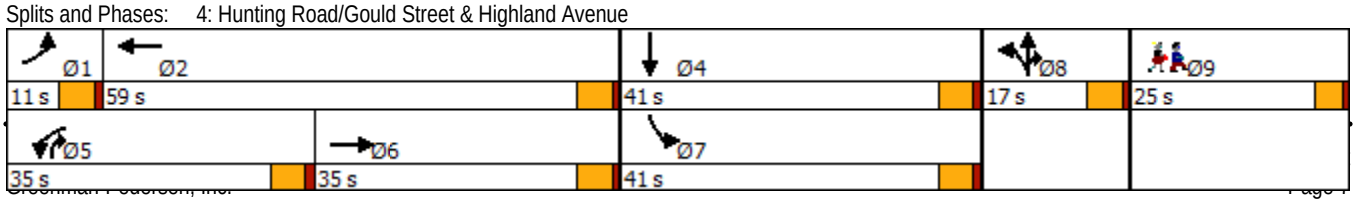
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	540	-	-	1032	-
HCM Lane V/C Ratio	0.015	-	-	0.002	-
HCM Control Delay (s)	11.8	-	-	8.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	650	15	124	741	168	32	75	97	317	139	61
Future Volume (vph)	28	650	15	124	741	168	32	75	97	317	139	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	11	11	10	10	11	11
Storage Length (ft)	200		250	250		0	0		100	100		0
Storage Lanes	1		1	1		0	0		1	1		0
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.997			0.972				0.850		0.964	
Flt Protected	0.950			0.950				0.985		0.950	0.989	
Satd. Flow (prot)	1685	3413	0	1685	3090	0	0	1797	1492	1585	1639	0
Flt Permitted	0.950			0.950				0.985		0.950	0.000	
Satd. Flow (perm)	1685	3413	0	1685	3090	0	0	1797	1492	1585	0	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		1			20				111		10	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			463	
Travel Time (s)		30.7			30.1			15.5			10.5	
Peak Hour Factor	0.95	0.95	0.95	0.88	0.88	0.88	0.87	0.87	0.87	0.89	0.89	0.89
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
Shared Lane Traffic (%)										18%		
Turn Type	Prot	NA		Prot	NA		Split	NA	pt+ov	Prot	NA	
Protected Phases	1	6		5	2		8	8	5 8	7	4	
Permitted Phases												
Detector Phase	1	6		5	2		8	8	5 8	7	4	
Switch Phase												
Minimum Initial (s)	4.0	10.0		6.0	20.0		6.0	6.0		6.0	6.0	
Minimum Split (s)	9.0	15.0		11.0	25.0		11.0	11.0		11.0	11.0	
Total Split (s)	11.0	35.0		35.0	59.0		17.0	17.0		41.0	41.0	
Total Split (%)	7.2%	22.9%		22.9%	38.6%		11.1%	11.1%		26.8%	26.8%	
Maximum Green (s)	6.0	30.0		30.0	54.0		12.0	12.0		36.0	36.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
All-Red Time (s)	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)	5.0	5.0		5.0	5.0			5.0		5.0	5.0	
Lead/Lag	Lead	Lag		Lead	Lag							
Lead-Lag Optimize?	Yes	Yes		Yes	Yes							
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												

Intersection Summary

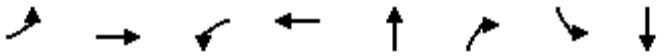
Area Type: Other
Cycle Length: 153
Actuated Cycle Length: 118.2
Natural Cycle: 105
Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Hunting Road/Gould Street & Highland Avenue



Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Lane Width (ft)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Shared Lane Traffic (%)	
Turn Type	
Protected Phases	9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	6.0
Minimum Split (s)	25.0
Total Split (s)	25.0
Total Split (%)	16%
Maximum Green (s)	21.0
Yellow Time (s)	3.0
All-Red Time (s)	1.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	2.0
Recall Mode	None
Walk Time (s)	6.0
Flash Dont Walk (s)	15.0
Pedestrian Calls (#/hr)	0

Intersection Summary



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	29	700	141	1033	123	111	292	289
v/c Ratio	0.37	0.67	0.69	0.80	0.70	0.24	0.60	0.57
Control Delay	71.0	39.9	68.6	35.7	75.2	7.5	43.0	40.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.0	39.9	68.6	35.7	75.2	7.5	43.0	40.2
Queue Length 50th (ft)	23	247	109	377	96	0	210	198
Queue Length 95th (ft)	57	333	175	450	#184	41	327	311
Internal Link Dist (ft)		1272		1244	601			383
Turn Bay Length (ft)	200		250			100	100	
Base Capacity (vph)	85	1039	430	1431	183	650	485	509
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	0.34	0.67	0.33	0.72	0.67	0.17	0.60	0.57

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	650	15	124	741	168	32	75	97	317	139	61
Future Volume (vph)	28	650	15	124	741	168	32	75	97	317	139	61
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	11	11	11	10	10	11	11
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00	0.95	0.95	
Frt	1.00	1.00		1.00	0.97			1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.99	
Satd. Flow (prot)	1685	3411		1685	3091			1797	1492	1585	1640	
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.00	
Satd. Flow (perm)	1685	3411		1685	3091			1797	1492	1585	0	
Peak-hour factor, PHF	0.95	0.95	0.95	0.88	0.88	0.88	0.87	0.87	0.87	0.89	0.89	0.89
Adj. Flow (vph)	29	684	16	141	842	191	37	86	111	356	156	69
RTOR Reduction (vph)	0	1	0	0	12	0	0	0	83	0	7	0
Lane Group Flow (vph)	29	699	0	141	1021	0	0	123	28	292	282	0
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
Turn Type	Prot	NA		Prot	NA		Split	NA	pt+ov	Prot	NA	
Protected Phases	1	6		5	2		8	8	5 8	7	4	
Permitted Phases												
Actuated Green, G (s)	3.4	38.2		14.3	49.1			11.5	30.8	36.2	36.2	
Effective Green, g (s)	3.4	38.2		14.3	49.1			11.5	30.8	36.2	36.2	
Actuated g/C Ratio	0.03	0.32		0.12	0.41			0.10	0.26	0.30	0.30	
Clearance Time (s)	5.0	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	2.0	
Lane Grp Cap (vph)	47	1084		200	1262			171	382	477	493	
v/s Ratio Prot	0.02	0.21		c0.08	c0.33			c0.07	0.02	c0.18	0.17	
v/s Ratio Perm												
v/c Ratio	0.62	0.65		0.70	0.81			0.72	0.07	0.61	0.57	
Uniform Delay, d1	57.8	35.2		50.9	31.4			52.8	33.9	36.0	35.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	15.7	1.0		8.9	3.7			11.4	0.0	1.6	1.0	
Delay (s)	73.5	36.2		59.8	35.1			64.2	33.9	37.6	36.5	
Level of Service	E	D		E	D			E	C	D	D	
Approach Delay (s)		37.7			38.1			49.8			37.0	
Approach LOS		D			D			D			D	

Intersection Summary

HCM 2000 Control Delay	38.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.2	Sum of lost time (s)	24.0
Intersection Capacity Utilization	65.8%	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
Lane Configurations												
Traffic Volume (vph)	0	0	28	30	1	18	7	225	12	5	580	6
Future Volume (vph)	0	0	28	30	1	18	7	225	12	5	580	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850		0.993			0.999	
Flt Protected					0.953			0.998				
Satd. Flow (prot)	0	1611	0	0	1775	1583	0	1846	0	0	1861	0
Flt Permitted					0.953			0.998				
Satd. Flow (perm)	0	1611	0	0	1775	1583	0	1846	0	0	1861	0
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			463			307	
Travel Time (s)		14.7			16.0			10.5			7.0	
Peak Hour Factor	0.75	0.75	0.75	0.72	0.72	0.72	0.92	0.92	0.92	0.86	0.86	0.86
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	1.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	28	30	1	18	7	225	12	5	580	6
Future Vol, veh/h	0	0	28	30	1	18	7	225	12	5	580	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	72	72	72	92	92	92	86	86	86
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	37	42	1	25	8	245	13	6	674	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	971	964	678	976	961	252	681	0	0	258	0	0
Stage 1	690	690	-	268	268	-	-	-	-	-	-	-
Stage 2	281	274	-	708	693	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	232	255	452	230	256	787	912	-	-	1307	-	-
Stage 1	435	446	-	738	687	-	-	-	-	-	-	-
Stage 2	726	683	-	426	445	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	221	251	452	208	252	787	912	-	-	1307	-	-
Mov Cap-2 Maneuver	221	251	-	208	252	-	-	-	-	-	-	-
Stage 1	431	443	-	731	680	-	-	-	-	-	-	-
Stage 2	694	676	-	388	442	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.7	20.4	0.3	0.1
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	912	-	-	452	209	787	1307	-	-
HCM Lane V/C Ratio	0.008	-	-	0.083	0.206	0.032	0.004	-	-
HCM Control Delay (s)	9	0	-	13.7	26.6	9.7	7.8	0	-
HCM Lane LOS	A	A	-	B	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.8	0.1	0	-	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	27	17	245	6	6	470
Future Volume (vph)	27	17	245	6	6	470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.947		0.997			
Flt Protected	0.970					0.999
Satd. Flow (prot)	1745	0	1894	0	0	1792
Flt Permitted	0.970					0.999
Satd. Flow (perm)	1745	0	1894	0	0	1792
Link Speed (mph)	20		30			30
Link Distance (ft)	474		307			641
Travel Time (s)	16.2		7.0			14.6
Peak Hour Factor	0.81	0.81	0.75	0.75	0.73	0.73
Heavy Vehicles (%)	0%	0%	0%	0%	0%	6%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	27	17	245	6	6	470
Future Vol, veh/h	27	17	245	6	6	470
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	-	-	-	-	-
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	33	21	327	8	8	644

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	991	331	0	0	335	0
Stage 1	331	-	-	-	-	-
Stage 2	660	-	-	-	-	-
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	275	715	-	-	1236	-
Stage 1	732	-	-	-	-	-
Stage 2	518	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	272	715	-	-	1236	-
Mov Cap-2 Maneuver	272	-	-	-	-	-
Stage 1	732	-	-	-	-	-
Stage 2	513	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.8	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	358	1236	-
HCM Lane V/C Ratio	-	-	0.152	0.007	-
HCM Control Delay (s)	-	-	16.8	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	90	19	200	42	10	265
Future Volume (vph)	90	19	200	42	10	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.976		0.976			
Flt Protected	0.960					0.998
Satd. Flow (prot)	1766	0	1818	0	0	1896
Flt Permitted	0.960					0.998
Satd. Flow (perm)	1766	0	1818	0	0	1896
Link Speed (mph)	25		30			30
Link Distance (ft)	562		255			293
Travel Time (s)	15.3		5.8			6.7
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.80	0.80	0.90	0.90	0.66	0.66
Heavy Vehicles (%)	1%	0%	2%	2%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	90	19	200	42	10	265
Future Vol, veh/h	90	19	200	42	10	265
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	80	80	90	90	66	66
Heavy Vehicles, %	1	0	2	2	0	0
Mvmt Flow	113	24	222	47	15	402

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	680	248	0	0	270	0
Stage 1	247	-	-	-	-	-
Stage 2	433	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	418	796	-	-	1305	-
Stage 1	796	-	-	-	-	-
Stage 2	656	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	411	794	-	-	1304	-
Mov Cap-2 Maneuver	411	-	-	-	-	-
Stage 1	795	-	-	-	-	-
Stage 2	646	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.5	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	449	1304	-
HCM Lane V/C Ratio	-	-	0.303	0.012	-
HCM Control Delay (s)	-	-	16.5	7.8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.3	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	0	50	0	2	0	195	21	1	220	0
Future Volume (vph)	1	0	0	50	0	2	0	195	21	1	220	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.994			0.987				
Flt Protected		0.950			0.954							
Satd. Flow (prot)	0	1805	0	0	1802	0	0	1842	0	0	1827	0
Flt Permitted		0.950			0.954							
Satd. Flow (perm)	0	1805	0	0	1802	0	0	1842	0	0	1827	0
Link Speed (mph)		20			25			30			30	
Link Distance (ft)		246			436			293			1225	
Travel Time (s)		8.4			11.9			6.7			27.8	
Confl. Peds. (#/hr)	2		3	3		2	3		3	2		2
Peak Hour Factor	0.25	0.25	0.25	0.76	0.76	0.76	0.83	0.83	0.83	0.66	0.66	0.66
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	4%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	0	50	0	2	0	195	21	1	220	0
Future Vol, veh/h	1	0	0	50	0	2	0	195	21	1	220	0
Conflicting Peds, #/hr	2	0	3	3	0	2	3	0	3	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	25	25	25	76	76	76	83	83	83	66	66	66
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	4	0
Mvmt Flow	4	0	0	66	0	3	0	235	25	2	333	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	591	603	339	591	591	253	336	0	0	263	0	0
Stage 1	340	340	-	251	251	-	-	-	-	-	-	-
Stage 2	251	263	-	340	340	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	422	416	708	422	422	791	1235	-	-	1313	-	-
Stage 1	679	643	-	758	703	-	-	-	-	-	-	-
Stage 2	758	694	-	679	643	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	418	413	704	419	419	787	1231	-	-	1309	-	-
Mov Cap-2 Maneuver	418	413	-	419	419	-	-	-	-	-	-	-
Stage 1	677	640	-	756	701	-	-	-	-	-	-	-
Stage 2	754	692	-	676	640	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.7	15	0	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1231	-	-	418	427	1309	-	-
HCM Lane V/C Ratio	-	-	-	0.01	0.16	0.001	-	-
HCM Control Delay (s)	0	-	-	13.7	15	7.8	0	-
HCM Lane LOS	A	-	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.6	0	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	718	210	105	298	77	116
Future Volume (vph)	718	210	105	298	77	116
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.969				0.919	
Flt Protected				0.987	0.980	
Satd. Flow (prot)	1805	0	0	1802	1652	0
Flt Permitted				0.987	0.980	
Satd. Flow (perm)	1805	0	0	1802	1652	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1354			549	1225	
Travel Time (s)	30.8			12.5	27.8	
Confl. Peds. (#/hr)		2	2		2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	7%	3%	3%	4%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	20					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	718	210	105	298	77	116
Future Vol, veh/h	718	210	105	298	77	116
Conflicting Peds, #/hr	0	2	2	0	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	7	3	3	4
Mvmt Flow	780	228	114	324	84	126

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1010	0	1450	898
Stage 1	-	-	-	-	896	-
Stage 2	-	-	-	-	554	-
Critical Hdwy	-	-	4.17	-	6.43	6.24
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.263	-	3.527	3.336
Pot Cap-1 Maneuver	-	-	667	-	143	335
Stage 1	-	-	-	-	397	-
Stage 2	-	-	-	-	574	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	666	-	113	334
Mov Cap-2 Maneuver	-	-	-	-	113	-
Stage 1	-	-	-	-	396	-
Stage 2	-	-	-	-	453	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3	151.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	188	-	-	666	-
HCM Lane V/C Ratio	1.116	-	-	0.171	-
HCM Control Delay (s)	151.7	-	-	11.5	0
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	10.3	-	-	0.6	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	840	6	18	359	8	24
Future Volume (vph)	840	6	18	359	8	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.999				0.900	
Flt Protected				0.998	0.987	
Satd. Flow (prot)	1858	0	0	1810	1688	0
Flt Permitted				0.998	0.987	
Satd. Flow (perm)	1858	0	0	1810	1688	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	549			284	522	
Travel Time (s)	12.5			6.5	17.8	
Confl. Peds. (#/hr)		3	2		3	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	20%	0%	5%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	840	6	18	359	8	24
Future Vol, veh/h	840	6	18	359	8	24
Conflicting Peds, #/hr	0	3	2	0	3	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	20	0	5	0	0
Mvmt Flow	913	7	20	390	9	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	923	0	1353	922
Stage 1	-	-	-	-	920	-
Stage 2	-	-	-	-	433	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	748	-	167	330
Stage 1	-	-	-	-	392	-
Stage 2	-	-	-	-	658	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	746	-	160	328
Mov Cap-2 Maneuver	-	-	-	-	160	-
Stage 1	-	-	-	-	391	-
Stage 2	-	-	-	-	634	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	21
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	260	-	-	746	-
HCM Lane V/C Ratio	0.134	-	-	0.026	-
HCM Control Delay (s)	21	-	-	10	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	867	0	1	376	2	6
Future Volume (vph)	867	0	1	376	2	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt					0.895	
Flt Protected					0.989	
Satd. Flow (prot)	1863	0	0	1827	1455	0
Flt Permitted					0.989	
Satd. Flow (perm)	1863	0	0	1827	1455	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	284			471	517	
Travel Time (s)	6.5			10.7	17.6	
Confl. Peds. (#/hr)			1			1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	0%	4%	0%	20%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	867	0	1	376	2	6
Future Vol, veh/h	867	0	1	376	2	6
Conflicting Peds, #/hr	0	0	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	0	4	0	20
Mvmt Flow	942	0	1	409	2	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	943	0	1354	944
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	411	-
Critical Hdwy	-	-	4.1	-	6.4	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.48
Pot Cap-1 Maneuver	-	-	736	-	167	294
Stage 1	-	-	-	-	382	-
Stage 2	-	-	-	-	674	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	735	-	166	293
Mov Cap-2 Maneuver	-	-	-	-	166	-
Stage 1	-	-	-	-	382	-
Stage 2	-	-	-	-	673	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	20.2
HCM LOS			C

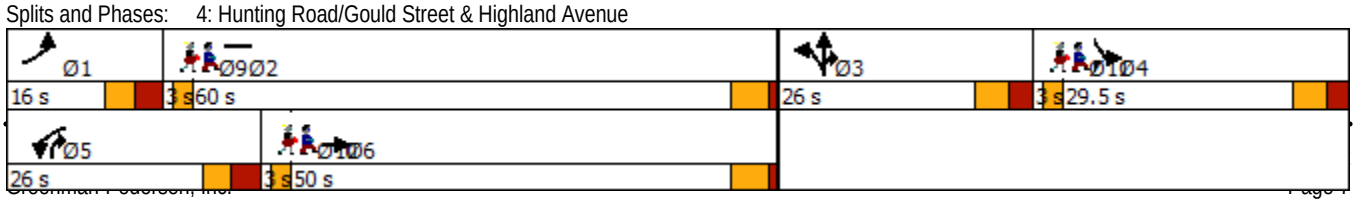
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	246	-	-	735	-
HCM Lane V/C Ratio	0.035	-	-	0.001	-
HCM Control Delay (s)	20.2	-	-	9.9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	841	18	44	615	413	30	235	240	172	66	30
Future Volume (vph)	106	841	18	44	615	413	30	235	240	172	66	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	11	11	11	11	11	11
Storage Length (ft)	175		0	165		0	0		100	100		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.997			0.940				0.850		0.966	
Flt Protected	0.950			0.950				0.994		0.950	0.986	
Satd. Flow (prot)	1636	3411	0	1668	3222	0	0	1810	1546	1564	1619	0
Flt Permitted	0.950			0.950				0.994		0.950	0.986	
Satd. Flow (perm)	1636	3411	0	1668	3222	0	0	1810	1546	1564	1619	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			141				134		9	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			463	
Travel Time (s)		30.7			30.1			15.5			10.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	0%
Shared Lane Traffic (%)										22%		
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												
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	
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0	12.0		12.0	12.0	
Total Split (s)	16.0	50.0		26.0	60.0		26.0	26.0		29.5	29.5	
Total Split (%)	11.6%	36.4%		18.9%	43.6%		18.9%	18.9%		21.5%	21.5%	
Maximum Green (s)	10.0	45.0		20.0	55.0		20.0	20.0		23.5	23.5	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5		3.5	3.5	
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	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	
Lead/Lag	Lead			Lead			Lead	Lead				
Lead-Lag Optimize?	Yes			Yes			Yes	Yes				
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		4.0			4.0					4.0	4.0	
Flash Dont Walk (s)		11.0			12.0					19.5	19.5	
Pedestrian Calls (#/hr)		1			1					1	1	

Intersection Summary

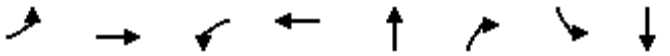
Area Type: Other
Cycle Length: 137.5
Actuated Cycle Length: 111.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Hunting Road/Gould Street & Highland Avenue



Lane Group	Ø9	Ø10	Ø11
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Turn Type			
Protected Phases	9	10	11
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	3.0	3.0	3.0
Total Split (s)	3.0	3.0	3.0
Total Split (%)	2%	2%	2%
Maximum Green (s)	1.0	1.0	1.0
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0	2.0
Recall Mode	None	None	None
Walk Time (s)	0.0	0.0	0.0
Flash Dont Walk (s)	0.0	0.0	0.0
Pedestrian Calls (#/hr)	1	1	1

Intersection Summary



Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	115	934	48	1117	288	261	146	146
v/c Ratio	0.77	0.71	0.39	0.88	0.87	0.53	0.69	0.64
Control Delay	84.0	32.9	63.3	37.4	71.8	14.4	64.8	57.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	84.0	32.9	63.3	37.4	71.8	14.4	64.8	57.9
Queue Length 50th (ft)	80	280	33	333	197	46	103	95
Queue Length 95th (ft)	#233	448	84	507	#476	115	205	195
Internal Link Dist (ft)		1272		1244	601			383
Turn Bay Length (ft)	175		165			100	100	
Base Capacity (vph)	150	1473	306	1700	332	653	338	357
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	0.77	0.63	0.16	0.66	0.87	0.40	0.43	0.41

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	106	841	18	44	615	413	30	235	240	172	66	30
Future Volume (vph)	106	841	18	44	615	413	30	235	240	172	66	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	11	11	11	11	11	11	11
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	0.95	0.95	
Frt	1.00	1.00		1.00	0.94			1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.99	
Satd. Flow (prot)	1636	3410		1668	3221			1810	1546	1564	1619	
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.99	
Satd. Flow (perm)	1636	3410		1668	3221			1810	1546	1564	1619	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	115	914	20	48	668	449	33	255	261	187	72	33
RTOR Reduction (vph)	0	1	0	0	88	0	0	0	99	0	8	0
Lane Group Flow (vph)	115	933	0	48	1029	0	0	288	162	146	138	0
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	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	
Permitted Phases												
Actuated Green, G (s)	10.2	42.9		8.2	40.9			20.4	28.6	15.1	15.1	
Effective Green, g (s)	10.2	42.9		8.2	40.9			20.4	28.6	15.1	15.1	
Actuated g/C Ratio	0.09	0.39		0.07	0.37			0.19	0.26	0.14	0.14	
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)	152	1334		124	1201			336	403	215	223	
v/s Ratio Prot	c0.07	0.27		0.03	c0.32			c0.16	0.10	c0.09	0.09	
v/s Ratio Perm												
v/c Ratio	0.76	0.70		0.39	0.86			0.86	0.40	0.68	0.62	
Uniform Delay, d1	48.5	27.9		48.3	31.6			43.2	33.4	44.9	44.5	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	17.2	1.3		0.7	6.0			18.3	0.2	6.5	3.6	
Delay (s)	65.7	29.3		49.0	37.6			61.5	33.7	51.5	48.1	
Level of Service	E	C		D	D			E	C	D	D	
Approach Delay (s)		33.2			38.1			48.3			49.8	
Approach LOS		C			D			D			D	

Intersection Summary

HCM 2000 Control Delay	39.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	109.6	Sum of lost time (s)	27.0
Intersection Capacity Utilization	76.7%	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)	0	0	5	24	0	15	17	342	40	19	298	2
Future Volume (vph)	0	0	5	24	0	15	17	342	40	19	298	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850		0.987			0.999	
Flt Protected					0.950			0.998			0.997	
Satd. Flow (prot)	0	1611	0	0	1770	1583	0	1835	0	0	1855	0
Flt Permitted					0.950			0.998			0.997	
Satd. Flow (perm)	0	1611	0	0	1770	1583	0	1835	0	0	1855	0
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			463			307	
Travel Time (s)		14.7			16.0			10.5			7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↰	↱		↔			↔	
Traffic Vol, veh/h	0	0	5	24	0	15	17	342	40	19	298	2
Future Vol, veh/h	0	0	5	24	0	15	17	342	40	19	298	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	5	26	0	16	18	372	43	21	324	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	805	818	325	800	798	394	326	0	0	415	0	0
Stage 1	367	367	-	430	430	-	-	-	-	-	-	-
Stage 2	438	451	-	370	368	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	301	311	716	303	319	655	1234	-	-	1144	-	-
Stage 1	653	622	-	603	583	-	-	-	-	-	-	-
Stage 2	597	571	-	650	621	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	284	298	716	291	306	655	1234	-	-	1144	-	-
Mov Cap-2 Maneuver	284	298	-	291	306	-	-	-	-	-	-	-
Stage 1	641	608	-	592	572	-	-	-	-	-	-	-
Stage 2	571	560	-	631	607	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.1	15.5	0.3	0.5
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1234	-	-	716	291	655	1144	-	-
HCM Lane V/C Ratio	0.015	-	-	0.008	0.09	0.025	0.018	-	-
HCM Control Delay (s)	8	0	-	10.1	18.6	10.6	8.2	0	-
HCM Lane LOS	A	A	-	B	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.3	0.1	0.1	-	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	14	12	414	47	20	265
Future Volume (vph)	14	12	414	47	20	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.937		0.986			
Flt Protected	0.974					0.996
Satd. Flow (prot)	1734	0	1837	0	0	1841
Flt Permitted	0.974					0.996
Satd. Flow (perm)	1734	0	1837	0	0	1841
Link Speed (mph)	20		30			30
Link Distance (ft)	474		307			641
Travel Time (s)	16.2		7.0			14.6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	2%	0%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	12	414	47	20	265
Future Vol, veh/h	14	12	414	47	20	265
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	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	2	0	3
Mvmt Flow	15	13	450	51	22	288

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	808	476	0	0	501	0
Stage 1	476	-	-	-	-	-
Stage 2	332	-	-	-	-	-
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	353	593	-	-	1074	-
Stage 1	629	-	-	-	-	-
Stage 2	731	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	345	593	-	-	1074	-
Mov Cap-2 Maneuver	345	-	-	-	-	-
Stage 1	629	-	-	-	-	-
Stage 2	713	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	428	1074	-
HCM Lane V/C Ratio	-	-	0.066	0.02	-
HCM Control Delay (s)	-	-	14	8.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	32	10	249	66	22	287
Future Volume (vph)	32	10	249	66	22	287
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.968		0.972			
Flt Protected	0.963					0.996
Satd. Flow (prot)	1601	0	1807	0	0	1808
Flt Permitted	0.963					0.996
Satd. Flow (perm)	1601	0	1807	0	0	1808
Link Speed (mph)	25		30			30
Link Distance (ft)	562		255			293
Travel Time (s)	15.3		5.8			6.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	14%	0%	2%	3%	0%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	1.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	10	249	66	22	287
Future Vol, veh/h	32	10	249	66	22	287
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	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	14	0	2	3	0	5
Mvmt Flow	35	11	271	72	24	312

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	667	307	0	0	343	0
Stage 1	307	-	-	-	-	-
Stage 2	360	-	-	-	-	-
Critical Hdwy	6.54	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.54	-	-	-	-	-
Critical Hdwy Stg 2	5.54	-	-	-	-	-
Follow-up Hdwy	3.626	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	406	738	-	-	1227	-
Stage 1	720	-	-	-	-	-
Stage 2	680	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	396	738	-	-	1227	-
Mov Cap-2 Maneuver	396	-	-	-	-	-
Stage 1	720	-	-	-	-	-
Stage 2	664	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14	0	0.6
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	445	1227	-
HCM Lane V/C Ratio	-	-	0.103	0.019	-
HCM Control Delay (s)	-	-	14	8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	1	0	11	0	3	1	182	66	13	304	2
Future Volume (vph)	4	1	0	11	0	3	1	182	66	13	304	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.973			0.964			0.999	
Flt Protected		0.962			0.962						0.998	
Satd. Flow (prot)	0	1828	0	0	1647	0	0	1783	0	0	1824	0
Flt Permitted		0.962			0.962						0.998	
Satd. Flow (perm)	0	1828	0	0	1647	0	0	1783	0	0	1824	0
Link Speed (mph)		20			25			30			30	
Link Distance (ft)		246			436			293			1225	
Travel Time (s)		8.4			11.9			6.7			27.8	
Confl. Peds. (#/hr)	10		6			4	10		4			6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	10%	2%	0%	2%	3%	2%	0%	4%	2%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	1	0	11	0	3	1	182	66	13	304	2
Future Vol, veh/h	4	1	0	11	0	3	1	182	66	13	304	2
Conflicting Peds, #/hr	10	0	6	0	0	4	10	0	4	0	0	6
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	10	2	0	2	3	2	0	4	2
Mvmt Flow	4	1	0	12	0	3	1	198	72	14	330	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	617	645	347	606	610	248	342	0	0	274	0	0
Stage 1	369	369	-	240	240	-	-	-	-	-	-	-
Stage 2	248	276	-	366	370	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.2	6.52	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.2	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.2	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.59	4.018	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	405	393	701	398	409	796	1217	-	-	1301	-	-
Stage 1	655	624	-	746	707	-	-	-	-	-	-	-
Stage 2	760	685	-	637	620	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	392	382	690	389	398	785	1205	-	-	1296	-	-
Mov Cap-2 Maneuver	392	382	-	389	398	-	-	-	-	-	-	-
Stage 1	648	610	-	742	703	-	-	-	-	-	-	-
Stage 2	749	682	-	624	606	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.4	13.6	0	0.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1205	-	-	390	436	1296	-	-
HCM Lane V/C Ratio	0.001	-	-	0.014	0.035	0.011	-	-
HCM Control Delay (s)	8	0	-	14.4	13.6	7.8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.1	0	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	447	83	166	707	116	105
Future Volume (vph)	447	83	166	707	116	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.979				0.936	
Flt Protected				0.991	0.974	
Satd. Flow (prot)	1845	0	0	1849	1700	0
Flt Permitted				0.991	0.974	
Satd. Flow (perm)	1845	0	0	1849	1700	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1354			549	1225	
Travel Time (s)	30.8			12.5	27.8	
Confl. Peds. (#/hr)			6			6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	1%	2%	0%	4%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	70.2					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	447	83	166	707	116	105
Future Vol, veh/h	447	83	166	707	116	105
Conflicting Peds, #/hr	0	0	6	0	0	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	0	1	2	0	4
Mvmt Flow	486	90	180	768	126	114

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	582	0	1665	543
Stage 1	-	-	-	-	537	-
Stage 2	-	-	-	-	1128	-
Critical Hdwy	-	-	4.11	-	6.4	6.24
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.209	-	3.5	3.336
Pot Cap-1 Maneuver	-	-	997	-	~ 108	536
Stage 1	-	-	-	-	590	-
Stage 2	-	-	-	-	312	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	991	-	~ 73	530
Mov Cap-2 Maneuver	-	-	-	-	~ 73	-
Stage 1	-	-	-	-	586	-
Stage 2	-	-	-	-	213	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	$ 509.1
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	124	-	-	991	-
HCM Lane V/C Ratio	1.937	-	-	0.182	-
HCM Control Delay (s)	$ 509.1	-	-	9.4	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	19.2	-	-	0.7	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	519	3	18	828	17	42
Future Volume (vph)	519	3	18	828	17	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.999				0.903	
Flt Protected				0.999	0.986	
Satd. Flow (prot)	1861	0	0	1877	1656	0
Flt Permitted				0.999	0.986	
Satd. Flow (perm)	1861	0	0	1877	1656	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	549			284	522	
Travel Time (s)	12.5			6.5	17.8	
Confl. Peds. (#/hr)		2	1		2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	6%	1%	0%	3%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	519	3	18	828	17	42
Future Vol, veh/h	519	3	18	828	17	42
Conflicting Peds, #/hr	0	2	1	0	2	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	6	1	0	3
Mvmt Flow	564	3	20	900	18	46

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	569	0	1510	569
Stage 1	-	-	-	-	568	-
Stage 2	-	-	-	-	942	-
Critical Hdwy	-	-	4.16	-	6.4	6.23
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.254	-	3.5	3.327
Pot Cap-1 Maneuver	-	-	984	-	134	520
Stage 1	-	-	-	-	571	-
Stage 2	-	-	-	-	382	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	982	-	128	519
Mov Cap-2 Maneuver	-	-	-	-	128	-
Stage 1	-	-	-	-	570	-
Stage 2	-	-	-	-	366	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	21.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	276	-	-	982	-
HCM Lane V/C Ratio	0.232	-	-	0.02	-
HCM Control Delay (s)	21.9	-	-	8.7	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.9	-	-	0.1	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	563	2	2	845	0	2
Future Volume (vph)	563	2	2	845	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	1863	0	0	1881	1644	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1881	1644	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	284			471	517	
Travel Time (s)	6.5			10.7	17.6	
Confl. Peds. (#/hr)			1			1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	0%	1%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	563	2	2	845	0	2
Future Vol, veh/h	563	2	2	845	0	2
Conflicting Peds, #/hr	0	0	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	0	1	0	0
Mvmt Flow	612	2	2	918	0	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	615	0	1536	615
Stage 1	-	-	-	-	614	-
Stage 2	-	-	-	-	922	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	974	-	129	495
Stage 1	-	-	-	-	544	-
Stage 2	-	-	-	-	391	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	973	-	128	494
Mov Cap-2 Maneuver	-	-	-	-	128	-
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	389	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.3
HCM LOS			B

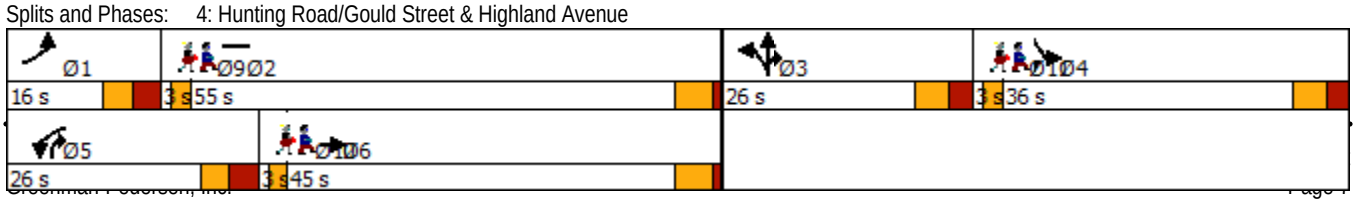
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	494	-	-	973	-
HCM Lane V/C Ratio	0.004	-	-	0.002	-
HCM Control Delay (s)	12.3	-	-	8.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	718	17	137	819	186	35	83	107	350	154	67
Future Volume (vph)	31	718	17	137	819	186	35	83	107	350	154	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	11	11	11	11	11	11
Storage Length (ft)	175		0	165		0	0		100	100		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.997			0.972				0.850		0.964	
Flt Protected	0.950			0.950				0.985		0.950	0.989	
Satd. Flow (prot)	1685	3412	0	1685	3090	0	0	1796	1546	1641	1639	0
Flt Permitted	0.950			0.950				0.985		0.950	0.989	
Satd. Flow (perm)	1685	3412	0	1685	3090	0	0	1796	1546	1641	1639	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			22				94		10	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			463	
Travel Time (s)		30.7			30.1			15.5			10.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
Shared Lane Traffic (%)										18%		
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												
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	
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0	12.0		12.0	12.0	
Total Split (s)	16.0	45.0		26.0	55.0		26.0	26.0		36.0	36.0	
Total Split (%)	11.5%	32.4%		18.7%	39.6%		18.7%	18.7%		25.9%	25.9%	
Maximum Green (s)	10.0	40.0		20.0	50.0		20.0	20.0		30.0	30.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5		3.5	3.5	
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	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	
Lead/Lag	Lead			Lead			Lead	Lead				
Lead-Lag Optimize?	Yes			Yes			Yes	Yes				
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		4.0			4.0					4.0	4.0	
Flash Dont Walk (s)		11.0			12.0					19.5	19.5	
Pedestrian Calls (#/hr)		1			1					1	1	

Intersection Summary

Area Type: Other
Cycle Length: 139
Actuated Cycle Length: 111.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Hunting Road/Gould Street & Highland Avenue



Lane Group	Ø9	Ø10	Ø11
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Turn Type			
Protected Phases	9	10	11
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	3.0	3.0	3.0
Total Split (s)	3.0	3.0	3.0
Total Split (%)	2%	2%	2%
Maximum Green (s)	1.0	1.0	1.0
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0	2.0
Recall Mode	None	None	None
Walk Time (s)	0.0	0.0	0.0
Flash Dont Walk (s)	0.0	0.0	0.0
Pedestrian Calls (#/hr)	1	1	1

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	34	798	149	1092	128	116	312	308
v/c Ratio	0.30	0.78	0.69	0.84	0.62	0.26	0.81	0.79
Control Delay	64.5	43.4	67.7	38.3	64.9	7.0	60.9	57.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.5	43.4	67.7	38.3	64.9	7.0	60.9	57.1
Queue Length 50th (ft)	27	285	116	404	99	7	245	232
Queue Length 95th (ft)	67	434	205	#653	178	32	#466	#445
Internal Link Dist (ft)		1272		1244	601			383
Turn Bay Length (ft)	175		165			100	100	
Base Capacity (vph)	158	1296	316	1465	337	640	463	469
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	0.22	0.62	0.47	0.75	0.38	0.18	0.67	0.66

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	31	718	17	137	819	186	35	83	107	350	154	67
Future Volume (vph)	31	718	17	137	819	186	35	83	107	350	154	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	11	11	11	11	11	11	11
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	0.95	0.95	
Frt	1.00	1.00		1.00	0.97			1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.99	
Satd. Flow (prot)	1685	3411		1685	3091			1797	1546	1641	1640	
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.99	
Satd. Flow (perm)	1685	3411		1685	3091			1797	1546	1641	1640	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	34	780	18	149	890	202	38	90	116	380	167	73
RTOR Reduction (vph)	0	1	0	0	13	0	0	0	71	0	8	0
Lane Group Flow (vph)	34	797	0	149	1079	0	0	128	45	312	300	0
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
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)	4.3	36.5		14.3	46.5			12.8	27.1	26.1	26.1	
Effective Green, g (s)	4.3	36.5		14.3	46.5			12.8	27.1	26.1	26.1	
Actuated g/C Ratio	0.04	0.32		0.13	0.41			0.11	0.24	0.23	0.23	
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)	64	1104		213	1275			204	371	380	379	
v/s Ratio Prot	0.02	0.23		c0.09	c0.35			c0.07	0.03	c0.19	0.18	
v/s Ratio Perm												
v/c Ratio	0.53	0.72		0.70	0.85			0.63	0.12	0.82	0.79	
Uniform Delay, d1	53.2	33.6		47.1	29.9			47.7	33.5	41.1	40.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	4.2	2.0		7.8	5.2			4.3	0.1	12.7	10.1	
Delay (s)	57.4	35.6		55.0	35.0			52.0	33.5	53.8	50.9	
Level of Service	E	D		D	D			D	C	D	D	
Approach Delay (s)		36.5			37.4			43.2			52.3	
Approach LOS		D			D			D			D	

Intersection Summary

HCM 2000 Control Delay	40.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	112.7	Sum of lost time (s)	27.0
Intersection Capacity Utilization	74.8%	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)	0	0	28	33	1	20	7	249	13	6	641	6
Future Volume (vph)	0	0	28	33	1	20	7	249	13	6	641	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850		0.994			0.999	
Flt Protected					0.954			0.999				
Satd. Flow (prot)	0	1611	0	0	1777	1583	0	1850	0	0	1861	0
Flt Permitted					0.954			0.999				
Satd. Flow (perm)	0	1611	0	0	1777	1583	0	1850	0	0	1861	0
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			463			307	
Travel Time (s)		14.7			16.0			10.5			7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	28	33	1	20	7	249	13	6	641	6
Future Vol, veh/h	0	0	28	33	1	20	7	249	13	6	641	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	30	36	1	22	8	271	14	7	697	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1021	1016	701	1024	1012	278	704	0	0	285	0	0
Stage 1	715	715	-	294	294	-	-	-	-	-	-	-
Stage 2	306	301	-	730	718	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	215	238	439	214	239	761	894	-	-	1277	-	-
Stage 1	422	434	-	714	670	-	-	-	-	-	-	-
Stage 2	704	665	-	414	433	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	205	233	439	196	234	761	894	-	-	1277	-	-
Mov Cap-2 Maneuver	205	233	-	196	234	-	-	-	-	-	-	-
Stage 1	417	430	-	706	663	-	-	-	-	-	-	-
Stage 2	675	658	-	382	429	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	13.8	20.9	0.2	0.1
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	894	-	-	439	197	761	1277	-	-
HCM Lane V/C Ratio	0.009	-	-	0.069	0.188	0.029	0.005	-	-
HCM Control Delay (s)	9.1	0	-	13.8	27.4	9.9	7.8	0	-
HCM Lane LOS	A	A	-	B	D	A	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.7	0.1	0	-	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	30	19	271	7	7	519
Future Volume (vph)	30	19	271	7	7	519
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.947		0.996			
Flt Protected	0.970					0.999
Satd. Flow (prot)	1745	0	1892	0	0	1792
Flt Permitted	0.970					0.999
Satd. Flow (perm)	1745	0	1892	0	0	1792
Link Speed (mph)	20		30			30
Link Distance (ft)	474		307			641
Travel Time (s)	16.2		7.0			14.6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	6%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	30	19	271	7	7	519
Future Vol, veh/h	30	19	271	7	7	519
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	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	6
Mvmt Flow	33	21	295	8	8	564

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	879	299	0	0	303	0
Stage 1	299	-	-	-	-	-
Stage 2	580	-	-	-	-	-
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	321	745	-	-	1269	-
Stage 1	757	-	-	-	-	-
Stage 2	564	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	318	745	-	-	1269	-
Mov Cap-2 Maneuver	318	-	-	-	-	-
Stage 1	757	-	-	-	-	-
Stage 2	559	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.1	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	409	1269	-
HCM Lane V/C Ratio	-	-	0.13	0.006	-
HCM Control Delay (s)	-	-	15.1	7.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	99	21	221	46	11	293
Future Volume (vph)	99	21	221	46	11	293
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.976		0.977			
Flt Protected	0.960					0.998
Satd. Flow (prot)	1766	0	1820	0	0	1896
Flt Permitted	0.960					0.998
Satd. Flow (perm)	1766	0	1820	0	0	1896
Link Speed (mph)	25		30			30
Link Distance (ft)	562		255			293
Travel Time (s)	15.3		5.8			6.7
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	2%	2%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	2.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	99	21	221	46	11	293
Future Vol, veh/h	99	21	221	46	11	293
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	0	2	2	0	0
Mvmt Flow	108	23	240	50	12	318

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	609	267	0	0	291	0
Stage 1	266	-	-	-	-	-
Stage 2	343	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	460	777	-	-	1282	-
Stage 1	781	-	-	-	-	-
Stage 2	721	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	454	776	-	-	1281	-
Mov Cap-2 Maneuver	454	-	-	-	-	-
Stage 1	780	-	-	-	-	-
Stage 2	712	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	490	1281	-
HCM Lane V/C Ratio	-	-	0.266	0.009	-
HCM Control Delay (s)	-	-	15	7.8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	0	55	0	2	0	215	23	1	243	0
Future Volume (vph)	1	0	0	55	0	2	0	215	23	1	243	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.996			0.987				
Flt Protected		0.950			0.954							
Satd. Flow (prot)	0	1805	0	0	1805	0	0	1842	0	0	1827	0
Flt Permitted		0.950			0.954							
Satd. Flow (perm)	0	1805	0	0	1805	0	0	1842	0	0	1827	0
Link Speed (mph)		20			25			30			30	
Link Distance (ft)		246			436			293			1225	
Travel Time (s)		8.4			11.9			6.7			27.8	
Confl. Peds. (#/hr)	2		3	3		2	3		3	2		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	4%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	0	55	0	2	0	215	23	1	243	0
Future Vol, veh/h	1	0	0	55	0	2	0	215	23	1	243	0
Conflicting Peds, #/hr	2	0	3	3	0	2	3	0	3	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	4	0
Mvmt Flow	1	0	0	60	0	2	0	234	25	1	264	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	519	531	270	519	519	252	267	0	0	262	0	0
Stage 1	269	269	-	250	250	-	-	-	-	-	-	-
Stage 2	250	262	-	269	269	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	471	457	774	471	464	792	1308	-	-	1314	-	-
Stage 1	741	690	-	759	704	-	-	-	-	-	-	-
Stage 2	759	695	-	741	690	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	467	454	770	468	461	788	1304	-	-	1310	-	-
Mov Cap-2 Maneuver	467	454	-	468	461	-	-	-	-	-	-	-
Stage 1	739	687	-	757	702	-	-	-	-	-	-	-
Stage 2	755	693	-	738	687	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.7	13.7	0	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1304	-	-	467	475	1310	-	-
HCM Lane V/C Ratio	-	-	-	0.002	0.13	0.001	-	-
HCM Control Delay (s)	0	-	-	12.7	13.7	7.8	0	-
HCM Lane LOS	A	-	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.4	0	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	718	296	204	298	75	109
Future Volume (vph)	718	296	204	298	75	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.961				0.920	
Flt Protected				0.980	0.980	
Satd. Flow (prot)	1790	0	0	1780	1654	0
Flt Permitted				0.980	0.980	
Satd. Flow (perm)	1790	0	0	1780	1654	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1354			549	1225	
Travel Time (s)	30.8			12.5	27.8	
Confl. Peds. (#/hr)		2	2		2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	7%	3%	3%	4%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	54.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	718	296	204	298	75	109
Future Vol, veh/h	718	296	204	298	75	109
Conflicting Peds, #/hr	0	2	2	0	2	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	7	3	3	4
Mvmt Flow	780	322	222	324	82	118

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	1104	0	1713	945
Stage 1	-	-	-	-	943	-
Stage 2	-	-	-	-	770	-
Critical Hdwy	-	-	4.17	-	6.43	6.24
Critical Hdwy Stg 1	-	-	-	-	5.43	-
Critical Hdwy Stg 2	-	-	-	-	5.43	-
Follow-up Hdwy	-	-	2.263	-	3.527	3.336
Pot Cap-1 Maneuver	-	-	614	-	99	315
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	455	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	613	-	~ 55	314
Mov Cap-2 Maneuver	-	-	-	-	~ 55	-
Stage 1	-	-	-	-	376	-
Stage 2	-	-	-	-	253	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.8	$ 484
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	108	-	-	613	-
HCM Lane V/C Ratio	1.852	-	-	0.362	-
HCM Control Delay (s)	$ 484	-	-	14.2	0
HCM Lane LOS	F	-	-	B	A
HCM 95th %tile Q(veh)	16.1	-	-	1.6	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	833	6	18	458	8	24
Future Volume (vph)	833	6	18	458	8	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.999				0.900	
Flt Protected				0.998	0.987	
Satd. Flow (prot)	1858	0	0	1809	1688	0
Flt Permitted				0.998	0.987	
Satd. Flow (perm)	1858	0	0	1809	1688	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	549			284	522	
Travel Time (s)	12.5			6.5	17.8	
Confl. Peds. (#/hr)		3	2		3	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	20%	0%	5%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	833	6	18	458	8	24
Future Vol, veh/h	833	6	18	458	8	24
Conflicting Peds, #/hr	0	3	2	0	3	2
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	20	0	5	0	0
Mvmt Flow	905	7	20	498	9	26

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	915	0	1453	914
Stage 1	-	-	-	-	912	-
Stage 2	-	-	-	-	541	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	754	-	145	334
Stage 1	-	-	-	-	395	-
Stage 2	-	-	-	-	588	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	752	-	139	332
Mov Cap-2 Maneuver	-	-	-	-	139	-
Stage 1	-	-	-	-	394	-
Stage 2	-	-	-	-	564	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	22
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	246	-	-	752	-
HCM Lane V/C Ratio	0.141	-	-	0.026	-
HCM Control Delay (s)	22	-	-	9.9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0.1	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	860	0	1	475	2	6
Future Volume (vph)	860	0	1	475	2	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt					0.895	
Flt Protected					0.989	
Satd. Flow (prot)	1863	0	0	1827	1455	0
Flt Permitted					0.989	
Satd. Flow (perm)	1863	0	0	1827	1455	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	284			471	517	
Travel Time (s)	6.5			10.7	17.6	
Confl. Peds. (#/hr)			1			1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	0%	4%	0%	20%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	860	0	1	475	2	6
Future Vol, veh/h	860	0	1	475	2	6
Conflicting Peds, #/hr	0	0	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	0	4	0	20
Mvmt Flow	935	0	1	516	2	7

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	936	0	1454	937
Stage 1	-	-	-	-	936	-
Stage 2	-	-	-	-	518	-
Critical Hdwy	-	-	4.1	-	6.4	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.48
Pot Cap-1 Maneuver	-	-	740	-	145	297
Stage 1	-	-	-	-	385	-
Stage 2	-	-	-	-	602	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	739	-	145	296
Mov Cap-2 Maneuver	-	-	-	-	145	-
Stage 1	-	-	-	-	385	-
Stage 2	-	-	-	-	601	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	20.9
HCM LOS			C

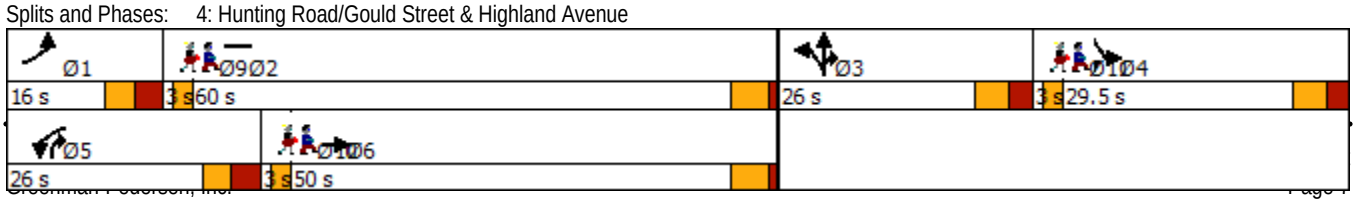
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	235	-	-	739	-
HCM Lane V/C Ratio	0.037	-	-	0.001	-
HCM Control Delay (s)	20.9	-	-	9.9	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Future Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	11	11	11	11	11	11
Storage Length (ft)	175		0	165		0	0		100	100		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.997			0.922				0.850		0.963	
Flt Protected	0.950			0.950				0.996		0.950	0.987	
Satd. Flow (prot)	1636	3411	0	1668	3172	0	0	1813	1546	1564	1617	0
Flt Permitted	0.950			0.950				0.996		0.950	0.987	
Satd. Flow (perm)	1636	3411	0	1668	3172	0	0	1813	1546	1564	1617	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			240				112		10	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			463	
Travel Time (s)		30.7			30.1			15.5			10.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	0%
Shared Lane Traffic (%)										21%		
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												
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	
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0	12.0		12.0	12.0	
Total Split (s)	16.0	50.0		26.0	60.0		26.0	26.0		29.5	29.5	
Total Split (%)	11.6%	36.4%		18.9%	43.6%		18.9%	18.9%		21.5%	21.5%	
Maximum Green (s)	10.0	45.0		20.0	55.0		20.0	20.0		23.5	23.5	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5		3.5	3.5	
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	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	
Lead/Lag	Lead			Lead			Lead	Lead				
Lead-Lag Optimize?	Yes			Yes			Yes	Yes				
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		4.0			4.0					4.0	4.0	
Flash Dont Walk (s)		11.0			12.0					19.5	19.5	
Pedestrian Calls (#/hr)		1			1					1	1	

Intersection Summary

Area Type: Other
Cycle Length: 137.5
Actuated Cycle Length: 124.6
Natural Cycle: 140
Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Hunting Road/Gould Street & Highland Avenue



Lane Group	Ø9	Ø10	Ø11
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Turn Type			
Protected Phases	9	10	11
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	3.0	3.0	3.0
Total Split (s)	3.0	3.0	3.0
Total Split (%)	2%	2%	2%
Maximum Green (s)	1.0	1.0	1.0
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0	2.0
Recall Mode	None	None	None
Walk Time (s)	0.0	0.0	0.0
Flash Dont Walk (s)	0.0	0.0	0.0
Pedestrian Calls (#/hr)	1	1	1

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	189	929	48	1391	426	259	154	154
v/c Ratio	1.44	0.61	0.42	0.92	1.46	0.59	0.75	0.70
Control Delay	275.5	29.8	69.1	39.1	262.4	19.6	74.7	65.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	275.5	29.8	69.1	39.1	262.4	19.6	74.7	65.6
Queue Length 50th (ft)	~206	286	38	466	~469	70	127	117
Queue Length 95th (ft)	#400	448	83	#738	#757	126	214	204
Internal Link Dist (ft)		1272		1244	601			383
Turn Bay Length (ft)	175		165			100	100	
Base Capacity (vph)	131	1520	268	1540	292	574	296	314
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	1.44	0.61	0.18	0.90	1.46	0.45	0.52	0.49

Intersection Summary

~ 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.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Future Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	11	11	11	11	11	11	11
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	0.95	0.95	
Frt	1.00	1.00		1.00	0.92			1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	0.99	
Satd. Flow (prot)	1636	3410		1668	3171			1813	1546	1564	1617	
Flt Permitted	0.95	1.00		0.95	1.00			1.00	1.00	0.95	0.99	
Satd. Flow (perm)	1636	3410		1668	3171			1813	1546	1564	1617	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	189	909	20	48	664	727	33	393	259	195	75	38
RTOR Reduction (vph)	0	1	0	0	135	0	0	0	86	0	9	0
Lane Group Flow (vph)	189	928	0	48	1256	0	0	426	173	154	145	0
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	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	
Permitted Phases												
Actuated Green, G (s)	10.0	55.5		8.4	53.9			20.1	28.5	16.4	16.4	
Effective Green, g (s)	10.0	55.5		8.4	53.9			20.1	28.5	16.4	16.4	
Actuated g/C Ratio	0.08	0.45		0.07	0.44			0.16	0.23	0.13	0.13	
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)	132	1533		113	1385			295	357	207	214	
v/s Ratio Prot	c0.12	0.27		0.03	c0.40			c0.23	0.11	c0.10	0.09	
v/s Ratio Perm												
v/c Ratio	1.43	0.61		0.42	0.91			1.44	0.48	0.74	0.68	
Uniform Delay, d1	56.7	25.7		55.2	32.4			51.6	41.1	51.5	51.0	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	232.2	0.5		0.9	8.6			218.0	0.4	11.9	6.6	
Delay (s)	288.9	26.1		56.1	41.0			269.7	41.5	63.4	57.6	
Level of Service	F	C		E	D			F	D	E	E	
Approach Delay (s)		70.5			41.5			183.4			60.5	
Approach LOS		E			D			F			E	

Intersection Summary

HCM 2000 Control Delay	79.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	123.4	Sum of lost time (s)	27.0
Intersection Capacity Utilization	95.7%	ICU Level of Service	F
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)	0	0	5	42	0	5	17	427	406	55	295	2
Future Volume (vph)	0	0	5	42	0	5	17	427	406	55	295	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850		0.935			0.999	
Flt Protected					0.950			0.999			0.992	
Satd. Flow (prot)	0	1611	0	0	1770	1583	0	1740	0	0	1846	0
Flt Permitted					0.950			0.999			0.992	
Satd. Flow (perm)	0	1611	0	0	1770	1583	0	1740	0	0	1846	0
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			463			307	
Travel Time (s)		14.7			16.0			10.5			7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	5	42	0	5	17	427	406	55	295	2
Future Vol, veh/h	0	0	5	42	0	5	17	427	406	55	295	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	5	46	0	5	18	464	441	60	321	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1165	1383	322	1166	1164	685	323	0	0	905	0	0
Stage 1	442	442	-	721	721	-	-	-	-	-	-	-
Stage 2	723	941	-	445	443	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	171	144	719	171	194	448	1237	-	-	752	-	-
Stage 1	594	576	-	419	432	-	-	-	-	-	-	-
Stage 2	417	342	-	592	576	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	153	126	719	153	170	448	1237	-	-	752	-	-
Mov Cap-2 Maneuver	153	126	-	153	170	-	-	-	-	-	-	-
Stage 1	575	520	-	406	418	-	-	-	-	-	-	-
Stage 2	399	331	-	531	520	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10	35.5	0.2	1.6
HCM LOS	B	E		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1237	-	-	719	153	448	752	-	-
HCM Lane V/C Ratio	0.015	-	-	0.008	0.298	0.012	0.079	-	-
HCM Control Delay (s)	8	0	-	10	38.2	13.1	10.2	0	-
HCM Lane LOS	A	A	-	B	E	B	B	A	-
HCM 95th %tile Q(veh)	0	-	-	0	1.2	0	0.3	-	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	13	15	402	134	171	299
Future Volume (vph)	13	15	402	134	171	299
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.928		0.966			
Flt Protected	0.977					0.982
Satd. Flow (prot)	1723	0	1799	0	0	1831
Flt Permitted	0.977					0.982
Satd. Flow (perm)	1723	0	1799	0	0	1831
Link Speed (mph)	20		30			30
Link Distance (ft)	474		307			641
Travel Time (s)	16.2		7.0			14.6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	2%	0%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	15	402	134	171	299
Future Vol, veh/h	13	15	402	134	171	299
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	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	2	0	3
Mvmt Flow	14	16	437	146	186	325

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1207	510	0	0	583	0
Stage 1	510	-	-	-	-	-
Stage 2	697	-	-	-	-	-
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	204	567	-	-	1001	-
Stage 1	607	-	-	-	-	-
Stage 2	498	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	158	567	-	-	1001	-
Mov Cap-2 Maneuver	158	-	-	-	-	-
Stage 1	607	-	-	-	-	-
Stage 2	385	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.8	0	3.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	258	1001	-
HCM Lane V/C Ratio	-	-	0.118	0.186	-
HCM Control Delay (s)	-	-	20.8	9.4	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.7	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	32	10	240	66	22	472
Future Volume (vph)	32	10	240	66	22	472
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.968		0.971			
Flt Protected	0.963					0.998
Satd. Flow (prot)	1601	0	1805	0	0	1810
Flt Permitted	0.963					0.998
Satd. Flow (perm)	1601	0	1805	0	0	1810
Link Speed (mph)	25		30			30
Link Distance (ft)	562		255			293
Travel Time (s)	15.3		5.8			6.7
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	14%	0%	2%	3%	0%	5%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	1.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	32	10	240	66	22	472
Future Vol, veh/h	32	10	240	66	22	472
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	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	14	0	2	3	0	5
Mvmt Flow	35	11	261	72	24	513

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	858	297	0	0	333	0
Stage 1	297	-	-	-	-	-
Stage 2	561	-	-	-	-	-
Critical Hdwy	6.54	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.54	-	-	-	-	-
Critical Hdwy Stg 2	5.54	-	-	-	-	-
Follow-up Hdwy	3.626	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	312	747	-	-	1238	-
Stage 1	727	-	-	-	-	-
Stage 2	548	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	304	747	-	-	1238	-
Mov Cap-2 Maneuver	304	-	-	-	-	-
Stage 1	727	-	-	-	-	-
Stage 2	533	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	16.7	0	0.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	354	1238	-
HCM Lane V/C Ratio	-	-	0.129	0.019	-
HCM Control Delay (s)	-	-	16.7	8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	1	0	11	0	3	1	173	66	13	489	2
Future Volume (vph)	4	1	0	11	0	3	1	173	66	13	489	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.973			0.963				
Flt Protected		0.962			0.962						0.999	
Satd. Flow (prot)	0	1828	0	0	1647	0	0	1781	0	0	1827	0
Flt Permitted		0.962			0.962						0.999	
Satd. Flow (perm)	0	1828	0	0	1647	0	0	1781	0	0	1827	0
Link Speed (mph)		20			25			30			30	
Link Distance (ft)		246			436			293			1225	
Travel Time (s)		8.4			11.9			6.7			27.8	
Confl. Peds. (#/hr)	10		6			4	10		4			6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	10%	2%	0%	2%	3%	2%	0%	4%	2%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	0.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	4	1	0	11	0	3	1	173	66	13	489	2
Future Vol, veh/h	4	1	0	11	0	3	1	173	66	13	489	2
Conflicting Peds, #/hr	10	0	6	0	0	4	10	0	4	0	0	6
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	10	2	0	2	3	2	0	4	2
Mvmt Flow	4	1	0	12	0	3	1	188	72	14	532	2

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	809	837	549	798	802	238	544	0	0	264	0	0
Stage 1	571	571	-	230	230	-	-	-	-	-	-	-
Stage 2	238	266	-	568	572	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.2	6.52	6.2	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.2	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.2	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.59	4.018	3.3	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	301	305	539	295	317	806	1025	-	-	1312	-	-
Stage 1	509	508	-	755	714	-	-	-	-	-	-	-
Stage 2	770	692	-	494	504	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	290	296	531	288	307	795	1015	-	-	1307	-	-
Mov Cap-2 Maneuver	290	296	-	288	307	-	-	-	-	-	-	-
Stage 1	503	495	-	751	710	-	-	-	-	-	-	-
Stage 2	759	689	-	483	491	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.6	16.3	0	0.2
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1015	-	-	291	334	1307	-	-
HCM Lane V/C Ratio	0.001	-	-	0.019	0.046	0.011	-	-
HCM Control Delay (s)	8.6	0	-	17.6	16.3	7.8	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0.1	0	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	447	103	181	707	223	213
Future Volume (vph)	447	103	181	707	223	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.975				0.934	
Flt Protected				0.990	0.975	
Satd. Flow (prot)	1838	0	0	1848	1697	0
Flt Permitted				0.990	0.975	
Satd. Flow (perm)	1838	0	0	1848	1697	0
Link Speed (mph)	30			30	30	
Link Distance (ft)	1354			549	1225	
Travel Time (s)	30.8			12.5	27.8	
Confl. Peds. (#/hr)			6			6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	1%	2%	0%	4%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	349.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	447	103	181	707	223	213
Future Vol, veh/h	447	103	181	707	223	213
Conflicting Peds, #/hr	0	0	6	0	0	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	0	1	2	0	4
Mvmt Flow	486	112	197	768	242	232

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	604	0	1710	554
Stage 1	-	-	-	-	548	-
Stage 2	-	-	-	-	1162	-
Critical Hdwy	-	-	4.11	-	6.4	6.24
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.209	-	3.5	3.336
Pot Cap-1 Maneuver	-	-	979	-	~ 101	528
Stage 1	-	-	-	-	583	-
Stage 2	-	-	-	-	300	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	973	-	~ 65	522
Mov Cap-2 Maneuver	-	-	-	-	~ 65	-
Stage 1	-	-	-	-	580	-
Stage 2	-	-	-	-	~ 194	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2	$ 1497.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	114	-	-	973	-
HCM Lane V/C Ratio	4.157	-	-	0.202	-
HCM Control Delay (s)	$ 1497.7	-	-	9.6	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	48.6	-	-	0.8	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	627	3	18	843	17	42
Future Volume (vph)	627	3	18	843	17	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.999				0.903	
Flt Protected				0.999	0.986	
Satd. Flow (prot)	1861	0	0	1877	1656	0
Flt Permitted				0.999	0.986	
Satd. Flow (perm)	1861	0	0	1877	1656	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	549			284	522	
Travel Time (s)	12.5			6.5	17.8	
Confl. Peds. (#/hr)		2	1		2	1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	6%	1%	0%	3%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	1.1					

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	627	3	18	843	17	42
Future Vol, veh/h	627	3	18	843	17	42
Conflicting Peds, #/hr	0	2	1	0	2	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	6	1	0	3
Mvmt Flow	682	3	20	916	18	46

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	687	0	1644	687
Stage 1	-	-	-	-	686	-
Stage 2	-	-	-	-	958	-
Critical Hdwy	-	-	4.16	-	6.4	6.23
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.254	-	3.5	3.327
Pot Cap-1 Maneuver	-	-	888	-	111	445
Stage 1	-	-	-	-	504	-
Stage 2	-	-	-	-	376	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	886	-	105	444
Mov Cap-2 Maneuver	-	-	-	-	105	-
Stage 1	-	-	-	-	503	-
Stage 2	-	-	-	-	358	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	26.6
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	230	-	-	886	-
HCM Lane V/C Ratio	0.279	-	-	0.022	-
HCM Control Delay (s)	26.6	-	-	9.2	0
HCM Lane LOS	D	-	-	A	A
HCM 95th %tile Q(veh)	1.1	-	-	0.1	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	690	2	2	880	0	2
Future Volume (vph)	690	2	2	880	0	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt					0.865	
Flt Protected						
Satd. Flow (prot)	1863	0	0	1881	1644	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1881	1644	0
Link Speed (mph)	30			30	20	
Link Distance (ft)	284			471	517	
Travel Time (s)	6.5			10.7	17.6	
Confl. Peds. (#/hr)			1			1
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	0%	0%	1%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Free			Free	Stop	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	690	2	2	880	0	2
Future Vol, veh/h	690	2	2	880	0	2
Conflicting Peds, #/hr	0	0	1	0	0	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	0	1	0	0
Mvmt Flow	750	2	2	957	0	2

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	753	0	1713	753
Stage 1	-	-	-	-	752	-
Stage 2	-	-	-	-	961	-
Critical Hdwy	-	-	4.1	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.2	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	866	-	101	413
Stage 1	-	-	-	-	469	-
Stage 2	-	-	-	-	374	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	865	-	100	412
Mov Cap-2 Maneuver	-	-	-	-	100	-
Stage 1	-	-	-	-	469	-
Stage 2	-	-	-	-	372	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.8
HCM LOS			B

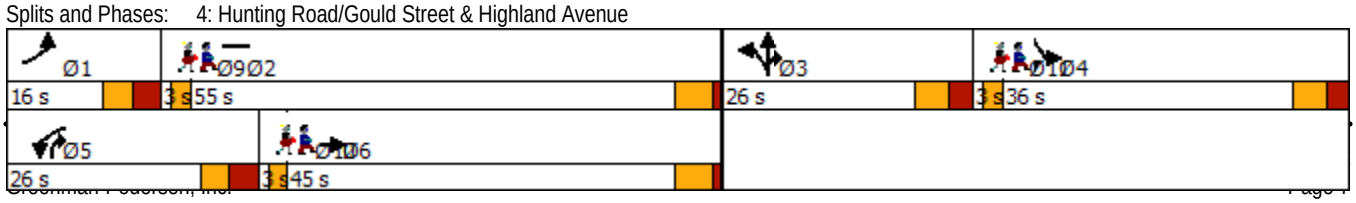
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	412	-	-	865	-
HCM Lane V/C Ratio	0.005	-	-	0.003	-
HCM Control Delay (s)	13.8	-	-	9.2	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Future Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	11	11	11	11	11	11
Storage Length (ft)	175		0	165		0	0		100	100		0
Storage Lanes	1		0	1		0	0		1	1		0
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	0.95	0.95	1.00
Frt		0.997			0.962				0.850		0.956	
Flt Protected	0.950			0.950				0.988		0.950	0.992	
Satd. Flow (prot)	1685	3413	0	1685	3080	0	0	1801	1546	1641	1629	0
Flt Permitted	0.950			0.950				0.988		0.950	0.992	
Satd. Flow (perm)	1685	3413	0	1685	3080	0	0	1801	1546	1641	1629	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			37				94		14	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			463	
Travel Time (s)		30.7			30.1			15.5			10.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
Shared Lane Traffic (%)										14%		
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												
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	
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0	12.0		12.0	12.0	
Total Split (s)	16.0	45.0		26.0	55.0		26.0	26.0		36.0	36.0	
Total Split (%)	11.5%	32.4%		18.7%	39.6%		18.7%	18.7%		25.9%	25.9%	
Maximum Green (s)	10.0	40.0		20.0	50.0		20.0	20.0		30.0	30.0	
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5		3.5	3.5	
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5		2.5	2.5	
Lost Time Adjust (s)	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	
Lead/Lag	Lead			Lead			Lead	Lead				
Lead-Lag Optimize?	Yes			Yes			Yes	Yes				
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Walk Time (s)		4.0			4.0					4.0	4.0	
Flash Dont Walk (s)		11.0			12.0					19.5	19.5	
Pedestrian Calls (#/hr)		1			1					1	1	

Intersection Summary

Area Type: Other
Cycle Length: 139
Actuated Cycle Length: 125.8
Natural Cycle: 140
Control Type: Actuated-Uncoordinated

Splits and Phases: 4: Hunting Road/Gould Street & Highland Avenue



Lane Group	Ø9	Ø10	Ø11
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Turn Type			
Protected Phases	9	10	11
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	3.0	3.0	3.0
Total Split (s)	3.0	3.0	3.0
Total Split (%)	2%	2%	2%
Maximum Green (s)	1.0	1.0	1.0
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0	2.0
Recall Mode	None	None	None
Walk Time (s)	0.0	0.0	0.0
Flash Dont Walk (s)	0.0	0.0	0.0
Pedestrian Calls (#/hr)	1	1	1

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	73	775	145	1153	159	113	630	625
v/c Ratio	0.62	0.68	0.74	0.92	0.75	0.26	1.60	1.55
Control Delay	82.1	41.3	77.1	48.3	75.8	6.7	313.8	294.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	82.1	41.3	77.1	48.3	75.8	6.7	313.8	294.6
Queue Length 50th (ft)	60	285	118	472	130	7	~798	~780
Queue Length 95th (ft)	#132	418	200	#708	216	31	#1143	#1125
Internal Link Dist (ft)		1272		1244	601			383
Turn Bay Length (ft)	175		165			100	100	
Base Capacity (vph)	135	1161	270	1256	288	559	394	402
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	0.54	0.67	0.54	0.92	0.55	0.20	1.60	1.55

Intersection Summary

~ 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.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Future Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	11	11	11	11	11	11	11
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	0.95	0.95	
Frt	1.00	1.00		1.00	0.96			1.00	0.85	1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.99	
Satd. Flow (prot)	1685	3411		1685	3081			1801	1546	1641	1628	
Flt Permitted	0.95	1.00		0.95	1.00			0.99	1.00	0.95	0.99	
Satd. Flow (perm)	1685	3411		1685	3081			1801	1546	1641	1628	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	73	757	18	145	863	290	38	121	113	733	337	185
RTOR Reduction (vph)	0	1	0	0	22	0	0	0	72	0	11	0
Lane Group Flow (vph)	73	774	0	145	1131	0	0	159	41	630	614	0
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
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)	7.4	43.1		14.7	50.4			14.9	29.6	30.3	30.3	
Effective Green, g (s)	7.4	43.1		14.7	50.4			14.9	29.6	30.3	30.3	
Actuated g/C Ratio	0.06	0.34		0.12	0.40			0.12	0.23	0.24	0.24	
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)	98	1166		196	1232			212	363	394	391	
v/s Ratio Prot	0.04	0.23		c0.09	c0.37			c0.09	0.03	c0.38	0.38	
v/s Ratio Perm												
v/c Ratio	0.74	0.66		0.74	0.92			0.75	0.11	1.60	1.57	
Uniform Delay, d1	58.4	35.3		53.8	35.8			53.7	37.9	47.9	47.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	23.2	1.1		11.9	10.6			12.4	0.1	281.2	269.2	
Delay (s)	81.6	36.4		65.7	46.5			66.1	37.9	329.1	317.0	
Level of Service	F	D		E	D			E	D	F	F	
Approach Delay (s)		40.3			48.6			54.4			323.1	
Approach LOS		D			D			D			F	

Intersection Summary

HCM 2000 Control Delay	140.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.15		
Actuated Cycle Length (s)	126.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	88.3%	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
Lane Configurations												
Traffic Volume (vph)	0	0	28	490	1	69	7	269	138	14	767	6
Future Volume (vph)	0	0	28	490	1	69	7	269	138	14	767	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				0.850		0.955			0.999	
Flt Protected					0.952			0.999			0.999	
Satd. Flow (prot)	0	1611	0	0	1773	1583	0	1777	0	0	1859	0
Flt Permitted					0.952			0.999			0.999	
Satd. Flow (perm)	0	1611	0	0	1773	1583	0	1777	0	0	1859	0
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			463			307	
Travel Time (s)		14.7			16.0			10.5			7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	403											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	0	28	490	1	69	7	269	138	14	767	6
Future Vol, veh/h	0	0	28	490	1	69	7	269	138	14	767	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	0	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	0	30	533	1	75	8	292	150	15	834	7

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1289	1326	838	1266	1254	367	841	0	0	442	0	0
Stage 1	868	868	-	383	383	-	-	-	-	-	-	-
Stage 2	421	458	-	883	871	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	141	156	366	~ 146	172	678	794	-	-	1118	-	-
Stage 1	347	370	-	640	612	-	-	-	-	-	-	-
Stage 2	610	567	-	~ 340	368	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	121	150	366	~ 130	165	678	794	-	-	1118	-	-
Mov Cap-2 Maneuver	121	150	-	~ 130	165	-	-	-	-	-	-	-
Stage 1	342	361	-	631	603	-	-	-	-	-	-	-
Stage 2	534	559	-	~ 304	359	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	15.7	$ 1286.5	0.2	0.1
HCM LOS	C	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	794	-	-	366	130	678	1118	-	-
HCM Lane V/C Ratio	0.01	-	-	0.083	4.105	0.111	0.014	-	-
HCM Control Delay (s)	9.6	0	-	15.7	$ 1465.8	11	8.3	0	-
HCM Lane LOS	A	A	-	C	F	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	54.2	0.4	0	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	163	204	301	46	41	520
Future Volume (vph)	163	204	301	46	41	520
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.925		0.982			
Flt Protected	0.978					0.996
Satd. Flow (prot)	1719	0	1866	0	0	1793
Flt Permitted	0.978					0.996
Satd. Flow (perm)	1719	0	1866	0	0	1793
Link Speed (mph)	20		30			30
Link Distance (ft)	474		307			641
Travel Time (s)	16.2		7.0			14.6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	6%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	24

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	163	204	301	46	41	520
Future Vol, veh/h	163	204	301	46	41	520
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	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	6
Mvmt Flow	177	222	327	50	45	565

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1007	352	0	0	377	0
Stage 1	352	-	-	-	-	-
Stage 2	655	-	-	-	-	-
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	269	696	-	-	1193	-
Stage 1	716	-	-	-	-	-
Stage 2	521	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	254	696	-	-	1193	-
Mov Cap-2 Maneuver	254	-	-	-	-	-
Stage 1	716	-	-	-	-	-
Stage 2	492	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	82.3	0	0.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	393	1193	-
HCM Lane V/C Ratio	-	-	1.015	0.037	-
HCM Control Delay (s)	-	-	82.3	8.1	0
HCM Lane LOS	-	-	F	A	A
HCM 95th %tile Q(veh)	-	-	12.6	0.1	-

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	99	21	436	46	11	328
Future Volume (vph)	99	21	436	46	11	328
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.976		0.987			
Flt Protected	0.960					0.998
Satd. Flow (prot)	1766	0	1839	0	0	1896
Flt Permitted	0.960					0.998
Satd. Flow (perm)	1766	0	1839	0	0	1896
Link Speed (mph)	25		30			30
Link Distance (ft)	562		255			293
Travel Time (s)	15.3		5.8			6.7
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	2%	2%	0%	0%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	2.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	99	21	436	46	11	328
Future Vol, veh/h	99	21	436	46	11	328
Conflicting Peds, #/hr	1	1	0	1	1	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	1	0	2	2	0	0
Mvmt Flow	108	23	474	50	12	357

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	882	501	0	0	525	0
Stage 1	500	-	-	-	-	-
Stage 2	382	-	-	-	-	-
Critical Hdwy	6.41	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	318	574	-	-	1052	-
Stage 1	611	-	-	-	-	-
Stage 2	692	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	313	573	-	-	1051	-
Mov Cap-2 Maneuver	313	-	-	-	-	-
Stage 1	610	-	-	-	-	-
Stage 2	682	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	22	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	340	1051	-
HCM Lane V/C Ratio	-	-	0.384	0.011	-
HCM Control Delay (s)	-	-	22	8.5	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.8	0	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	0	0	55	0	2	0	430	23	1	278	0
Future Volume (vph)	1	0	0	55	0	2	0	430	23	1	278	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor												
Frt					0.996			0.993				
Flt Protected		0.950			0.954							
Satd. Flow (prot)	0	1805	0	0	1805	0	0	1852	0	0	1827	0
Flt Permitted		0.950			0.954							
Satd. Flow (perm)	0	1805	0	0	1805	0	0	1852	0	0	1827	0
Link Speed (mph)		20			25			30			30	
Link Distance (ft)		246			436			293			1225	
Travel Time (s)		8.4			11.9			6.7			27.8	
Confl. Peds. (#/hr)	2		3	3		2	3		3	2		2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	0%	2%	0%	0%	4%	0%
Shared Lane Traffic (%)												
Sign Control		Stop			Stop			Free			Free	

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	0	55	0	2	0	430	23	1	278	0
Future Vol, veh/h	1	0	0	55	0	2	0	430	23	1	278	0
Conflicting Peds, #/hr	2	0	3	3	0	2	3	0	3	2	0	2
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	0	0	2	0	0	4	0
Mvmt Flow	1	0	0	60	0	2	0	467	25	1	302	0

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	790	802	308	790	790	485	305	0	0	495	0	0
Stage 1	307	307	-	483	483	-	-	-	-	-	-	-
Stage 2	483	495	-	307	307	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.1	-	-	4.1	-	-
Critical Hdwy Stg 1	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.1	5.5	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.5	4	3.3	3.5	4	3.3	2.2	-	-	2.2	-	-
Pot Cap-1 Maneuver	310	320	737	310	325	586	1267	-	-	1079	-	-
Stage 1	707	665	-	569	556	-	-	-	-	-	-	-
Stage 2	569	549	-	707	665	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	307	318	733	308	323	583	1263	-	-	1076	-	-
Mov Cap-2 Maneuver	307	318	-	308	323	-	-	-	-	-	-	-
Stage 1	705	662	-	567	554	-	-	-	-	-	-	-
Stage 2	566	547	-	704	662	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.8	19.3	0	0
HCM LOS	C	C		

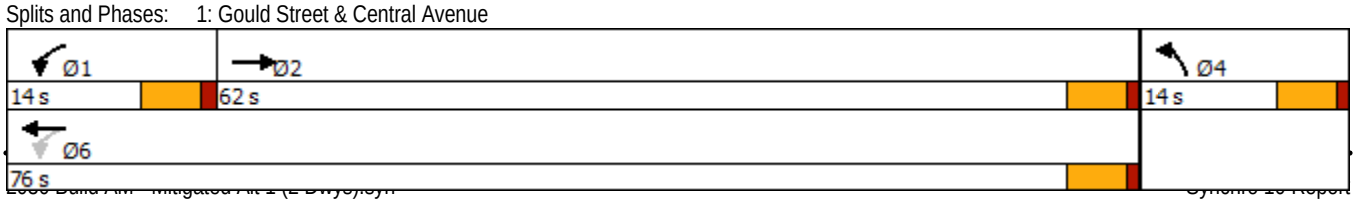
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1263	-	-	307	313	1076	-	-
HCM Lane V/C Ratio	-	-	-	0.004	0.198	0.001	-	-
HCM Control Delay (s)	0	-	-	16.8	19.3	8.3	0	-
HCM Lane LOS	A	-	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0.7	0	-	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	718	296	204	298	75	109
Future Volume (vph)	718	296	204	298	75	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	11	11	12	12
Storage Length (ft)		0	100		0	0
Storage Lanes		0	1		1	0
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	0.99		1.00		0.98	
Frt	0.961				0.920	
Flt Protected			0.950		0.980	
Satd. Flow (prot)	1779	0	1631	1783	1625	0
Flt Permitted			0.066		0.980	
Satd. Flow (perm)	1779	0	113	1783	1618	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	45				64	
Link Speed (mph)	30			30	30	
Link Distance (ft)	1354			549	1225	
Travel Time (s)	30.8			12.5	27.8	
Confl. Peds. (#/hr)		2	2		2	2
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	2%	2%	7%	3%	3%	4%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	
Protected Phases	2		1	6	4	
Permitted Phases			6			
Detector Phase	2		1	6	4	
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.0		11.0	15.0	11.0	
Total Split (s)	62.0		14.0	76.0	14.0	
Total Split (%)	68.9%		15.6%	84.4%	15.6%	
Maximum Green (s)	57.0		9.0	71.0	9.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	Min		None	Min	None	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 88.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Gould Street & Central Avenue



Lane Group	EBT	WBL	WBT	NBL
Lane Group Flow (vph)	1102	222	324	200
v/c Ratio	0.97	0.92	0.23	0.90
Control Delay	37.8	63.7	2.9	68.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	37.8	63.7	2.9	68.4
Queue Length 50th (ft)	517	78	36	78
Queue Length 95th (ft)	#867	#215	56	#208
Internal Link Dist (ft)	1274		469	1145
Turn Bay Length (ft)		100		
Base Capacity (vph)	1161	242	1429	222
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.95	0.92	0.23	0.90

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	718	296	204	298	75	109
Future Volume (vph)	718	296	204	298	75	109
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	11	11	12	12
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frpb, ped/bikes	0.99		1.00	1.00	0.98	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.96		1.00	1.00	0.92	
Flt Protected	1.00		0.95	1.00	0.98	
Satd. Flow (prot)	1778		1631	1783	1625	
Flt Permitted	1.00		0.07	1.00	0.98	
Satd. Flow (perm)	1778		113	1783	1625	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	780	322	222	324	82	118
RTOR Reduction (vph)	17	0	0	0	57	0
Lane Group Flow (vph)	1085	0	222	324	143	0
Confl. Peds. (#/hr)		2	2		2	2
Heavy Vehicles (%)	2%	2%	7%	3%	3%	4%
Turn Type	NA		pm+pt	NA	Prot	
Protected Phases	2		1	6	4	
Permitted Phases			6			
Actuated Green, G (s)	55.6		69.6	69.6	9.0	
Effective Green, g (s)	55.6		69.6	69.6	9.0	
Actuated g/C Ratio	0.63		0.79	0.79	0.10	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	1115		242	1400	165	
v/s Ratio Prot	c0.61		c0.09	0.18	c0.09	
v/s Ratio Perm			0.62			
v/c Ratio	0.97		0.92	0.23	0.86	
Uniform Delay, d1	15.8		29.7	2.5	39.2	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	20.6		35.9	0.1	34.4	
Delay (s)	36.4		65.7	2.6	73.6	
Level of Service	D		E	A	E	
Approach Delay (s)	36.4			28.2	73.6	
Approach LOS	D			C	E	

Intersection Summary

HCM 2000 Control Delay	38.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	88.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	90.7%	ICU Level of Service	E
Analysis Period (min)	15		

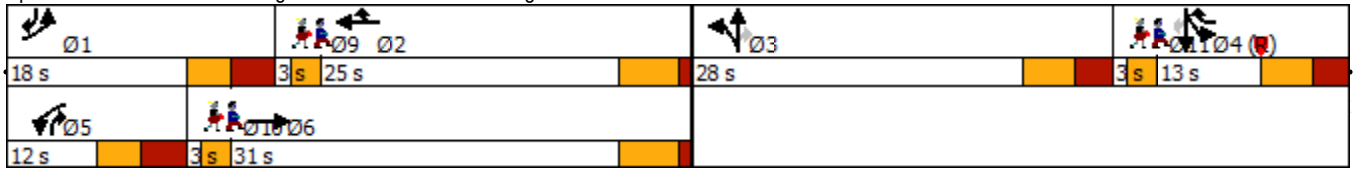
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Future Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	13	11	11	11	11	11	11
Storage Length (ft)	175		0	165		400	0		150	200		200
Storage Lanes	1		0	1		1	0		1	1		1
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.997				0.850			0.850			0.850
Flt Protected	0.950			0.950				0.996		0.950		
Satd. Flow (prot)	1636	3411	0	1668	3388	1669	0	1813	1546	3193	1801	1561
Flt Permitted	0.950			0.950				0.996		0.950		
Satd. Flow (perm)	1636	3411	0	1668	3388	1669	0	1813	1546	3193	1801	1561
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				231			170			170
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			465	
Travel Time (s)		30.7			30.1			15.5			10.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	pt+ov	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6		5	2	2 4	3	3	5	4	4	1
Permitted Phases									3			4
Detector Phase	1	6		5	2	2	3	3	3	4	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	6.0
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0	12.0	12.0	12.0	12.0	12.0
Total Split (s)	18.0	31.0		12.0	25.0		28.0	28.0	12.0	13.0	13.0	18.0
Total Split (%)	20.0%	34.4%		13.3%	27.8%		31.1%	31.1%	13.3%	14.4%	14.4%	20.0%
Maximum Green (s)	12.0	26.0		6.0	20.0		22.0	22.0	6.0	7.0	7.0	12.0
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5	3.0	2.5	2.5	3.0
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)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead			Lead			Lead	Lead	Lead			Lead
Lead-Lag Optimize?	Yes			Yes			Yes	Yes	Yes			Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Min		None	Min		None	None	None	C-Min	C-Min	None
Walk Time (s)		4.0			4.0					4.0	4.0	
Flash Dont Walk (s)		11.0			12.0					19.5	19.5	
Pedestrian Calls (#/hr)		1			1					1	1	

Intersection Summary

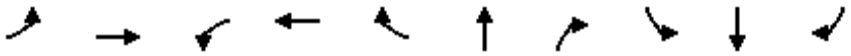
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:SBTL, Start of Yellow, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 4: Huntington Road/Gould Street & Highland Avenue



Lane Group	Ø9	Ø10	Ø11
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Turn Type			
Protected Phases	9	10	11
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	3.0	3.0	3.0
Total Split (s)	3.0	3.0	3.0
Total Split (%)	3%	3%	3%
Maximum Green (s)	1.0	1.0	1.0
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0	2.0
Recall Mode	None	None	None
Walk Time (s)	0.0	0.0	0.0
Flash Dont Walk (s)	0.0	0.0	0.0
Pedestrian Calls (#/hr)	1	1	1

Intersection Summary



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	189	929	48	664	727	426	259	195	75	38
v/c Ratio	0.89	0.74	0.43	0.78	0.96	0.96	0.46	0.59	0.40	0.06
Control Delay	78.7	30.9	52.9	39.5	39.8	69.7	8.0	46.0	43.2	1.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.7	30.9	52.9	39.5	39.8	69.7	8.0	46.0	43.2	1.3
Queue Length 50th (ft)	107	256	27	184	161	240	22	55	41	0
Queue Length 95th (ft)	#227	#396	63	#291	#627	#425	58	#112	#95	2
Internal Link Dist (ft)		1272		1244		601			385	
Turn Bay Length (ft)	175		165		400		150	200		200
Base Capacity (vph)	218	1259	111	853	759	443	561	333	188	589
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.74	0.43	0.78	0.96	0.96	0.46	0.59	0.40	0.06

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Future Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	13	11	11	11	11	11	11
Total Lost time (s)	6.0	5.0		6.0	5.0	5.0		6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00	1.00	0.97	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1636	3410		1668	3388	1669		1813	1546	3193	1801	1561
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1636	3410		1668	3388	1669		1813	1546	3193	1801	1561
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	189	909	20	48	664	727	33	393	259	195	75	38
RTOR Reduction (vph)	0	1	0	0	0	146	0	0	122	0	0	30
Lane Group Flow (vph)	189	928	0	48	664	581	0	426	137	195	75	8
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	0%
Turn Type	Prot	NA		Prot	NA	pt+ov	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6		5	2	2 4	3	3	5	4	4	1
Permitted Phases									3			4
Actuated Green, G (s)	11.7	33.2		3.6	25.1	33.3		22.0	25.6	8.2	8.2	19.9
Effective Green, g (s)	11.7	33.2		3.6	25.1	33.3		22.0	25.6	8.2	8.2	19.9
Actuated g/C Ratio	0.13	0.37		0.04	0.28	0.37		0.24	0.28	0.09	0.09	0.22
Clearance Time (s)	6.0	5.0		6.0	5.0			6.0	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	2.0
Lane Grp Cap (vph)	212	1257		66	944	617		443	439	290	164	449
v/s Ratio Prot	c0.12	c0.27		0.03	0.20	c0.35		c0.23	0.01	0.06	0.04	0.00
v/s Ratio Perm									0.08			0.00
v/c Ratio	0.89	0.74		0.73	0.70	0.94		0.96	0.31	0.67	0.46	0.02
Uniform Delay, d1	38.5	24.6		42.7	29.1	27.4		33.6	25.3	39.6	38.8	27.4
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.96	0.94	1.00
Incremental Delay, d2	33.3	2.0		28.4	2.0	22.7		32.7	0.1	11.8	8.9	0.0
Delay (s)	71.8	26.6		71.1	31.1	50.1		66.3	25.4	49.8	45.5	27.4
Level of Service	E	C		E	C	D		E	C	D	D	C
Approach Delay (s)		34.3			42.0			50.8			46.0	
Approach LOS		C			D			D			D	

Intersection Summary

HCM 2000 Control Delay	41.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

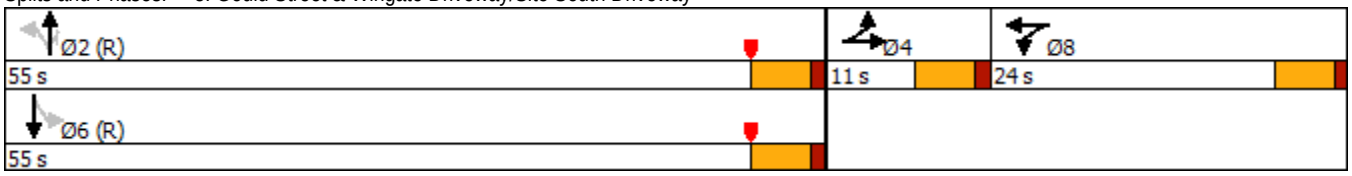
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	5	42	0	5	17	427	406	55	295	2
Future Volume (vph)	0	0	5	42	0	5	17	427	406	55	295	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.865			0.970				0.850		0.999	
Flt Protected				0.950	0.962			0.998			0.992	
Satd. Flow (prot)	0	1611	0	1681	1651	0	0	1859	1583	0	3507	0
Flt Permitted				0.950	0.962			0.981			0.826	
Satd. Flow (perm)	0	1611	0	1681	1651	0	0	1827	1583	0	2920	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		604			85				441		1	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			465			307	
Travel Time (s)		14.7			16.0			10.6			7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)				44%								
Turn Type		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)	11.0	11.0		23.0	23.0		15.0	15.0	15.0	23.0	23.0	
Total Split (s)	11.0	11.0		24.0	24.0		55.0	55.0	55.0	55.0	55.0	
Total Split (%)	12.2%	12.2%		26.7%	26.7%		61.1%	61.1%	61.1%	61.1%	61.1%	
Maximum Green (s)	6.0	6.0		19.0	19.0		50.0	50.0	50.0	50.0	50.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
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												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		C-Min	C-Min	C-Min	C-Min	C-Min	
Walk Time (s)				7.0	7.0					7.0	7.0	
Flash Dont Walk (s)				11.0	11.0					11.0	11.0	
Pedestrian Calls (#/hr)				0	0					0	0	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 44 (49%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 5: Gould Street & Wingate Driveway/Site South Driveway



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	5	26	25	482	441	383
v/c Ratio	0.01	0.20	0.12	0.31	0.31	0.15
Control Delay	0.0	41.8	1.2	2.8	0.8	2.7
Queue Delay	0.0	0.0	0.0	0.4	0.3	0.0
Total Delay	0.0	41.8	1.2	3.2	1.1	2.7
Queue Length 50th (ft)	0	14	0	49	6	17
Queue Length 95th (ft)	0	41	0	m117	m19	56
Internal Link Dist (ft)	351		389	385		227
Turn Bay Length (ft)						
Base Capacity (vph)	671	354	415	1565	1419	2502
Starvation Cap Reductn	0	0	0	583	448	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.07	0.06	0.49	0.45	0.15

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	5	42	0	5	17	427	406	55	295	2
Future Volume (vph)	0	0	5	42	0	5	17	427	406	55	295	2
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		0.95	0.95			1.00	1.00		0.95	
Frt		0.86		1.00	0.97			1.00	0.85		1.00	
Flt Protected		1.00		0.95	0.96			1.00	1.00		0.99	
Satd. Flow (prot)		1611		1681	1650			1859	1583		3509	
Flt Permitted		1.00		0.95	0.96			0.98	1.00		0.83	
Satd. Flow (perm)		1611		1681	1650			1828	1583		2922	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	5	46	0	5	18	464	441	60	321	2
RTOR Reduction (vph)	0	5	0	0	24	0	0	0	102	0	0	0
Lane Group Flow (vph)	0	0	0	26	1	0	0	482	339	0	383	0
Turn Type		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)		1.2		4.7	4.7			69.1	69.1		69.1	
Effective Green, g (s)		1.2		4.7	4.7			69.1	69.1		69.1	
Actuated g/C Ratio		0.01		0.05	0.05			0.77	0.77		0.77	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		21		87	86			1403	1215		2243	
v/s Ratio Prot		c0.00		c0.02	0.00							
v/s Ratio Perm								c0.26	0.21		0.13	
v/c Ratio		0.00		0.30	0.02			0.34	0.28		0.17	
Uniform Delay, d1		43.8		41.1	40.5			3.3	3.1		2.8	
Progression Factor		1.00		1.00	1.00			0.84	1.20		1.00	
Incremental Delay, d2		0.1		1.9	0.1			0.2	0.2		0.2	
Delay (s)		43.9		43.0	40.5			3.0	3.9		3.0	
Level of Service		D		D	D			A	A		A	
Approach Delay (s)		43.9			41.8			3.4			3.0	
Approach LOS		D			D			A			A	

Intersection Summary

HCM 2000 Control Delay	4.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	53.7%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	13	15	402	134	171	299
Future Volume (vph)	13	15	402	134	171	299
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		100	100	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1805	1615	1863	1583	1805	1845
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1615	1863	1583	1805	1845
Link Speed (mph)	20		30			30
Link Distance (ft)	474		307			641
Travel Time (s)	16.2		7.0			14.6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	2%	0%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	13	15	402	134	171	299
Future Vol, veh/h	13	15	402	134	171	299
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	0	-	100	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	2	0	3
Mvmt Flow	14	16	437	146	186	325

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1134	437	0	0	583	0
Stage 1	437	-	-	-	-	-
Stage 2	697	-	-	-	-	-
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	226	624	-	-	1001	-
Stage 1	655	-	-	-	-	-
Stage 2	498	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	184	624	-	-	1001	-
Mov Cap-2 Maneuver	184	-	-	-	-	-
Stage 1	655	-	-	-	-	-
Stage 2	405	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18	0	3.4
HCM LOS	C		

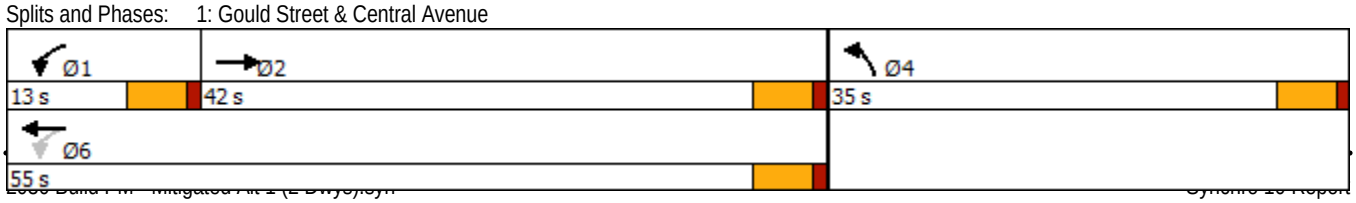
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	184	624	1001	-
HCM Lane V/C Ratio	-	-	0.077	0.026	0.186	-
HCM Control Delay (s)	-	-	26.2	10.9	9.4	-
HCM Lane LOS	-	-	D	B	A	-
HCM 95th %tile Q(veh)	-	-	0.2	0.1	0.7	-

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	447	103	181	707	223	213
Future Volume (vph)	447	103	181	707	223	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	11	11	12	12
Storage Length (ft)		0	100		0	0
Storage Lanes		0	1		1	0
Taper Length (ft)			25		25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor			1.00		0.99	
Frt	0.975				0.934	
Flt Protected			0.950		0.975	
Satd. Flow (prot)	1838	0	1728	1801	1673	0
Flt Permitted			0.141		0.975	
Satd. Flow (perm)	1838	0	256	1801	1673	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	16				58	
Link Speed (mph)	30			30	30	
Link Distance (ft)	1354			549	1225	
Travel Time (s)	30.8			12.5	27.8	
Confl. Peds. (#/hr)			6			6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	1%	0%	1%	2%	0%	4%
Shared Lane Traffic (%)						
Turn Type	NA		pm+pt	NA	Prot	
Protected Phases	2		1	6	4	
Permitted Phases			6			
Detector Phase	2		1	6	4	
Switch Phase						
Minimum Initial (s)	10.0		6.0	10.0	6.0	
Minimum Split (s)	15.0		11.0	15.0	11.0	
Total Split (s)	42.0		13.0	55.0	35.0	
Total Split (%)	46.7%		14.4%	61.1%	38.9%	
Maximum Green (s)	37.0		8.0	50.0	30.0	
Yellow Time (s)	4.0		4.0	4.0	4.0	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	5.0		5.0	5.0	5.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?	Yes		Yes			
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Recall Mode	Min		None	Min	None	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 77
Natural Cycle: 65
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: Gould Street & Central Avenue



Lane Group	EBT	WBL	WBT	NBL
Lane Group Flow (vph)	598	197	768	474
v/c Ratio	0.84	0.67	0.77	0.84
Control Delay	33.9	23.5	20.7	37.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	33.9	23.5	20.7	37.8
Queue Length 50th (ft)	261	48	287	195
Queue Length 95th (ft)	#422	#132	475	#375
Internal Link Dist (ft)	1274		469	1145
Turn Bay Length (ft)		100		
Base Capacity (vph)	925	300	1214	711
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.65	0.66	0.63	0.67

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	447	103	181	707	223	213
Future Volume (vph)	447	103	181	707	223	213
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	12	11	11	12	12
Total Lost time (s)	5.0		5.0	5.0	5.0	
Lane Util. Factor	1.00		1.00	1.00	1.00	
Frpb, ped/bikes	1.00		1.00	1.00	0.99	
Flpb, ped/bikes	1.00		1.00	1.00	1.00	
Frt	0.97		1.00	1.00	0.93	
Flt Protected	1.00		0.95	1.00	0.98	
Satd. Flow (prot)	1837		1727	1801	1673	
Flt Permitted	1.00		0.14	1.00	0.98	
Satd. Flow (perm)	1837		256	1801	1673	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	486	112	197	768	242	232
RTOR Reduction (vph)	10	0	0	0	40	0
Lane Group Flow (vph)	588	0	197	768	434	0
Confl. Peds. (#/hr)			6			6
Heavy Vehicles (%)	1%	0%	1%	2%	0%	4%
Turn Type	NA		pm+pt	NA	Prot	
Protected Phases	2		1	6	4	
Permitted Phases			6			
Actuated Green, G (s)	29.5		42.6	42.6	24.0	
Effective Green, g (s)	29.5		42.6	42.6	24.0	
Actuated g/C Ratio	0.39		0.56	0.56	0.31	
Clearance Time (s)	5.0		5.0	5.0	5.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	707		297	1001	524	
v/s Ratio Prot	0.32		0.07	c0.43	c0.26	
v/s Ratio Perm			0.30			
v/c Ratio	0.83		0.66	0.77	0.83	
Uniform Delay, d1	21.3		13.3	13.2	24.4	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	8.3		5.5	3.6	10.4	
Delay (s)	29.6		18.8	16.7	34.8	
Level of Service	C		B	B	C	
Approach Delay (s)	29.6			17.2	34.8	
Approach LOS	C			B	C	

Intersection Summary			
HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	76.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	78.0%	ICU Level of Service	D
Analysis Period (min)	15		

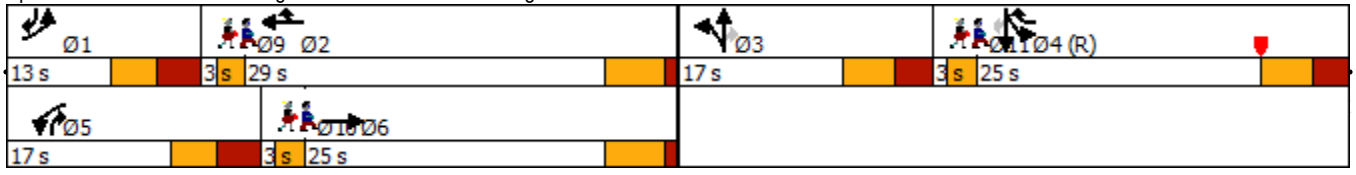
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Future Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	13	11	11	11	11	11	11
Storage Length (ft)	175		0	165		400	0		150	200		200
Storage Lanes	1		0	1		1	0		1	1		1
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.997				0.850			0.850			0.850
Flt Protected	0.950			0.950				0.988		0.950		
Satd. Flow (prot)	1685	3413	0	1685	3116	1669	0	1801	1546	3351	1818	1516
Flt Permitted	0.950			0.950				0.988		0.950		
Satd. Flow (perm)	1685	3413	0	1685	3116	1669	0	1801	1546	3351	1818	1516
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				290			170			185
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			463	
Travel Time (s)		30.7			30.1			15.5			10.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	pt+ov	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6		5	2	2 4	3	3	5	4	4	1
Permitted Phases									3			4
Detector Phase	1	6		5	2	2	3	3	3	4	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	6.0
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0	12.0	12.0	12.0	12.0	12.0
Total Split (s)	13.0	25.0		17.0	29.0		17.0	17.0	17.0	25.0	25.0	13.0
Total Split (%)	14.4%	27.8%		18.9%	32.2%		18.9%	18.9%	18.9%	27.8%	27.8%	14.4%
Maximum Green (s)	7.0	20.0		11.0	24.0		11.0	11.0	11.0	19.0	19.0	7.0
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5	3.0	2.5	2.5	3.0
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)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead			Lead			Lead	Lead	Lead			Lead
Lead-Lag Optimize?	Yes			Yes			Yes	Yes	Yes			Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Min		None	Min		None	None	None	C-Min	C-Min	None
Walk Time (s)		4.0			4.0					4.0	4.0	
Flash Dont Walk (s)		11.0			12.0					19.5	19.5	
Pedestrian Calls (#/hr)		1			1					1	1	

Intersection Summary

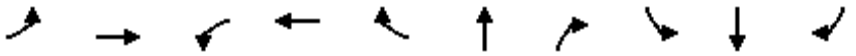
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:SBTL, Start of Yellow, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 4: Huntington Road/Gould Street & Highland Avenue



Lane Group	Ø9	Ø10	Ø11
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Turn Type			
Protected Phases	9	10	11
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	3.0	3.0	3.0
Total Split (s)	3.0	3.0	3.0
Total Split (%)	3%	3%	3%
Maximum Green (s)	1.0	1.0	1.0
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0	2.0
Recall Mode	None	None	None
Walk Time (s)	0.0	0.0	0.0
Flash Dont Walk (s)	0.0	0.0	0.0
Pedestrian Calls (#/hr)	1	1	1

Intersection Summary



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	73	775	145	863	290	159	113	733	337	185
v/c Ratio	0.57	0.88	0.77	0.86	0.26	0.77	0.23	0.89	0.75	0.28
Control Delay	58.9	46.2	64.8	40.9	1.4	63.7	1.8	46.0	43.0	6.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.9	46.2	64.8	40.9	1.4	63.7	1.8	46.0	43.0	6.2
Queue Length 50th (ft)	41	222	80	248	0	88	0	141	126	15
Queue Length 95th (ft)	#96	#366	#167	#400	19	#180	6	#357	#348	42
Internal Link Dist (ft)		1272		1244		601			383	
Turn Bay Length (ft)	175		165		400		150	200		200
Base Capacity (vph)	131	878	205	1000	1104	220	493	827	448	667
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.88	0.71	0.86	0.26	0.72	0.23	0.89	0.75	0.28

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Future Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	13	11	11	11	11	11	11
Total Lost time (s)	6.0	5.0		6.0	5.0	5.0		6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00	1.00	0.97	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1685	3411		1685	3116	1669		1801	1546	3351	1818	1516
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1685	3411		1685	3116	1669		1801	1546	3351	1818	1516
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	73	757	18	145	863	290	38	121	113	733	337	185
RTOR Reduction (vph)	0	1	0	0	0	125	0	0	87	0	0	128
Lane Group Flow (vph)	73	774	0	145	863	165	0	159	26	733	337	57
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
Turn Type	Prot	NA		Prot	NA	pt+ov	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6		5	2	2 4	3	3	5	4	4	1
Permitted Phases									3			4
Actuated Green, G (s)	5.6	24.3		10.2	28.9	51.1		10.3	20.5	22.2	22.2	27.8
Effective Green, g (s)	5.6	24.3		10.2	28.9	51.1		10.3	20.5	22.2	22.2	27.8
Actuated g/C Ratio	0.06	0.27		0.11	0.32	0.57		0.11	0.23	0.25	0.25	0.31
Clearance Time (s)	6.0	5.0		6.0	5.0			6.0	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	2.0
Lane Grp Cap (vph)	104	920		190	1000	947		206	352	826	448	569
v/s Ratio Prot	0.04	0.23		c0.09	c0.28	0.10		c0.09	0.01	c0.22	0.19	0.01
v/s Ratio Perm									0.01			0.03
v/c Ratio	0.70	0.84		0.76	0.86	0.17		0.77	0.07	0.89	0.75	0.10
Uniform Delay, d1	41.4	31.0		38.7	28.7	9.3		38.7	27.3	32.7	31.4	22.2
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.98	0.98	1.63
Incremental Delay, d2	16.0	6.7		15.0	7.6	0.0		15.0	0.0	12.3	10.0	0.0
Delay (s)	57.4	37.7		53.7	36.2	9.4		53.7	27.3	44.3	40.8	36.2
Level of Service	E	D		D	D	A		D	C	D	D	D
Approach Delay (s)		39.4			32.2			42.7			42.2	
Approach LOS		D			C			D			D	

Intersection Summary

HCM 2000 Control Delay	38.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

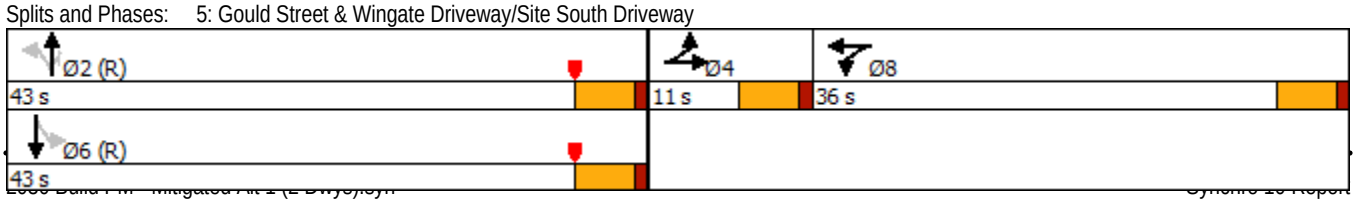
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	28	490	1	69	7	269	138	14	767	6
Future Volume (vph)	0	0	28	490	1	69	7	269	138	14	767	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0		0	0		0	0		0	100		0
Storage Lanes	0		0	1		0	0		1	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	0.95
Frt		0.865			0.962				0.850		0.999	
Flt Protected				0.950	0.964			0.999			0.999	
Satd. Flow (prot)	0	1611	0	1681	1641	0	0	1861	1583	0	3532	0
Flt Permitted				0.950	0.964			0.978			0.948	
Satd. Flow (perm)	0	1611	0	1681	1641	0	0	1822	1583	0	3352	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		107			20				150		1	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			463			307	
Travel Time (s)		14.7			16.0			10.5			7.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)				42%								
Turn Type		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)	11.0	11.0		23.0	23.0		15.0	15.0	15.0	23.0	23.0	
Total Split (s)	11.0	11.0		36.0	36.0		43.0	43.0	43.0	43.0	43.0	
Total Split (%)	12.2%	12.2%		40.0%	40.0%		47.8%	47.8%	47.8%	47.8%	47.8%	
Maximum Green (s)	6.0	6.0		31.0	31.0		38.0	38.0	38.0	38.0	38.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
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												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		C-Min	C-Min	C-Min	C-Min	C-Min	
Walk Time (s)				7.0	7.0					7.0	7.0	
Flash Dont Walk (s)				11.0	11.0					11.0	11.0	
Pedestrian Calls (#/hr)				0	0					0	0	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 34 (38%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 5: Gould Street & Wingate Driveway/Site South Driveway



Lane Group	EBT	WBL	WBT	NBT	NBR	SBT
Lane Group Flow (vph)	30	309	300	300	150	856
v/c Ratio	0.14	0.72	0.69	0.29	0.16	0.46
Control Delay	1.5	39.2	35.6	13.0	2.8	15.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1.5	39.2	35.6	13.0	2.8	15.1
Queue Length 50th (ft)	0	167	150	77	0	161
Queue Length 95th (ft)	0	232	214	m179	m21	255
Internal Link Dist (ft)	351		389	383		227
Turn Bay Length (ft)						
Base Capacity (vph)	207	579	578	1018	951	1873
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	0.14	0.53	0.52	0.29	0.16	0.46

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	28	490	1	69	7	269	138	14	767	6
Future Volume (vph)	0	0	28	490	1	69	7	269	138	14	767	6
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		0.95	0.95			1.00	1.00		0.95	
Frt		0.86		1.00	0.96			1.00	0.85		1.00	
Flt Protected		1.00		0.95	0.96			1.00	1.00		1.00	
Satd. Flow (prot)		1611		1681	1642			1860	1583		3532	
Flt Permitted		1.00		0.95	0.96			0.98	1.00		0.95	
Satd. Flow (perm)		1611		1681	1642			1821	1583		3350	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	30	533	1	75	8	292	150	15	834	7
RTOR Reduction (vph)	0	29	0	0	15	0	0	0	70	0	0	0
Lane Group Flow (vph)	0	1	0	309	285	0	0	300	81	0	856	0
Turn Type		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)		3.6		23.1	23.1			48.3	48.3		48.3	
Effective Green, g (s)		3.6		23.1	23.1			48.3	48.3		48.3	
Actuated g/C Ratio		0.04		0.26	0.26			0.54	0.54		0.54	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0		5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)		64		431	421			977	849		1797	
v/s Ratio Prot		c0.00		c0.18	0.17							
v/s Ratio Perm								0.16	0.05		c0.26	
v/c Ratio		0.02		0.72	0.68			0.31	0.09		0.48	
Uniform Delay, d1		41.5		30.5	30.1			11.6	10.2		13.0	
Progression Factor		1.00		1.00	1.00			0.91	0.87		1.00	
Incremental Delay, d2		0.1		5.6	4.3			0.8	0.2		0.9	
Delay (s)		41.6		36.1	34.4			11.3	9.1		13.9	
Level of Service		D		D	C			B	A		B	
Approach Delay (s)		41.6			35.2			10.5			13.9	
Approach LOS		D			D			B			B	

Intersection Summary

HCM 2000 Control Delay	20.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	62.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	163	204	301	46	41	520
Future Volume (vph)	163	204	301	46	41	520
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		100	100	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1805	1615	1900	1615	1805	1792
Flt Permitted	0.950				0.950	
Satd. Flow (perm)	1805	1615	1900	1615	1805	1792
Link Speed (mph)	20		30			30
Link Distance (ft)	474		307			641
Travel Time (s)	16.2		7.0			14.6
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	6%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection						
Int Delay, s/veh	7.5					

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	163	204	301	46	41	520
Future Vol, veh/h	163	204	301	46	41	520
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	0	-	100	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	6
Mvmt Flow	177	222	327	50	45	565

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	982	327	0	0	377	0
Stage 1	327	-	-	-	-	-
Stage 2	655	-	-	-	-	-
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	279	719	-	-	1193	-
Stage 1	735	-	-	-	-	-
Stage 2	521	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	268	719	-	-	1193	-
Mov Cap-2 Maneuver	268	-	-	-	-	-
Stage 1	735	-	-	-	-	-
Stage 2	501	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.1	0	0.6
HCM LOS	D		

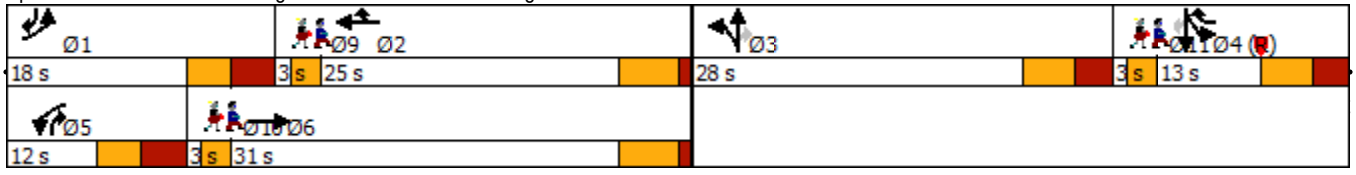
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	268	719	1193	-
HCM Lane V/C Ratio	-	-	0.661	0.308	0.037	-
HCM Control Delay (s)	-	-	41.2	12.2	8.1	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	4.3	1.3	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Future Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	12	11	11	11	11	11	11
Storage Length (ft)	175		0	165		400	0		150	200		200
Storage Lanes	1		0	1		1	0		1	1		1
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.997				0.850			0.850			0.850
Flt Protected	0.950			0.950				0.996		0.950		
Satd. Flow (prot)	1636	3411	0	1668	3388	1615	0	1813	1546	3193	1801	1561
Flt Permitted	0.950			0.950				0.996		0.950		
Satd. Flow (perm)	1636	3411	0	1668	3388	1615	0	1813	1546	3193	1801	1561
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				231			170			170
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			462	
Travel Time (s)		30.7			30.1			15.5			10.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	0%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	pt+ov	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6		5	2	2 4	3	3	5	4	4	1
Permitted Phases									3			4
Detector Phase	1	6		5	2	2	3	3	3	4	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	6.0
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0	12.0	12.0	12.0	12.0	12.0
Total Split (s)	18.0	31.0		12.0	25.0		28.0	28.0	12.0	13.0	13.0	18.0
Total Split (%)	20.0%	34.4%		13.3%	27.8%		31.1%	31.1%	13.3%	14.4%	14.4%	20.0%
Maximum Green (s)	12.0	26.0		6.0	20.0		22.0	22.0	6.0	7.0	7.0	12.0
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5	3.0	2.5	2.5	3.0
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)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead			Lead			Lead	Lead	Lead			Lead
Lead-Lag Optimize?	Yes			Yes			Yes	Yes	Yes			Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Min		None	Min		None	None	None	C-Min	C-Min	None
Walk Time (s)		4.0			4.0					4.0	4.0	
Flash Dont Walk (s)		11.0			12.0					19.5	19.5	
Pedestrian Calls (#/hr)		1			1					1	1	

Intersection Summary

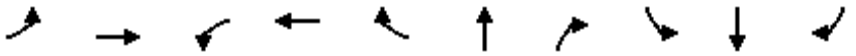
Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:SBTL, Start of Yellow, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 4: Huntington Road/Gould Street & Highland Avenue



Lane Group	Ø9	Ø10	Ø11
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Turn Type			
Protected Phases	9	10	11
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	3.0	3.0	3.0
Total Split (s)	3.0	3.0	3.0
Total Split (%)	3%	3%	3%
Maximum Green (s)	1.0	1.0	1.0
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0	2.0
Recall Mode	None	None	None
Walk Time (s)	0.0	0.0	0.0
Flash Dont Walk (s)	0.0	0.0	0.0
Pedestrian Calls (#/hr)	1	1	1

Intersection Summary



Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	189	929	48	664	727	426	259	195	75	38
v/c Ratio	0.89	0.74	0.43	0.78	0.98	0.96	0.46	0.59	0.40	0.06
Control Delay	78.7	30.9	52.9	39.5	46.0	69.7	8.0	45.7	42.7	1.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.7	30.9	52.9	39.5	46.0	69.7	8.0	45.7	42.7	1.0
Queue Length 50th (ft)	107	256	27	184	172	240	22	56	41	1
Queue Length 95th (ft)	#227	#396	63	#291	#638	#425	58	#114	#96	4
Internal Link Dist (ft)		1272		1244		601			382	
Turn Bay Length (ft)	175		165		400		150	200		200
Base Capacity (vph)	218	1259	111	853	739	443	561	333	188	589
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.87	0.74	0.43	0.78	0.98	0.96	0.46	0.59	0.40	0.06

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Future Volume (vph)	174	836	18	44	611	669	30	362	238	179	69	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	12	11	11	11	11	11	11
Total Lost time (s)	6.0	5.0		6.0	5.0	5.0		6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00	1.00	0.97	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1636	3410		1668	3388	1615		1813	1546	3193	1801	1561
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1636	3410		1668	3388	1615		1813	1546	3193	1801	1561
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	189	909	20	48	664	727	33	393	259	195	75	38
RTOR Reduction (vph)	0	1	0	0	0	146	0	0	122	0	0	30
Lane Group Flow (vph)	189	928	0	48	664	581	0	426	137	195	75	8
Heavy Vehicles (%)	3%	2%	2%	1%	3%	0%	0%	1%	1%	6%	2%	0%
Turn Type	Prot	NA		Prot	NA	pt+ov	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6		5	2	2 4	3	3	5	4	4	1
Permitted Phases									3			4
Actuated Green, G (s)	11.7	33.2		3.6	25.1	33.3		22.0	25.6	8.2	8.2	19.9
Effective Green, g (s)	11.7	33.2		3.6	25.1	33.3		22.0	25.6	8.2	8.2	19.9
Actuated g/C Ratio	0.13	0.37		0.04	0.28	0.37		0.24	0.28	0.09	0.09	0.22
Clearance Time (s)	6.0	5.0		6.0	5.0			6.0	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	2.0
Lane Grp Cap (vph)	212	1257		66	944	597		443	439	290	164	449
v/s Ratio Prot	c0.12	c0.27		0.03	0.20	c0.36		c0.23	0.01	0.06	0.04	0.00
v/s Ratio Perm									0.08			0.00
v/c Ratio	0.89	0.74		0.73	0.70	0.97		0.96	0.31	0.67	0.46	0.02
Uniform Delay, d1	38.5	24.6		42.7	29.1	27.9		33.6	25.3	39.6	38.8	27.4
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	0.95	0.94	1.00
Incremental Delay, d2	33.3	2.0		28.4	2.0	30.0		32.7	0.1	11.7	8.9	0.0
Delay (s)	71.8	26.6		71.1	31.1	57.9		66.3	25.4	49.4	45.1	27.4
Level of Service	E	C		E	C	E		E	C	D	D	C
Approach Delay (s)		34.3			46.0			50.8			45.7	
Approach LOS		C			D			D			D	

Intersection Summary

HCM 2000 Control Delay	43.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

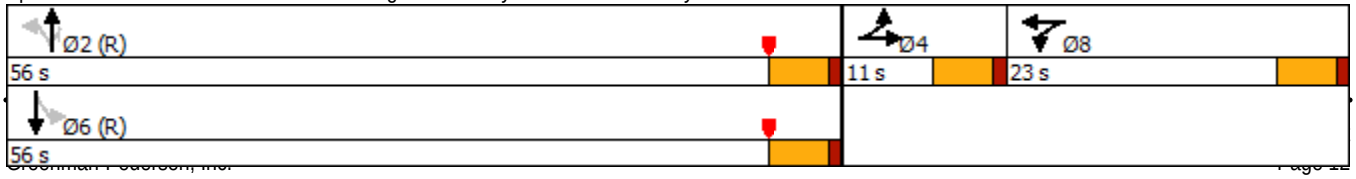
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	5	55	0	10	17	293	540	226	282	2
Future Volume (vph)	0	0	5	55	0	10	17	293	540	226	282	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	100		0
Storage Lanes	0		0	1		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865			0.953				0.850		0.999	
Flt Protected				0.950	0.967			0.997		0.950		
Satd. Flow (prot)	0	1611	0	1681	1685	0	0	1857	1583	1770	1861	0
Flt Permitted				0.950	0.967			0.978		0.557		
Satd. Flow (perm)	0	1611	0	1681	1685	0	0	1822	1583	1038	1861	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		596			85				587		1	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			462			408	
Travel Time (s)		14.7			16.0			10.5			9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)				40%								
Turn Type		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)	11.0	11.0		23.0	23.0		15.0	15.0	15.0	23.0	23.0	
Total Split (s)	11.0	11.0		23.0	23.0		56.0	56.0	56.0	56.0	56.0	
Total Split (%)	12.2%	12.2%		25.6%	25.6%		62.2%	62.2%	62.2%	62.2%	62.2%	
Maximum Green (s)	6.0	6.0		18.0	18.0		51.0	51.0	51.0	51.0	51.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
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)		5.0		5.0	5.0			5.0	5.0	5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		C-Min	C-Min	C-Min	C-Min	C-Min	
Walk Time (s)				7.0	7.0					7.0	7.0	
Flash Dont Walk (s)				11.0	11.0					11.0	11.0	
Pedestrian Calls (#/hr)				0	0					0	0	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 49 (54%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 5: Gould Street & Wingate Driveway/Site South Driveway



Lane Group	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	5	36	35	336	587	246	309
v/c Ratio	0.01	0.26	0.16	0.23	0.42	0.29	0.20
Control Delay	0.0	42.5	1.6	3.0	1.0	4.7	3.6
Queue Delay	0.0	0.0	0.0	0.0	0.4	0.0	0.0
Total Delay	0.0	42.5	1.6	3.0	1.5	4.7	3.6
Queue Length 50th (ft)	0	21	0	33	9	25	29
Queue Length 95th (ft)	0	50	1	m74	m28	99	101
Internal Link Dist (ft)	351		389	382			328
Turn Bay Length (ft)						100	
Base Capacity (vph)	663	336	405	1486	1399	846	1518
Starvation Cap Reductn	0	0	0	0	384	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	0.01	0.11	0.09	0.23	0.58	0.29	0.20

Intersection Summary

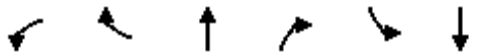
m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	5	55	0	10	17	293	540	226	282	2
Future Volume (vph)	0	0	5	55	0	10	17	293	540	226	282	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)		5.0		5.0	5.0			5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00		0.95	0.95			1.00	1.00	1.00	1.00	
Frt		0.86		1.00	0.95			1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.97			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1611		1681	1685			1858	1583	1770	1861	
Flt Permitted		1.00		0.95	0.97			0.98	1.00	0.56	1.00	
Satd. Flow (perm)		1611		1681	1685			1822	1583	1037	1861	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	5	60	0	11	18	318	587	246	307	2
RTOR Reduction (vph)	0	5	0	0	33	0	0	0	147	0	0	0
Lane Group Flow (vph)	0	0	0	36	2	0	0	336	440	246	309	0
Turn Type		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)		1.2		6.4	6.4			67.4	67.4	67.4	67.4	
Effective Green, g (s)		1.2		6.4	6.4			67.4	67.4	67.4	67.4	
Actuated g/C Ratio		0.01		0.07	0.07			0.75	0.75	0.75	0.75	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		21		119	119			1364	1185	776	1393	
v/s Ratio Prot		c0.00		c0.02	0.00						0.17	
v/s Ratio Perm								0.18	c0.28	0.24		
v/c Ratio		0.00		0.30	0.02			0.25	0.37	0.32	0.22	
Uniform Delay, d1		43.8		39.7	38.9			3.5	3.9	3.7	3.4	
Progression Factor		1.00		1.00	1.00			0.85	1.53	1.00	1.00	
Incremental Delay, d2		0.1		1.4	0.1			0.1	0.3	1.1	0.4	
Delay (s)		43.9		41.1	39.0			3.1	6.3	4.8	3.8	
Level of Service		D		D	D			A	A	A	A	
Approach Delay (s)		43.9			40.1			5.1			4.2	
Approach LOS		D			D			A			A	

Intersection Summary

HCM 2000 Control Delay	6.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group



Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	10	407	0	0	470
Future Volume (vph)	0	10	407	0	0	470
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected						
Satd. Flow (prot)	0	1644	1863	0	0	1845
Flt Permitted						
Satd. Flow (perm)	0	1644	1863	0	0	1845
Link Speed (mph)	20		30			30
Link Distance (ft)	474		408			540
Travel Time (s)	16.2		9.3			12.3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	2%	2%	0%	3%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	10	407	0	0	470
Future Vol, veh/h	0	10	407	0	0	470
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	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	2	2	0	3
Mvmt Flow	0	11	442	0	0	511

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	442	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	620	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	620	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.9	0	0
HCM LOS	B		

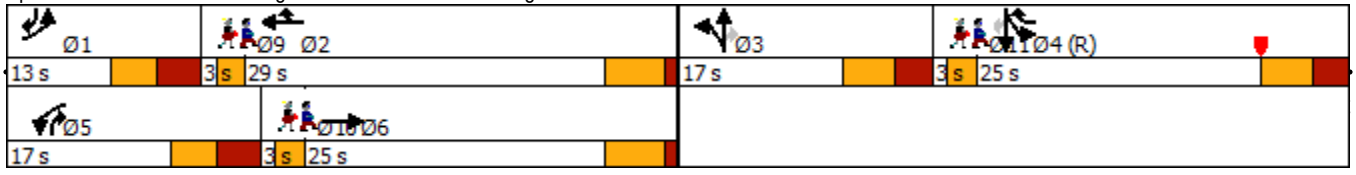
Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	620	-
HCM Lane V/C Ratio	-	0.018	-
HCM Control Delay (s)	-	10.9	-
HCM Lane LOS	-	B	-
HCM 95th %tile Q(veh)	-	0.1	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Future Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	10	11	11	10	11	11	11	11	11	11	11	11
Storage Length (ft)	175		0	165		400	0		150	200		200
Storage Lanes	1		0	1		1	0		1	1		1
Taper Length (ft)	150			75			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.997				0.850			0.850			0.850
Flt Protected	0.950			0.950				0.988		0.950		
Satd. Flow (prot)	1685	3413	0	1685	3116	1561	0	1801	1546	3351	1818	1516
Flt Permitted	0.950			0.950				0.988		0.950		
Satd. Flow (perm)	1685	3413	0	1685	3116	1561	0	1801	1546	3351	1818	1516
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2				290			170			185
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1352			1324			681			465	
Travel Time (s)		30.7			30.1			15.5			10.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
Shared Lane Traffic (%)												
Turn Type	Prot	NA		Prot	NA	pt+ov	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6		5	2	2 4	3	3	5	4	4	1
Permitted Phases									3			4
Detector Phase	1	6		5	2	2	3	3	3	4	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	6.0
Minimum Split (s)	12.0	15.0		12.0	15.0		12.0	12.0	12.0	12.0	12.0	12.0
Total Split (s)	13.0	25.0		17.0	29.0		17.0	17.0	17.0	25.0	25.0	13.0
Total Split (%)	14.4%	27.8%		18.9%	32.2%		18.9%	18.9%	18.9%	27.8%	27.8%	14.4%
Maximum Green (s)	7.0	20.0		11.0	24.0		11.0	11.0	11.0	19.0	19.0	7.0
Yellow Time (s)	3.0	4.0		3.0	4.0		3.5	3.5	3.0	3.5	3.5	3.0
All-Red Time (s)	3.0	1.0		3.0	1.0		2.5	2.5	3.0	2.5	2.5	3.0
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)	6.0	5.0		6.0	5.0			6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead			Lead			Lead	Lead	Lead			Lead
Lead-Lag Optimize?	Yes			Yes			Yes	Yes	Yes			Yes
Vehicle Extension (s)	2.0	2.0		2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0
Recall Mode	None	Min		None	Min		None	None	None	C-Min	C-Min	None
Walk Time (s)		4.0			4.0					4.0	4.0	
Flash Dont Walk (s)		11.0			12.0					19.5	19.5	
Pedestrian Calls (#/hr)		1			1					1	1	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:SBTL, Start of Yellow, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 4: Huntington Road/Gould Street & Highland Avenue



Lane Group	Ø9	Ø10	Ø11
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Ideal Flow (vphpl)			
Lane Width (ft)			
Storage Length (ft)			
Storage Lanes			
Taper Length (ft)			
Lane Util. Factor			
Frt			
Flt Protected			
Satd. Flow (prot)			
Flt Permitted			
Satd. Flow (perm)			
Right Turn on Red			
Satd. Flow (RTOR)			
Link Speed (mph)			
Link Distance (ft)			
Travel Time (s)			
Peak Hour Factor			
Heavy Vehicles (%)			
Shared Lane Traffic (%)			
Turn Type			
Protected Phases	9	10	11
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	3.0	3.0	3.0
Total Split (s)	3.0	3.0	3.0
Total Split (%)	3%	3%	3%
Maximum Green (s)	1.0	1.0	1.0
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	2.0	2.0	2.0
Recall Mode	None	None	None
Walk Time (s)	0.0	0.0	0.0
Flash Dont Walk (s)	0.0	0.0	0.0
Pedestrian Calls (#/hr)	1	1	1

Intersection Summary

Lane Group	EBL	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	73	775	145	863	290	159	113	733	337	185
v/c Ratio	0.57	0.88	0.77	0.86	0.28	0.77	0.23	0.89	0.75	0.28
Control Delay	58.9	46.2	64.8	40.9	1.5	63.7	1.8	45.1	41.6	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	58.9	46.2	64.8	40.9	1.5	63.7	1.8	45.1	41.6	6.0
Queue Length 50th (ft)	41	222	80	248	0	88	0	194	163	22
Queue Length 95th (ft)	#96	#366	#167	#400	19	#180	6	m#346	m#313	m39
Internal Link Dist (ft)		1272		1244		601			385	
Turn Bay Length (ft)	175		165		400		150	200		200
Base Capacity (vph)	131	878	205	1000	1040	220	493	827	448	667
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.56	0.88	0.71	0.86	0.28	0.72	0.23	0.89	0.75	0.28

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Future Volume (vph)	67	696	17	133	794	267	35	111	104	674	310	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	10	11	11	10	11	11	11	11	11	11	11	11
Total Lost time (s)	6.0	5.0		6.0	5.0	5.0		6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95	1.00		1.00	1.00	0.97	1.00	1.00
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1685	3411		1685	3116	1561		1801	1546	3351	1818	1516
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1685	3411		1685	3116	1561		1801	1546	3351	1818	1516
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	73	757	18	145	863	290	38	121	113	733	337	185
RTOR Reduction (vph)	0	1	0	0	0	125	0	0	87	0	0	128
Lane Group Flow (vph)	73	774	0	145	863	165	0	159	26	733	337	57
Heavy Vehicles (%)	0%	2%	0%	0%	12%	0%	0%	1%	1%	1%	1%	3%
Turn Type	Prot	NA		Prot	NA	pt+ov	Split	NA	pm+ov	Split	NA	pm+ov
Protected Phases	1	6		5	2	2 4	3	3	5	4	4	1
Permitted Phases									3			4
Actuated Green, G (s)	5.6	24.3		10.2	28.9	51.1		10.3	20.5	22.2	22.2	27.8
Effective Green, g (s)	5.6	24.3		10.2	28.9	51.1		10.3	20.5	22.2	22.2	27.8
Actuated g/C Ratio	0.06	0.27		0.11	0.32	0.57		0.11	0.23	0.25	0.25	0.31
Clearance Time (s)	6.0	5.0		6.0	5.0			6.0	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	2.0
Lane Grp Cap (vph)	104	920		190	1000	886		206	352	826	448	569
v/s Ratio Prot	0.04	0.23		c0.09	c0.28	0.11		c0.09	0.01	c0.22	0.19	0.01
v/s Ratio Perm									0.01			0.03
v/c Ratio	0.70	0.84		0.76	0.86	0.19		0.77	0.07	0.89	0.75	0.10
Uniform Delay, d1	41.4	31.0		38.7	28.7	9.4		38.7	27.3	32.7	31.4	22.2
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.04	1.02	1.62
Incremental Delay, d2	16.0	6.7		15.0	7.6	0.0		15.0	0.0	9.6	7.6	0.0
Delay (s)	57.4	37.7		53.7	36.2	9.4		53.7	27.3	43.6	39.4	35.8
Level of Service	E	D		D	D	A		D	C	D	D	D
Approach Delay (s)		39.4			32.2			42.7			41.3	
Approach LOS		D			C			D			D	

Intersection Summary

HCM 2000 Control Delay	37.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	27.0
Intersection Capacity Utilization	73.3%	ICU Level of Service	D
Analysis Period (min)	15		

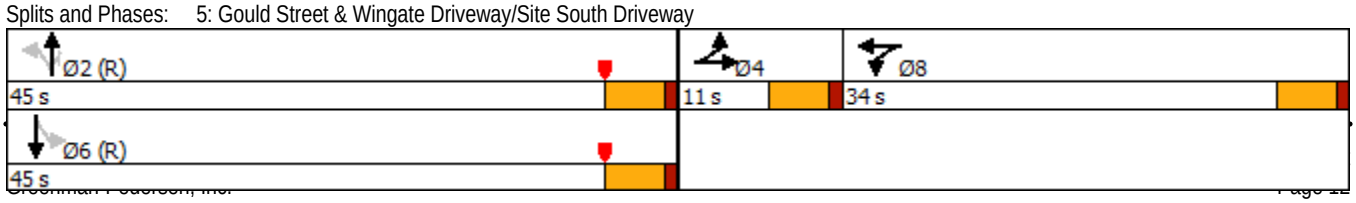
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	28	653	1	136	7	223	184	55	604	6
Future Volume (vph)	0	0	28	653	1	136	7	223	184	55	604	6
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	100		0
Storage Lanes	0		0	1		0	0		1	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865			0.947				0.850		0.998	
Flt Protected				0.950	0.969			0.998		0.950		
Satd. Flow (prot)	0	1611	0	1681	1678	0	0	1859	1583	1770	1859	0
Flt Permitted				0.950	0.969			0.980		0.570		
Satd. Flow (perm)	0	1611	0	1681	1678	0	0	1825	1583	1062	1859	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		114			32				200		1	
Link Speed (mph)		20			20			30			30	
Link Distance (ft)		431			469			465			408	
Travel Time (s)		14.7			16.0			10.6			9.3	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Shared Lane Traffic (%)				38%								
Turn Type		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)	11.0	11.0		23.0	23.0		15.0	15.0	15.0	23.0	23.0	
Total Split (s)	11.0	11.0		34.0	34.0		45.0	45.0	45.0	45.0	45.0	
Total Split (%)	12.2%	12.2%		37.8%	37.8%		50.0%	50.0%	50.0%	50.0%	50.0%	
Maximum Green (s)	6.0	6.0		29.0	29.0		40.0	40.0	40.0	40.0	40.0	
Yellow Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
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)		5.0		5.0	5.0			5.0	5.0	5.0	5.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	None		None	None		C-Min	C-Min	C-Min	C-Min	C-Min	
Walk Time (s)				7.0	7.0					7.0	7.0	
Flash Dont Walk (s)				11.0	11.0					11.0	11.0	
Pedestrian Calls (#/hr)				0	0					0	0	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 8 (9%), Referenced to phase 2:NBTL and 6:SBTL, Start of Yellow
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 5: Gould Street & Wingate Driveway/Site South Driveway



Lane Group	EBT	WBL	WBT	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	30	440	419	250	200	60	664
v/c Ratio	0.14	0.85	0.78	0.27	0.22	0.11	0.70
Control Delay	1.4	46.0	37.1	14.6	3.9	15.1	24.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	1.4	46.0	37.1	14.6	3.9	15.1	24.3
Queue Length 50th (ft)	0	234	201	77	0	20	324
Queue Length 95th (ft)	0	#404	#331	m114	m5	44	#481
Internal Link Dist (ft)	351		389	385			328
Turn Bay Length (ft)						100	
Base Capacity (vph)	213	546	566	931	905	542	949
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	0.14	0.81	0.74	0.27	0.22	0.11	0.70

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	28	653	1	136	7	223	184	55	604	6
Future Volume (vph)	0	0	28	653	1	136	7	223	184	55	604	6
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)		5.0		5.0	5.0			5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00		0.95	0.95			1.00	1.00	1.00	1.00	
Frt		0.86		1.00	0.95			1.00	0.85	1.00	1.00	
Flt Protected		1.00		0.95	0.97			1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1611		1681	1678			1860	1583	1770	1860	
Flt Permitted		1.00		0.95	0.97			0.98	1.00	0.57	1.00	
Satd. Flow (perm)		1611		1681	1678			1826	1583	1062	1860	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	30	710	1	148	8	242	200	60	657	7
RTOR Reduction (vph)	0	29	0	0	22	0	0	0	103	0	1	0
Lane Group Flow (vph)	0	1	0	440	397	0	0	250	97	60	663	0
Turn Type		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)		3.6		27.7	27.7			43.7	43.7	43.7	43.7	
Effective Green, g (s)		3.6		27.7	27.7			43.7	43.7	43.7	43.7	
Actuated g/C Ratio		0.04		0.31	0.31			0.49	0.49	0.49	0.49	
Clearance Time (s)		5.0		5.0	5.0			5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		64		517	516			886	768	515	903	
v/s Ratio Prot		c0.00		c0.26	0.24						c0.36	
v/s Ratio Perm								0.14	0.06	0.06		
v/c Ratio		0.02		0.85	0.77			0.28	0.13	0.12	0.73	
Uniform Delay, d1		41.5		29.2	28.2			13.8	12.7	12.6	18.5	
Progression Factor		1.00		1.00	1.00			0.95	1.39	1.00	1.00	
Incremental Delay, d2		0.1		12.7	6.8			0.7	0.3	0.5	5.3	
Delay (s)		41.6		41.9	35.1			13.8	18.0	13.1	23.8	
Level of Service		D		D	D			B	B	B	C	
Approach Delay (s)		41.6			38.6			15.6			22.9	
Approach LOS		D			D			B			C	

Intersection Summary

HCM 2000 Control Delay	28.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	0	137	368	0	0	561
Future Volume (vph)	0	137	368	0	0	561
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.865				
Flt Protected						
Satd. Flow (prot)	0	1644	1900	0	0	1792
Flt Permitted						
Satd. Flow (perm)	0	1644	1900	0	0	1792
Link Speed (mph)	20		30			30
Link Distance (ft)	474		408			540
Travel Time (s)	16.2		9.3			12.3
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	0%	0%	0%	0%	0%	6%
Shared Lane Traffic (%)						
Sign Control	Stop		Free			Free

Intersection Summary

Area Type: Other
Control Type: Unsignalized

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	137	368	0	0	561
Future Vol, veh/h	0	137	368	0	0	561
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	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	0	0	6
Mvmt Flow	0	149	400	0	0	610

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	-	400	0	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.2	-	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.3	-	-	-	-
Pot Cap-1 Maneuver	0	654	-	0	0	-
Stage 1	0	-	-	0	0	-
Stage 2	0	-	-	0	0	-
Platoon blocked, %			-			-
Mov Cap-1 Maneuver	-	654	-	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.1	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	WBLn1	SBT
Capacity (veh/h)	-	654	-
HCM Lane V/C Ratio	-	0.228	-
HCM Control Delay (s)	-	12.1	-
HCM Lane LOS	-	B	-
HCM 95th %tile Q(veh)	-	0.9	-

From: noreply@civicplus.com
To: Alexandra Clee; Lee Newman; Elisa Litchman
Subject: Online Form Submittal: Contact Planning Board
Date: Wednesday, February 3, 2021 8:46:44 PM

The following form was submitted via your website: Contact Planning Board

Full Name:: Lisa Cherbuliez

Email Address:: Lisa.cherbuliez@gmail.com

Address:: 17 Lindbergh Ave

City/Town:: Needham

State:: MA

Zip Code:: 02494

Telephone Number:: 781-400-3608

Comments / Questions: Wonderful presentation and discussion about zoning and development of the Muzi Ford location. I am attending the zoom meeting but there was too many people to fit all questions. I write in support of this with 2 questions/comments. How do we factor in the likely long term impact of covid and likely sustained work from home (maybe decreased traffic?) And for the health of our residents, community and environment, I would like to see a strong focus on making this area walkable with sidewalks, green space, and buses into town (Needham) including train stop and across 128. Thanks for your consideration.

Additional Information:

Form submitted on: 2/3/2021 8:46:40 PM

Submitted from IP Address: 108.7.77.94

Referrer Page: https://linkprotect.cudasvc.com/url?a=https%3a%2f%2fwww.needhamma.gov%2f1114%2fPlanning-Board&c=E,1,RtjTAfSStO6iBgjRaaeF7p6Jf2w-0L7PEET6MEwkJSofGOUgV5EAVD0nFRDgT3YreLDLkFlJ8ScXeB1BLKe7Tr5bJDo-yst8miCLbRdF8fFSYUvvt7OA7mY,&typo=1

Form Address: https://linkprotect.cudasvc.com/url?a=http%3a%2f%2fwww.needhamma.gov%2fForms.aspx%3fFID%3d229&c=E,1,865DzAIQSgB3P8GBw8ZBXCLw3x3BsA3g0auGDVxCv1Vsofr2mXMvCm3-_nPvZ_yosOhnW7Cid28TxsqMzsUz8QjQzMb5MfMlJJjJK6cVdWdEb-psVXI,&typo=1

From: Ganesh Rao
To: Planning
Subject: Highway commercial 1 zoning
Date: Wednesday, February 3, 2021 8:47:50 PM

Hello,

I have a few questions from the zoning meeting this evening. If there is a FAQ, please point me to it.

1. What mechanisms do you have to control the types of businesses that would occupy the site? What's if the developer is renting out the space? I.e. can you or will you be able to prevent this from becoming a destination like Legacy Place?

2. Can you prevent a hazardous chemical or harmful pathogen lab from occupying the R & D space?

3. What is the impact of this development on neighboring commercially zoned sites? If they redeveloped "by right", how much could they grow and contribute to traffic?

Thank you,
Ganesh Rao
Elder Road

Sent from my iPhone

From:	Monty Krieger
To:	Planning
Subject:	Regarding Highway commercial 1 zoning district planning - concern about traffic
Date:	Wednesday, February 3, 2021 9:12:10 PM

Feb. 3, 2021

Dear Planning Board,
Rebecca Brown's approach in describing the influence of altered zoning on traffic generally sounded like she was spinning the results to minimize the consequences of development on traffic. That may not be the case, but it seemed such to me and undercuts the credibility of her conclusions.

I am very worried about the traffic issues, and unless more convincing analysis were presented, I would oppose the new regulations.

I also want to thank all of those on the planning board for your hard work for Needham and for your willingness to listen to Needham residents.

Best,

Monty Krieger
33 Woodbine Circle, Needham

From:	Leigh Doukas
To:	Planning
Subject:	Proposed Zoning for Business 1/Muzi Site
Date:	Wednesday, February 3, 2021 9:12:20 PM

Hi Lee:

Thank you for answering my question. I do think this proposal is much improved from the original. I would have 2 additional comments.
1 - The 1.0 FAR is large enough. The traffic predictions, even with significant developer improvements are not that good.
2 - Maybe there could be incentives under the special permit that would allow for the increased volume with the addition of green space/buffer zone.

My final comment is that the meeting seemed to be hijacked at the end by an organized group, who did not ask questions, or really comment on the proposal, but just wanted a platform for their group. They took up a lot of time from others who may have had questions. Perhaps there should be a time limit/number of questions people can ask.

Thank you.

Leigh

Leigh Rossi Doukas, ABR, CIAS
International President's Circle 2018, 2019
Hall of Fame 2016, 100% Club 2012 - 2017
Coldwell Banker Realty
1498 Highland Ave, Needham MA 02492

Your Needham/Metrowest Real Estate Expert
Cell: 617-966-1245
Website: www.LRDHOMES.com

Your referrals are much appreciated!

From: Nathanson,Larry (HMFP - Emerg Med ISClinical RaD)
To: Planning
Subject: Needham Heights Meeting 2/3
Date: Wednesday, February 3, 2021 9:30:19 PM

---

1) I'd like to thank Adam Block and the panelists for a very informative meeting.

2) A question was asked regarding overflow traffic impacting residential streets such as Noanett, Lee and Gary. I am also very concerned about this.
Adam's answer stated that a traffic study would be done as part of a developer's proposal and the town would peer review that developers study.
However if these proposed zoning changes are approved and a developer then chose to build-by right what recourse would the town have against a very negative traffic study?
I would therefore advocate for a much lower by-right density in the proposal.
I would like to hear more about this impact from the planning board,

3) I would support the multiple comments regarding the inclusion of green space and promotion of recreational and similar uses that directly benefit Needham residents as opposed to developers.

4) The meeting was very long and clearly tiring toward the end. However a number of excellent questions were asked in the last portion of the meeting without even an attempt at answering. I would like to see the planning board publicly answer those questions that were raised at the end.

Thank you,

Larry Nathanson
52 Noanett Rd

From: Nathanson,Larry (HMFP - Emerg Med ISClinical RaD)
To: Planning
Subject: Fwd: Needham Heights Meeting 2/3
Date: Wednesday, February 3, 2021 9:37:52 PM

I would add that a quick review of the Traffic Impact study shows the existing/future scenarios portion of the document does not even show Noanett Rd (but does include an unnamed driveway with minimal traffic?!?!)

This definitely does not leave me with the impression that the impact on the surrounding neighborhood is being considered.

--L

Begin forwarded message:

From: Larry Nathanson <lnathans@bidmc.harvard.edu>
Subject: Needham Heights Meeting 2/3
Date: February 3, 2021 at 9:30:12 PM EST
To: planning@needhamma.gov

1) I'd like to thank Adam Block and the panelists for a very informative meeting.

2) A question was asked regarding overflow traffic impacting residential streets such as Noanett, Lee and Gary. I am also very concerned about this.
Adam's answer stated that a traffic study would be done as part of a developer's proposal and the town would peer review that developers study.
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Thank you,

Larry Nathanson
52 Noanett Rd

From:	Leigh Doukas
To:	Planning; adam block
Subject:	Re: Proposed Zoning for Business 1/Muzi Site
Date:	Thursday, February 4, 2021 7:04:28 AM

Hi Alex:

I have some additional questions:

1 - If a developer decides to use the the by right 1.0 FAR, can the town compel them to do the traffic remediations, which look costly.

2 - What is the projected cost to the town in terms of services with a full build out at the 1.0 FAR and the 1.3 special permit FAR. Is the 1.5 million dollars in taxes based on a full build out using the special permit function,

3 - The traffic remediation where the developer does a taking of their own land - in this scenario would there still be a requirement for 20/25% green space on the lot, or would the taking then remove much of the green space.

4 - What is the current FAR at full buildout with the current zoning, if the warehouse and other undesirable uses, were removed? What type of traffic would this generate?

5 - What if an overlay district was used to increase building height at the highway, allowing for the 70' height as of right, but preserving more green space along Gould Street and put the lower profile retail/restaurants etc, similar to the street in Chestnut Hill.

6 - 4X more traffic at the intersection of Higland/Gould/Hunting is not going to be a plus for the residential communtiy, no matter how it is looked at. If the traffice remediation can not be forced upon the developer, this is going to be a costly fix for the town.

With a current budget/expenditures over $203,000,000 for the town, the additional $1.5 million in taxes is not going to make a significant difference in the quality of life in Needham. A strangulated traffic entry into the town wil.

Thank you.

Leigh

Leigh Rossi Doukas, ABR, CIAS
International President's Circle 2018, 2019
Hall of Fame 2016, 100% Club 2012 - 2017
Coldwell Banker Realty
1498 Highland Ave, Needham MA 02492

Your Needham/Metrowest Real Estate Expert
Cell: 617-966-1245
Website: www.LRDHOMES.com

Your referrals are much appreciated!

On Wed, Feb 3, 2021 at 9:17 PM Planning <planning@needhamma.gov> wrote:

Thank you for following up with your written comments; I have received them and will share them with the Planning Board.

Thanks, alex.

Alexandra Clee

Assistant Town Planner

Needham, MA

www.needhamma.gov

From: Leigh Doukas <lrdhomes@gmail.com>
Sent: Wednesday, February 3, 2021 9:12 PM
To: Planning <planning@needhamma.gov>
Subject: Proposed Zoning for Business 1/Muzi Site

Hi Lee:

Thank you for answering my question. I do think this proposal is much improved from the original. I would have 2 additional comments.

1 - The 1.0 FAR is large enough. The traffic predictions, even with significant developer improvements are not that good.

2 - Maybe there could be incentives under the special permit that would allow for the increased volume with the addition of green space/buffer zone.

My final comment is that the meeting seemed to be hijacked at the end by an organized group, who did not ask questions, or really comment on the proposal, but just wanted a platform for their group.

They took up a lot of time from others who may have had questions. Perhaps there should be a time limit/number of questions people can ask.

Thank you.

Leigh

Leigh Rossi Doukas, ABR, CIAS

International President's Circle 2018, 2019

Hall of Fame 2016, 100% Club 2012 - 2017

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1498 Highland Ave, Needham MA 02492

Your Needham/Metrowest Real Estate Expert
Cell: 617-966-1245
Website: www.LRDHOMES.com

Your referrals are much appreciated!

From: noreply@civicplus.com
To: Alexandra Clee; Lee Newman; Elisa Litchman
Subject: Online Form Submittal: Contact Planning Board
Date: Thursday, February 4, 2021 10:39:43 AM

The following form was submitted via your website: Contact Planning Board

Full Name:: Oscar Mertz

Email Address:: ocreate@verizon.net

Address:: 67 Rybury Hillway

City/Town:: Needham

State:: MA

Zip Code:: 02492

Telephone Number:: 3392250843

Comments / Questions: Dear Planning Board and Needham staff and consultant - This email is a follow up to last night's public hearing on the Muzi re-zoning presentation and comment session. I want to thank the planning board, staff and the consultant team again for the effort to continue to explore, and seek community involvement in, the appropriate strategy for rezoning this significant site.
I do feel that Needham is facing a serious crisis by not being able to offer a range of housing choices to more economically and racially diverse community. Housing should be highly recommended and a key program in this development. Although the zoning cannot make this mandatory it would be interesting to find ways to incentivise this for developers through added height or density. I think the issue of building scale and setback can be addressed with thoughtful zoning dimensioning guidelines to be able to address the concerns of the community.
Some of the local community stated a clear interest in reducing density and height and in providing commercial (retail) choices, green space and possibly a community / sports element. However, density is actually our friend because it allows the buildings to be more efficient and it can allow for more green space so developers can meet their development and open space goals. Reducing height and density too much can make it harder to restore more open space and likely force more surface parking. This would be a less desirable experience i think for the site. Taller buildings appropriately set back can allow for more open space. Greater density can make it more economical to build structured parking that would replace some of the surface parking and allow more open space. There is a balancnig act to allow enough development with incentives to provide the right setbacks and open space so the scale fits appropriately with the surrounding context. For this site the majority of project frontage is facing highway or commercial and the only residential frontage on Gould is facing Wingate which is 2-3 stories. I consider Highland a major thoroughfare where an appropriate scale (3 st) building with landscape buffer would be possible and desirable, given the large ROW for Highland Avenue.
I was also interested in the idea that the town reconsider what a broader vision for the site might be - maybe through a working group planning effort that engaged a range of community viewpoints.
I remain confident that there is a solution for this site to reach it's maximum potential and be developed thoughtfully as a model for what a Needham aspires to be, a welcoming community responding to the challenges of affordability, equity and climate, facing greater Boston.
A final note is that the traffic will always be a big concern so everything we can do to leverage alternative transit should be pursued. This can include public bus service rerouting (mentioned by Studio Enee report), public shuttle service to Hts T station (3/4 mi), ride share incentive (for commercial) and general parking and traffic impact reduction through mixing uses and increasing housing unit limits which ultimately reduces total car trips for the development.
Thank you and I look forward to the pursuit of the appropriate zoning approach.
Oscar Mertz
67 Rybury Hillway
Precinct I
.

Additional Information:

Form submitted on: 2/4/2021 10:39:38 AM

Submitted from IP Address: 108.7.75.70

Referrer Page: No Referrer - Direct Link

Form Address: https://linkprotect.cudasvc.com/url?a=http%3a%2f%2fwww.needhamma.gov%2fForms.aspx%3fFID%3d229&c=E,1,U0CwDZI2H7VxBNrCt7iHvVk4fDNcOx7EQd2fyvCjket1J0T7l5vclTQJoNmpRNKsedC1aM2gpZuOJxefceF-p48nGzhpMAEq-4yNsEUhf9F32rLXqEnmQw,,&typo=1

From:	Paula Dickerman
To:	Planning
Subject:	Muzi Site zoning
Date:	Thursday, February 4, 2021 3:17:58 PM

Good morning,

I would like to thank you for the informative presentation of the updated zoning proposal for the Muzi site last night.

Also, I would like to request that you consider 1. making residential units part of the By Right process also, not just the Special Permit process, and 2. increasing the number of residential units allowed to 275 (or another number higher than 240). Let's at least give developers the opportunity to build more residential units.

The presentation made clear that more residential units, and therefore less space devoted to commercial use, would help reduce the traffic issues plainly revealed in the worst-case scenario.

My requests come from a desire to see Needham do whatever it can to increase housing availability in the region and the Commonwealth. There is a housing shortage crisis, and we must do our part to alleviate it. Needham is full of individuals and non-profit organizations that have shown by their actions that they value compassion for people. It's that kind of town.

Last, I was glad to see that there will be an affordable unit requirement of 12.5% and am encouraged to hear that the Town is reconsidering its inclusionary zoning policies.

Thank you for your work and your time.

Paula Dickerman
20 Burnside Road
Needham, MA 02494

From: bruceeisenhut8
To: Planning
Subject: Zoom webinar comments
Date: Thursday, February 4, 2021 3:27:02 PM

I wish to thank the Planning Board for a well organized and moderated Zoom meeting regarding the "Muzi rezoning" . As a long time member of the Planning Board, TM member for precinct D and citizen, I have followed the process and the Northland development just accross the river in Newton. The developable area of that project is seven acres larger and there is a known developer Nevertheless, there are ideas and conditions that should be incorporated into the Needham proposal.

First, there has been a consistent expressed interest in open space and community opportunities in that space. The minimal open space required in Northland is 40%. The developer agreed to this in recognition of the value of the location. Further , the developer agreed to a litany of public amenities in the open space (that would count toward meeting the open space minimum). I agree that 40% may be too draconian for Needham, but 20% is too meager. I believe 30% would enhance aesthetics, be better for the environment and would not have a chilling effect on responsibe development. You could word it so that certain public amenities would count toward the 30% such as uncovered outdoor recreation, community gardens, unpaved walkways, etc. Northland is building a community kids wading pool for example.

I strongly oppose a limit on the number of housing units in a special permit process. First, you have to appreciate that historically in many communities the stated fear of impacting the school budget has been a pretext for racial or low income bias. It is difficult for many good people to accept a moral equivalency between providing housing opportunities for low income persons, or couples on fixed incomes against a modest increase in the school budget, especially in a well off community like Needham. Also, there is more of a perception of bias when the school population is leveling off or decreasing as appears the case in Needham. See the MAPC's population projections for Needham out to 2030.

Having a limit on housing units has the potential to derail the TM discusion to broader social issues and take away from the merits and work of the PB. I know some TM members who will take issue with a limit. There is no need for a limit, at least with respect to a special permit process where the PB may discuss and even negotiate with an applicant over the number and mix of housing units. The BOS needs to trust the PB in its expertise and experience doing this.

The question was raised at the Zoom meeting where did the limit of 240 come from. There was no specific answer, just an unsatisfactory vague response of a need to balance. I don't believe there is a good answer. A good developer like Northland could put foward a fabulous housing project or set of projects exceeding that number. The limit may foreclose creativity.

Moving on; although I think Mr. Crocker was confused as to diminsional requirements in his presentation, his point regarding neighborhood aesthetics is shared and should not be ignored. Kudos to the PB in decreasing the FAR and height. However, IMO a slight increase in the side setbacks along Gould and Highland a bit would go a long way in alleviating those concerns, concerns raised at the last TM.

Finally, there has been a cosistent interest and comments arguing the need to bake into the

zoning some environmental protections. Gold Leed certification is required in Northland for, as best I understand, all buildings. Needham could at least bake into the proposed bylaw a silver Leed standard, if not certifi ation, for all commercial buildings over a specified size. At this point in time, the silver standard is fairly minimal. I would not require a certificate from Leed but an engineer's certification that the standard has been met. Again, I submit that an environmental standard baked into the zoning would be favorable to TM., even a minimal one.

Please be so kind as to share these thoughts to the PB members and the BOS. I sincerely appreciate your efforts since the last TM.

Bruce T. Eisenhut
Janis M. Soma
106 Marked Tree Rd.

From: Alexa
To: Planning
Subject: Muzi lot: request for green space
Date: Friday, February 5, 2021 6:11:08 AM

Hi,

I'm a resident of Needham and am very much against any type of new buildings on the Muzi lot. The traffic in Needham is already too heavy and unpleasant as it is, and the quality of life and desirability of the town will decrease substantially with any more traffic. Increased traffic is also a noise and pollution issue, as well as a safety issue for our kids. Please consider these values above and beyond all others.

My hope is to make Muzi into green space to attempt to make what is very ugly as an entrance into the town more visually appealing. Lots of trees would be ideal.

Please vote no to develop land where Muzi is and do right by Needham residents who do not want continued development in our town to the detriment of residents.

Thanks,
Alexa Mukherjee

Sent from my iPhone

From:	Lee Newman
To:	Alexandra Clee
Subject:	FW: Muzi Site
Date:	Monday, February 8, 2021 10:21:24 AM

From: Jeanne McKnight <jeannemcknight@comcast.net>
Sent: Sunday, February 7, 2021 9:00 PM
To: Lee Newman <LNewman@needhamma.gov>
Subject: FW: Muzi Site

Forwarding this comment.

Jeanne

From: J Leghorn <jleghorn@needhamfarm.org>
Sent: Wednesday, February 3, 2021 6:40 PM
To: Jeanne McKnight <jeannemcknight@comcast.net>
Subject: Re: Muzi Site

Jeanne,

While I am concerned with number of vehicles, we also need to consider the mix. If a significant component are heavy or long trucks, that affects intersections. Also, size of vehicles, tons on the road at ant given time, the bumps that can intensify the forces on the road bed, can affect the breakdown of the road and the need for rebuild or replacement. What I would like to know are studies about what the current road bed can sustain, what load will cause it to break down, what will it cost to build a road bed that can withstand what the developer's use will impose on the road bed. The Planning Board needs an engineer on it. That's not me, although my undergraduate training math and physics.

Talk to you soon.

Stay healthy,

Joe

On Feb 3, 2021, at 5:20 PM, Jeanne McKnight <jeannemcknight@comcast.net> wrote:

Joe:

The Planning Board's expectation, whether we are dealing with a development allowed by right but requiring site plan approval, or a larger development requiring a special permit, is that we will be able, in accordance with the site plan review criteria or the special permit criteria, to demand funds, as a condition of permit approval, for whatever traffic mitigation is determined to be necessary depending on the likely traffic to be generated by the proposed project.

Jeanne

From: J Leghorn <jleghorn@needhamfarm.org>
Sent: Wednesday, February 3, 2021 4:32 PM
To: Jeanne McKnight <jeannemcknight@comcast.net>
Subject: Re: Muzi Site

Thanks, Jeanne. I like to do a little preparation before making comments. I did find the updated traffic analysis. What I am particularly interested in is an infrastructure analysis. If Gould Street is going to start getting heavy truck traffic, is it built for it? If not developer should have to pay most, if not all of the costs for upgrade. If I can't make the meeting, I will watch, read and then comment. I think we have had a enough of the commons supporting developers, time for them to pay a fair share. If taxes go up, but any increase is spent on improving infrastructure to the benefit of the developer, the people lose again and the developer laughs all the way to the bank.

> On Feb 3, 2021, at 4:09 PM, Jeanne McKnight <jeannemcknight@comcast.net> wrote:
>
> Joe:
>
> The purpose of tonight's community meeting is to get input that will inform our final drafting of what will be then advertised for a public hearing. The attached use and dimensions spreadsheet shows proposed changes from the existing zoning by-law, the proposed amendment presented to Town Meeting 2 years ago, and what is to be presented tonight as proposed use and dimensional requirements. I hope it is readable and helpful. You will learn more if you're able to attend tonight's Zoom community meeting – see Town website for link.
>
> Jeanne
>
> ---
>
> **From:** Joe Leghorn <jleghorn@needhamfarm.org>
> **Sent:** Wednesday, February 3, 2021 11:32 AM

To: Jeanne McKnight <jeannemcknight@comcast.net>
Subject: Muzi Site

Jean,

Is there a draft zoning proposal for Muzi site that is publicly available? I could not find one on the Town's website.
Thanks.

Best wishes,

Joe
<HC1 Zoning Comparison w footnotes Lee 1.29.2021.xlsx>

February 10, 2021

Dear Needham Planning Board,

Thank you for the recent presentation about the rezoning of the Muzi area near 128.

We are writing to express support for the inclusion of as many affordable housing units within the zone as possible. The mix of units should include a significant portion with three and four bedrooms to accommodate extended families and families with children. The goal is to increase the economic and racial diversity of our schools and community. We support increasing the cap from 240 units to 500 units, with an inclusionary zoning percentage of 15% or even 17.5%, to match our neighbor Newton's inclusionary zoning percentage.

We noted that the estimated $4 million in increased tax revenue could support about 100 new student enrollments assuming half the new revenue goes to the school system and Needham spends about $19,000 per student per year.

Sincerely,

Equal Justice Needham

Peter Olive	Jill Olive	Wendy Blom	Si Si Nyunt Goneconto
Paula DIckerman	Smriti Rao	Kristin Casasanto	Rachel Green
Oscar Mertz	John Kirk	Susan Kirk	Heidi Schwartz
Jan Soma	Sarah Keselman	Noah Mertz	Robert Vecchi
Paula Kahn	Andrea Wizer		

From:	Richard Putprush
To:	Planning
Subject:	Proposed re-zoning of Industrial-1
Date:	Monday, February 15, 2021 5:14:21 PM

Members of the Needham Planning Board,

My name is Rick Putprush and I am writing to you as a concerned Needham resident (97 Manning Street), Needham business owner (Partner at Fulcrum Real Estate Partners, LLC, 935 Great Plain Avenue), and long-time member of Needham's Council of Economic Advisors (CEA). Over the past several years, I have had opportunities to voice my opinions on various matters of the Town, including the on-going discussions regarding the potential re-zoning of the current "Industrial -1" zoned area bordered by Gould Street, Highland Ave and Rt 128 (for sake of simplicity, hereinafter referred to as the "Muzi site") which is the topic of my concerns.

First, I applaud the inclusive process the Select Board has undertaken, and its desire to reach the required consensus in this matter. The goal has always been to convert the zoning of one of the last remaining major development sites along Rt 128 to its "highest and best" use, greatly increasing the tax revenues from the site to the relief of our residents, creating additional high paying jobs for our residents and others, as well as creating an architecturally pleasing entrance to Needham. The public concerns, in general, have always revolved around the increased traffic, particularly on Highland Ave, Gould Street, and Central Ave, fears of creating a "monolithic canyon" down Gould Street, and whether or not a less intensive "recreational" use might be better.

My concern is that the public does not realize or understand, especially considering their issues, that the current Industrial-1 zoning could allow the very situation they are hoping to avoid. Under the current zoning, if I'm not mistaken, approximately 300,000 square feet of 40' high warehouse/distribution space could be developed. Five years ago, this would be an unlikely scenario because such a development would not generate a "market value" for the site. However, things have changed...the trend of internet shopping, e-commerce, has taken hold, ever more pronounced by the COVID-19 pandemic, with no signs of stopping, prompting the Amazons, Walmarts, etc., in this space to find new site locations meeting demographic and major highway access criteria for modern (1,000,000 SF) distribution hubs, and smaller satellite "fulfillment center" distribution centers. My company, Fulcrum Real Estate Partners, specializes in investment in industrial properties, and consultation services for various types of users for site selection. In our recent experience, we are learning that for the right location, price (whether it is for the site for their own development or for leasing a property built for their own specification on the site) is becoming a less important and influential criteria than others. Access to major highways, workforce, customers...and the ability to occupy relatively quickly without the risk of having to spend an inordinate amount of time and money for approvals and permits to operate their business with no guarantee of success...have become the major drivers. In short, the e-commerce giants will compete on price for a well-located site where they can develop a fulfillment center by right, with minimal oversight by the Town.

Again, having watched and participated in the public process of the proposed re-zoning for almost 5 years, I am concerned that the public still does not recognize or understand the potential problems that the continuous delay and revisiting of the merits of the rezoning may

bring. The point here is that a 40' high, 300,000 SF "monolith" warehouse/distribution "fulfillment center" on the Muzi site, bringing 24/7 tractor trailer, box truck and van traffic on Gould Street and Highland Ave is not as far from a potential reality under the current zoning as the Planning Board, or the residents who are fighting what I personally believe to be a reasonable and well-thought out zoning change, might think it is. If it were to happen, it would be an incredible missed opportunity for Needham, in my opinion.

I support the Highway Commercial 1 rezoning effort and thank the Board for its consideration of my concerns.

Sincerely,
Rick Putprush

--
Rick Putprush
Fulcrum Real Estate Partners, LLC / REP Realty Advisors, LLC
935 Great Plain Avenue, #123
Needham, MA 02492-3030
617.697.9750
rick.putprush@gmail.com

From: noreply@civicplus.com
To: Alexandra Clee; Lee Newman; Elisa Litchman
Subject: Online Form Submittal: Contact Planning Board
Date: Wednesday, February 17, 2021 12:49:43 PM

The following form was submitted via your website: Contact Planning Board

Full Name:: Gerry Rovner

Email Address:: Gerry80059@Comcast.net

Address:: 48 Cynthia Road

City/Town:: Needham

State:: MA

Zip Code:: 02494

Telephone Number:: 781-444-7170

Comments / Questions: RE: "Muzi-Ch 5 Re-Zoning" Traffic study. After listening to the public presentation and reviewing the Traffic Study, it is woefully inadequate . NO consideration of the current traffic issues on Gould St/Central Ave to Chestnut St, just over the bridge at the Needham/Newton line traffic light has been mentioned. The backup at that light is a major cause of the backup along Central even beyond Gould St. Mitigation issues for you to consider should include more than just Gould St intersections alone.

Additional Information:

Form submitted on: 2/17/2021 12:49:34 PM

Submitted from IP Address: 73.126.83.130

Referrer Page: https://linkprotect.cudasvc.com/url?a=https%3a%2f%2fwww.needhamma.gov%2f1114%2fPlanning-Board&c=E,1,CzvaaQQMHwCoKLs2NLq99DJhICJ9F-a_wzxa5eU9u61e3iakb0rGvQ7g2ZXgUmDrmAM8JgbLLQa5GGFC8OLqnGPXyWcQcvemBmcEx1wZDiQcjYzY&typo=1

Form Address: https://linkprotect.cudasvc.com/url?a=http%3a%2f%2fwww.needhamma.gov%2fForms.aspx%3fFID%3d229&c=E,1,lR2eornJlE4mM7Ynx-fptAl8x8ZHcOQhQyuP_5wUqkcXoZ5lCXEBAOhuRLE8dAC4hOBtRmRNVeWFia7K1M5MRC3QAKZc-4706UL8RKZC_Yy_&typo=1

PSD
BOSTON NEW YORK
www.psdfirm.com

POLLACK SOLOMON DUFFY LLP
101 Huntington Avenue . Suite 530 . Boston, MA 02199
(617) 439-9800

March 11, 2021

By Overnight Mail and
Email planning@needhamma.gov

Chair Jeanne McKnight
Vice Chair Paul S. Alpert
Adam Block
Martin Jacobs
Ted Owens
Needham Planning Board
1471 Highland Avenue
Needham, MA 02492

Re: Objections to Proposal for Highway Commercial-1
Zoning Change at Muzi / Channel 5 Properties

Dear Chair McKnight and Members of the Planning Board:

We represent Barry Pollack, a resident of and homeowner in Needham, Massachusetts, in connection with the objections set forth herein to the Planning Board's proposed change in zoning to a new Highway Commerical-1 District for the properties operated as Muzi and Channel 5 (the "Proposal"). The following objections are made to the Proposal:

Objection 1: The Proposal is subject to the statutory bar because Town Meeting Members rejected a town proposal of a substantially similar nature less than two years ago.

The Supreme Judicial Court has precluded municipal boards from a second bite at the apple for a period of two years following the failure of a proposed zoning change. In *Penn vs. Town of Barnstable*, 96 Mass. App. Ct. 205, 208-09, 212, *review denied*, 483 Mass. 1108 (2019), the appeals court summarized the unforgiving history of the SJC's application of a statutory bar under M.G.L. c. 40A, § 5 to overly-persistent municipal boards attempting to wear down the will of the people by manipulating changes to a failed proposal to try again within two years, contrary to the need for finality:

> *Johnson*, 354 Mass. at 752, 242 N.E.2d 420 (proposed zoning bylaw authorizing golf clubs and tennis courts not fundamentally changed by provisions omitting tennis courts and prescribing minimum size for golf clubs); *Sullivan*, 346 Mass. at 784, 196 N.E.2d 185 (extending length of proposed zoning district was not

> "fundamental" change); *Doliner*, 343 Mass. at 13, 175 N.E.2d 925 (changing zoning for some small areas on map "did not change the substantial character of the [proposed bylaw]"); *Dunn*, 318 Mass. at 218-219, 61 N.E.2d 243 (similar).

Id. at 212 n. 12. "The purpose of the two-year bar is to give some measure of finality to unfavorable action taken by a municipal legislative body so that 'members of the public shall be able to ascertain the legislative status of a proposed change at all times, and to rely on unfavorable action ... as a complete defeat of the proposal.'" *Id*. at 210 (quoting *Kitty v. Springfield*, 343 Mass. 321, 326 (1961)).

As you know, the Planning Board proposed an extremely similar proposal to change the same exact property to allow and encourage office buildings with an FAR of 1.0, where now only an FAR of 0.3 is allowed. At Town Meeting less than two years ago, that substantially similar proposal failed to gather the requisite vote of Town Meeting Members. When asked about the reason for certain Special Permit requirements in the present Proposal (as described in more detail in Objection 6), a Planning Member recently stated it was just a carryover from the 2019 proposal. Obviously the present Proposal is simply a derivative of the failed 2019 effort. The present Proposal of the Planning Board is thus illegal.

Objection 2: The Proposal has resulted from an unfair and unreliable process suffering from conflicts of interest.

As you also know, the Planning Board, the Select Board, the Council of Economic Advisors (CEA) and what used to function as the Needham Heights Neighborhood Association, have overlapping leaders and members that have functioned with conflicts of interest that have deprived the residents of Needham Heights of an informed opportunity to be heard. The Needham Heights Neighborhood Association (NHNA) holds itself out on a website as having a primary mission "to enhance and protect the residential character and livability of the area." The NHNA is not functioning, however, as an independent community organization to fulfill that mission. A member of the Select Board serves as a board member of the NHNA, and the Chair of the CEA sits on the Planning Board and acts at times as the President of the NHNA, though since he has done so, the NHNA has not made any requisite state filings. The President of the NHNA is charged with protection of the "residential character" of the neighborhood, but as Chair of the CEA, he is charged with promoting "new and existing industry, business, and commerce" and advising the town on zoning matters for the growth of businesses, not resident-centric functions. In other words, Needham Heights residents could not turn as they expected to the NHNA to advocate for "the residential character and livability" on which it was founded. The NHNA has rejected in writing a written request by a member and former board member to poll members of the NHNA about their views of the proposed zoning changes to help formulate a position by the organization. These overlapping and conflicting roles hurt notions of transparency, limit the informed voices of our residents, and close off expectable and reliable channels of communication between municipal bodies and residents.

These conflicts are compounded by the representation of Muzi on the CEA. While that representative has at times recused himself from CEA discussions about the Proposal, at the

January 2021 CEA meeting, he did not, as reflected on video and in the minutes. The results of a recent public records request reflect private meetings, texts, emails and conversations by a Select Board member with the Muzi representative. A news article reports that this Select Board member has now acknowledged the discussions, but refused to describe any specific content. Prior to the public record request calling for such materials, at the January 27, 2020 community meeting concerning the potential second bite at the rezoning apple, that same Select Board member sat next to another town board member as he provided inaccurate or misleading information to the public in response to a direct question. At the 2 hour, 3 minute and 8 second mark of the public video recording of that meeting, the following question and answer occur:

> (Resident:) So Muzi Ford and Channel 5 have never given any input or anything?"
> (Board Member:) "No."

The text messages and emails subsequently received in response to a public records request confirm that answer was incorrect. The resident had preceded his particular question with the comment, "Be honest," calling attention to the need for transparency, but the town did not oblige. Obviously town officials may need to speak with residents such as a representative of Muzi, but the existence of those discussions should not be hidden at public meetings and careful regard should be given for the rights of residents to a transparent process. Efforts by town officials to engage in private, confidential discussions regarding public matters should be handled prudently and with a goal of transparency in mind.

Additional issues exist concerning transparency and the adequacy of disclosures to residents. At community meetings, town officials have played down the extent of traffic problems that would result from development under the Proposal. For example, at the recent February 2021 community meeting, town officials downplayed the traffic problems that should be expected from the development under the Proposal, as confirmed from the report of a town-engaged traffic engineer at an earlier joint meeting of the Select Board, Planning Board and Finance Committee, held on November 18, 2020. The following excerpts (with minute and second markers on the public recordings) provide an example of information not adequately shared with the residents of Needham:

a) **February 3, 2021 Community Meeting Excerpt from Video Recording:**

   At 1 hr, 35 second mark: Town Meeting Member question: "Last quick question, just **there was a reference to a land taking for the traffic mitigation, might be in or for someone in my precinct, where or what intersection would that be at?**"

   Planning Board member answer: "So, so any land taking I think is uh specifically was y'know uh is speculative at this point, the uh **the aim would be uh as a function of making the uh improvements to traffic at the corner of Highland and Gould uh that the uh developer would effectively use their own land to widen that strip** that would make the most sense and they would effectively be doing their own takings, **that would not be something that the town would would do (pause) necessarily**, but it all it

all would depend on whatever type of uh development goes in. So it's undetermined at this point."

b) **November 18, 2020 Joint Meeting of Planning Board, Select Board and Finance Committee:**

At 42 minutes 22 seconds: "I'm wondering, um, so even with the proposed modifications in traffic, y'know we still have a few areas that are D and F, so **what would it take, uh, to rectify that situation so the level of service is more acceptable, like what would it take in terms of costs or takings of land**, what else would need to be done?" **Answer of traffic engineer:** "Yep, um, so yeah **one of those is obviously the Gould Street at Central Avenue intersection** where I mentioned in the morning that's at a level of service E still. So **to be able to rectify that it would require construction of an additional lane on Gould Street so that you would have separate left and right hand turn lanes there. And that would require a property taking on one or potentially both** of those corners ...."

45 minutes 32 seconds: Answer of Traffic engineer: "Where **the greatest need is on the Hunting Road northbound approach where right now that approach has a shared left turn and through lane and dedicated right turn lane and that really should be three lanes on that approach ... and that would require some, some widening and property takings**" involving partial "property takings on each side" or "**more substantial takings** on one side of the road to be able to get rid of those service Es and bring the entire intersection back down to a level of D..."

46 minutes 20 seconds: Board member question: "**Those property takings are not reflected on your schematics?" Answer by traffic engineer (about presentations used for community): "They are not, correct**."

49 minutes 9 seconds: Board member: "I think **we may be underestimating the amount of traffic that Hunting Road will need to take northbound going straight across to the new Muzi built out site... I do believe it will be necessary to do what you just indicated with a right turn, a straight and a left turn lane dedicated on Hunting Road in order to be able to manage the traffic** that we will have in the morning rush hour coming up northbound on Hunting Road from Greendale."

52 minutes 25 seconds: Board member responding to traffic engineer: "I have a particular bias which says to me that to the extent that you can make traffic conditions more efficient, you invite more traffic" .. ; 52 minutes 52 seconds: "we are in the middle of an inflection point in terms of traffic, and working habits and coming out of this uh pandemic, I think work patterns and hour patterns in terms of when people work and or commute or don't commute and work from home are very very different than what we think they are going to be ... **so I would be very cautious about sinking a lot of resource into optimizing traffic flow and focus more on how this property is going to be used**."

Undoubtedly an accurate relay of the traffic engineer's actual report would increase and bolster objections by residents. There are indications, however, that members of the Planning Board and Select Board have predetermined a result here, without regard for objections. Minutes from a March 6, 2019 meeting show the CEA using a disparaging term for neighbors with objections, discussing how to "put an end to NIMBY responses" about a rezoning for Muzi; "NIMBY" meaning "Not In My BackYard." CEA members further discussed how difficulty putting an end to "NIMBY" responses was "an ongoing weakness at public hearings--need an organized campaign; more supporters from CEA, speaking for themselves, should speak in favor of these zoning changes" that benefit Muzi. CEA members commented how "[t]hey need to provide a couunterbalance to those opposed." A member of the Planning Board and Select Board participated in the discussion about overcoming "NIMBY" responses without taking issue about predetermined results or disparaging language. With objections viewed so negatively before residents even make them, fundamental notions of process have been undermined and true channels of important communications closed.

Objection 3: The Proposal contains inadequate height restrictions well beyond the character of the neighborhood, resulting in eyesores, an excessive FAR and traffic burdens.

The increased height for buildings in the Proposal, which range from 4-5 stories or 56'-70' depending on setback, is unlike the height of surrounding buildings on this side of Route 128. It is clear that the Planning Board and Select Board remain committed to a substantially similar change in zoning that would generate FAR of 1.0 as of right, despite the traffic problems that it would cause.

Taking the traffic engineer's report as true, how would an ambulance reach timely, during rush hour, an injured child or adult at the tennis courts, baseball field or playground off of Gould Street between Highland Avenue and Central Avenue. During all the presentations and throughout written materials, nothing has been said or done to address this risk to safety of our families engaged in activities that do, on some regular basis, result in the need for medical care for injuries.

In addition, a Petition consistent with certain of the objections herein has already been electronically signed by more than 320 people, and additional people have signed hard copies. We expect the Petition results will be separately submitted to the Planning Board. The more than 320 signatories on the Petition to date have objected to the height allowance in the Proposal, recommending lower numbers. The content of the Petition allows change and growth, but not unreasonably the way the present proposal does.

Objection 4: The Proposal contains inadequate setbacks.

Similar to the problems with excessive heights for buildings in the Proposal, the setbacks are inadequate. Some of the setback dimensions appear in the proposed zoning bylaw to contain illogical reductions of setbacks as heights increase. The more than 320 signatories on the Petition to date have objected to the inadequate setbacks in the Proposal, recommending larger numbers

and a tree easement. Again, the content of the Petition allows change and growth, but not unreasonably the way the present Proposal does.

Objection 5: The Proposal fails to include adequate green space or tree and landscaping easements.

At the community meeting in January 2020 and since, residents have repeatedly asked for more green space and trees at the borders as an offset to large development, but the Proposal ignores those concerns. Instead, the Proposal relies on a grossly inadequate figure of 20% green space, which offers little more than the inadequate setbacks with some lawns. The more than 300 signatories on the Petition have objected to the inadequacy of green space and lack of trees at the boundaries missing from the Proposal, recommending greater green space and a tree easement. Once again, the content of the Petition allows change and growth, but not unreasonably the way the present Proposal does.

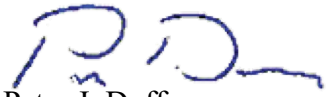
Objection 6: The Proposal arbitrarily makes it more complicated than at present to develop a fitness center/sports complex on a portion of the property by requiring a special permit for such use even though that use is as of right under present zoning rules.

At present, a fitness center as a sports complex or a skating rink that could handle hockey can be constructed on the property at issue as of right under existing zoning rules. The Proposal requires a Special Permit for any fitness center, and might not even allow a skating rink. Town officials have explained repeatedly that the effort seeks to expand productive and desirable uses, while eliminating the possibility of the (unlikely) 2-story warehouse or distribution center supposedly allowed as of right under present rules for the property. Since the January 2020 community meeting, residents formed a group page on Facebook, called the "Youth Sports Complex at the Gateway to Needham," gathering support for zoning that would encourage development of such a recreational facility on part of the property at issue.

The Planning Board does not appear to have adequately considered the productive use of part of the property as a fitness center. When asked about why, under the Proposal, a sports complex would need a Special Permit, even though it could be constructed as of right under present zoning, a Planning Board member said it was just a carryover from the 2019 effort. The Special Permit requirement for a fitness center, or the unavailability of a skating rink, could jeopardize a valuable use of the property. The youth sports complex industry is now a multi-billion dollar industry, with complexes being constructed in many sophisticated towns. The developer of the sports complex in Wellesley has joined the Facebook page for the Youth Sports Complex at the Gateway to Needham and expressed significant interest, having given a tour of the Wellesley facility to a Select Board member. In addition, the YMCA has expressed interest in a new location for a premium facility at the property. More than 700 people have been approved individually (verifying connections to Needham) to join the Facebook page "Youth Sports Complex at the Gateway to Needham." While some people may have joined for information, clearly more than 600 residents favor zoning that would continue to allow fitness facilities and rinks as of right because they are uses many people want to see at the property.

Based on the foregoing, we believe that the Planning Board should wait out the remainder of the two-year bar, and use the intervening time to invite participation by Town Meeting Members in this process, with due regard for the substantial input that residents have provided. We reserve the right to supplement these objections.

Sincerely,



Peter J. Duffy

cc: Barry S. Pollack
Christopher Heep

From: Larry Stein
To: Planning
Subject: Muzi
Date: Saturday, March 13, 2021 4:22:39 PM

To whom it may concern:

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Larry Stein

Sent from my iPhone

From:	Sarah Abdelaziz
To:	Planning
Subject:	Muzi
Date:	Saturday, March 13, 2021 4:24:58 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Sarah Abdelaziz
Needham, MA

From: Jason Stone
To: Planning
Subject: Objection to Proposed Rezoning
Date: Saturday, March 13, 2021 4:26:09 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

-Jason Stone
42 Hewitt Circle
Needham, MA 02494

From: Janice Bennett
To: Planning
Subject: Mizo Ford proposal
Date: Saturday, March 13, 2021 4:27:28 PM

I strongly object to the size of the project with five stories, are you serious? That’s going to wreck are area here in this neighborhood. Please reconsider the enormity of this project.

From: Casey Fedde
To: Planning
Subject: Reconsider Muzi rezoning plan
Date: Saturday, March 13, 2021 4:28:56 PM

Dear Planning Board,

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

As a Needham Heights resident who lives a few blocks away from the Muzi site, I'm especially wary of increased traffic to the area, and it will only get worse with the construction in Newton just on the other side of the highway. I urge the planning board to reconsider the use of this space.

Thank you,
Casey Fedde

Sent from my iPhone

From: Larry Tobin
To: Planning
Subject: Objection to Muzi rezoning
Date: Saturday, March 13, 2021 4:36:55 PM

Hello,

As an immediate neighbor to the vicinity at 31 greendale ave, I take issue with the proposed rezoning. The sets backs and height increases are ridiculous and unsightly and don't mesh with the neighborhood. The traffic report clearly states the huge problems and the proposed mitigation's don't solve them fully. Moreover, I believe strongly it would be wholly irresponsible for the town to shift the zoning without an explicit agreement for what development will ensue with a clear agreement for tax payments for years to come. By doing things out of order, it's only the property owners who stand to gain and it's not a guarantee the town will increase its tax base enough to offset the disaster. If, for instance, this project were to increase the tax base enough such that it could guarantee meaningfully lower property taxes for residents of 02494, then I'd be inclined to engage in a conversation. Otherwise the property owner wins me (which is perfectly fine by me) but we all lose, which is ludicrous.

Thank you!
Lawrence Tobin

Larry Tobin
LT@TheShapiroFoundation.org
781-864-2222

From: Victoria Martell
To: Planning
Subject: Muzi Rezoning
Date: Saturday, March 13, 2021 4:39:05 PM

Hello,

I am a Needham resident, living on Gary Road in the Heights, which as you likely know is rather close to the Muzi property. I am writing to ask that the planning board reconsider its position on the rezoning and place the best interests of the residents of this area above that of the Muzi family. The dealership isn't exactly a beautiful landmark, but surely we can do better than the current proposed zoning changes that allow for tall buildings with small setbacks. Why are we trying to cram five story buildings within feet of a residential road? Why are we trying to maximize the sale value of this property for the Muzi family? The message that is being sent is that the planning board is more concerned with assisting the Muzi family than it is the residents of the Heights. I sincerely hope that is untrue, and hope as a group that you will take a step back and reevaluate this zoning to prevent a monstrous eyesore that will result in a huge amount of traffic to the area from occurring. What about people who currently live on quiet streets that will turn into cut throughs as a result of this project? That is a change to their quality of life and property values. There are far reaching effects to the current proposal that seem to be getting intentionally ignored. Surely we can do better than what is currently on the table.

Thank you,
Victoria Martell

Sent from my iPhone

From:	Kathryn Bender
To:	Planning
Cc:	Kathryn C Bender
Subject:	No to rezoning of Muzi
Date:	Saturday, March 13, 2021 4:42:28 PM

Dear sirs and madams,
I sincerely implore you to vote down the development project of Muzi in Needham. I am a resident and enjoy the town and relative traffic congestion and do not want more traffic, less green space and more development.
Thank you for thinking about the residents beat interests, not those of business development.
Thank you,
Kathryn Bender

Sent from my iPhone

From: Kathryn Bender
To: Planning
Subject: Re: No to rezoning of Muzi
Date: Saturday, March 13, 2021 4:42:58 PM

My address is 1091, Highland Ave #1, Needham Heights MA 02494

Sent from my iPhone

> On Mar 13, 2021, at 4:42 PM, Kathryn Bender <kathrynesq@gmail.com> wrote:
>
> Dear sirs and madams,
> I sincerely implore you to vote down the development project of Muzi in Needham. I am a resident and enjoy the town and relative traffic congestion and do not want more traffic, less green space and more development.
> Thank you for thinking about the residents beat interests, not those of business development.
> Thank you,
> Kathryn Bender
>
> Sent from my iPhone

From: eileenoc114
To: Planning
Subject: Muzi rezoning
Date: Saturday, March 13, 2021 4:46:47 PM

I object to the current rezoning plan for the Muzi property. 5 story buildings would be an eyesore..not enough setback and certainly not enough green space..I am quite perplexed as to why the Town is proposing such a plan for this area, the gateway to Needham..a high rise? More business and traffic that has not been addressed. Traffic is a major consideration yet it is being ignored..that seems very suspicious to me.The Town should aquire the property..and dont reply "can't afford it" new police, fire, schools?
Eileen O'Connor 117 Sachem Rd Needham
"

Sent from my Sprint Samsung Galaxy Phone.

From: Alan Yee
To: Planning
Subject: Rezoning of Muzi
Date: Saturday, March 13, 2021 4:47:59 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.
I live on Central Avenue near Gould Street, I have two little ones, and am afraid for their safety as there will unprecedented amount of traffic through Gould Street and Central Avenue.

Best Regards,
Alan Yee

Needham Heights Resident

Sent from my T-Mobile 5G Device
Get Outlook for Android

From: Lois Sockol
To: Planning
Subject: REZoning of Muzi Property
Date: Saturday, March 13, 2021 4:49:49 PM

I know it is extremely difficult to balance the town's budgetary needs with community, and particularly neighborhood needs, but I do agree with the follow statement. “I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project." Filling the Planning Board's mailbox with such objections, in these or your own words, can only help us.”

Lois Sockol, 611 Greendale Ave. 02492

From: Victoria
To: Planning
Subject: Protest against new Zoning at Muzi
Date: Saturday, March 13, 2021 4:51:54 PM

To whomsoever it may concern,

I protest new zoning regarding proposed development at Muzi site, near route 128. My understanding is that this project will bring unprecedented level of traffic to already congested area. Squeezing tall buildings, increasing traffic and taking green space will make entering into Needham and surrounding neighborhoods challenging. I am against current proposal.
Thank you,
Victoria

From:	Mark Levine
To:	Planning
Subject:	Rezoning for Muzi
Date:	Saturday, March 13, 2021 4:52:11 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Mark Levine
1 Lakin Street

From: Julie Reich
To: Planning
Subject: Muzi redevelopment
Date: Saturday, March 13, 2021 4:54:44 PM

To the Planning Board:

I am writing to share my concern about the proposed rezoning for the area where Muzi Motors now sits. The possibility of developing 5-story buildings west of Route 128 is unprecedented, and the proposed setbacks and green space are insufficient. In addition, I am concerned about the effect that increased traffic will have on the surrounding community and the whole town. I hope you will consider a scaled-down project.

Thank you.

Sincerely,
Julie Reich
57 Hemlock St.
Needham 02492

From: Rob Dangel
To: Planning
Subject: Muzi rezoning
Date: Saturday, March 13, 2021 5:01:02 PM

I have been closely following the muzi rezoning I massively object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

I also live on Hewitt and see Gould from my back porch. The fact that the town is appearing to conspire with the property owners, seems a bit disingenuous. The word that we are hearing is that one of the options to mitigate traffic is to take property by eminent domain.
If you have to resort to that type of action just to get a certain type of development is a red flag.
I'm not really sure that people making these decisions will be as affected by us "commoners" that actually live here.

You must STOP this rezoning plan immediately. And actually listen to the people that live here.

Thank you.
Rob Dangel
28 Hewitt Cir
Needham 02494

Thumbed from my iPhone

From: Holly Charbonnier
To: Planning
Subject: Muzi Rezoning
Date: Saturday, March 13, 2021 5:11:36 PM

The proposed rezoning for Muzi should NOT be voted on as is. I object to the height of 5-story buildings at that site. It would be unprecedented on this side of Route 128 and too big for our small town. We are NOT a city nor do we want to be a city. The proposed rezoning offers insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Holly Charbonnier
94 Sachem Rod
Needham Heights

Sent from my iPhone

From:	Jodi
To:	Planning
Subject:	Objecting to the Proposed Rezoning for Muzi
Date:	Saturday, March 13, 2021 5:16:52 PM

Hello
This message is to make the board aware that we object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

We live at 54 high st in Needham. Along with our concern about the building height, we are very concerned about traffic issues and overflow traffic impacting this already busy street.

We appreciate your attention to this email.

Best
Jodi and Colin Feeney

From: cwrm72@mac.com
To: Planning
Subject: Muzi rezoning objection
Date: Saturday, March 13, 2021 5:16:59 PM

I strongly object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Carlos Rodriguez
Webster Street

From: Nancy Judge
To: Planning
Subject: Zoining of the Muzi property
Date: Saturday, March 13, 2021 5:19:54 PM

I feel there is better use of the land than building hi rises. I feel that an athletic complex would be a greater use of the land.< im sure that neighboring towns plus the people of needham would get greater enjoyment of using it. I also feel that there is to much going on behind closed doors, makes me think we are dealing with Beacon Hill and there politics.

From:	Nick Larsen
To:	Planning
Cc:	Ronnie Wei
Subject:	complaint about Muzi zoning
Date:	Saturday, March 13, 2021 5:28:51 PM

Dear Planning Board,
My family has lived at 120 Central Ave (02494) since 2009. Some years ago, you announced you would construct a behemoth St Mary pumping station immediately across the street from us, which has been an eyesore ever since. All the neighbors who attended the town meeting complained, but to no avail. The decision had already been made with no input from the community.

Now the Planning Board is making another decision about Muzi Ford zoning, with no input from the community. No one asked me for my opinion. But I will give it. The traffic along Central Ave is horrendous already. Cars go by my front door at 40-50 MPH. In the morning, I have counted from 600-900 cars going by per hour. We do NOT need more cars! As a resident, I do not appreciate the Board making arbitrary decisions about neighborhoods where they don't live. It's shameful. I therefore protest the new zoning plans and demand that something more reasonable be done.

Thank you
Nick Larsen & Ronnie Wei
120 Central Ave
Needham, MA 02494

From:	Nader Khedr
To:	Planning
Subject:	Muzi rezoning objection
Date:	Saturday, March 13, 2021 5:31:32 PM

Dears

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Kind regards

Nader Khedr
28 Guild Rd, Needham Heights, MA 02494

From:	patricia doyle
To:	Planning
Subject:	Muzi development
Date:	Saturday, March 13, 2021 5:31:34 PM

"I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project."

Patricia Doyle
Needham, MA 02492

From:	Vanderklish, Julie E.,N.P.
To:	Planning
Date:	Saturday, March 13, 2021 5:33:00 PM

Planning Department Needham Ma:

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Please Reconsider this!!

Julie Vanderklish
71 Ardmore Road
Needham Ma 02494
771-400-5544

From:	M M
To:	Planning
Subject:	Muzi rezoning objection
Date:	Saturday, March 13, 2021 5:33:23 PM

Hi

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Kind regards

Marwa Abdalla
28 Guild Rd Needham 02494

From: Richard
To: Planning
Subject: The Muzi rezoninf
Date: Saturday, March 13, 2021 5:41:47 PM

Dear zoning board

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Rick Freedman
Gilbert Road

Sent from Xfinity Connect Application

From: Matt Kence
To: Planning
Subject: Muzi Ford
Date: Saturday, March 13, 2021 5:44:42 PM

Hi,

I am concerned that this proposal is not being given the proper scrutiny. This is a great opportunity to make Needham more livable due to the addition of more green space and community services.

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Matt Kence

Sent from my iPhone

From:	MarySue Cotton
To:	Planning
Subject:	Muzi Property Zoning changes
Date:	Saturday, March 13, 2021 5:48:44 PM

Hi there
I am very concerned about the drastic changes being proposed for the Muzi site. The dramatic change in building height and set-backs from the road really are alarming.
Have all the studies been made about traffic? How does this affect Gould Street? Will the roads around the Muzi property be affected? Will the infrastructure be impacted? What will this do to the student population, can our schools handle this? I live in the heights, but behind the SWES school. This is not in my backyard but affects the town I have called home for over 30 years. This is a small town, and I would hate to trade in that small town feel, and create this dense area that really doesn't belong here.
Are there drawings of what this area will look like with these proposed changes?
I appreciate your time.
Thank you
MarySue Cotton
40 Sunset Road

From: Inga Puzikov
To: Planning
Subject: Muzi
Date: Saturday, March 13, 2021 6:36:20 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

I feel that the process itself was corrupted to the core, unfair and dishonest.

Please, let me know who I can talk to to follow up. People of Needham should be able to express their conserns and what is going on with construction in the area is unbelievable !!!!

We have a planning comiettee to protect us and I do not see any help, protection or even interest.

Very disappointed.

Please, put me in touch with person in charge

From: Heather Krechmer
To: Planning
Subject: Muzi rezoning concerns
Date: Saturday, March 13, 2021 7:01:50 PM

Dear Planning Board,

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

From:	Sara Zaiger
To:	Planning
Subject:	Muzi Rezoning
Date:	Saturday, March 13, 2021 7:07:39 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Thank you for your attention to my concerns.
Sincerely,
Sara Zaiger
35 Avery Street
Needham Heights MA 02494

From: Kate Home
To: Planning
Subject: Muzi plan objection.
Date: Saturday, March 13, 2021 7:07:54 PM

I live in the Perry Park area (203 Highgate street) and I use the intersection at Muzi frequently. I would like to send to you my concerns about the current proposed Muzi plan.

I object to the plan for the filling reasons:

• it allows possible development of 5 story buildings that are unsightly and unprecedented in our town. At this side of the highway this is too high, there are insufficient setbacks, not nearly enough green space.
• This process has and plan has resulted from an unreliable process, limited information sharing and will result in an excessive increase in traffic
• The true value of this proposal to the town (as opposed to the increase in value to the sellers) has never been fully explained. Specially the value of this size development over a scaled back, more reasonable project.

I hope that this project will not be approved as presented and more thought and sharing of information will be forthcoming.

Best regards,

Kate Findlen
Sent from my iPhone

From: Sarah Zilzer
To: Planning
Subject: Muzi development
Date: Saturday, March 13, 2021 7:31:52 PM

Dear Planning Board,

I am writing to express my objection to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Please hear your constituents on this matter and stop being party to the corruption that is so obviously prevalent in the Needham governance system today, first and foremost by the Select Board.

-Sarah Zilzer
247 Webster St.

Sent from my iPhone

From: jeanh293@gmail.com
To: Planning
Cc: jeanh293@gmail.com
Subject: Property currently occupied by Muzi Ford
Date: Saturday, March 13, 2021 7:33:57 PM

Dear members of the Planning Board,

My husband and I have lived in Needham since 1979 and care so much about what is happening with the rezoning of properly currently occupied by Muzi Ford.

We object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project."

The intersection of the highway, Highland Ave., Hunting Rd. and Gould Street is already at capacity. Please scale back any future plans for the Muzi property, keeping in mind the wishes of our community and the residents who live in this area.

Thank you.

Jean Higgins
293 Webster St.
Needham, MA 02494

From:	Kean, Linda
To:	Planning
Subject:	objection to the proposed rezoning for Muzi
Date:	Saturday, March 13, 2021 8:53:07 PM

Hello,

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project

Sincerely,
Linda Kean

From: mjz1021@comcast.net
To: Planning
Subject: Muzi re-zoning
Date: Saturday, March 13, 2021 9:05:27 PM

To whom I may concern,

I object to the proposed re-zoning of Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Melanie Zakin
99 Noanett Road

From:	Andrew Starr
To:	Planning
Subject:	Objection to proposed rezoning for Muzi
Date:	Saturday, March 13, 2021 9:11:55 PM

Hi,

My name is Andrew and I live at 99 Noanett Rd. I am sending this email to let you know I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Thank you,
Andrew

From: Justin
To: Planning
Subject: Planning Board
Date: Saturday, March 13, 2021 9:19:04 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Regards

Justin Oriel
47 Lee Rd
Needham, MA

From: Robyn Fink
To: Planning
Subject: Objection to rezoning
Date: Saturday, March 13, 2021 9:25:13 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project. I will be attending the Zoom meeting this week.

Robyn Fink
128b Hillside Ave 02494

Sent from my iPhone

From:	Kevin Henneberger
To:	Planning
Subject:	Objection to proposed rezoning for Muzi
Date:	Saturday, March 13, 2021 9:43:03 PM

I object to the proposed rezoning for Muzi because it is a short-sighted decision lacking comprehensive strategy and community unity for Needham.

The rezoning proposal has optimized tax revenue for the town while mitigating other obvious implications. Considering and presenting other extreme optimizations (ie 100% recreational zoning OR 100% residential zoning) — along with the ramifications of those options (ie schooling, taxes, traffic, etc) — will surface the most value for the entire town. This will empower the community to rally support for a good idea, with conscious trade-offs. The current proposal is a short-sighted sales pitch for easy revenue — it is one-sided and strategically incomplete.

Develop and communicate a comprehensive zoning decision based on a love for Needham.

Show the town you care, then showcase the revenue and other benefits . . . the opposite comes across as mindless or heartless.

Kevin Henneberger
16 Mills Rd
Needham Heights, MA 02494

From: Terence Ryan
To: Planning
Subject: Objection to Proposed Rezoning for Muzi/WCVB
Date: Saturday, March 13, 2021 10:36:24 PM

Dear Needham Planning Board,

I can appreciate the effort that you have put in to do something that you think will benefit Needham.

However, I object to the current, proposed rezoning for Muzi/WCVB because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Thank you,
Terence Ryan
79 Evelyn Rd
Needham, MA 02494

From: Gerri Shubow
To: Planning
Subject: Re: proposed rezoning for Muzi
Date: Sunday, March 14, 2021 12:15:43 AM

To: Planning Board Needham

I strongly object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

I live right near this spot - the proposed rezoning must be re-evaluated!

Sincerely,
Gerri Feuer Shubow
Sent from my iPhone

From:	Nathalie Blitz
To:	Planning
Subject:	proposed rezoning for Muzi objection
Date:	Sunday, March 14, 2021 8:29:01 AM

Hi there,

As a Noanett Rd resident, I object to the rezoning plans for Muzi lot and making it a five story building with no greenery. Please ask the residents who will be directly affected by your decisions. None of us want this current plan.
We want more transparency in the process and have our concerns taken seriously. We want greenery, enough setbacks, and a center who can benefit the residents, town and visitors like a little shopping center. The TJ Maxx plaza in Newton comes to mind.

See you Tuesday,

Nathalie Blitz
127 Noanett Rd
Needham

From: Jeff Pearson
To: Planning
Subject: Muzi Rezoning
Date: Sunday, March 14, 2021 8:40:28 AM

Dear Planning Board Members,

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Yes, I copied this for efficiency's sake. I support every word. I live half a mile from the proposed project.

Jeff Pearson
72 Avon Cir, Needham Heights, MA 02494
617-721-9673

From: Amy Mercer
To: Planning
Subject: Muzi Rezoning
Date: Sunday, March 14, 2021 8:41:03 AM

We strongly object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Best,

William and Amy Mercer
23 Gould St,
Needham, MA 02494

From: Michael Herman
To: Planning
Subject: Planning Board RE Rezoning for Muzi Property
Date: Sunday, March 14, 2021 8:51:46 AM

"We object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project."

Thank you for your careful consideration in this matter.

Michael Herman
13 Carey Road
Needham Heights, MA 02494

From:	Daniel Warn
To:	Planning
Subject:	Rezoning for Muzi - Opposed!!
Date:	Sunday, March 14, 2021 9:08:08 AM

Hello,

As someone who lives in Needham Heights, I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project. I pass through the intersection at Highland Ave and Gould streets daily to access my house, the town center, and the Mills sports complex. Rezoning the Muzi property without significant improvements accounting for families and kids who live in this area is unacceptable.

I urge you to also reject the current rezoning proposal along with me and numerous other concerned residents of Needham Heights.

Best regards,

Dan Warn
118 Parker Road
Needham Heights MA, 02494

From:	Ronha Loma
To:	Planning
Subject:	Muzi Ford Rezoning Objection
Date:	Sunday, March 14, 2021 9:11:20 AM

I am formally objecting to an allowed use of 5 story development on the corner of Gould Street and Highland Avenue, known as the Muzi Ford property.

Allowed uses, the traffic patterns and actual amount of traffic it brings should be of paramount importance to the Planning Board as it considers allowed uses for this property.

Please **do not** leave this to the Special Permit process.

It is of great importance that you consider the interests of Needham residents in your public deliberations.

Susan Herman
13 Cary Road

From: Ronit Velde
To: Planning
Subject: Rezoning for Muzi
Date: Sunday, March 14, 2021 10:09:41 AM

To whom it may concern,

I am writing to express my objection to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Warmly,
Ronit Velde
40 Homsy Ln, Needham Heights, MA 02494

From: Julia A. B. Pearson
To: Planning
Subject: Muzi
Date: Sunday, March 14, 2021 10:29:06 AM

To whom it may concern,

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Sincerely,

Julia Pearson
72 Avon Cir, Needham Heights, MA 02494

From:	Stephanie Wallace
To:	Planning
Date:	Sunday, March 14, 2021 11:30:50 AM

To the Planning Board,

As a resident of a neighborhood off of Gould Street, I heartily object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Sincerely,
Stephanie Wallace
Gary Road

From:	Debbie M. Jacobs
To:	Planning
Subject:	Muzi
Date:	Sunday, March 14, 2021 11:43:08 AM

Good Morning,

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Thank you for your time.

Debbie Jacobs

--
Debbie Jacobs, LCSW
A.R.T. Certified Practitioner
Allergy Release Technique®
EAT FREELY ● LIVE FULLY

From: Jennifer Wald Oriel
To: Planning
Subject: Planning Board
Date: Sunday, March 14, 2021 12:05:53 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Regards

Jen Oriel
47 Lee Rd
Needham, MA

From:	Chris Lalonde
To:	Planning
Subject:	In Re Proposed Muzi Rezoning
Date:	Sunday, March 14, 2021 12:07:53 PM

Members of the Planning Board,

I am writing to express my objection to the proposed rezoning of the land currently occupied by Muzi Ford, Muzi Chevrolet, Muzi Autobody, Wash World and WCVB. I do not believe that allowing for large scale commercial development of multi-story office buildings in that area is in the best interests of the town or its residents - which the residents of the town already indicated when a substantially similar proposal was voted down less than two years ago. The feasibility review of the proposal also seemed to indicate, though not fully address, the significant amount of land taking that would be necessary to attempt to accommodate the amount of additional traffic that such a development would create. Without such a taking, the ability for Needham residents, current business owners and those seeking to do business in Needham would be negatively impacted in a potentially severe manner due to the tremendous congestion the development would create at the main point of ingress to the town. The contemplated proposal puts the economic interests of a small few (the existing land holders) above those of the town and its other business and land owners.

I urge you to vote against the current proposal, which legally should not even be up for consideration given the aforementioned town vote, and to instead seek to identify a solution that would seek to better balance the needs and interests of the town's residents and other business owners with those of the current landowners. A smaller scale commercial development, with increased green space and perhaps additional community facilities could seemingly be such a compromise.

Best regards,

Chris Lalonde
38 Bennington St
Needham, MA 02494
781-400-1572

From: Janice Bennett
To: Planning
Subject: Re: Mizo Ford proposal
Date: Sunday, March 14, 2021 12:58:50 PM

On Sat, Mar 13, 2021 at 4:27 PM Janice Bennett <janicemb58@gmail.com> wrote:

> I strongly object to the size of the project with five stories, are you serious? That's going to wreck are area here in this neighborhood. Please reconsider the enormity of this project.

From: Lauren Soper
To: Planning
Subject: Muzi
Date: Sunday, March 14, 2021 1:19:38 PM

Hello planning board, I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Lauren Eilberg
32 Mark Lee Rd
Needham Ma

Sent from my iPhone

From:	Kenneth Phillips
To:	Planning
Subject:	Muzi
Date:	Sunday, March 14, 2021 1:28:23 PM

I have lived in this nice town for 40 years, your present disregard for this neighborhood is distressing. Whom do you represent?
I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project!!!

Ken Phillips
74 Sachem Rd.
Needham Hts., MA 02494-2148

From: Marge Phillips
To: Planning
Subject: Muzi Motors
Date: Sunday, March 14, 2021 1:33:32 PM

I am disappointed with the zoning board's proposal for Muzi Motors property.

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Marge Phillips
74 Sachem Rd.
Needham Hts., MA 02494

From:	Shari Stier
To:	Planning
Subject:	Please DO NOT rezone Muzi space
Date:	Sunday, March 14, 2021 3:14:12 PM

I object to the proposed rezoning for Muzi. It allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project. I live right near Muzi and do not want that space to have a 5 story building or stores or apartment buildings. The traffic alone will make it impossible getting in and out of Needham. You Can't allow this.

Shari Stier 23 Park Avenue Needham Ma 02494

From:	Debra Hoffman-Davidson
To:	Planning
Subject:	muzi Re-zoning
Date:	Sunday, March 14, 2021 3:59:04 PM

Hello,
As a resident of Needham Heights I am concerned about the potential land use for the current Muzi site. My specific concerns are regarding this being the entryway into Needham and making this attractive and useful to the nearby community. In addition I am concerned about increased traffic through nearby residential streets. I also wonder how a private business has gotten the town to consider zoning changes? Wouldn't this be up to any private developer to do after the land is purchased? I write you this letter not because NIMBY applies. I actually believe a thoughtful and sound development in the area could be positive and beneficial to the neighborhood and town as a whole. It is vital that Needham Heights residents voices are heard and that any proposals for the land are not based on political motives where any one or any entity profits at the expensive of the neighborhood.
Sincerely,
Deb Hoffman-Davidson
Elder Rd

Sent from my iPad

From:	Daniel Krechmer
To:	Planning
Subject:	Muzi rezoning and redevelopment concerns
Date:	Sunday, March 14, 2021 4:44:52 PM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Thanks,
Dan Krechmer
44 Yale Rd, Needham Heights, MA 02494

From: Abigail Harmon
To: Planning
Subject: Muzi Ford
Date: Sunday, March 14, 2021 4:50:43 PM

Hello,
I am concerned about the proposed zoning for the Muzi Ford site. I feel that it is important to incorporate additional green space (I saw the 33% number put somewhere) into any plan. The town has allowed tear down after tear down to remove trees for years with the excuse of tax base. Along with the aging trees of Needham, our air quality is in danger. Adding a building that takes additional houses (and their trees/grass) and adds additional cars in an unsafe way (according to the traffic study) is not what Needham needs - even for additional taxes. Please listen to the concerns of Needham and Needham Heights when considering this issue.

Thanks,
Abigail Harmon
Needham Heights

From: Leslie Prescott
To: Planning
Subject: Objection to rezoning for Muzi Ford lot
Date: Sunday, March 14, 2021 6:00:03 PM

I object to the proposed rezoning for Muzi. I live around the corner from Muzi and the traffic and congestion will dramatically impact my and our neighborhood's daily life. The new zoning allows the possibility for a development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space. The process has been too fast with not enough input from Needham residence. This will inevitably lead to too much traffic without understanding the incremental value to the town.

From:	Jodine Kuhlman
To:	Planning
Subject:	Rezoning
Date:	Sunday, March 14, 2021 7:01:33 PM

Hello Planning Board,

I object to the proposed rezoning for the Muzi site, because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Regards,

Jodine Kuhlman
Needham Resident

ejkuhlman@aol.com

From: Nelson Nemser
To: Planning
Subject: Proposed Rezoning for Muzi Site
Date: Sunday, March 14, 2021 9:27:46 PM

To:Town of Needham Planning Board,

We are concerned about the proposed rezoning for Muzi Site because I have not heard nor seen anything of substance from the Planning Board on their position regarding the pros and cons for the site. This seems to be a major decision for the town that doesn't involve town related services like the new fire stations and police facilities. It seems more like a private enterprise will be involved and more scrutiny required. Any private entity involved is unlikely to be as transparent as the board should/must be, and will not necessarily have the town's best interest in mind.
Trever Ballantyne's (Wicked Local) piece in the recent Needham Times shed some light on the situation. As not everyone in town has the time and inclination to follow the Planning Board activities it would be informative if the Planning Board made more of an effort to publicize the options and their position regarding this major project. This should include the available paths forward for this site and their impacts, including costs, traffic. revenue, etc. Also, allowing the possibile construction of a five story office building or office complex is likely to create a traffic nightmare at the already congested 128/95 overpass.
Personally, I prefer a facility that the residents of Needham could use and benefit from, rather than a business or businesses that just pay taxes (like Channel 5 and Muzi). What also is needed is the independent economic review and traffic assessment of all options being considered.

Nelson and Lesley Nemser
Needham MA 02494

From:	Bruce W
To:	Planning
Subject:	Fwd: Planning Board Meeting
Date:	Monday, March 15, 2021 8:36:49 AM

To the Needham Planning Board,

I am writing to express my deep opposition to the Planning Boards' proposal to "upzone" the Muzi Ford property.

This proposal was written by real estate developers and for real estate developers. It does not consider the short or long-term needs of Needham, nor does it consider how many in the Needham community would like to see this property developed.

Due to its location, the Muzi Ford property is extremely valuable and whoever develops the property stands to make a lot of money. The town should be working with those developers to build out a mixed-use property that includes green spaces, access (and upgrades) to the rail trail, support for small and local businesses, and an upgraded sports facility (indoor pool, ice rink, improved Y). The forthcoming development of the Marshalls plaza on Needham street is an example of how a developer can work with the local community to build something that improves the community while still delivering a substantial profit.

This property offers so much opportunity to the town. It would be a shame to lose that opportunity and end up with a large complex of over massed office buildings that end up destroying the character and quality of life in our beautiful town.

Thank you

Bruce Wolfeld

Bruce Wolfeld
brw917@gmail.com
617-901-5662
www.linkedin.com/in/brucewolfeld

From:	Lauren Greenstein
To:	Planning
Subject:	Petition Objecting to the Proposed Rezoning for Muzi
Date:	Monday, March 15, 2021 8:54:38 AM

Hello,

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Please preserve the beauty of Needham. It's becoming very concrete between the project on Greendale a few years ago and the whole technology area near TripAdvisor. Stop building! Everything is on top of one another.

Sincerely,

Lauren Greenstein
82 Cynthia Road
617-721-3554

From: Lauren Schuller
To: Planning
Subject: Objection to proposed rezoning for Muzi!
Date: Monday, March 15, 2021 11:38:38 AM

Good morning,

My name is Lauren Schuller, and I live at 25 Mills Rd in Needham. I want to make it very clear that I object to the proposed rezoning for Muzi. It allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project. I hope you will take into account the loud and passionate voices from the community objecting to this project and the negative impact it will have on all of us.

Thank you,
Lauren Schuller

From:	Barry Pollack
To:	Planning
Subject:	Objection to Proposed Rezoning for Muzi
Date:	Monday, March 15, 2021 11:41:24 AM
Attachments:	210315 letter to Planning Board.pdf 210315 PETITION CONCERNING ZONING AT THE GATEWAY TO NEEDHAM.pdf 210315 petition signatories.pdf

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Dear Chair McKnight and Members of the Needham Planning Board,

Please see the attached correspondence. I am a resident of Needham who lives at 15 Pandolf Lane, in Needham Heights, 02494. Also attached is a copy of a Petition, generated through Google Forms, and a list of Needham residents who joined the Petition as signatories, along with their zip code of residence. Between electronic and hard copy signatures to the Petition, more than 600 Needham residents object to the Planning Board's proposed rezoning for Muzi.

Respectfully submitted,

Barry Pollack

March 15, 2021

By Overnight Mail and Email planning@needhamma.gov

Chair Jeanne McKnight
Vice Chair Paul S. Alpert
Adam Block
Martin Jacobs
Ted Owens
Needham Planning Board
1471 Highland Avenue
Needham, MA 02492

Re: Objections to Proposal for Highway Commercial-1
Zoning Change at Muzi / Channel 5 Properties

Dear Chair McKnight and Members of the Planning Board:

A group of Needham residents has recently formed and registered the Needham Heights Alliance, Inc. (the "Heights Alliance"). A Facebook page for "Needham Heights Alliance" already enjoys 340 members. I am one of the incorporators of the Heights Alliance.

As you probably know, before forming the Heights Alliance, some of those who became its initial members organized a Petition objecting to the pending rezoning proposal by the Planning Board, raising objections to the permissible heights as excessive, the setbacks on Highland Avenue and Gould Street as inadequate, insufficient green space, and the lack of a tree easement. A copy of the form of Petition and the list of electronic signatories are attached hereto. Within less than 10 days, more than 600 Needham residents have signed the Petition either electronically or by hard copy. More than 1/3 of the electronic signatures come from residents of 02492, reflecting that concerns are spread across our town. I understand the hard copies are being submitted separately.

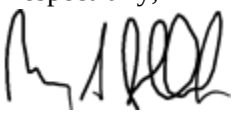
The signatories have provided certain responses that may contain personal identifiable information ("PII"), within the meaning of 2 CFR § 200.79. We removed those signatories who reside outside of Needham. We removed duplicate electronic entries. One or more emails have been sent to the signatories to validate email addresses. Any bounce-back has resulted in a removal or correction. One person asked to be removed (and was), when she reported that she spoke to Chair McKnight and believed there was a possibility of a compromise while she could await further information before taking a position. One person asked to be removed because he had just resigned from the Needham Heights Neighborhood Association and did not want involvement with the attention drawn to the controversy over the NHNA's recent determination that it would not take a position on any zoning issues. Appropriate steps have been taken to gather signatories for the Petition while protecting PII and maintaining social distancing. As you can see, the Petition does not seek a vote on any particular new

THE NEEDHAM HEIGHTS ALLIANCE, INC.
163 HIGHLAND AVENUE #1037 | NEEDHAM HEIGHTS, MA 02494 | www.facebook.com/groups/NeedhamHeightsAlliance

zoning, but rather only objects to the excessiveness of the pending proposal by the Planning Board. As a result, email addresses have been preserved, while only zip codes of residence accompany each person's name in this submission.

I know that members of the Heights Alliance look forward to working with the Planning Board on a more reasonable proposal.

Respectfully,



Barry S. Pollack
Incorporator

THE NEEDHAM HEIGHTS ALLIANCE, INC.
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PETITION CONCERNING ZONING AT THE GATEWAY TO NEEDHAM

* Required

Email address *

Your email

Objections and Responses to the Planning Board's Proposal

WHEREAS, in 2019, the Planning Board proposed a new zoning use district known as “Highway Commercial 1” (“HC-1”) that would have allowed buildings up to seven stories; and

WHEREAS, in November 2019 at a Special Town Meeting, a vote of Town Meeting Members rejected that zoning change; and

WHEREAS, the Planning Board has now re-proposed the creation of an HC-1 use district that would allow buildings up to five stories; and

WHEREAS, we believe that the residents of Needham seek zoning at the Gateway to Needham that balances the increase of a tax base with concerns about aesthetics, beneficial uses, green space, environmental impact, traffic and other burdens on neighbors; and

WHEREAS, for decades, Needham Heights residents have made efforts, in part through a formal association, “to enhance and protect the residential character and livability of the area," including the Gateway to Needham, and still seek to achieve those goals;

The undersigned object to the proposed building heights, insufficient setbacks, insufficient green space, and certain uses and special permit requirements and entitlements of the proposed HC-1 zoning district, as presently defined, and submit the following as their position to the Planning Board, Select Board and Town Meeting Members:

1. A setback for building shall be at least 100’ from Highland Avenue and from Gould Street.

2. Between 100’ and 200’ from Highland Avenue and from Gould Street, the permissible height of buildings shall be no higher than 42’, inclusive of any roof, whether or not pitched, and without further height allowances for any utility apparatus.

3. From 200’ and further from Highland Avenue and from Gould Street, the permissible height of buildings, with a special permit that requires developers to take mitigation efforts that maintain pre-build traffic conditions, shall be 56’, inclusive of any roof, whether or not pitched, and without further height allowances for utility apparatus.

4. Permissible uses shall be limited to those allowed for existing Business District zoning and existing zoning for the present lots, and shall be subject to Special Permits as allowed for existing Business District zoning and zoning for the present lots, except that (a) planned housing shall be allowed; (b) the size of office space may be increased by Special Permit, and (c) the following uses shall be expressly excluded from permissible uses: warehouses, distribution centers, industrial services, large retail operations in excess of 5,750 square feet, and junkyards.

5. To the extent that an owner constructs a building with a height in excess of 42’, the green space for the lot shall be no less than 33%.

6. The town shall hold a landscape easement requiring trees that are customarily used in the vicinity, spaced at regular intervals no less than 40’ apart in the setbacks along Highland Avenue and Gould Street.

Name *

Your answer

Email Address *

Your answer

Zip Code of Residence *

Your answer

Do you join the objections to the Planning Board's proposal for zoning changes in height, setback and greenspace at the Gateway to Needham? *

- ◯ Yes

Send me a copy of my responses.

Submit

Never submit passwords through Google Forms.

Barry Pollack	02494
Abigail Harmon	02494
Ada Chan	02494
Adam Mersky	02494
Ahmed Abdelaziz	02494
Aimee Stone	02494
Ajay Batra	02494
Alan Yee	02494
Alejandra Marroquin	02494
Alex Puzikov	02494
Alex Shtifman	02494
Alexa Moore	02494
Alison Reiser	02494
Alyse Winston	02494
Amanda Fernandes	02494
Amelia Egan	02494
Amy E Mercer	02494
Andrea cunningham	02494
Andrew Spear	02494
Andrew Starr	02494
Andy Effenson	02494
Anna Calvagna	02494
Anna W. Katsnelson	02494
AnnaMarie Defeo	02494
Anne Pickett	02494
Annie King	02494
Anthony Scarsella	02494

Ashly Scheufele	02494
Aurora Liao	02494
Ben Daniels	02494
Benjamin Shimamura	02494
Beth McCarthy	02494
Bipin Mistry	02494
Brandon Grunes	02494
Brian T Moore	02494
Bridget dangel	02494
Bridget Francescone	02494
Callie Curran Morrell	02494
Carlos Javier Rodríguez	02494
Carol Fraini	02494
Carol Macey	02494
Carol Richmond	02494
Carol Stuckey	02494
Caroline Valentini	02494
Carolyn M Spiros	02494
Carolyn McKee	02494
Caryn Manning	02494
Casey Fedde	02494
CATHERINE SPALDING	02494

Charla Turgel	02494
Cheri Pugatch	02494
Christina Bailey	02494
Christina Hua	02494
Christopher Lalonde	02494
Claudine Eilberg	02494
Colin Feeney	02494
Colleen Mutrie	02494
Corey Wilk	02494
Dan Warn	02494
Dana Fugate	02494
Daniel Colino	02494
Daniel Krechmer	02494
Daniel R Morrell	02494
Daniel Robert Morrell	02494
Danny Socci	02494
David Katsnelson	02494
David Linde	02494
David Murray	02494
David Packer	02494
Deb keene	02494
Debbie Jacobs	02494
Deborah Brown	02494
Deborah Johnson	02494
Debra Whitney	02494

Diana Babson	02494
Diana Rittenberg	02494
Dianne Sapra	02494
Dina Creiger	02494
Dory Fish	02494
Douglas Most	02494
Ecaterina	02494
Edmund Ho	02494
Edward Bayiates	02494
Eileen O'Connor	02494
Elaine Fortin	02494
Elina Kaplan	02494
Elisa Scarsella-Bayiates	02494
Elissa Schechner	02494
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Elizabeth Gasman	02494
Ellen Fine	02494
Ellen May	02494
Ema Bimbli	02494
Emily cooper	02494
Emily McSweeney	02494
Emily Pick	02494
Eric Lim	02494
Eugene Ho	02494
Felicia Mathias	02494
FRancid M. Judge	02494
Frederica Lalonde	02494

Gabriela Spear	02494
Gabrielle	02494
Gail Stone	02494
Ganesh Rao	02494
Gary Bean	02494
Gena Koufos	02494
Gennady Solodar	02494
George Doukas	02494
Gerald Tracey	02494
Gerri Shubow	02494
Giuseppe	02494
Grace Chan	02494
Guanshi Li	02494
GUILLAUME BOURGEOIS-PIN	02494
Hajnalka Lakatos	02494
Heather Curtis	02494
Heather krechmer	02494
Heidi Wilson	02494
Helaine And Dennis Miller	02494
Henry Ragin	02494
Hilary Rosenbaum	02494
Hilary Rosengard	02494
Holly Charbonnier	02494
Howard Breslau	02494
Ilene Effenson	02494

Ilia Korboukh	02494
Inga Puzikov	02494
J Barry Sullivan	02494
Jacquie Sherman	02494
Jalvi Shah	02494
James DeFeo	02494
James DiMeo	02494
James G. Higgins	02494
James N. Calvagna	02494
Jane Breslau	02494
Janice Bennett	02494
Janice Bennett	02494
Janice Chen	02494
Jason Stone	02494
Jason Tuchin	02494
Jayne Colino	02494
Jean S Higgins	02494
Jeff greenstein	02494
Jeffrey Euse	02494
Jeffrey Pearson	02494
Jen Oriel	02494
Jen Sieczkowski	02494
Jennie Jonas	02494
Jennifer Lichtman	02494
Jennifer Yogel	02494
Jeremy Fiset	02494
Jesse Kaddy	02494

Jessica Tobin	02494
Jillian Erdos	02494
Jim Cook	02494
JOAN E FEENEY	02494
Joanne Neale	02494
Joanne tedeschi	02494
Jodi feeney	02494
Jodi Rooney	02494
Jodine Kuhlman	02494
John Keene	02494
John Kopellas	02494
John Reidy	02494
Jonah Lichtman	02494
Joni Schockett	02494
Joseph Knowles	02494
Joseph Lichtman	02494
julia fraini	02494
Julia Pearson	02494
Julie Levine	02494
Julie Tracey	02494
Julie Traub	02494
Julie VanderKlish	02494
Juliet SooHoo	02494
Justin Finkle	02494
Justin Oriel	02494
K. Hannele Saramo-Raja	02494

Kara Williams	02494
Karen Bejian	02494
Karin Wilinski	02494
Karl T Velde	02494
Kathryn C Bender	02494
Kathryn Kraft	02494
Katie ross	02494
Kelly Close	02494
Kevin Henneberger	02494
Kevin Leary	02494
Kevin Reulbach	02494
Kim Marie Nicols	02494
Kristen Casey	02494
Kristi Bimbli	02494
Larry Keller	02494
Larry Stein	02494
Laura Rosen	02494
Lauren Eilberg	02494
Lauren greenstein	02494
Lauren Knowles	02494
Lauren Levine	02494
Lauren Ross	02494
Lauren Schuller	02494
Lawrence J Gage	02494
Lawrence tobin	02494
Le Truong	02494

Leigh Rossi Doukas	02494
LeRoy Ullrich	02494
Lesley Nemser	02494
Leslie Susan Prescott	02494
Lev Gaitsgory	02494
Linda Bleakney	02494
Linda Flueckiger	02494
Linda Garcia	02494
Linda Kean	02494
Liron gal	02494
Lisa Durkin	02494
Lori B Peljovich	02494
Lynn Rodman	02494
MaeLynn Patten	02494
Maggie Flanagan	02494
Mamie Marcus	02494
Mariateresa Fulciniti	02494
Marie Vasil	02494
Marissa Traeger	02494
marjorie spofford	02494
Mark Francescone	02494
Mark Greene	02494
Mark Levine	02494
Mark Nasson	02494
mark owen	02494

Marlene Shore	02494
MartieAnne Marinelli	02494
Marwa Abdalla	02494
Mary Duhaime	02494
Masha Sherman	02494
Mathew Nathan Hesser	02494
Mathura	02494
Matt Flanagan	02494
Matthew Ching	02494
Matthew Scheufele	02494
Maureen DiMeo	02494
Maureen Walsh	02494
Max Breslau	02494
Meg Stafford	02494
Megan Mistry	02494
Melanie Zakin	02494
Melissa kameras	02494
Melyssa Taylor	02494
Michael Kelly	02494
Michael Paulete	02494
Michael Schockett	02494
Michael turgel	02494
Michaela Fraini	02494
Michele Fox	02494
Michele Markley	02494
michelle hoffman	02494

Michelle Limaj	02494
Michelle Saipe	02494
Mike Battista	02494
Mike Fraini	02494
Mike Michaud	02494
Mike Pugatch	02494
Mike Rozman	02494
Mimi Woo	02494
Mitchell Macey	02494
Monica Anand	02494
Monty Krieger	02494
Nader Khedr	02494
Nancy Greenwald	02494
Nancy Herbstman	02494
Nancy Krieger	02494
Nancy Panza	02494
Natalie Mutter	02494
Natalya Vorontsova	02494
NATHALIE BLITZ	02494
Nelson Nemser.	02494
Nicholas Larsen	02494
Nicole C Pollack	02494
Nicole Gage	02494
Nicole Nasson	02494
Pam Fernandes	02494

Pamela Greene	02494
Pamela SooHoo	02494
Pamela venti	02494
Paolo Socci	02494
Paramjit Singh	02494
Patricia Paulete	02494
Patty Deroian	02494
Paul Abdalian	02494
Paul Charbonnier	02494
Paul Galvin	02494
Paula Craig	02494
Pazit Gabriel	02494
Peter DiMeo	02494
Peter Resnick	02494
Peter schuller	02494
Phil Murray	02494
Pradeep Saxena	02494
Rachael Mindich	02494
Rachel A Tedrake	02494
Rachel Hesser	02494
Rachel panza	02494
Ranen Schechner	02494
Rebecca Young	02494
Richard Tedeschi	02494
Rob Fish	02494
Robert dangel	02494

Robert T Timmerman II	02494
Robyn Fink	02494
Ronit KLEIN	02494
Ronit Velde	02494
Ronnie Friedman	02494
Ronnie R Wei	02494
Ryan	02494
Ryan Manning	02494
Samantha Grunes	02494
Sara Zaiger	02494
Sarah Abdelaziz	02494
Sarah Dussault	02494
Sarah O’Leary	02494
Sarah Zilzer	02494
Scott Aubrey	02494
Sean Finnegan	02494
Sean Walley	02494
Seema Meloni	02494
Shari Shocket	02494
Shari stier	02494
Shirley lin	02494
Sid Sharma	02494
Smitha Narreddi	02494
Stacey Nathanson	02494
Stacey Slavkin	02494
Stacy Landau	02494

Stephanie Wallace	02494
Steven Aaron Sussman	02494
Steven Deroian	02494
steven peljovich	02494
Sue Cotton	02494
Susan Abdalian	02494
Susan B. Condon	02494
Susan DeMinico	02494
Susan Herman	02494
Susan Nealon	02494
Susan whalen	02494
Suzanne Derenzo	02494
Suzanne Galvin	02494
Suzanne Nissen	02494
Suzanne Stein	02494
Tamara Kremer Mecabell	02494
Tatyana Groza	02494
Terence Ryan	02494
Teresa Combs	02494
thomas nasson	02494
Timothy M Gannon	02494
Todd Markley	02494
Tom Keating	02494
Tony Liu	02494
Ty Hua	02494
Valerie Paquette	02494

Vanessa Wronski	02494
Varun Sapra	02494
Victoria Doroshenko	02494
Victoria Korboukh	02494
Victoria Martell	02494
Vinod Sanjay Mohanasundaram	02494
Vyacheslav Doroshenko	02494
Walter Heeger	02494
Wes Soper	02494
William Mercer	02494
Yana frankel	02494
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Yim Ho	02494
Yiu Foo SooHoo	02494
Yulia Murray	02494
Zachary dangel	02494
Zeenat Rasheed	02494
Zidane Ouard	02494
Zoe Bourgeois-Pin	02494
Zongli Li	02494
Karen Quigley	02494-2445
Kenneth M. Phillips	02494-2148
Marjorie A. Phillips	02494-2148

David N Berkowitz	02494-2128
Kim E Stone	02494-2128
Courtney Elf Rowe	02494-1811
Leslie Duberstein Ofer	02494-1403
michael london	02492-1017
Aimee E. Bierman	02492
Alana Dore	02492
Albert dore	02492
Alvin Peh	02492
Alyssa Sinel	02492
Amanda Sorrento	02492
Amy Sample	02492
Amy Schaffer	02492
Anita Ritchie	02492
Ann Shaughnessy	02492
Anne Seggerman	02492
Arkadiy Perchenok	02492
Arthur P Huntington	02492
Artie Crocker	02492
Ashley Mackoff	02492
Barbara Mullin	02492
Bernie McTernan	02492
Beth Holland	02492

Bianka Eichelberger	02492
Bonnie McLellan	02492
Brian Cummings	02492
Brian Sykora	02492
Bridget Fitzpatrick	02492
Bruce Wolfeld	02492
Calvin Lee	02492
Caren Carpenter	02492
Carla Kopikis	02492
Carly Carty	02492
Carol Tiffany	02492
Catherine Flaherty	02492
Catherine Memory	02492
Cathy Freedberg	02492
Charles Hecht	02492
Charlie smith	02492
Charlotte Zindle	02492
Chris Giancola	02492
Chris Morahan	02492
Chrissie Segal	02492
Christine Mawhinney	02492
Christine McMahon	02492
Christopher Carty	02492
Christopher Jones	02492
Clayton Schuller	02492
Courtney Olson	02492

Cynthia Landau	02492
DAN GORFINKLE	02492
Dana Solomon	02492
Daniel Socci	02492
Daphna Fields	02492
David Negro	02492
David Weiner	02492
DIANE DEFILIPPO	02492
Diane Roberts	02492
Dianne Rossi	02492
Dmitry Gorenburg	02492
Donna Blake	02492
Doug Beyer	02492
Doug Fox	02492
Doug kalish	02492
Elizabeth Bresnahan	02492
Elizabeth Handler	02492
Elizabeth Lee	02492
Emilie Kahn-Boesel	02492
Erik Peterson-Eacott	02492
Erin Travia	02492
Gabriel Nanda	02492
Gayani Weeraratne	02492
GEORGE S. MARINO	02492

Hannah Krispin	02492
Heather Kortenkaemper	02492
Heather Simmons	02492
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Henry Ching	02492
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Inna Wegner	02492
Ira Shaw	02492
Jackie Boni	02492
James McInerney	02492
Jane Blomberg	02492
Jane Kourtis	02492
Janet B Petronio	02492
Janice Davoren	02492
Jared Emond	02492
Jason hemming	02492
Jean Resnick	02492
Jeffrey Richman	02492
Jen jenkins	02492
Jennifer Adler	02492
Jennifer Barker	02492
Jennifer Peterson-Eacott	02492
Jeri Smoller	02492
Jessica Musiak	02492

Jessica poliquin	02492
Jessica Sassi	02492
Jessica Zaplin Karlin	02492
Jill Kahn	02492
Jill Yanofsky	02492
Jim Reddish	02492
Joona Sohn	02492
Joshua Cooper	02492
Julie Reich	02492
Julie Shulman	02492
Julie Vigneault Licona	02492
Kaitlin Nagle	02492
Karin Ludlow	02492
Katherine Fitzpatrick	02492
Katherine Lawrence	02492
Kathleen Findlen	02492
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Katie Lynch	02492
Katie McGrath	02492
Kelly Cummings	02492
Kenneth Gustin	02492

Kerem Aytek	02492
Kimberly Herman	02492
Kristen Capodilupo	02492
Kristin Auffermann	02492
Laura A Goldfarb	02492
Laura Fox	02492
Laura Gere	02492
Laura Koebler	02492
Lauren Dore	02492
Laurie Spitz	02492
Leo Simon	02492
Leon Shaigorodsky	02492
Lingyun Zhang	02492
Lisa Olsen	02492
Lois Sockol	02492
Lollie Weeks	02492
Lynn Basilio	02492
Lynn Clancy	02492
Madeline Wolfield	02492
Mahesh Padval	02492
Mamta Dubey	02492
Marc Burke	02492
Marcus Nelson	02492
Mari Shor	02492
Marilyn Okonow	02492

Matt Courcier	02492
Matt Howell	02492
Matthew Kence	02492
Matthew Leibowitz	02492
Maureen K McInerney	02492
May Steinkrauss	02492
Meghan Handwerker	02492
Melissa Jacoby	02492
Micah Jacobs	02492
Michael Fields	02492
Michael Gustat	02492
Michael Koufos	02492
Michael Margolis	02492
Michelle Lawrence	02492
Mike Zeylikman	02492
Mindy Kalish	02492
Mya Fonarov	02492
Nar Lee	02492
Nicole MacLaughlan	02492
Olivia Kahn-Boesel	02492
Pamela Norden	02492
Paolo Socci	02492
Patricia Doyle	02492

Patty O’Neill	02492
Paul Hammerstrand	02492
Poonam Saraf	02492
Rafal K Boni	02492
Rebecca Shaw	02492
Rick Freedman	02492
Robert Carey	02492
Robin Jaeger	02492
Robyn Glazier	02492
Ron Sockol	02492
Sandra Shefelbine	02492
Sandra Walters	02492
Sara Berney	02492
Sarah Aytek	02492
Scott F Katz	02492
Scott J Epstein	02492
Second Standard	02492
Shanna Deng	02492
Sharon Ellis	02492
Sheila sullivan	02492
Shyan-Yuan Kao	02492
Siobhan O’Connell	02492
Stacey Marino	02492
Steph Novak	02492

Stu Carpenter	02492
Sunny singh	02492
Susan Banez	02492
Susan Hanson	02492
Susan Shoobe	02492
Teresa SooHoo	02492
Tim Roberts	02492
Todd Lawrence	02492
Tracy Zendzian	02492
Travis Jonasson	02492
Trish Roach	02492
Veronica Schauer	02492
Victor Saratella	02492
Wayne Olson	02492
Wendie Murstein	02492
Wolfgang Floitgraf	02492
Yelena Perchenok	02492

From: Peter Schuller
To: Planning
Subject: I object to the proposed rezoning for Muzi
Date: Monday, March 15, 2021 11:47:52 AM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Peter Schuller
25 Mills Rd 02494

From:	Jill Kahn
To:	Planning; Selectboard; Kate Fitzpatrick; Sandy Cincotta; jbulian@rcn.com
Subject:	Planning Board Zoom Meeting 3-16-21, 7:15pm
Date:	Monday, March 15, 2021 4:34:30 PM

Good afternoon -

Planning Board Meeting Tuesday March 16th, 7:15pm: please resend email to Planning Board list subscribers with a direct link to the Zoom meeting, so that interested citizens who would like to attend and participate may do so easily, without logging into Zoom, then entering the 878-8270-9890 ID, etc.

More folks would like to participate in Town matters - - let's make it more streamlined and straightforward for them to do so.

Also, please make sure that all participants can see each speaker, not just see the Article proponents. Participatory government is important and good. Many participants in the recent Zoom meeting on this topic, myself included, were very disappointed that we could only see the name of each speaker, not see the actual speaker. Unless it was an Article proponent. Then we could see the speaker. Please make sure we can view all speakers as they speak, just as we did in non-virtual meetings prior to March 2020.

Thank you.

Jill Kahn

Sent from my iPhone

From: ssabda
To: Planning
Subject: Muzi Property Rezoning
Date: Monday, March 15, 2021 6:01:30 PM

Dear Planning Board,

I am opposed to the proposed rezoning under consideration for the development project on the Muzi Motors property. The proposed 5 story buildings are way too tall and imposing on the surrounding environs, especially with only a 20 foot setback

There should be more green space included, and it is likely to cause a large increase in traffic to an already busy intersection. The process must take into consideration the Needham residents who will be in daily contact with these structures which will not be a welcoming "gateway" to my Needham neighborhood.

I intend to attend the zoom meeting tomorrow and hope that these concerns are addressed and can result in this project being scaled down.

Thank you.

Susan Abdalian
21 Lee Rd
Needham, MA 02494

From:	Laura Koebler
To:	Planning
Subject:	Proposed Rezoning for Muzi Ford Area
Date:	Monday, March 15, 2021 11:24:02 PM

I am writing to object to the proposed rezoning at the Muzi Ford area because it allows the possible development of 5-story buildings which may be too big for this area without sufficient setbacks, it does not provide enough green space, and may result in increased and unsafe local traffic patterns, especially around the A to Z Daycare Center nearby.

Bernard and Laura Koebler
193 Melrose Avenue

From: Tamara C. Takoudes
To: Planning
Subject: Muzi Ford re zoning
Date: Tuesday, March 16, 2021 8:18:59 AM

I object to the proposed rezoning for Muzi because it allows the possible development of 5-story buildings that are unprecedented on this side of Route 128 and too big with insufficient setbacks, not enough green space, and has resulted from an unreliable process while leading to too much traffic without understanding the incremental value to the town over a reasonably scaled-down project.

Tamara C. Takoudes
Maternal Fetal Medicine
BOSTON MFM
www.bostonmfm.org
One Brookline Place Suite 301
(617) 264-0364 (office)
(617) 264-0365 (fax)

If you are a patient please call the office.

Sent from my iPhone

From:	DOUG FOX
To:	Planning
Subject:	Objection to Muzi rezoning
Date:	Tuesday, March 16, 2021 9:24:58 AM

Hi,

I write to object to the Muzi rezoning for the 3rd time in 2 years. Your objectives for this rezoning of maximizing tax revenue are so misaligned with those of my/our constituents.

And these are not NIMBY's (not that elected officials should ever refer to any citizens that way). I am a town meeting member from precinct F, so deep in 02492.

Not that it should matter. I always feel I represent all citizens, not just the ones in my precinct. But in my polling of my network, it was pretty similar to the past 2 times I've done it. Only 1 citizen spoke out for the zoning, while 50+ spoke against.

The consensus is the increase in tax revenue is not worth the increase in size/traffic. And once again that is in direct opposition to the goals of your board and town leadership with this parcel. For this reason, I am recommending you do not bring the proposed zoning changes before town meeting.

I am always pushing the town to do more data driven decision making. Hire a research company to survey broad swaths of the town on their goals for development overall. Not just at Muzi. Ask them whether they prioritize tax revenue or traffic reduction, retail amenities or small town feel, affordable housing or office space. Then the town's elected officials should follow the will of the people and let that drive our zoning.

I know there is a feeling from town leadership that we have to move on this now. I don't feel this urgency. But if you want to know what I would vote for now, here it is:

> I signed Barry Pollack's petition along with 600 others. Lower density with more green space. This would be the closest to a read of something acceptable to our citizens. So I would vote yes if you meet the terms of this petition.

> I would also vote yes to a pure residential rezoning. As of right it would match the residential area, ie multi family town homes. And on a special permit, building with more density for 30-40% affordable and/or senior housing. With each added story, an increase in %. And based on the new legislation, with a simple majority, you may not even need my vote.

Lastly I also fear with the continued release of public information around the workings of town leadership on this matter that this could lead to a very contentious town meeting. And one that will not reflect well on the town nor its leadership. That is another reason to think long and hard about what you bring (or don't bring) to town meeting.

Thank you.

Doug Fox
TMM Precinct F

Sent from my iPhone

From: Richard Putprush
To: Planning
Subject: Fwd: Proposed re-zoning of Industrial-1
Date: Tuesday, March 16, 2021 12:58:55 PM

Members of the Needham Planning Board,
As an important follow-up to the concerns of which I wrote to the Board on February 15, please see the link below to an article that appeared in the Boston Globe this morning that further supports my concerns. Again, I believe the public needs to be made aware that if action is not taken regarding the proposed zoning of Industrial 1, and further delays are the result, what can happen next may end up being the opposite of what the residents were hoping to see, to the detriment of Needham as a whole.

Rick Putprush

https://edition.pagesuite.com/popovers/dynamic_article_popover.aspx?artguid=fb694d40-396c-45a9-861b-23f452df3b03&appid=1165

---------- Forwarded message ---------
From: **Richard Putprush** <rick.putprush@gmail.com>
Date: Mon, Feb 15, 2021 at 5:14 PM
Subject: Proposed re-zoning of Industrial-1
To: <planning@needhamma.gov>

Members of the Needham Planning Board,

My name is Rick Putprush and I am writing to you as a concerned Needham resident (97 Manning Street), Needham business owner (Partner at Fulcrum Real Estate Partners, LLC, 935 Great Plain Avenue), and long-time member of Needham's Council of Economic Advisors (CEA). Over the past several years, I have had opportunities to voice my opinions on various matters of the Town, including the on-going discussions regarding the potential re-zoning of the current "Industrial -1" zoned area bordered by Gould Street, Highland Ave and Rt 128 (for sake of simplicity, hereinafter referred to as the "Muzi site") which is the topic of my concerns.

First, I applaud the inclusive process the Select Board has undertaken, and its desire to reach the required consensus in this matter. The goal has always been to convert the zoning of one of the last remaining major development sites along Rt 128 to its "highest and best" use, greatly increasing the tax revenues from the site to the relief of our residents, creating additional high paying jobs for our residents and others, as well as creating an architecturally pleasing entrance to Needham. The public concerns, in general, have always revolved around the increased traffic, particularly on Highland Ave, Gould Street, and Central Ave, fears of creating a "monolithic canyon" down Gould Street, and whether or not a less intensive "recreational" use might be better.

My concern is that the public does not realize or understand, especially considering their issues, that the current Industrial-1 zoning could allow the very situation they are hoping to avoid. Under the current zoning, if I'm not mistaken, approximately 300,000 square feet of 40' high warehouse/distribution space could be developed. Five years ago, this would be an unlikely scenario because such a development would not generate a "market value" for the

site. However, things have changed...the trend of internet shopping, e-commerce, has taken hold, ever more pronounced by the COVID-19 pandemic, with no signs of stopping, prompting the Amazons, Walmarts, etc., in this space to find new site locations meeting demographic and major highway access criteria for modern (1,000,000 SF) distribution hubs, and smaller satellite "fulfillment center" distribution centers. My company, Fulcrum Real Estate Partners, specializes in investment in industrial properties, and consultation services for various types of users for site selection. In our recent experience, we are learning that for the right location, price (whether it is for the site for their own development or for leasing a property built for their own specification on the site) is becoming a less important and influential criteria than others. Access to major highways, workforce, customers...and the ability to occupy relatively quickly without the risk of having to spend an inordinate amount of time and money for approvals and permits to operate their business with no guarantee of success...have become the major drivers. In short, the e-commerce giants will compete on price for a well-located site where they can develop a fulfillment center by right, with minimal oversight by the Town.

Again, having watched and participated in the public process of the proposed re-zoning for almost 5 years, I am concerned that the public still does not recognize or understand the potential problems that the continuous delay and revisiting of the merits of the rezoning may bring. The point here is that a 40' high, 300,000 SF "monolith" warehouse/distribution "fulfillment center" on the Muzi site, bringing 24/7 tractor trailer, box truck and van traffic on Gould Street and Highland Ave is not as far from a potential reality under the current zoning as the Planning Board, or the residents who are fighting what I personally believe to be a reasonable and well-thought out zoning change, might think it is. If it were to happen, it would be an incredible missed opportunity for Needham, in my opinion.

I support the Highway Commercial 1 rezoning effort and thank the Board for its consideration of my concerns.

Sincerely,
Rick Putprush

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Rick Putprush
Fulcrum Real Estate Partners, LLC / REP Realty Advisors, LLC
935 Great Plain Avenue, #123
Needham, MA 02492-3030
617.697.9750
rick.putprush@gmail.com

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Needham, MA 02492-3030
617.697.9750
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Suburbs gather to map Amazon's 'last mile'

Wary of warehouses, seek a regional plan

By Tim Logan, Globe Staff

In an ever-escalating race to get packages to your door faster, Amazon is opening shipping centers at a rapid clip in suburban towns all over Greater Boston — more rapidly, in fact, than those towns can figure out how to regulate them.

Now some of those suburbs are joining forces, trying to devise a regional approach to managing traffic and other issues related to all these warehouses, and to make sense of a segment of the retail industry that has grown rapidly during the COVID-19 pandemic and shows no signs of slowing.

The Metropolitan Area Planning Council recently released a 64-page report on the spread of e-commerce in Massachusetts. It focused on the front lines of the industry, the last-mile distribution centers that serve as way stations for packages dropped off overnight by the truckload and ushered out each morning by fleets of delivery drivers.

They're cropping up all over Greater Boston, as Amazon and its competitors expand their delivery networks closer to where customers live.

"There's an expectation now that deliveries happen ASAP,'' said Alison Felix, a transportation planner who wrote the report. "To meet that demand, companies are really focusing on these distribution centers.''

Amazon has 20 of them in Massachusetts — 10 of which opened since the start of 2020 — and 14 more are in the works, according to the council's report. When they're all up and running, Amazon will occupy 12.1 million square feet of warehouse space in the state, most of it along or inside Interstate 495.

Earlier this month, the Globe reported that Amazon is in the running to secure a site for a major shipping center at Widett Circle, just south of downtown Boston. The company is considering malls and big-box stores, too — former brick-and-mortar retail spaces that can be repurposed for the online age.

Other major retailers are also gobbling up warehouse space. Last week, home improvement chain Lowe's leased a 179,000-square-foot warehouse in Wilmington,

while Peloton earlier this month signed a five-year deal for a 75,000 square-foot shipping center in Middleborough, the better to get its exercise bikes to buyers faster.

No one, though, has an operation like that of Amazon, whose trademark blue delivery vans and legions of "Flex'' drivers in their personal cars fan out in waves from warehouses, sometimes several times a day.

Those trips take them through communities such as Dedham, where the company is seeking permission to more than triple the size of the 60,000-square-foot shipping center on Sprague Street it opened about five years ago.

Even at its current size, neighbors say, traffic generated by the busy warehouse clogs nearby streets with hundreds of vehicles a day. Residents are often roused from their sleep in the wee hours by the rumble of 16-wheelers. Some residents are pressuring the Planning Board to rein in Amazon's expansion plans, and the project has been stalled for months as the debate continues.

It can be hard to strike a balance between the desires of residents and the needs of businesses that occupy the same neighborhoods, said Dedham planning director Jeremy Rosenberger. That part of Sprague Street, just over the town line from Boston, has been industrial for decades and is zoned for warehouses.

Amazon wants to expand into space that was vacated by distribution centers for Macy's and Restoration Hardware, but those kinds of warehouses generated far less traffic.

"Trucks would come and go, and workers would arrive and leave, but it'd be pretty quiet,'' Rosenberger said. "Amazon runs a 24/7 operation.''

Adding to the frenzied activity, Amazon has changed the way it operates warehouses, speeding up delivery cycles and bringing in more drivers to meet customer demand. About five years ago, Everett approved a 51,000-square-foot Amazon warehouse on Beacham Street, near its bustling produce center along the Chelsea line. The city thought it had a handle on the amount of traffic Amazon would generate, said Jay Monty, a transportation planner for Everett. Then Amazon launched Flex.

"Everything changed. Suddenly [personal cars] were driving a lot in and out of the place,'' he said. "It's a much harder thing to track, much harder to regulate.''

The city is now asking operators of large warehouses to craft transportation management plans — the sort of consideration more commonly associated with big mixed-use developments in Boston — as they go through permitting. Monty hopes it will help mitigate the impact of a 222,000 square-foot distribution center that was recently approved for the city's bustling warehouse district. No tenant has yet been announced, but Amazon is always a possibility.

Then there are towns that don't have an Amazon warehouse, but are nonetheless affected by them.

This includes Wrentham, which straddles Interstate 495 just north of Rhode Island. There are Amazon distribution centers nearby in Bellingham and Milford and another one preparing to open next door in Mansfield. Amazon leases the lot of an undeveloped shopping center site in Wrentham as a satellite parking for delivery drivers, said planning and economic development director Rachel Benson. That alone generates dozens of extra car trips at busy times of day, and even causes lines at gas stations.

"I get calls about it all the time,'' Benson said. "People ask, 'Did you approve one of those Amazon warehouses?' ''

She is part of a group of local planners and administrators in the southwest region of Greater Boston — where Amazon's distribution network is thickest — who are starting to think about solutions that are broader than what any one community can execute.

That, Benson said, might include working with the Massachusetts Department of Transportation — which maintains many of the roads that delivery drivers travel — to better regulate traffic. Or it might involve mandating the kind of rigorous state environmental review that's typically required for larger office or residential projects, but not for most distribution centers.

The Metropolitan Area Planning Council is collaborating with Benson and her colleagues on a variety of ideas. The agency's recent report floats the prospect of requiring e-commerce companies to share more data about their delivery routes or offering incentives to minimize trips. Eric Bourassa, director of transportation at the council, acknowledged that it doesn't yet have an answer for dealing with the proliferation of Amazon centers.

"We raised more issues than we actually have policy solutions for at this point," he said.

Amazon disputed some of the report's findings, saying it "is not an accurate reflection of the benefits associated with our growth in Massachusetts." Warehouses, the company said, effectively reduce driving by replacing car trips of individual shoppers with a single delivery van. It added that Amazon has created 20,000 jobs across the state in recent years and has invested $6.2 billion over the last decade in Massachusetts facilities, infrastructure, and worker pay.

There is no disagreement over the reality of the e-commerce boom. Online shopping accounts for about 14 percent of retail sales, but that number has doubled in the last five years and continues to increase.

"What happens when it doubles again? When it gets to 30 percent?" What does that look like?" Bourassa said. "We're really only at the beginning of this."

Tim Logan can be reached at timothy.logan@globe.com.

NEEDHAM
ZONING BOARD OF APPEALS
AGENDA

THURSDAY, March 18, 2021 - 7:30PM

Zoom Meeting ID Number: 869-6475-7241

FOR PLANNING BOARD USAGE ONLY

To join the meeting link at: https://us02web.zoom.us/j/86964757241

Minutes	Review and approve Minutes from February 25, 2020 meeting.
Case #1 – 7:30PM	238 Highland Avenue- Public notice is hereby given that Allen Douglass and Christine Lachkey, applicants, have applied to the Board of Appeals for a Special Permit Amendment under Sections 5.1.1.5, 5.1.2, 5.1.3(j), 5.1.3(k), 5.1.3(l), 5.1.3(n), 7.5.2 and any other applicable Sections of the Zoning By-Law to expand the Needham Montessori School to allow up to 114 children. As part of this expansion, the parking area is proposed to be redesigned to meet design criteria and improved safety. The subject property is located at 238 Highland Avenue, Needham MA in the Highland Commercial -128 District.
Case #2 – 7:45 PM	**1257 Highland Avenue-** Public notice is hereby given that Melissa Gale/The Cookie Monstah Company, applicant, has applied to the Board of Appeals for a Special Permit under Sections 3.2.2, 5.1.1.5, 5.1.2, 5.1.3 7.5.2 and any other applicable Sections of the Zoning By-Law for a take-out counter accessory to a food retail establishment; for retail sales of ice cream, frozen yogurt and similar products for consumption on or off premises; for more than one non-residential use on a lot; and to waive strict adherence to parking requirements. The subject property is located at **1257 Highland Avenue, Needham MA** in the Business District.

Next Meeting: **Thursday, April 15, 2020,** 7:30pm

TOWN OF NEEDHAM
MASSACHUSETTS
BOARD OF APPEALS

RECEIVED TOWN CLERK NEEDHAM, MA
2021 FEB 22 PM 4:55

APPLICATION FOR HEARING

IT IS STRONGLY RECOMMENDED THAT APPLICANTS CONSULT WITH THE BUILDING INSPECTOR PRIOR TO FILING THIS APPLICATION.

Note: Application must be complete, with certified plot plan attached, and application fee included, or application will not be accepted.

Date: February 22, 2021

Name of Applicant or Appellant: Mr. Allen Douglass, Ms. Christine Lachkey

Address: 3 Curtis Street, Newton Highlands, MA

(Optional) E-mail address: needhammontessori@gmail.com

Daytime telephone: 781-664-3473

(Optional) Cell phone: _____

(Optional) additional contact information, (ie: ☐ contractor ☐ architect ☐ builder or ☒ attorney):

Evans Huber, Esq., Frieze Cramer Rosen & Huber, LLP, 60 Walnut Street, Wellesley, MA eh@128law.com

Address/Location of Property 238 Highland Ave., Needham, MA

Assessor map/parcel number 199/300.0 - 0059

Zone of property: HC-128

Is property within 100 feet of wetlands, 200 ft. of stream or in flood plain? ☐ Yes ☒ no

Applicant is ☐ owner, ☒ tenant, ☐ prospective tenant, ☐ licensee ☐ prospective purchaser

Type of Permit requested: ☐ residential or ☐ commercial

If residential renovation, will renovation constitute "new construction"? ☐ yes ☐ no

If commercial, please consult with building inspector regarding parking issues

Select one: ☐ Special Permit ☐ Variance ☐ Comprehensive Permit, M.G. L Ch. 40B

☒ Amendment ☐ Appeal Building Inspector Decision*

*(For an appeal from decision of Building Inspector, attach copy of the decision or other written notice received from the Building Inspector.)

Existing Conditions: By decision dated July 21, 2016, this Board granted a Special Permit to operate a Montessori School for 29 children. By decision dated April 26, 2018, the SP was amended to allow up to 50 children.

Statement of relief sought: Applicants seek to amend the SP to allow up to 114 children and up to 15 staff. As part of this proposed expansion, the parking areas are proposed to be re-designed to meet design criteria and improve safety.

Applicable Section(s) of Zoning By-Law: 7.5.2; 5.1.2; 5.1.3(j); 5.1.3(k); 5.1.3(l); 5.1.3(n), and any other applicable sections of the bylaw.

If application under Zoning Section 1.4, listed immediately above:

List nonconformities related to lot/structure(s) in application: No change to the structure is proposed. The current parking area has the nonconformities listed above, and others.

Date structure(s) on lot constructed (including any additions): N/A

Date lot created:

A certified plot plan, prepared by a registered surveyor, must be attached to each of the thirteen (13) copies of this application at time of filing. Application will be returned if a copy of the plot plan is not attached to each application.

•Applications for Comprehensive permits under M.G.L. Ch. 40B require thirteen (13) copies of plot plan (two reduced to 8 ½ by 11), plus additional submissions.

Please feel free to attach any additional information/photos relative to the application.

Additional information may be requested by the Board at any time during the application or hearing process.

A hearing before the Board of Appeals, with reference to the above noted application or appeal, is requested by

Signed _____

Title ATTORNEY FOR APPLICANTS

Application Packets must be delivered to the Town Clerk's Office.

COMMONWEALTH OF MASSACHUSETTS

NORFOLK, ss

NEEDHAM ZONING
BOARD OF APPEALS

Allen Douglass and Christine Lachkey, Applicants	)
Re: Application for Amendment To Special Permit For 238 Highland Ave, Needham	)

APPLICANTS' MEMORANDUM IN SUPPORT OF THEIR APPLICATION FOR AMENDMENT TO THEIR SPECIAL PERMIT

Applicants Allen Douglas and Christine Lachkey, who run the Needham Montessori School located at 238 Highland Avenue, submit this Memorandum in support of their request that the Board allow an amendment to their Special Permit, increasing the permitted enrollment from the currently allowed 50 children and 5 staff, to a maximum of 114 children and 15 staff. In connection with this Application, Applicants are also proposing a redesign of the existing parking areas which will (1) allow for a 6-foot wide walkway along the edge of the building adjacent to the main west parking lot (where none presently exists), for increased pedestrian safety, and (2) eliminate existing dimensional nonconformities as to setback from edge of building, length of spaces, width of maneuvering aisles, and requirements for handicapped spaces. However, this proposed redesign of the parking areas will have the effect of reducing the onsite parking supply from 55 spaces to 50 spaces, and, even after the redesign, certain other existing non-conformities with the requirements of Section 5.1.3 of the Bylaw (discussed below) will continue to be present. For the reasons set forth in this Memo and as presented at the hearing on this application, Applicants respectfully request that their application for an amendment to their existing Special Permit be approved.

I. FACTUAL BACKGROUND

A. The Property:

The Property is located in the C - 128 zoning district. The size of the property is approximately 45,800 s.f., located at the intersection of Highland Avenue and First Avenue, and contains a single-story building of approximately 15,400 s.f. At present, slightly less than half of the building, 7,265 s.f., is vacant. The site currently has 55 parking spaces, in two parking areas.

A certified plan of the existing conditions, including onsite parking, is attached hereto as **Exhibit 1**. The certified plot plan has also been submitted electronically as a separate document, which may be easier to read.[1]

B. The Needham Montessori School

The Needham Montessori school is one of two tenants at the property. It has been operating there since 2016 pursuant to a Special Permit issued by this Board. The Special Permit was amended by this Board in 2018, to allow an increase to up to 50 children and 5 staff. The hours of operation, as allowed by a 2017 amendment to the Special Permit, are from 7:00 a.m. to 6:00 p.m., on weekdays.

At present, the Needham Montessori School is occupying approximately 4,155 s.f. of the building. By this application, Applicants are seeking an amendment to their Special Permit to increase the maximum allowed enrollment to 114 children, and up to 15 staff. If this is allowed, the School is planning to expand into the remaining 7,265 s.f. of vacant space, which would result in the School occupying approximately 11,400 s.f. of the building.

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[1] This memorandum, with eight exhibits, is being submitted as a single PDF. In addition, because of their size, electronic versions of certain documents supporting this application (including exhibits 1, 3, and 4 to this memo) are being submitted separately. These include (1) the certified plot plan; (2) the proposed conceptual redesign of the parking areas; (3) the architectural drawings; (4) the traffic impact study; (5) the appendices to the traffic impact study; and (6) drop off and pickup operational data supporting the parking lot circulation analysis.

A letter from the owner of the property, RK Highland Avenue, LLC ("RK"), consenting to and expressing approval of this application, is attached as **Exhibit 2**. A plan of Needham Montessori's proposed use of the space is attached as **Exhibit 3.**

C. The Proposed Redesign of the Parking Areas

The applicants' view is that safety and functionality of the current parking area could be improved by a redesign of the main (east) parking area, and a restriping of the smaller (west) parking area (on the Mighty Subs side of the property). This is so for two primary reasons.

First, the main entrance to the space to be occupied by the School, if this expansion is allowed, faces the main (east) parking area, relatively close to Highland Avenue. As discussed in greater detail below, as part of this proposed expansion, applicants intend to require parents or caregivers (with the direction of staff members during peak hours) to pull as far into the parking lots as possible (i.e., as far away from Highland Avenue as possible), park, and walk their children to and from the entrance. At present, there is virtually no space between the perpendicular spaces adjacent to the east side of the building and the building itself, meaning that parents and children on that side of the building will have to walk through the parking lot itself to get to the main entrance.

As shown on **Exhibit 4** hereto, the proposed redesign of this parking lot will include a 6-foot wide sidewalk along the edge of the eastern side of the building. This will allow pedestrians who have parked in the east parking lot to safely walk to the front entrance on that side of the building.

Second, as shown on the certified plan of existing conditions attached as **Exhibit 1**, the current east parking lot does not meet Bylaw requirements as to setback from building, length of spaces, width of maneuvering aisles, and location of handicapped spaces. The proposed redesign

of the east parking area will eliminate these nonconformities. (Other existing non-conformities will remain, as discussed below).

In the smaller, west parking lot, the parking spaces will be restriped as perpendicular spaces. The Board's attention is drawn to three aspects of the proposed redesign of this area. First, the area identified as "PROP EXPANSION" on **Exhibit 4** does not represent an expansion of the building, but is identifying a portion of the existing paved parking lot to be fenced off and used as an outdoor play area. Second, there is an entrance to the building in the southwest corner of that parking lot, next to the proposed new outdoor play area. As discussed in greater detail below, one group of children and their parents/caregivers will use this parking area for drop-off and pick up, and will enter the building through that entrance. Third, the portion of the building in which Mighty Subs is located is actually on a separate, and separately owned, lot, with an address of 250 Highland Avenue. The spaces associated with that lot are shown on **Exhibit 4** as striped with dotted lines, indicating that they are not part of the parking supply for 238 Highland Ave, and are not counted in the parking supply in connection with the waiver requested under section 5.1.2 of the Bylaw.

Accordingly, as part of this Application, a proposed redesign of the parking lots is attached hereto as **Exhibit 4**. The redesign will, however, reduce the total parking supply on site from 55 to 50 spaces; 37 in the east parking lot, and 13 in the west parking lot.

D. Peak Drop Off and Pick Up Periods

In order to manage the arrival and departure of vehicles during peak drop-off and pick up periods, and to ensure that there is adequate parking at all times, if the proposed expansion sought by this application is allowed the School intends to implement the following drop-off and pick-up schedule:

1. Drop-offs

a. Drop-offs in the East Lot

The east lot will be used for drop-off and pick-up of the three groups known as the Infant, Pre-School, and Elementary School children.

School for the Infant and Elementary School children will begin at 8:20 a.m., and anticipated enrollment in these groups (if the full increase in enrollment is allowed) is approximately 36 children between these two programs. Anticipated arrival for these groups is between 8:00- 8:20 a.m., with virtually all parents and caregivers gone by, or shortly after, 8:20 a.m. School for the Pre-School children will begin at 8:50 a.m., and anticipated maximum enrollment in this group (if the full increase in enrollment is allowed) will be approximately 58 children. Anticipated arrival for this group is between 8:20- 8:50 a.m.

Children in these three groups will enter and exit the School through the main entrance, which faces the east parking lot near Highland Avenue. As shown by actual data collected by the School, the average length of time parents and caregivers spend in the parking lots during drop off is approximately two minutes (and during pick-up is less than four minutes). Further, a number of the currently enrolled children are siblings of other children in the programs, meaning that there currently is, and will continue to be, less than one vehicle per student arriving for drop-off and pick up. Given this, as well as the staggered arrival times, and the peak period drop-off and pick up protocols described below, the parking supply of 37 spaces in the (proposed redesigned) east lot is expected to be more than adequate for the no more than 94 children being dropped off in the east lot, in the 50-minute period between 8:00 a.m. and 8:50 a.m. This is discussed in greater detail in the Traffic Impact Analysis filed herewith.

b. Drop-offs in the West lot

The west lot will be used for drop-off and pick up of the group known as "Beginners." Anticipated enrollment for this program, if the full increase in enrollment is allowed, is approximately 20 children. School for the Beginner group will start at 8:30 with an anticipated 30-minute arrival period between 8:00-8:30 a.m. These children will enter (and exit) the School through the entrance to the building located at the southwest corner of the west lot. For the reasons discussed above, the parking supply of 13 spaces in the (proposed redesigned) west lot is expected to be more than adequate for the no more than 20 children being dropped off in the 30-minute period between 8:00 a.m. and 8:30 a.m. This is discussed in greater detail in the Traffic Impact Analysis filed herewith.

2. Pickups

Student pickup varies throughout the day. While a small percentage of children are picked up between 11:30 a.m. – Noon, for purposes of this application, the applicants are conservatively assuming that all children will fall into one of two groups: Full Day students, who are picked up at the end of the scheduled day (either 2:20 or 2:50, depending in which group the child is in); or Extended Day students, who are picked up sporadically between 3:00 – 6:00 p.m. Based on current enrollment, it is expected that approximately 60% of the students (approx. 69 children) will be Full Day, with the remaining 40% (approx.. 45 children) in Extended Day enrollment. Therefore, pick-ups are anticipated to operate as follows:

a. Pickups in the east lot

Those Full Day children to be picked up in the east lot (all children except for "Beginners") will be dismissed from school in two groups. Assuming full enrollment requested by this application is allowed, the first group will be approximately 22 students dismissed at 2:20 p.m. Based on current pick-up patterns, it is expected that parents and caregivers for this group

will arrive in a 20- minute window between 2:00-2:20 p.m. and will be gone shortly after 2:20 p.m. The second group will be approximately 35 students dismissed at 2:50 p.m. Based on current pick-up patterns, it is expected that parents and caregivers for this group will arrive in a 30- minute window between 2:20-2:50 p.m, and will be gone by 3:00 p.m.

Extended Day students to be picked up from the east lot, expected to be approximately 37 students, will be picked up during the three-hour period between 3:00-6:00 p.m.

b. Pickups in the west lot

As noted above, the group known as "Beginners," expected to be approximately 20 in number, will utilize the west lot for pick-ups. Of this group, approximately 12 are expected to be Full Day students dismissed starting at 2:00 p.m. with a 30-minute arrival period for parents and caregivers between 2:00-2:30 p.m. Extended day students in this group, expected to be about 8 children, will be picked up from the west lot between 3:00-6:00 p.m.

E. Proposed Peak Drop Off and Pick Up Protocols

During peak periods, School staff will be stationed at the drop-off/ pick-up areas to manage traffic and to facilitate the safety of pedestrians. Parents will be required to park for drop off and pick-up. No parking or stacking/idling in the travel aisle will be allowed, to be enforced by staff. Parents and caregivers will be expected, and directed by staff, to pull as far into the parking lot as possible to find a parking space, before parking and accompanying their child(ren) to and from the entrances. Parents and caregivers will be given information on school drop-off and pick-up times and procedures at the beginning of the school year, with periodic updates and reminders as necessary.

F. The Other Tenant at the Property:

The only other tenant at the property is the Mandarin Cuisine Restaurant (the "Mandarin"), which occupies approximately 4,000 s.f. of space at the south end of the east lot.

The Mandarin has 105 seats and is open on weekdays from 11:30 a.m. to 9:30 p.m. The Bylaw formula for restaurant parking is 1 space per 3 seats, plus 10 spaces for a take-out station. Strictly applied to the Mandarin, this would require 45 spaces, which is less than the redesigned parking supply on site. But more importantly, as described in an email attached hereto as **Exhibit 5** from Joan Low, owner and operator of the Mandarin, the typical peak periods and the number of customers typically present during those peak periods are such that actual parking demand for the restaurant is far less than the 45 spaces derived from the Bylaw formula.

That email shows the following: (1) During weekdays, the peak customer period for the Mandarin is between 11:30 a.m. and 1:30 p.m., and the typical actual customer load would require (applying the bylaw formula), approximately 28 spaces. (2) From 2:00 p.m. to 5:00 p.m., there is only minimal customer activity at the Mandarin, requiring only a few parking spaces at any given time. (3) during the dinner period, from 5:30 p.m. to 9:30 p.m., the typical actual customer load would require (applying the bylaw formula), approximately 23 parking spaces. This means that there is no overlap between the morning drop-off for the School and the Mandarin's operations, since the restaurant does not open until 11:30 a.m. Similarly, there is no overlap between the peak afternoon pick-up period for the School (largely between 2:00 p.m. and 3:00 p.m.) and the Mandarin's operations, since the Mandarin has virtually no customer activity between 2:00 and 5:00 p.m.

In addition, a letter from Ms. Low is attached hereto as **Exhibit 6**. In the letter, Ms. Low expresses support for the proposed expansion of the Needham Montessori School, which she considers to be a good neighbor. She explains that she has reviewed the proposed redesign of the parking areas, and that she has no concerns about parking issues, because the peak periods of the restaurant's operation do not overlap with the peak periods for drop off and pick up of children at the School.

G. Parking Requirements For Which A Special Permit Is Needed

a. Number of Spaces – Section 5.1.2

Because the Bylaw does not specify the number of spaces required for a use such as the School, applicants have requested a determination of that number from Commissioner Roche. As of the date of this filing, applicants have not received that letter, but anticipate that it will be provided by Mr. Roche in advance of the hearing on this matter.

It is expected that Commissioner Roche will calculate the parking requirement for the Needham Montessori School at this location, using the formula that the Town has been using for many years for similar uses. That formula states that if the projected maximum enrollment is known, for enrollments for 45 or fewer children, one parking space is required for every five students, plus employee parking. For enrollments greater than 45, 8 parking spaces are required, plus 1 space for every 40 students, plus employee parking. The number of spaces required for employee parking is determined as "the maximum number of staff on duty at any one time. Fractional spaces should be rounded up to the next full space." If this formula is applied to a maximum of 114 children and a maximum of 15 employees on site at any given time, the expanded enrollment will result in a parking requirement of 26 spaces -- 8 spaces, plus 1 space for every 40 students (3 spaces) plus 15 employee spaces, for a total of 26 parking spaces.

The Board may recall that one of the conditions of the current Special Permit is that School staff, if they arrive by car, must park offsite. The applicants expect to continue to comply with that condition, and to that end, the applicants have secured the agreement of Restaurant Depot that School staff may park in the nearby Restaurant Depot lot. An email to that effect, from the manager of Restaurant Depot, is attached as **Exhibit 7**. That lot is located close to 238 Highland; staff members parking there will simply have to cross Cabot Street and walk up First Avenue to an entrance into the School that faces First Avenue.

b. Certain Design Requirements – Section 5.1.3.

As noted above, the current east parking lot does not meet the requirements of Sections 5.1.3 (c) handicapped parking; (f) parking space size; (i) width of maneuvering aisle; (j) setbacks; (k) landscaping; (l) trees; and (n) bicycle racks, of the Bylaw. The proposed redesign of the parking lots will eliminate the non-conformities with respect to sections (c), (f), and (i), and one of the non-conformities with respect to section (j) (setback from building). However, even under the proposed redesign there will still be nonconformities with respect to section (j), (k), (l), and (n), so waivers are requested with respect to the requirements of those sections of Section 5.1.3 of the Bylaw. Applicants have not performed a photometric study of the parking lots, so it is unknown whether the lots comply with illumination requirements. However, virtually all of the School operations take place during daylight hours, and in any event applicants do not plan to make any changes to the existing lighting.

ARGUMENT

A. The Board Should Allow The Proposed Increase in Enrollment and Staff, And Grant A Waiver From The Requirements of Section 5.1.2. Of The Bylaw, Because There Is Sufficient Parking At The Property To Meet the School's Parking Needs, And Its Parking Needs Do Not Conflict With Those Of The Mandarin Cuisine Restaurant

Section 5.1.1.5 of the Bylaw provides, in part:

> The Board of Appeals may grant in all zoning districts excepting the Center Business District a special permit to waive strict adherence to the requirements of Section 5.1.2 and/or 5.1.3 where it can be demonstrated by an applicant with a parking plan prepared and reviewed in accordance with the provisions of Section 5.1.3 that a particular use, structure or lot, owing to special circumstances, does not warrant the number of parking spaces required by Section 5.1.2 and/or the application of certain design requirements contained in Section 5.1.3.
>
> 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 application 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

(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 can not be met.

With respect to the number of spaces required by Section 5.1.2 of the Bylaw, in this case, it is clear that the circumstances set forth in subparagraph (ii), above, are present. Literally applied, the Bylaw would require a total of seventy-one spaces at the property. It is evident from the plans submitted as Exhibits 1 and 4 that it is not physically possible to create 71 parking spaces in any manner at the property, much less 71 legal, conforming spaces. Nor would this situation be ameliorated if there were different tenants in the portion of the building that the School is planning to occupy. That portion of the building consists of approximately 11,400 s.f. of space (in total), and if this space were to be occupied by typical commercial tenants with a parking requirement of one space per 300 s.f. (such as, for example, retail or wholesale stores or services, offices, and banks), the parking requirement for the entire property would be 38 spaces for that portion of the building, plus 45 spaces for the Mandarin, for a total of 83 spaces. Clearly, this is not possible.

The question before this Board is thus not whether, if the property is to be fully occupied, a waiver of the parking requirements for number of spaces will be necessary, regardless of who occupies the portion of the building that the School is hoping to expand into. Clearly, the Bylaw parking requirements for other potential occupants is likely even higher than for the School (26 versus a potential of as much as 38 spaces required for other typical potential occupants of this portion of the building). The question is, what is the best way to balance full occupancy of the building with the need to make sure that parking, circulation, and traffic safety issues are addressed to the greatest extent possible?

Applicants have presented a variety of facts and circumstances, set forth above, that they believe merit allowing the School to expand into the remaining space, and allowing the proposed increase in enrollment and staff. These include:

1. Applicants' calculated parking requirement for the entire space not occupied by the Mandarin is substantially less than that which would be required for other potential commercial occupants of this portion of the building.

2. Applicants have secured the agreement of the nearby Restaurant Depot, allowing the School's staff to park in the Restaurant Depot lot, and reducing the parking demand on the 238 Highland lots by up to 15 spaces. It is doubtful that other potential commercial tenants at 238 Highland would be able to secure such an agreement, or that even if they did, customers of businesses located at 238 Highland would want to park in the Restaurant depot lot.

3. When this off-site parking is taken into account, the actual total onsite parking requirement as calculated by the Bylaw and the Town's oft-used formula is only 56 (45 for the Mandarin and 11 for the School). This is a shortfall of only 6 spaces – 56 versus the 50 that will be available under the proposed redesign of the parking lots.

4. Applicants are proposing a redesign of the parking lots that will eliminate some existing non-conformities and improve pedestrian safety. This proposed redesign has been shared with Commissioner Roche, who agrees that it is an improvement over existing conditions, notwithstanding the reduction in the overall number of spaces on site (from 55 to 50).

5. Applicants have demonstrated a workable plan and schedule for pick-up and drop-off that will allow all children to be safely dropped off and picked up within the two redesigned parking lots, and without materially impairing traffic flow on Highland Avenue.

6. Applicants' proposed drop-off and pick-up schedule does not conflict with the peak operational periods of the only other tenant at the property, the Mandarin.

7. The owner of the Mandarin, who is in the best position to know what kind of neighbor the School is, has expressed support for the proposed expansion of the School, and has no concerns about parking for her customers, or the proposed redesign of the parking lots.

For all of these reasons, Applicants request that their application for an amendment to their Special Permit be allowed, and that the amended Special Permit waive the requirement of strict compliance with the number of spaces called for by Section 5.1.2 of the Bylaw

B. Special Circumstances Justify The Board Granting A Waiver From The Parking Design Requirements of Sections 5.1.3 (j), (k), (l) and (n) Of The Bylaw

The design requirements of Section 5.1.3 for which waivers are requested are subsections (j) setbacks; (k) landscaping; (l) trees; and (n) bicycle racks. With respect to the setback requirements of subsection (j), one will be eliminated by the proposed redesign (parking space setback from edge of building), but there are two that are still an issue:(i) parking spaces should be setback at least 4 feet from the property line and (ii) spaces must be setback at least 20 feet from a front lot line or street right of way.

The "special circumstances" here are that the size and layout of the building mandates that the parking spaces be located where they are. If the Board were to require literal compliance with these design criteria, it would further substantially reduce the number of bylaw-compliant spaces, in two respects. First, the easternmost row of spaces in the east lot would not have sufficient room for the required width of the maneuvering aisle, and would have to be redesigned in a way that further reduces the number of spaces in that row. Second, the two spaces in that row closest to Highland Avenue within the 20-foot setback would have to be eliminated. Clearly, these are not desirable outcomes.

The parking lots (both existing and the proposed redesign) also do not meet design criteria for landscaping and trees. As can be seen from the site plan, there is virtually no room on the property for landscaping and trees. Applicants request that a Special Permit waiving the requirements of these subsections of Section 5.1.3 of the Bylaw be granted.

Lastly, Applicants request a waiver of the requirements for bicycle racks, which are required whenever there are 40 or more parking spaces. It is not anticipated that children enrolled at the School will be arriving by bicycle.

C. The Application Complies with Section 7.5.2.1 of the Bylaw

Section 7.5.2.1 of the Bylaw provides, in part:

> Prior to granting a special permit, the Board of Appeals shall make a finding and determination that the proposed use, building, structure . . . 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;
>
> (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; [and]
>
> (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.

With respect to Section 7.5.2.1 (a), for the reasons discussed above, the proposed expansion of the School satisfies the criteria of Section 5.1.1.5, the section of the Bylaw under which this amendment to the existing Special Permit is sought.

With respect to Section 7.5.2.1 (b), Applicants' proposed expansion of its space and enrollment is consistent with the general purposes of the Bylaw as set forth in Section 1.1, specifically including promoting the convenience and welfare of the inhabitants of Needham by making available to more of them than is currently the case, a high-quality private school option for young children, for which there is high demand.

Finally, with respect to Section 7.5.2.1 (c), the proposed expanded program is compatible with the existing features on the site, and is compatible with other buildings in the area. The School has already been operating successfully at this location for almost 5 years, and the feedback from many parents is that they like the location.

CONCLUSION

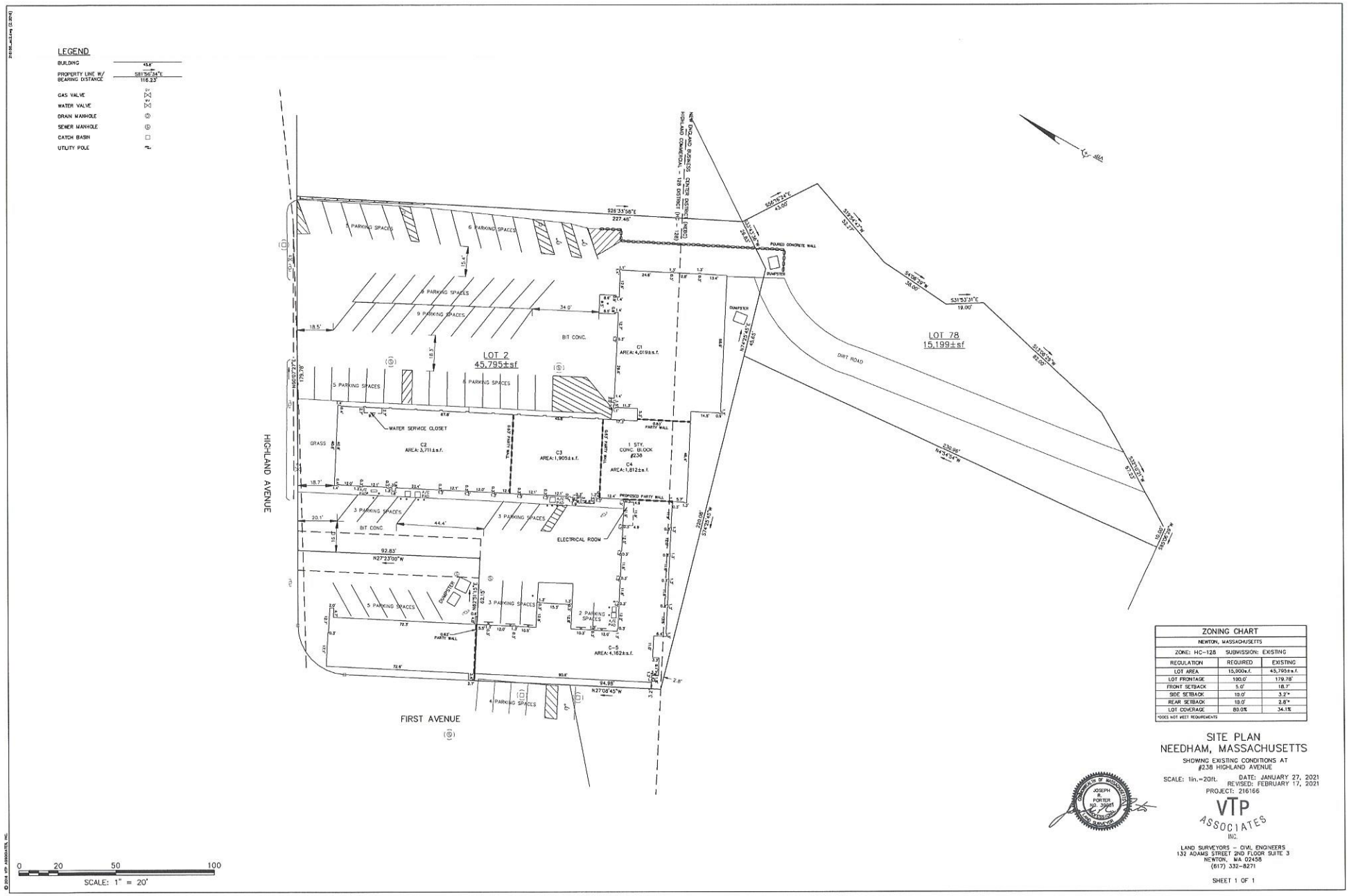
For the reasons set forth above, Applicants request that their application for an amendment to their Special Permit, allowing an expansion of the permitted enrollment to a maximum of 114 children and up to 15 staff, and subject to such conditions as the Board may reasonably impose, be approved.

Respectfully Submitted
Applicants
Allen Douglass and Christine Lachkey,
By their attorneys,

Evans Huber, Esq.
BBO # 542133
Frieze Cramer Rosen & Huber LLP
60 Walnut Street
Wellesley, MA 02481
(781) 943-4000

Date: February 22, 2021

EXHIBIT 1



ZONING CHART		
NEWTON, MASSACHUSETTS		
ZONE: HC-128	SUBMISSION: EXISTING	
REGULATION	REQUIRED	EXISTING
LOT AREA	15,000s.f.	45,795±s.f.
LOT FRONTAGE	100.0'	179.78'
FRONT SETBACK	5.0'	18.7'
SIDE SETBACK	10.0'	3.2'*
REAR SETBACK	10.0'	2.8'*
LOT COVERAGE	80.0%	34.1%
*DOES NOT MEET REQUIREMENTS		

SITE PLAN
NEEDHAM, MASSACHUSETTS

SHOWING EXISTING CONDITIONS AT #238 HIGHLAND AVENUE

SCALE: 1in.=20ft. DATE: JANUARY 27, 2021
REVISED: FEBRUARY 17, 2021
PROJECT: 216166

VTP ASSOCIATES INC.
LAND SURVEYORS – CIVIL ENGINEERS
132 ADAMS STREET 2ND FLOOR SUITE 3
NEWTON, MA 02458
(617) 332-8271

SHEET 1 OF 1

EXHIBIT 2

RKCenters

R.K. Highland Avenue, LLC
50 Cabot Street, Suite 200
Needham, Massachusetts 02494

February 11, 2021

Jon D. Schneider, Chair
Needham Zoning Board of Appeals
500 Dedham Avenue
Needham, MA 02492

Re: 238 Highland Ave. Needham, MA

Dear Mr. Schneider:

R.K. Highland Avenue, LLC, ("RK") is the owner of the property located at 238 Highland Ave. in Needham. I am writing on behalf of RK in support of the application of the The Needham Montessori School for an amendment to its existing Special Permit. The proposed amendment, if approved by this Board, will permit The Needham Montessori School to increase the number of students it is allowed to serve, which in turn will allow the School to expand into the approximately 7,250 s.f. portion of the building at this location that is currently vacant.

As part of its application, Needham Montessori is, with the approval of RK, proposing a redesign of the parking lots servicing the property. The purpose of the redesign is (1) to create a 6-foot wide sidewalk along the side of the building to allow Needham Montessori parents and students to safely walk from their parked cars to the front entrance of the building; and (2) to ensure that Bylaw requirements for length and width of spaces, width of maneuvering aisles, and size and location of handicapped spaces, are met. Although re-designing the parking areas to meet these goals will result in a reduction of the current parking supply on the property, from 55 to 50, RK believes that, given the nature of the two tenants, the benefits of the re-design outweigh the reduction in the number of parking spaces.

At present, there are two tenants at the building; Needham Montessori, and the Mandarin Restaurant. We have met with the owners of the Mandarin Restaurant to discuss Needham Montessori's proposed expansion into the currently vacant space, and proposed redesign of the parking area. The Mandarin Restaurant supports these proposals.

In terms of peak uses of the parking areas, the Mandarin Restaurant and Needham Montessori are complimentary uses. Their peak periods of use of the parking areas do not overlap or conflict with one another. Because of this, we believe that these two tenants, collectively occupying the entire building, are the best possible combination of tenants at the

property. If Needham Montessori's proposed amendment to its Special Permit is approved by this Board, they will be the only two tenants at the property.

We hope the Board takes these matters into consideration in making its decision. Thank you.

Sincerely,

R.K. Highland Avenue, LLC

David Katz
Manager

EXHIBIT 3

INTERIOR EXPANSION
NEEDHAM MONTESSORI SCHOOL
238 HIGHLAND AVENUE,
NEEDHAM, MA

TENANT:
NEEDHAM MONTESSORI SCHOOL

CONTACT: ALLEN DOUGLASS
TEL 617-633-4133

RKCenters
50 CABOT STREET
SUITE 200
NEEDHAM, MA 02494

CONTACT: DAVID BAKER
TEL 781-320-0001

February 22, 2021
Issued for Zoning Board of Appeal Hearing
Building Permit and Construction

CODE COMPLIANCE - 780 CMR - 9TH EDITION

EXISTING AREA, USE & OCCUPANCY	4, 155 S.F., EDUCATION
EXPANSION TO EXISTING, AREA, USE AND OCCUPANCY	7, 265 S.F. MERCANTILE
NEW TOTAL AREA, USE AND OCCUPANCY	11,420 S.F., EDUCATION
TYPE OF CONSTRUCTION	2B
ALTERATION LEVEL	LEVEL 2-CHAPTER 8
FIRE PROTECTION SYSTEM	AUTOMATIC SPRINKLER SYSTEM-EXISTING
OCCUPANT LOAD-TABLE 1004.1.2	11,420 S.F / 20 S.F. PER OCCUPANT = 521
ACTUAL NUMBER OF STUDENTS	114
ACTUAL NUMBER OF TEACHERS AND CAREGIVERS	15
REQUIRED NUMBER AND WIDTH OF EGRESS	3 EXITS, 79" WIDTH(521X.15"/OCCUPANT)
PROVIDED NUMBER AND WIDTH OF EGRESS	7 EXITS, 324" WIDTH(5-36"+2-72")
REQUIRED NUMBER OF TOILETS:	6 INFANTS: NONE , 18 TODDLERS: 2, 60 PRE-SCHOOL: 4, 30 ELEMENTARY: 2, 15 STAFF: 2 , TOTAL OF 10
PROVIDED NUMBER OF TOILETS:	TODDLERS: 4, PRE-SCHOOL: 4, ELEMENTARY: 2, STAFF: 2 , TOTAL: 10
REQUIRED ACCESSIBLE TOILETS	2 ACCESSIBLE TOILETS
PROVIDED ACCESSIBLE TOILETS	3 ACCESSIBLE TOILETS.

DRAWING LIST

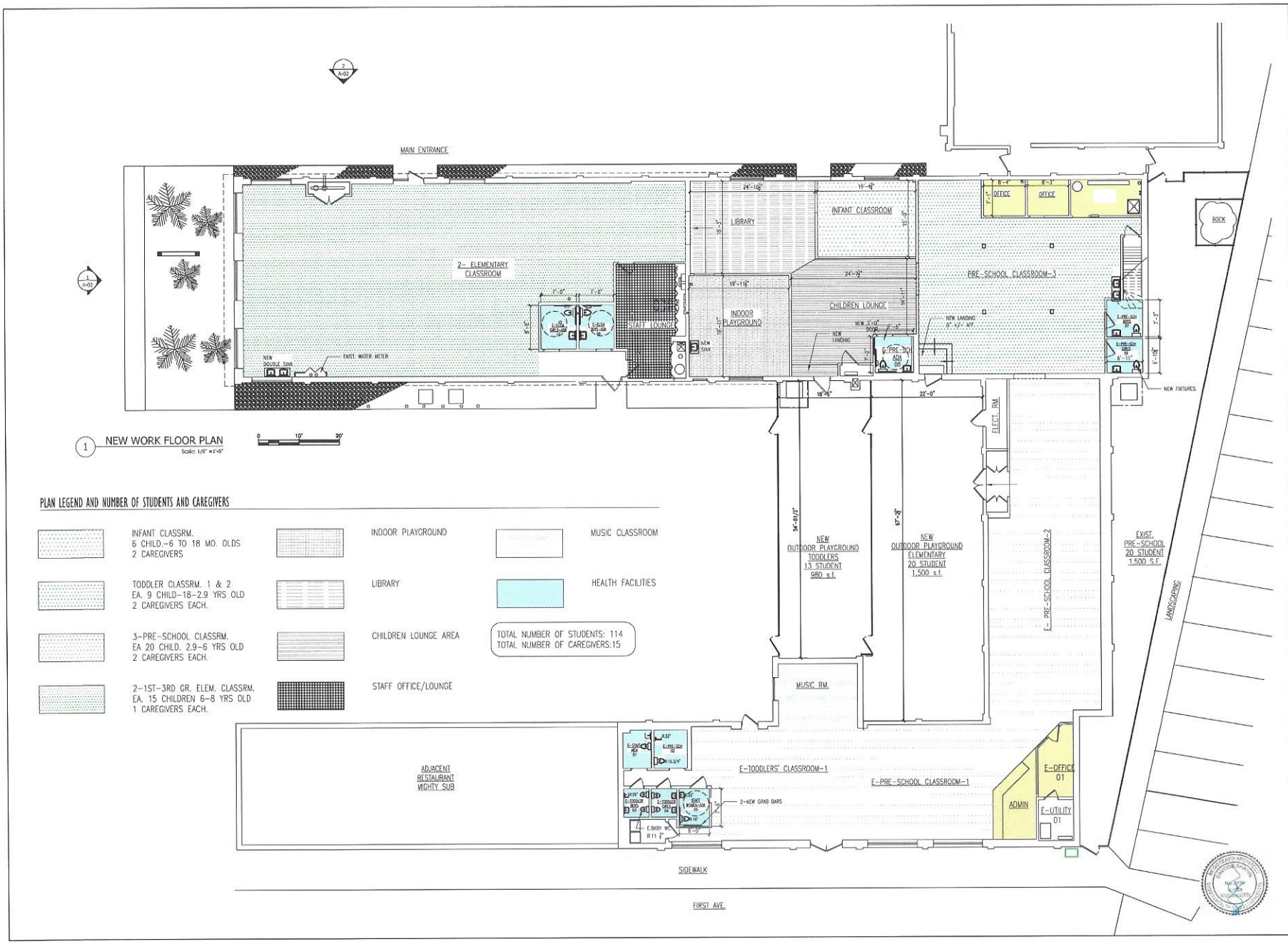
ARCHITECTURAL

KEY PLAN

DSH DESIGN GROUP - ARCHITECTS

architecture that is Distinctive, Simple & Harmonious

233 NEEDHAM STREET, Suite 300 Newton, MA 02464 T-617-454-1230 F-617-454-1231 E-info@dshdesigngroup.com www.dshdesigngroup.com



1 NEW WORK FLOOR PLAN
Scale: 1/8" = 1'-0"

0 10' 20'

PLAN LEGEND AND NUMBER OF STUDENTS AND CAREGIVERS

- INFANT CLASSRM. 6 CHILD.–6 TO 18 MO. OLDS 2 CAREGIVERS
- TODDLER CLASSRM. 1 & 2 EA. 9 CHILD–18–2.9 YRS OLD 2 CAREGIVERS EACH.
- 3–PRE–SCHOOL CLASSRM. EA 20 CHILD. 2.9–6 YRS OLD 2 CAREGIVERS EACH.
- 2–1ST–3RD GR. ELEM. CLASSRM. EA. 15 CHILDREN 6–8 YRS OLD 1 CAREGIVERS EACH.
- INDOOR PLAYGROUND
- LIBRARY
- CHILDREN LOUNGE AREA
- STAFF OFFICE/LOUNGE
- MUSIC CLASSROOM
- HEALTH FACILITIES

TOTAL NUMBER OF STUDENTS: 114
TOTAL NUMBER OF CAREGIVERS:15

DSH Design Group ARCHITECTS ENGINEERS
135 Second Ave, Suite 405 Needham, MA 02494
info@dshdesigngroup.com 1-617-454-4101 www.dshdesigngroup.com

RKCenters
50 CABOT STREET
SUITE 200
NEEDHAM, MA 02494

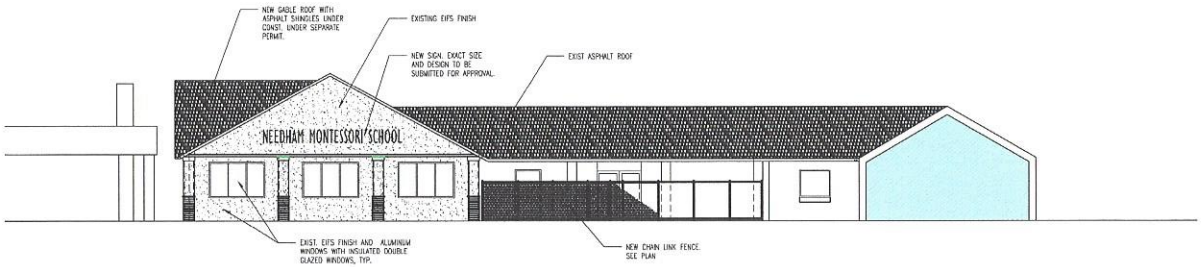
DRAWING ISSUED:
DATE: 02.16.2021
ISSUED FOR ZBA HEARING AND PERMIT

SPACE ALOCATION AND PLAYGROUND PLAN

INTERIOR EXPANSION OF NEEDHAM MONTESSORI SCHOOL
HIGHLAND PLAZA
238 HIGHLAND AVE, NEEDHAM, MA. 02494

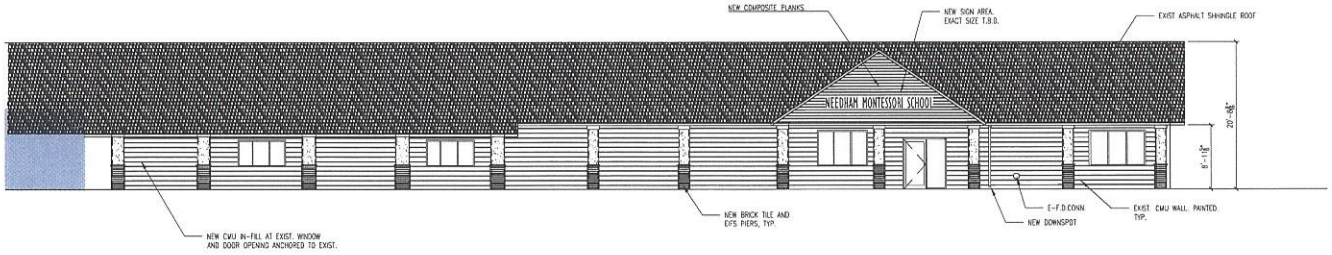
DATE: 11.01.2020
DATE: 1 /8"=1'-0"

A-01



1 EXISTING FRONT ELEVATION-FOR REFERENCE

Scale: 1/8" =1'-0"



2 EXISTING SIDE ELEVATION-FOR REFERENCE

Scale: 1/8" =1'-0"

0 10' 20'

DSH Design Group ARCHITECTS ▫ ENGINEERS ▫ CM
15 Kneeland Ave, Suite 601 Needham, MA 02494 (781)-454-1208 www.dshdesigngroup.com
e-mail@dshdesigngroup.com

RKCenters
50 CABOT STREET
SUITE 200
NEEDHAM, MA 02494

DRAWING ISSUED:

DATE:	ISSUED FOR ZBA HEARING AND PERMIT
02.16.2021	

BUILDING ELEVATIONS

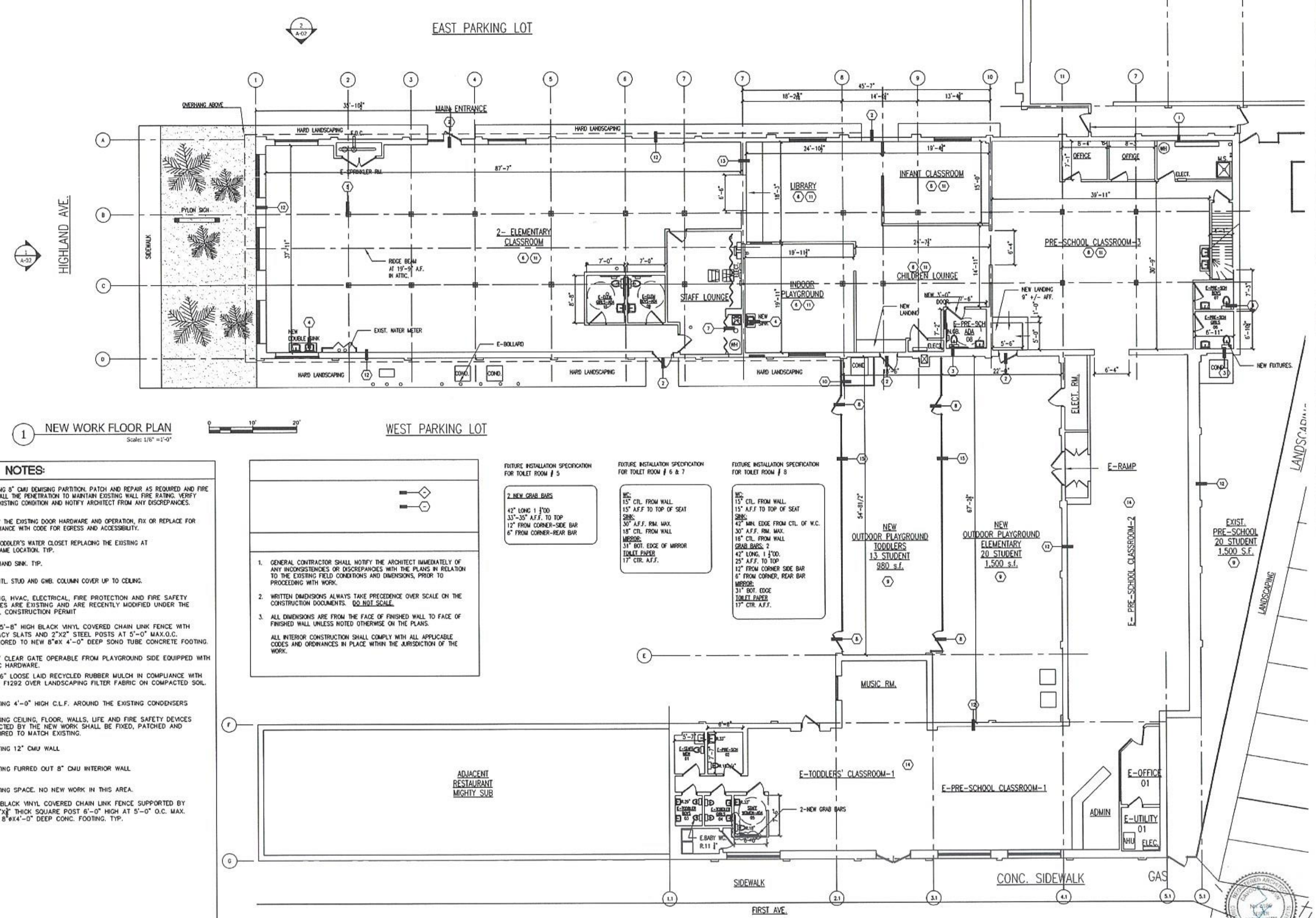
INTERIOR EXPANSION OF NEEDHAM MONTESSORI SCHOOL
HIGHLAND PLAZA
238 HIGHLAND AVE, NEEDHAM, MA. 02494

DATE: 08.11.2020

DATE: 1 /8"=1'-0"

A-02

2 OF 3 SHEETS



1 NEW WORK FLOOR PLAN
Scale: 1/8" =1'-0"

PLAN NOTES:

1. EXISTING 8" CMU DEMISING PARTITION. PATCH AND REPAIR AS REQUIRED AND FIRE SAFE ALL THE PENETRATION TO MAINTAIN EXISTING WALL FIRE RATING. VERIFY THE EXISTING CONDITION AND NOTIFY ARCHITECT FROM ANY DISCREPANCIES.
2. VERIFY THE EXISTING DOOR HARDWARE AND OPERATION. FIX OR REPLACE FOR COMPLIANCE WITH CODE FOR EGRESS AND ACCESSIBILITY.
3. NEW TODDLER'S WATER CLOSET REPLACING THE EXISTING AT THE SAME LOCATION. TYP.
4. NEW HAND SINK. TYP.
5. NEW MTL. STUD AND GWB. COLUMN COVER UP TO CEILING. TYP.
6. CEILING, HVAC, ELECTRICAL, FIRE PROTECTION AND FIRE SAFETY DEVICES ARE EXISTING AND ARE RECENTLY MODIFIED UNDER THE SHELL CONSTRUCTION PERMIT
7. NEW 5'-8" HIGH BLACK VINYL COVERED CHAIN LINK FENCE WITH PRIVACY SLATS AND 2"X2" STEEL POSTS AT 5'-0" MAX.O.C. ANCHORED TO NEW 8"ø X 4'-0" DEEP SONO TUBE CONCRETE FOOTING.
8. 3'-0" CLEAR GATE OPERABLE FROM PLAYGROUND SIDE EQUIPPED WITH PANIC HARDWARE.
9. NEW 6" LOOSE LAID RECYCLED RUBBER MULCH IN COMPLIANCE WITH ASTM F1292 OVER LANDSCAPING FILTER FABRIC ON COMPACTED SOIL. TYP.
10. EXISTING 4'-0" HIGH C.L.F. AROUND THE EXISTING CONDENSERS
11. EXISTING CEILING, FLOOR, WALLS, LIFE AND FIRE SAFETY DEVICES AFFECTED BY THE NEW WORK SHALL BE FIXED, PATCHED AND REPAIRED TO MATCH EXISTING.
12. EXISTING 12" CMU WALL
13. EXISTING FURRED OUT 8" CMU INTERIOR WALL
14. EXISTING SPACE. NO NEW WORK IN THIS AREA.
15. NEW BLACK VINYL COVERED CHAIN LINK FENCE SUPPORTED BY 3"X3"X¼" THICK SQUARE POST 6'-0" HIGH AT 5'-0" O.C. MAX. WITH 8"øX4'-0" DEEP CONC. FOOTING. TYP.

1. GENERAL CONTRACTOR SHALL NOTIFY THE ARCHITECT IMMEDIATELY OF ANY INCONSISTENCIES OR DISCREPANCIES WITH THE PLANS IN RELATION TO THE EXISTING FIELD CONDITIONS AND DIMENSIONS, PRIOR TO PROCEEDING WITH WORK.
2. WRITTEN DIMENSIONS ALWAYS TAKE PRECEDENCE OVER SCALE ON THE CONSTRUCTION DOCUMENTS. DO NOT SCALE.
3. ALL DIMENSIONS ARE FROM THE FACE OF FINISHED WALL TO FACE OF FINISHED WALL UNLESS NOTED OTHERWISE ON THE PLANS.

ALL INTERIOR CONSTRUCTION SHALL COMPLY WITH ALL APPLICABLE CODES AND ORDINANCES IN PLACE WITHIN THE JURISDICTION OF THE WORK.

FIXTURE INSTALLATION SPECIFICATION FOR TOILET ROOM # 5

2 NEW GRAB BARS
42" LONG 1 ¼"OD
33"-35" A.F.F. TO TOP
12" FROM CORNER-SIDE BAR
6" FROM CORNER-REAR BAR

FIXTURE INSTALLATION SPECIFICATION FOR TOILET ROOM # 6 & 7

WC:
15" CTL. FROM WALL
15" A.F.F TO TOP OF SEAT
SINK:
30" A.F.F. RIM. MAX.
18" CTL. FROM WALL
MIRROR:
31" BOT. EDGE OF MIRROR
TOILET PAPER
17" CTR. A.F.F.

FIXTURE INSTALLATION SPECIFICATION FOR TOILET ROOM # 8

WC:
15" CTL. FROM WALL
15" A.F.F TO TOP OF SEAT
SINK:
42" MIN. EDGE FROM CTL. OF W.C.
30" A.F.F. RIM. MAX.
18" CTL. FROM WALL
GRAB BARS: 2
42" LONG, 1 ¼"OD.
25" A.F.F. TO TOP
12" FROM CORNER SIDE BAR
6" FROM CORNER, REAR BAR
MIRROR:
31" BOT. EDGE
TOILET PAPER
17" CTR. A.F.F.

DSH Design Group
ARCHITECTS ▫ ENGINEERS ▫ CM
15 Second Ave, Suite 405 Needham, MA 02494
info@dshdesigngroup.com 1-617-454-1230 www.dshdesigngroup.com

RKCenters
50 CABOT STREET
SUITE 200
NEEDHAM, MA 02494

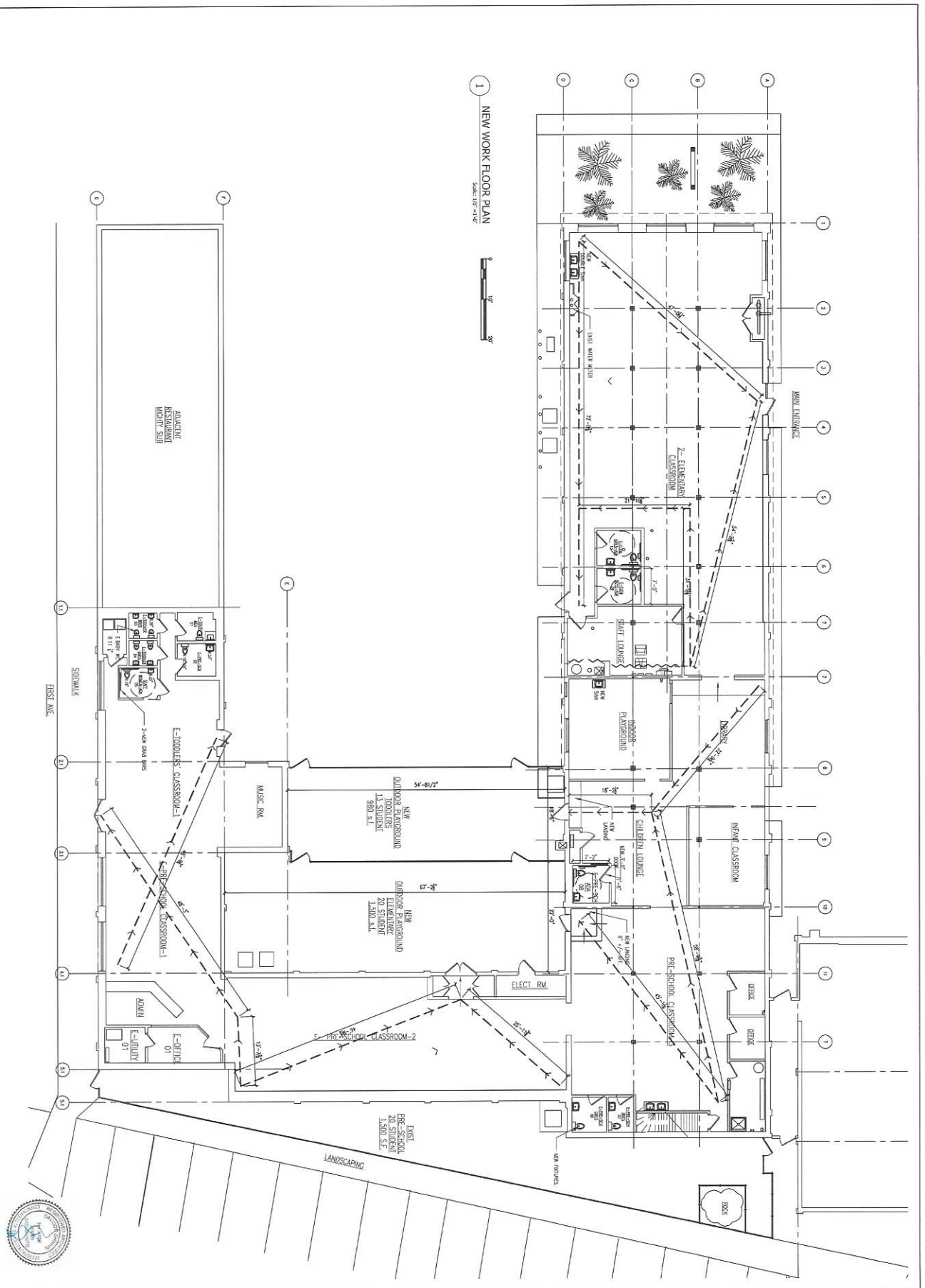
DATE:	DRAWING ISSUED:
02.16.2021	ISSUED FOR ZBA HEARING AND PERMIT

CONSTRUCTION FLOOR PLAN

INTERIOR EXPANSION OF NEEDHAM MONTESSORI SCHOOL
HIGHLAND PLAZA
238 HIGHLAND AVE, NEEDHAM, MA. 02494

DATE: 11.01.2020
DATE: 1 /8"=1'-0"

A-03



A-04	EGRESS TRAVEL PATH FLOOR PLAN	DATE:	DRAWING ISSUED:
5 OF 5 SHEETS	INTERIOR EXPANSION OF NEEDHAM MONTESSORI SCHOOL HIGHLAND PLAZA 238 HIGHLAND AVE, NEEDHAM, MA. 02494	02.16.2021	ISSUED FOR ZBA HEARING AND PERMIT
	DATE: 11.01.2020 DATE: 1 /8"=1'-0"		

RKCenters
50 CABOT STREET
SUITE 200
NEEDHAM, MA 02494

DSH Design Group ARCHITECTS ▫ ENGINEERS ▫ CM
75 Second Ave, Suite 605 Needham, MA 02494
info@dshdesigngroup.com T:617-454-9230 www.dshdesigngroup.com

EXHIBIT 4

NEEEDHAM MONTESSORI SCHOOL

CONCEPTUAL PARKING & CIRCULATION

238 HIGHLAND AVE

January 25, 2021

SCALE 1"=40'

PARKING SUMMARY

MANDARIN LOT:
37 TOTAL SPACES

45 DEGREE PARKING WITH 14' ONE-WAY AISLE

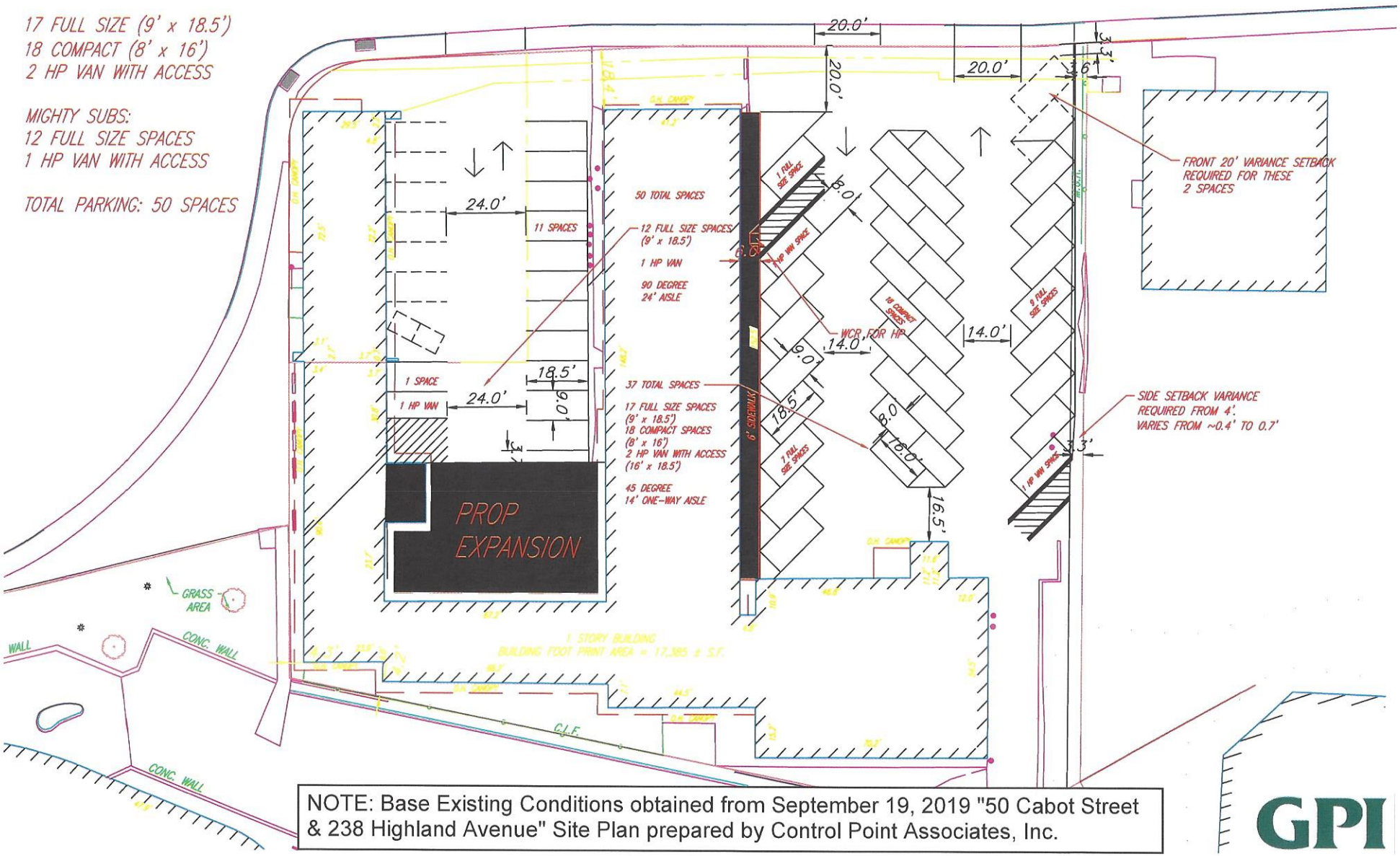
17 FULL SIZE (9' x 18.5')
18 COMPACT (8' x 16')
2 HP VAN WITH ACCESS

MIGHTY SUBS:
12 FULL SIZE SPACES
1 HP VAN WITH ACCESS

TOTAL PARKING: 50 SPACES

HIGHLAND AVENUE

(VARIABLE - PUBLIC - STATE HIGHWAY LAYOUT NO.8524)



NOTE: Base Existing Conditions obtained from September 19, 2019 "50 Cabot Street & 238 Highland Avenue" Site Plan prepared by Control Point Associates, Inc.

GPI

EXHIBIT 5

Evans Huber

From: Allen Douglass <needhammontessori@gmail.com>
Sent: Monday, February 1, 2021 2:46 PM
To: John Diaz; Evans Huber
Subject: Fwd: parking letter

---------- Forwarded message ---------
From: **Allen Douglass** <allendgls19@gmail.com>
Date: Mon, Feb 1, 2021 at 2:44 PM
Subject: Fwd: parking letter
To: Allen Douglass <needhammontessori@gmail.com>

---------- Forwarded message ---------
From: <ylow@aol.com>
Date: Mon, Feb 1, 2021 at 1:01 AM
Subject: Re: parking letter
To: allendgls19@gmail.com <allendgls19@gmail.com>

02/01/2021

To whom it may concern,

Mandarin Cuisine is a restaurant located on 238 Highland Avenue, Needham, MA 02494. The restaurant seats 105 at full capacity. This is an estimate of the operation traffic for Mandarin Cuisine before COVID-19. Mandarin Cuisine is open daily Monday through Friday at 11:30 AM to 09:30 PM.

From 11:30 AM to 01:30 PM, ≈65/105 dine-in seats are filled on average. ≈6/10 pickup parking spots are filled on average.

From 02:00 PM to 05:00 PM, ≈5/105 dine-in seats are filled on average. ≈2 pickup parking spots are filled on average.

From 05:30 PM to 09:30 PM, ≈50/105 dine-in seats are filled on average. ≈6 pickup parking spots are filled on average.

These numbers should be reasonably accurate for before January 2020, the pre-COVID-19 period. I hope this helps in the concern of parking during the school and restaurant operating hours.

Sincerely,

Joan Low
Mandarin Cuisine
238 Highland Ave
Needham, MA 02494
Tel: 781-455-8801

EXHIBIT 6

Low & Zhang, Inc.
d/b/a Mandarin Cuisine
238 Highland Avenue
Needham, MA 02494

February 17, 2021

Jon D. Schneider, Chair
Needham Zoning Board of Appeals
500 Dedham Avenue
Needham, MA 02492

Dear Mr. Schneider:

I am the owner of the Mandarin Cuisine restaurant located at 238 Highland Avenue in Needham. Allen Douglas of the Needham Montessori School has told me that the School is planning to expand into the rest of the building that is currently empty, and to increase the number of students. I have told him that I fully support his proposed expansion, as I consider the School to be a good neighbor.

I have also met with the landlords of the property, who have shown me the proposed new design of the parking lots. They have explained to me that although this will result in fewer parking spaces, the new design will now comply with the Town's parking design requirements, and will allow a walkway along the edge of the building for children and parents to walk to the front entrance of the School.

I want to let the Board know that I am in favor of allowing the School to increase in size and expand into the rest of the building, and I am also in favor of the proposed redesign of the parking lots. I am not concerned about any parking issues, since the peak operational hours of Mandarin Cuisine do not conflict with the peak hours of the School for parents dropping off and picking up their children. I have previously provided Mr. Douglas with an email with details of Mandarin Cuisine's peak hours and percentage of seats typically occupied in the restaurant.

Thank you.

Sincerely,

Joan Low

EXHIBIT 7

Evans Huber

From: Allen Douglass <needhammontessori@gmail.com>
Sent: Friday, January 8, 2021 4:04 PM
To: Davood Shahin; Evans Huber; John Diaz; Michael Doton; Dave Baker; Paul Landry; Chris Grant
Subject: Fwd: Parking

---------- Forwarded message ---------
From: **Manager Needham** <manager.050@jetrord.com>
Date: Fri, Jan 8, 2021 at 2:59 PM
Subject: Re: Parking
To: Allen Douglass <needhammontessori@gmail.com>

Mr. Douglass,

Great speaking with you as well. Partnering with Needham Crossing Tenants, I will allow parking in the right side of the property(Cabot Street side).

I believe this will not affect our business by your team parking there.

RD will not be responsible for any of the vehicles that are parked on the property like our customers.

If anyone has any questions, please feel free to have them contact me at the store.

Thank you,
Steve Keenan
Restaurant Depot #550
114 1st Ave
Needham, MA 02494
(781) 449-1010
(781) 449-8998 Fax

From: Allen Douglass <needhammontessori@gmail.com>
Sent: Friday, January 8, 2021 1:30 PM
To: Manager Needham <manager.050@jetrord.com>
Subject: Parking

Good afternoon Steve,

Thank you for speaking with me today. I wanted to send an email to you about getting verification that Needham Montessori employees can use your parking accommodations against Cabot St? We would need parking on Monday-Fridays from 8am-2:30pm.

Please respond to this email with your response so we have this email as documentation.

Thank you,
Allen Douglass
Director
Needham Montessori School

Town of Needham
Building Department
500 Dedham Ave.
Needham, MA 02492

Tel.781-455-7550 x 308

February 16, 2021

Evans Huber, Esq.
Frieze Cramer Rosen & Huber LLP
60 Walnut Street
Wellesley, MA 02481

Re: Parking Determination
The Needham Montessori School
238 Highland Ave, Needham

Dear Mr. Huber:

I have reviewed the information that you provided me and am responding to your request for a parking determination for the proposed increase in enrollment in the program presently being run by The Needham Montessori School in a portion of the premises located at 238 Highland Avenue. The Needham Montessori School has been operating pursuant to a Board of Appeals decision issued on September 16, 2016 and subsequently amended in 2017 (to increase the hours of operation) and 2018 (to increase the maximum enrollment to 50 students).

The Needham Zoning By-Law (Section 5.1.2) does not specify a parking requirement for private pre-schools, elementary schools, day care centers, or afterschool facilities. The Needham Montessori School use is similar to other uses in which, for the past 20-plus years, the Town has relied on a study entitled "Parking and Trip Generation Characteristics for Daycare Facilities" by John W. Van Winkle and S. Colin Klnton, published in the ITE Journal of July, 1994 (the "Parking Study"). The parking requirement cited therein, which has been utilized on numerous occasions by the Town, and which I relied on for a previous calculation of the parking requirement for the Needham Montessori School at this location, is that if the projected maximum enrollment is known, for enrollments for 45 or fewer children, one parking space is required for every five students, plus employee parking. For enrollments greater than 45, 8 parking spaces are required, plus 1 space for every 40 students, plus employee parking. The number of spaces required for employee parking is determined as "the maximum number of staff on duty at any one time. Fractional spaces should be rounded up to the next full space."

As noted above, in 2018, the Needham Montessori School proposed to expand its enrollment to a maximum of 50 children and a maximum of five employees. Relying on the Parking Study, and at the request of the Needham Montessori School, at that time I determined that the proposed increased enrollment and additional staffing resulted in a parking requirement of 15 spaces (8 spaces, plus 1 space for every 40 students (2 spaces) plus 5 employee spaces equals a total of 15 parking spaces).

The Needham Montessori School is now proposing to expand into other portions of the building that are currently vacant, and another expansion in enrollment and staffing of its program, to a maximum of 114 children and a maximum of 15 employees on site at any given time. This expanded enrollment will result in a parking requirement of 26 spaces (8 spaces, plus 1 space for every 40 students (3 spaces) plus 15 employee spaces equals a total of 26 parking spaces).

I therefore have made a determination pursuant to Section 5.1.2 of the Zoning By-Law that the parking requirement for the proposed use is 26, on the condition that the maximum enrollment is 114 children and the maximum number of employees at any given time is 15.

If you have any questions, please do not hesitate to contact me.

David A. Roche
Building Commissioner
Town of Needham

TOWN OF NEEDHAM
MASSACHUSETTS
BOARD OF APPEALS

Allen Douglass and Christine Lachkey
Record owners: Terrazzino Investment Trust
238 Highland Avenue, Map 300, Parcel 59

July 21, 2016

Allen Douglass and Christine Lachkey, prospective tenants, applied to the Board of Appeals for a Special Permit under Sections 3.2.5.2(c), and 7.5.2, and any other applicable Sections of the Zoning By-law to operate a Montessori school for toddlers and pre-schoolers in a 4,162 square-foot space and to waive strict adherence to parking and design requirements pursuant to Section 5.1.1.5 of the Zoning By-law. The property is located at 238 Highland Avenue in the Highland Commercial 128 District and the New England Business Center District. A public hearing was held on July 21, 2016 pursuant to notice thereof published in a local newspaper and mailed to all parties of interest.

Documents of Record:

- Application Packet for Special Permit stamped June 27, 2016, containing:
  1. Application dated June 27, 2016.
  2. Site Plan showing existing conditions prepared by VTP Associates, signed and stamped by Joseph R. Porter, Registered Professional Surveyor no. 39051 dated June 21, 2011.
- Documents submitted before or at the August 25, 2016 hearing:
  3. Cover letter from Bret J. Francis, Esq., dated June 29, 2016.
  4. Site Plan showing existing conditions prepared by VTP Associates, signed and stamped by Joseph R. Porter, Registered Professional Surveyor no. 39051 dated August 5, 2016 (the "Plan").
  5. Continuance request from Bret J. Francis, Esq. dated July 13, 2016.
  6. Letter from Albertina DeHano dated August 25, 2016.
  7. Memorandum of Facts and Law dated August 25, 2016.
  8. Letter from David Roche, Building Commissioner dated August 23, 2016.
  9. Letter from Thomas A. Ryder, Assistant Town Engineer dated August 24, 2016.
  10. Memo from Lt. John Kraemer, Police Department dated August 22, 2016.
  11. Letter from the Planning Board dated August 11, 2016.

July 21, 2016

The Board included Jon D. Schneider, Chairman; Jonathan D. Tamkin, Member; and Howard S. Goldman, Member. Mr. Schneider said that the applicant has requested the case be continued and it would be continued until August 25, 2016.

The Board included Jon D. Schneider, Chairman; Jonathan D. Tamkin, Member; and Howard S. Goldman, Member. Also participating was Peter Friedenberg, Associate Member and Kathy Lind Berardi, Associate Member. Mr. Schneider opened the hearing at 7:32 p.m. by reading the public notice.

Mr. Bret Francis of the Scafidi Juliano law firm, the attorney representing the applicants, explained that his clients want to open a Montessori School in Needham as there presently is none. Allen Douglass and Christine Lachkey's goal is to provide an early education Montessori based program including education in the arts, music, movement indoor play and exploration specifically designed for each child. The proposed location is 238 Highland Avenue in the Highland Commercial- 128 District and the New England Business Center District. The site is improved with a mixed use of retail and restaurant establishments. The property is owned by Terrazzino Investment Trust and the area proposed to be occupied by the applicant has been vacant since 2010. They are seeking special permits for a private school use and a waiver of the number of required parking spaces under Sections 3.2.5.2 and 5.1.1.5. The proposed use is consistent with the Town's by-laws. The proposed use will not adversely impact the surrounding area from excessive noise, light, dust or smoke and there will be no emission or discharge of noxious or hazardous materials and no pollution of water ways or ground water.

There are 73 parking spaces on site. Most of the current tenants are served by a second parking lot and the parking lot immediately adjacent to the proposed school is used by only 3 to 4 cars. The current tenants are Mandarin Cuisine requiring 44 spaces; Boston Consignment requiring 12 spaces; Golftec requiring 6 spaces; and Highland Nails and Spa also requiring 6 spaces. The total required parking by the zoning by-law is 68 spaces.

The Building Commissioner classified the applicant's proposed use from the ITE Journal as a day care facility which requires one parking space for every five children plus one space for each employee. The applicants expect to initially have 29 students and five employees. Based on the ITE classification, 11 parking spaces are required. The applicants propose a staggered pick-up and drop-off schedule outlined in the memo dated August 25, 2016. There will be no after school care and the facility closes at 3:00 pm. Mr. Francis said that according to the police and engineering departments, the spot labeled P-3 is not a valid parking spot. The property manager has agreed, if required, to stripe a walkway from the parking to the entrance and to restrict parking during designated hours to allow exclusive use by the school. The applicants said that two employees would park off-site and two employees would commute in. The fifth employee is not hired so it is unclear whether they will have a car or not.

Parents would pull in and park in one of the designated spots, get out and walk their child in. Then back out like any other use. Mr. Francis estimated that this would take 3-5 minutes. Because the driver can only take a right turn out of the parking lot, traffic will not get backed up.

Mr. Schneider emphasized to the Applicant that the traffic is horrible in this area: traffic is at a dead stop many times throughout the day.

Mr. Francis said that any tenant would have the same issue and this use has fewer cars than other potential uses. He does not think they need as many parking spaces as suggested by the ITE guide.

Mr. Tamkin said that he was not concerned about the precise drop-off and pick-up times because he thinks no parent will be there for the allotted time due to the traffic. The traffic is a deterrent for busy parents.

Mr. Francis suggested that the property manager would agree to restrict parking in certain spots during the hours of 8:00 am to 8:45 am, 11:00 am to 11:15 am, and 2:30 pm to 3:00 pm. There are 17 parking spaces adjacent to the entrance. Only one spot is typically used by the nail salon because the salon's main entrance is on the other side. Occasionally a customer does park there. Mr. Francis said that the applicants have met all the legal requirements for these special permits.

Mr. Schneider said that the Planning Board had no comment.

Mr. Schneider said that the Town Engineer wrote that it is not clear of the location for passenger pick up and drops off as well as the vehicle turning movements into and out of the parking lot. In addition, at least one of the proposed parking spaces is shown to not have adequate dimensions for a compliant space and may also be located directly in front of the accessible access way into the building.

Mr. Francis acknowledged that they now understand that parking spot P-3 is not valid and that the landlord can give them other spots.

Mr. Schneider said that the Building Commissioner determined that 11 parking spaces are required which should include one van accessible space with loading zone near the front entry. The Building Commissioner is concerned about the queuing of cars during the pick-up and drop-off of students, specifically blocking spaces in front of the other businesses that have access to this parking lot. He also wrote that "the Board will make the final decision, but I am not sure that this is the best location for this use."

Mr. Schneider said that the Police Department wrote that the area is heavily congested and there are major roadway projects in the future proposed at this location. All traffic exiting must turn right.

Mr. Schneider said that the traffic during the morning is very heavy and is often backed up onto Route 128. The afternoon does subsides before the evening commute.

Mr. Francis said that the tenant intends to stay for a long time and can survive during the construction. He suggested that there is van accessible spot on town land which they can use, but they are willing to put it elsewhere if required. The property manager will agree to reserve 11 parking spots from 7:45 am until 3:00 pm so that parents can arrive and park. Mr. Francis submitted a letter of support from Albertina DeHano, the property manager.

Mr. Schneider said that he thinks this is a benign use, but he notes that the police have said that the traffic is a disaster.

Mr. Goldman said he also thought the use was ok, but the access concerned him.

Ms. Berardi said she was particularly concerned that the parents of toddlers only have three hours and won't like this location because they don't want to get stuck. The use is ok, but she is not sure a school will be successful in this location.

Mr. Francis suggested that they could come back for a review at a future date.

Mr. Tamkin doesn't think there is anything to review. The use is good and there is enough parking. He would limit the number of students. The space is vacant and he is interested in filling vacant space.

The Board decided that they would require reserved spaces and not constrain the applicant with specific drop-off and pick-up times. The Board agreed that employees should park off-site.

Ms. Albertina DeHano of Terrazzino Investment Trust suggested that the parking spaces on First

Avenue could also be used. These spaces have been maintained by her father as agreed to in the past. She also said that the lot is typically empty except for occasional Might Sub customers and some of the tenant owners. It is very few cars. After some discussion, Ms. Dehano said she would commit to reserving 11 parking spaces for the pre-school use from 7:00 am to 3:00 pm. This would be specified in the lease.

The Board agreed that the school would be limited to 29 students and 5 staff and the maximum operating hours are 7:00 am to 4:00 pm. Monday through Friday.

Mr. Tamkin made a motion to grant a Special Permit under Sections 3.2.5.2(c), and 7.5.2, to operate a Montessori school for toddlers and pre-schoolers at 238 Highland Avenue with the following conditions: no employee parking on-site; 11 parking spaces will be reserved for the school use from 7:00 am to 3:00 pm; size be limited to 29 students and 5 staff; maximum operating hours are 7:00 am to 4:00 pm. Monday through Friday; parking spot labeled P-3 cannot be used for parking and to grant the parking waiver.

Mr. Goldman seconded the motion. The Board unanimously approved the motion.

The hearing closed at 8:15 p.m.

FINDINGS

On the basis of the evidence presented at the hearing, the Board makes the following findings:

1. The premises contains approximately 45,796 square feet of land located mostly in the Highland Commercial-128 Zoning District with a small portion in the New England Business Center District.

2. The premises is improved with commercial buildings containing approximately 11,590 square feet and parking lots. As shown on the Plan, the buildings are divided into five spaces:

C-1	4019 square feet	restaurant (Mandarin Cuisine)
C-2	3711 square feet	retail (Boston Consignment Shop)
C-3	1905 square feet	retail (Golftec)
C-4	1812 square feet	medical use (Nail Salon & Spa)
C-5	4162 square feet	proposed school

3. The applicant proposes to occupy building C-5 as a Montessori school. There would be a total of 29 students: 9 toddlers (age 18-36 months) and 20 pre-schoolers (age 3-6 years). Operations would be Monday – Friday from 8:00 am to 3:00 pm. There would be no Saturday or Sunday operations. There would be staggered drop off and pick up to manage traffic flow. Parking relating to students would be temporary: limited to the time that the parent/guardian delivers the student from the car to the school or from the school to the car. Applicant will obtain all required licenses to operate the facility.

4. There would be four staff members plus a part-time administrative director.

5. The use as a private school is allowed in the Highland Commercial – 128 District where building C-5 is located by special permit.

6. The Board expressed serious concern about the viability of a school at this location because of the difficult access (the premises can only be accessed from the one side of Highland Avenue because an island separates Highland Avenue) and the extremely congested stop and go traffic on Highland Avenue, especially during the morning drop off. In addition, Highland Avenue in this area is about to be reconstructed which will add to the traffic issues. The police department and building department expressed similar concern. If it were not for these traffic issues, the premises is suited to a use as a

school. The use as a school reduces parking demand from what might be needed for a retail or other allowed use. The times for drop off and pick up are different from the times when there is meaningful demand for parking by the other tenants. Any tenant would face the traffic issues and the owner notes that the space to be occupied by the applicant has been vacant for six years. In the end, the Board concluded that the traffic issues do not create a safety problem for the students or the public and the special permit should not be denied because the applicant is making a questionable business decision.

7. The police department has expressed concern that cars dropping off students do not back up onto Highland Avenue. The Board is satisfied that there is sufficient parking (as discussed below) and that the staggered drops off/pick up schedule can be managed to avoid any cars backing up onto Highland Avenue. Management of the drop off/pick up will be a condition of the Special Permit.

8. The issuance of a Special Permit for operation of a Montessori school as proposed by the applicant is consistent with the allowed uses in the District and the criteria of Section 7.5.2.1.

9. The current uses of the premises (without the proposed school) require 74 parking spaces as determined by the Board in a Decision dated August 17, 2011 granting a parking waiver for the occupancy of the nail salon. The Plan indicates that there are 46 parking spaces (including two handicap spaces) in Lot 2 adjacent to the restaurant and the front entrances of the current tenants. The Plan also indicates that there are 17 parking spaces in a separate lot adjacent to the proposed school. The building department has noted that the spaces marked P-3 should not be consider a space because it blocks the entrance to building C-5 leaving 16 spaces. There are also 5 spaces (including one handicap space) adjacent to the building C-5 on First Avenue. These five spaces are on land owned by the Town, but have historically been maintained and used in connection with building C-5. While these spaces are available to the public, they also are available to be used by the applicant.

10. The applicant represents (and the owner confirms) that very few of the 16 spaces adjacent to building C-5 are currently being used. If they are used, it is typically by employees of the other tenants who make access through rear doors or by customers of Mighty Subs who have no legal right to make use of the parking.

11. The current parking seems to work because the restaurant does not open until 11:00 am and the other tenants do not generate significant demand for parking. Customers of the current tenants park in Lot 2 near the front entrance to the existing businesses and do not park in the area near the proposed school.

12. The Building Commissioner has determined that the applicant's proposed school should have six spaces for students and five spaces for employees. The landlord has agreed to include a provision in the applicant's lease that they will have 11 spaces reserved for their exclusive use from 7:00 am until 3:00 pm. In addition, the applicant has agreed that all employees will park off-site.

13. The existing spaces do not meet some of the design requirements for parking including distances from buildings, landscaping and size.

14. The owner is not seeking to expand the building space. Compliance with design requirements would cause the loss of spaces on a property that already has a number less than what is required in the Zoning By-Law. Special circumstances exist for the waiving of the design requirements and the number of spaces.

DECISION

On the basis of the foregoing findings, following due and open deliberation, upon motion duly made and seconded, the Board by unanimous vote, grants the applicant a) a Special Permit pursuant to

Section 3.2.5.2 for the use of building C-5 by the applicant as a private school, and b) a Special Permit pursuant to Section 5.1.1.5 waiving the design requirements for parking and the required number of parking spaces, provided that the parking remains as currently configured and shown on the plans submitted with the Application, subject to the following conditions:

1. Hours of operation of the school will be limited to 7:00 am to 4:00 pm on Monday through Friday. No school operations will be allowed on Saturday or Sunday.

2. The number of students is limited to 29.

3. The number of employees is limited to 4 instructors and one administrative person.

4. The applicant will stagger drop off and pick up times so that no more than 10 students are scheduled for any 15 minute period. The applicant will expand the 15 minute period for each group of students if needed to manage traffic flow.

5. The applicant will manage parking and traffic flow so that there is no back up of cars on Highland Avenue waiting to enter the parking lot used by the applicant. If back up is a problem, the applicant will take measures to eliminate the backup, such as to assign an employee to monitor traffic flow or adjustment of the periods of drop off/pick up.

6. The applicant will obtain all licenses required for its operation.

7. The applicant's lease will provide for 11 spaces reserved for its exclusive use between 7:00 am and 3:00 pm in the parking lot adjacent to the front entrance. Parking space P-3 shown on the plan will not be used for parking and will not be one of the 11 spaces reserved for applicant.

8. All employee parking will be off site.

9. As provided in the Decision dated August 17, 2011, the owner shall be required to appear before the Board to apply for a Special Permit relating to the number and design of parking spaces before any future vacancy can be filled.

Jon D. Schneider, Chairman

Jonathan D. Tamkin, Member

Howard S. Goldman, Member

TOWN OF NEEDHAM
MASSACHUSETTS
BOARD OF APPEALS

Allen Douglass and Christine Lachkey
Record owners: Terrazzino Investment Trust
238 Highland Avenue, Map 300, Parcel 59

September 19, 2017

Allen Douglass and Christine Lachkey, applicants, applied to the Board of Appeals for a Special Permit Amendment under Sections 3.2.5.2(c), and 7.5.2, and any other applicable Sections of the Zoning By-law to extend the hours of operation of a Montessori school for toddlers and preschoolers from 7:00 a.m. to 4:00 p.m. to 7:00 a.m. to 6:00 p.m. The property is located at **238 Highland Avenue** in the Highland Commercial 128 District and the New England Business Center District. A public hearing was held on September 19, 2017 pursuant to notice thereof published in a local newspaper and mailed to all parties of interest.

Documents of Record:

- Application Packet for Special Permit Amendment stamped August 18, 2017, containing:
  1. Application dated August 14, 2017
  2. Exhibit 1 –238 Highland Avenue Zoning Board of Appeals Decision July 21, 2016.
  3. Memorandum of Fact and Law signed by Fret Francis, Esq, dated September 19, 2017.
- Documents submitted at the September 19, 2017 hearing:
  4. Interior images of the Montessori School (16).

September 19, 2017

The Board included Jon D. Schneider, Chairman; Howard S. Goldman, Member, and Kathy Lind Berardi, Associate Member. Also participating was Peter Friedenberg, Associate Member. Mr. Schneider opened the hearing at 7:32 p.m. by reading the public notice.

Mr. Bret Francis of the Scafidi Juliano law firm, the attorney representing the applicants, explained that the applicants were seeking to extend their hours of operation from 7:00 a.m. to 4:00 p.m. to 7:00 a.m. to 6:00 p.m. This request is in response to requests made by parents. He indicated that the landlord had agreed to extend the exclusive use of eleven parking spaces until 6:00 p.m. He introduced the Property Manager, Dina Delano, who was in support of the extension of hours. She confirmed that the landlord would extend the exclusive use parking spaces.

Mr. Francis informed the Board that the Montessori School is at one-third capacity with 12 or 13 enrolled students. The school's capacity is 29 students. One issue for the enrolled and interested parents is the need for extended hours of operation.

Mr. Francis reported that the location has been greatly modified and he provided pictures of the school's interior. He noted that the school's opening will take place in October; they are later than expected due to delays by the Commonwealth.

There was no public comment.

Mr. Goldman inquired if there are Needham families enrolled in the program. Mr. Allen Douglass responded that the families came from a variety of towns including Norwood, Avon and Stoneham.

Mr. Douglass reported that the construction of the 128 Bridge had been tough on the school, but that its progress and the completion of the Kendrick exit will greatly improve the traffic situation.

Ms. Berardi inquired about the impact of the extended hours on the required staggered student pick-up times. Mr. Douglass responded that the pick-up time of the students will continue to be staggered depending on the individual parent's needs.

Mr. Goldman moved to amend the Special Permit to increase the school's hours of operation to 7:00 a.m. to 6:00 p.m., subject to the condition that the lease be amended to reflect the change to the hours of operation as well as for the usage of the eleven exclusive-right parking spaces; and that a copy of the amended lease be provided to the Board. Ms. Berardi seconded the motion. The motion was unanimously approved.

Mr. Douglass extended an invitation to the Board to attend the Grand Opening on September 25, 2017 at 2:00 p.m.

The hearing closed at 7:41 p.m.

DECISION

Based upon the evidence presented at the hearing, the Board finds as follows:

1. On July 21, 2016, the Board granted the applicants a Special Permit to operate a Montessori school with hours of 7:00 am to 4:00 pm on Monday through Friday, along with other conditions. The applicants have significantly renovated the location, but have not opened for business.

2. In the processing of marketing the school, the applicant found a demand for late hours and now seeks extended operating hours of 7:00 a.m. to 6:00 p.m. on Monday to Friday.

3. The landlord has confirmed that the applicant's exclusive right to use 11 parking spaces from 7:00 a.m. to 3:00 p.m. will extend to 7:00 a.m. to 6:00 p.m.

4. No one appeared in opposition to the request for extended hours.

5. The Board's principal concerns in issuing the Special Permit were the congested traffic on Highland Avenue and the need to manage the flow of cars so there is no back up on Highland Avenue. Given the amount of parking and the willingness of the applicant to stagger pick up and drop off times, the Board believes that the extended hours are not likely to cause a problem and will assist the applicant in developing a viable business. Amendment of the Special Permit is consistent with the criteria in Section 7.5.2.

On the basis of the foregoing findings, following motion duly made and seconded, after due and open deliberation, the Board by unanimous vote grants the applicant an amendment to the Special Permit dated July 21, 2016 to extend the hours of operation from 7:00 a.m. to 4:00 p.m. to 7:00 a.m. to 6:00 p.m. on Monday through Friday, subject to the following conditions: 1) the applicant file with the Board a copy of the lease amendment providing the applicant with the exclusive right to use 11 parking spaces during the extended hours of operation, and 2) that the applicant observe all other conditions of the Special Permit including, without limitation, the requirement to stagger drop off and pick up times and prevent any back up of traffic onto Highland Avenue.

Jon D. Schneider, Chairman

Howard S. Goldman, Member

Kathy Lind Berardi, Associate Member

TOWN OF NEEDHAM
MASSACHUSETTS

BOARD OF APPEALS

AMENDMENT TO SPECIAL PERMIT

Allen Douglass and Christine Lachkey
Record owners: Terrazzino Investment Trust
238 Highland Avenue, Map 300, Parcel 59

April 26, 2018

Allen Douglass and Christine Lachkey, applicants, applied to the Board of Appeals for a Special Permit Amendment under Sections 5.1.2 (c), and 7.5.2, and any other applicable Sections of the Zoning By-law to increase the enrollment of the number of students from 29 to 50 and to waive the parking requirements. The property is located at **238 Highland Avenue** in the Highland Commercial 128 District. A public hearing was held on Thursday, April 26, 2018 pursuant to notice thereof published in a local newspaper and mailed to all parties of interest.

Documents of Record:

- Application for Hearing dated March 5, 2018, Clerk stamped March 30, 2018, containing:
  1. Memorandum of Fact and Law to Petition of Allen Douglass and Christine Lachkey, Bret Francis, Esquire, dated March 29, 2018.
  2. Fire Department Comment - Email dated April 17, 2018.
  3. Health Department Comment – Email dated April 12, 2018.
  4. Building Department Comment – Letter dated April 18, 2018.
  5. Police Department Comment – Memo dated April 17, 2018
- Documents submitted before or at the April 26, 2018 hearing:
  6. Planning Board Comment – Letter dated April 25, 2018.
  7. Supplemental Memorandum of Fact and Law to Petition of Allen Douglass and Christine Lachkey, Bret Francis, Esquire, dated April 27, 2018 (sic) April 26, 2017.
  8. Photographs of parking lot – dated March 26, 2018 – April 22, 2018.
- Documents submitted before or at the May 17, 2018 hearing:
  9. ZBA Memo, Jon D. Schneider, Chairman – April 30, 2018.
  10. Building Department Comment – May 9, 2018.
  11. Planning Board Comment – May 9, 2018.
  12. Police Department Comment – May 8, 2018.

The hearing was held at the Selectmen's Chambers, Town Hall, 1471 Dedham Street, Needham, MA. The Board included Jon D. Schneider, Chairman; Jonathan D. Tamkin, Member; and Howard S. Goldman, Member. Also participating was Kathy Lind Berardi, Associate Member. Mr. Schneider opened the hearing at 8:08 p.m. by reading the public notice.

The applicants Allen Douglass and Christine Lachkey, operate the Needham Montessori School. Bret Francis, Esq., attorney for the applicants explained that the school has been in operation since October of 2017 and has been successful to date. The applicants now seek an amendment to the Special Permit dated September 6, 2016, allowing the school to increase enrollment from 29 students to 50 students. Mr. Francis noted that the location is working for the applicants, parents of the enrolled children and the landlord. Additionally, the Commonwealth of Massachusetts has authorized the location for 50 students based on the square footage of the operation, pending local approval. The applicants stated that they are seeking an increase in enrollment to be profitable and to make the most efficient use of the property as a Montessori School.

At the hearing, the applicants submitted the *Supplemental Memorandum of Fact and Law to Petition of Allen Douglass and Christine Lachkey*. Mr. Francis prepared this document in response to comments received from the Health, Police, Fire and Building Departments.

Mr. Schneider read the comments received from the following town departments into the record:

- **Health Department** – no comment.
- **Police Department** – identified congested parking on First Avenue. They noted that two dumpsters that were located in two parking spaces. The Police Department is not in favor of the increase in students due to heavy congestion in the area.
- **Building Department** – does not think this is a good location for a school and is concerned about the increased enrollment. Concerned about the need for staff parking.
- **Fire Department** – concerns about increasing enrollment due to this being a high traffic area. Particularly concerned with drop off, fire exiting and outdoor areas of refuge. Also concerned that there is insufficient parking.
- **Planning Board** - Recommended that the Board review the reconstruction plans for the Highland Avenue Reconstruction to determine if the site will lose any parking. They also recommend that the staff walk the children to and from a designated drop-off/pick-up area rather than parents and that the drop-off/pick-up be staggered.

Mr. Francis addressed the comments received from the various town departments in applicants' Supplemental Memorandum as follows :

Exiting in case of fire - Mr. Francis submitted the applicants' Fire Drill Schedule and Emergency Procedures that are part of their school handbook. He also confirmed that the Commonwealth of Massachusetts has approved the applicants' emergency plans.

Dumpster concern - Mr. Francis noted that the dumpsters were moved into the parking lot for convenience due to the underutilization of the parking spaces. He confirmed that the dumpsters have been removed from the parking lot and will remain in their original location.

Drop-offs/Pick-ups– Mr. Francis provided photographs of the parking lot on various days and times (March 26, 2018 at 11:30 a.m. to April 22, 2018 at 4:46 p.m.). The photographs show a virtually empty parking lot. Mr. Francis stated that drop-offs and pick-ups are staggered throughout the day and there is ample parking. Typically, no more than one or two spaces are used at a time in the lot for drop-offs and pick-ups. Mr. Francis noted that seven families of the current 29 students enrollment have multiple enrolled students. The car trips generated, therefore, are less than the number of students enrolled. The applicants provided emails from parents of enrolled children reporting on the ease of drop-offs and pick-ups.

High traffic area- The applicants stated that the location next to Route 95 was a benefit. No accidents or complaints have been identified at the location. Mr. Francis stated that no traffic backs up on Highland Avenue as a result of the school.

Parking Lot congestion: Mr. Francis challenged the Police Department's memo of April 17, which identified a parking lot on First Street. This is not the school's parking lot; the school parking and entrance is located off of Highland Avenue on the other side of the building.

The applicants stated that that all of the comments made by the various town departments were made without observation of the actual operation of the school. Mr. Douglass noted that there have been no visits by the Police or Fire Departments, other than the Fire Department for the routine fire drills, which the school has successfully completed.

Mr. Francis noted that the Special Permit is already conditioned on the drop-offs/pick-ups being staggered, that school employees or parents already accompany the children to the school, and that school employees are prohibited from parking in the 11 parking spaces reserved for the school. Additionally, the drop-offs and pick-ups do not require the use of all 11 reserved parking spaces.

Mr. Schneider noted that the parking spaces allocated to the school are far from Highland Avenue, making it unlikely that it will be affected by the reconstruction referred to in the comments from the Planning Board.

Mr. Douglass stated that his primary concern is the safety of the children. Fire drills are practiced routinely. As to pick up and drop off, Mr. Douglass confirmed that the area is under camera surveillance and that when a car arrives, it is observed on the surveillance monitor and a school employee meets the child at the car or the parent brings the child into the building where the staff greet the child. The process is reversed for pick-ups.

The applicants further confirmed that the doors to the facility are secure and only the school employees know the codes. Drop-offs/pick-ups are staggered throughout the day. Most of the drop-offs/pick-ups occur in the two parking spaces directly in front of the school. Drop-offs happen between 7:00 a.m. – 10:00 a.m. and pick-ups from 11:30 a.m. – 6:00 p.m.

The program has a current enrollment of 22 students; with a roster of 42 students who are interested in the program. With the expansion, Mr. Douglass will increase the staff by three people. The staff would not use the parking spaces allotted for the school.

Mr. Tamkin wants a better understanding from the Fire, Police and Building Department about their concerns. Ms. Berardi suggested a parking study or some further documentation of the

current parking demands. Mr. Schneider did not think there was an issue with parking, but rather the concern was about public safety and/or traffic congestion on Highland Avenue.

Tina Delano, property manager, concurred that the lot is virtually empty. If there is a photograph of the parking lot being used, it is highly likely that the car is not one of their tenants. She noted that in her discussion with Mass DOT, none of her parking spaces were to be taken as a result of the Highland Avenue reconstruction. She highlighted that the student pick-up/drop-off area is a safe and a far distance from the street.

Mr. Schneider did not think that an additional 20 plus cars entering and exiting off the parking lot would materially affect the total number of cars on Highland Avenue. Ms. Delano thought that once the newly installed streetlight is activated, the traffic at the corner would improve. She does not think that the increase in the student enrollment would be a traffic issue.

Mr. Schneider suggested that the Board write a memo to the Police, Fire and Building Departments providing the facts presented by the applicants in their Supplemental Memorandum and requesting further explanation of the various town departments' concerns. The hearing was continued to the next Board meeting on May 17, 2018.

The meeting adjourned at 8:52 p.m.

May 17, 2018

The Board included Jon D. Schneider, Chairman; Howard S. Goldman, Member and Kathy Lind Berardi, Associate Member. Also participating was Peter Friedenberg, Associate Member. Mr. Schneider opened the hearing at 8:19 p.m. by reading the public notice.

Mr. Schneider reported that he wrote a memo on behalf of the Board to the Planning Board, Police, Fire, and Building Departments providing them with the facts and photographs presented by the applicants and requesting further understanding of their concerns.

Mr. Schneider presented the comments received:

- **Planning Board** – the additional materials provided by the applicants addressed their concerns.
- **Police Department**- they noticed that the snow piles left in the parking lot appear to narrow or block some of the parking spaces. They observed that two of the abutting buildings are vacant and when occupied they will use the available parking spaces. They made no comment on the drop-off or pick-off process. The Police stated the area is heavily congested and that there are major roadway projects scheduled.
- **Building Department**-based on the increased enrollment to 50 students, the Building Commissioner calculated that 15 dedicated parking spaces would be needed, and that future tenants must be carefully selected keeping in mind the parking availability.

David A. Roche, Building Commissioner, attended the hearing. Mr. Schneider asked Mr. Roche how he had arrived at the 15-space requirement. Mr. Roche based the number on a formula developed and used by the Planning Board. Mr. Roche does not support granting a parking waiver because the neighboring businesses are vacant and once filled those waived spaces may be needed. Mr. Schneider responded that the 11 parking spots dedicated for drop-offs and pick-ups seem to far exceed the need. In addition, the Special Permit prohibits staff parking in the 11

reserved parking spaces. Mr. Roche questioned how staff parking would be enforced. Mr. Roche urged that new tenants must be carefully selected, because of the possible impact of their parking demand. Mr. Francis stated that regardless of future tenants, the school would protect their 11 parking spaces. Mr. Roche said that the Police, Fire and he have concerns about this location. He was concerned about automobile accidents. Mr. Francis responded by providing a police report indicating that no accidents have been reported at this location during the time that the school has been in operation. Mr. Schneider said that parents wrote that they had no problems getting off or onto Highland Avenue.

Mr. Schneider thought the applicants have been persuasive about the adequacy of their parking. The parking spots are used only for a very short time, during staggered drop-offs and pick-offs. Mr. Roche said he cannot monitor the parking and does not know if there are special parent events when the demand for parking is greater. Mr. Francis responded that when special events are held in the evening, alternative parking is found. Mr. Douglass said that two evening events for professional development with keynote speakers were held after the school from 6:00 p.m. to 8:00 p.m. He notified the Police Department of the events. All 11 parking spaces were used. Mr. Schneider noted that there were two other parking lots adjacent to the building.

Mr. Goldman inquired if the Temple Beth Shalom model, suggested by the Planning Board, of staff walking the children from drop-offs and to pick-ups could be adopted. Mr. Douglass said staff already walk the children to the school for the parents who drop-off their children. Mr. Schneider did not want to prohibit parents from walking their children into the school. Mr. Goldman suggested that a condition be included in any approval because this is a large increase in enrollment in an already congested area.

Ms. Berardi commented that the Board had reservations because of the location, but part of the reason that the Special Permit was granted was due to the small enrollment. She thought the proposed increase in enrollment is a significant change.

Mr. Schneider did not think there was a parking issue. He thought the critical issue is the approach to and from Highland Avenue. None of the comments received addressed this issue. Even though the calculations require 15 parking spaces, the applicant has demonstrated that they have been working successfully with 11 spaces.

Mr. Schneider asked if there were any comments from the public. There were no comments from the public.

Ms. Berardi asked how many parent-oriented events are held each year. Mr. Douglass said there are parent/teacher conferences held in May, which are staggered. The preschoolers are scheduled from 8:00 a.m. to 12:00 p.m.; and toddlers from 12:00 p.m. to 6:00 p.m. Mr. Douglass said the adopted staggered scheduling is a key to their success.

Ms. Berardi thought the lack of the additional four parking spaces was a concern. However, the applicant has documented that it is working. She thought that going forward parking will be a somewhat self-regulating issue as the landlord will have to respond to tenant demands if there is not adequate parking and will not be able to take on certain tenants. She was satisfied that the applicants have demonstrated that the 11 parking spaces are adequate for the proposed demand. In addition, she thought the increase in enrollment was also partially self-regulating: if the location is not working for parents' needs, they will find alternative schools.

Mr. Goldman was concerned about the congestion at the school's location, but he was impressed by the controls the applicants have implemented. He thought the applicants made a case that there is not a demand for 15 parking spaces. He wanted to condition the amendment to specify that there be parent/teacher coordination of the drop-offs and pick-ups.

Mr. Schneider identified that the area is a congested one, but the applicants do not create the problem. He concluded that an additional 20 cars spread out over the day would have little effect on the traffic. There is adequate parking and there are no safety issues with the parking lot so far. He concurred that both the parking waiver and increased enrollment was self -regulating: if parents are frustrated they will search for an alternative.

Mr. Goldman moved to grant the applicant a Special Permit Amendment at 238 Highland Avenue under Sections 5.1.2 (c) and 7.5.2 to increase the enrollment of the number of students from 29 to 50 and to waive the parking requirements to 11 spaces with the condition that during drop-offs and pick-ups, staff or a parent accompany the student to the school. Ms. Berardi seconded the motion. The motion was unanimously approved.

FINDINGS

On the basis of the evidence presented at the hearing, The Board makes the following findings:

1. The applicants operate the Needham Montessori School (the "School"), located at 238 Highland Avenue in the Highland Commercial-128 District. The property contains approximately 45,795 square feet and includes a mixed-use building and a parking lot with 73 parking spaces.
2. On September 6, 2016, the applicants obtained a Special Permit (the "2016 Special Permit") to operate the School with certain restrictions, including that enrollment be limited to 29 students.
3. On October 20, 2017, the applicants obtained an Amendment to the 2016 Special Permit (the "2017 Amendment"), to extend the hours of operation of the school.
4. The applicants now seek a further amendment to the 2016 Special Permit to increase the enrollment of the school from 29 students to 50 students and to waive the parking requirements set forth by Section 5.1.2 of the By-Law.
5. The applicants stated that they are seeking the increase in enrollment to 50 students in order to be profitable and make the most efficient use of the property as a Montessori School. The Commonwealth of Massachusetts has committed to allow the applicants to increase enrollment to a maximum of 50 students.
6. Pursuant to the conditions of the 2016 Special Permit, there are currently 11 parking spaces reserved for use by the School on the property. The Building Commissioner determined that an increase in enrollment to 50 students would require 10 parking spaces for the students and 5 additional parking spaces for the employees, for a total of 15 parking spaces. As a result, there is a shortfall of 4 spaces under this requirement.
7. The applicants confirmed that the 11 parking spaces are sufficient for the actual parking demand generated by the School, even with the proposed increase in enrollment. The students are dropped off and picked up and therefore cars do not remain parked in the lot. Additionally, pursuant to the 2016 Special Permit, the drop-off and pick-ups are staggered and employees are prohibited from parking in the 11 reserved parking spaces.

8. The Needham Police Department, Fire Department and Building Department all expressed concerns about the location of this School and about increasing enrollment. The Applicants submitted additional information in response to the specific concerns of each Department, including the Fire Drill Schedule, Procedures in Case of An Emergency and Emergency Plan documents. The applicants submitted several photographs of the parking lot on different dates and times, demonstrating that most of the 11 reserved parking spaces were empty. Additionally, the applicants provided several letters from parents of children enrolled at the School stating their support of the increased enrollment and their positive experience with the pick-up and drop-off procedures at the School. None of the parents expressed any concern about the location of the School in the submitted letters.
9. Section 5.1.1.5 of the By-Law grants authority to the Board to issue a Special Permit waiving strict adherence to the requirements of Section 5.1.2 where it can be demonstrated by an applicant with a parking plan prepared and reviewed in accordance with the provisions of Section 5.1.3 that a particular use, structure or lot, owing to special circumstances, does not warrant the number of parking spaces required by Section 5.1.2.
10. Based upon the condition that 11 parking spaces be reserved for the exclusive use of the School, the prohibition against employees parking on the property, the required staggered pick-up and drop-offs, and the evidence submitted by the applicants including photos documenting actual parking demand for the 11 reserved parking spaces and letters submitted by parents of children regarding the parking use and demand, the Board finds that sufficient special circumstances exist that do not warrant the 15 required parking spaces. The Board further finds that the increase in enrollment to a maximum of 50 students is consistent with the general purposes of the By-Law and is consistent and meets the criteria of Section 7.5.2.1 of the By-Law.

DECISION

On the basis of the foregoing findings, following motion duly made and seconded, after due and open deliberation, the Board by unanimous vote grants the applicants an Amendment to the Special Permit dated July 21, 2016 (1) allowing an increase in enrollment to a maximum of 50 students and (2) waiving the required number of parking spaces resulting from the increased enrollment, pursuant to Section 5.1.1.5; all subject to the following conditions:

a) During drop-offs and pick-ups, a School employee or a parent shall accompany students from the parking lot to the School; and
b) The applicants shall observe all other conditions of the Special Permit dated July 21, 2016 and the Amendment to the Special Permit dated September 19, 2017.

Jon D. Schneider, Chairman

Howard S. Goldman, Member

Kathy Lind Berardi, Associate Member

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February 22, 2021

Town of Needham
Zoning Board of Appeals
Needham, Massachusetts 02492

Attn: Daphne M. Collins, Administrative Specialist

Re: Melissa Gale / The Cookie Monstah Company
1257 Highland Avenue, Needham, MA

Dear Ms. Collins,

Please be advised this office represents Melissa Gale and The Cookie Monstah Company (hereinafter, jointly, both "Cookie Monstah" and the "Applicant") with respect to the commercial space at 1257 Highland Avenue, Needham, MA 02492 (hereinafter the "Premises"). In connection therewith, submitted herewith please find:

1. One Completed Application for Hearing

2. One copy of architectural plans, dated January 21, 2021, revised January 28, 2021, prepared by Main Street Architecture & Planning, Inc., 127 Elliott Street, Danvers, MA 01923, consisting of one sheet: A1.1, "Floor Plan and Details, Cookie Monstah"; and

3. One copy of "ALTA / ACSM Land Title Survey, 1257 & 1299 Highland Avenue, Needham, Massachusetts", dated January 20, 2017, prepared by O'Driscoll Land Surveying Co, 46 Cottage Street, Medway, Massachusetts 02053.

The Premises is identified as 1257 Highland Avenue and is one of several commercial spaces at the plaza at 1257-1299 Highland Avenue. It was last occupied by Stacy's Juice Bar for purposes of a food retail operation with accessory take-out and 18 inside seats, as well as accessory health and wellness workshops[1]. After approximately seven years of operation, Stacy's closed this past November.

[1] See Board of Appeals Decision issued to JBP Holdings, LLC d/b/a Stacy's Juice Bar, dated September 19, 2013, filed with the Town Clerk October 15, 2013, and Amendment dated October 17, 2013, filed with the Town Clerk on November 12, 2013.

Now, Melissa Gale, owner and proprietor of The Cookie Monstah Company, desires to open a Cookie Monstah store at the premises, with 18 inside seats and a walk-up, take-out window at the front patio. Much like Stacy's Juice Bar, the Cookie Monstah is a food retail operation, selling baked cookies and ice cream sandwiches for consumption both on premises and off premises. While the sale of the cookies is an allowed use, both the sale of ice cream and related products and the take-out aspect of the operation require special permits. In addition, because of the parking situation at the plaza, special permits are also required to waive strict compliance with the off-street parking requirements of the Zoning By-Law.

Please schedule this matter for the next available hearing of the Board, whether in person, via Zoom or other electronic format. In the meantime, if you have any questions, comments or concerns relative to the foregoing, please do not hesitate to contact me so that I may be of assistance.

Your courtesy and attention are appreciated.

Sincerely,

George Giunta, Jr.

TOWN OF NEEDHAM
MASSACHUSETTS
BOARD OF APPEALS

APPLICATION FOR HEARING

IT IS STRONGLY RECOMMENDED THAT APPLICANTS CONSULT WITH THE BUILDING INSPECTOR PRIOR TO FILING THIS APPLICATION.

Note: Application must be complete, with certified plot plan attached, and application fee included, or application will not be accepted.

Date: February 22, 2021

Name of Applicant or Appellant Melissa Gale / The Cookie Monstah Company

Address: 75 Newbury Street

Danvers, MA 01923

(Optional) E-mail address: melissa@thecookiemonstah.com

Daytime telephone: 978-810-1877 (Melissa Gale)

(Optional) Cell phone: Same as above

(Optional) additional contact information, (ie: ☐ contractor ☐ architect, ☐ builder or ☒ attorney):

George Giunta, Jr., Esq. – 281 Chestnut Street, Needham, MA 02492

781-449-4520; george.giuntajr@needhamlaw.net

Address/Location of Property 1257 Highland Avenue, Needham, MA 02492

Assessor Map / Parcel Number Map 52, Parcel 3

Zone for property: Business (B)

Is property within 100 feet of wetlands, 200 ft. of stream or in flood plain? ☐ Yes ☒ no

Applicant is ☐ owner, ☐ tenant, ☒ prospective tenant, ☐ licensee ☐ prospective purchaser

Type of Permit requested: ☐ residential or ☒ commercial

If residential renovation, will renovation constitute "new construction"? ☐ yes ☐ no

If commercial, please consult with building inspector regarding parking issues

Select one: ☒ Special Permit ☐ Variance ☐ Comprehensive Permit, M.G. L Ch. 40B

☐ Amendment ☐ Appeal Building Inspector Decision*

*(For an appeal from decision of Building Inspector, attach copy of the decision or other written notice received from the Building Inspector.)

Existing Conditions:

Eat in / take out eating establishment accessory to a food retail operation; to wit, Stacy's Juice Bar.

Statement of relief sought:

1. Special permit pursuant to Section 3.2.2 for a take-out food counter accessory to a food retail establishment;

2. Special permit pursuant to Section 3.2.2 for retail sales of ice cream, frozen yogurt and similar products for consumption on or off the premises;

3. Special permit pursuant to Section 3.2.2 for more than one non-residential building or use on a lot;

4. Special permit pursuant to Section 5.1.1.5 waving strict adherence with the requirements of Section 5.1.2 (Required Parking) and / or Section 5.1.3 (Parking Plan and Design Requirements); and

5. All other relief necessary and appropriate to permit the use of the subject premises for retail sales of cookies, baked goods, ice cream, and similar products as a Cookie Monstah store with a walk-up, take-out window.

Applicable Section (s) of Zoning By-Law 3.2.2, 5.1.1.5, 5.1.2, 5.1.3, 7.5.2 and any other applicable Section or By-Law

_____

If application under Zoning Section 1.4, listed immediately above:

List nonconformities related to lot/structure(s) in application:

N/A (Non-conforming two-family use authorized by variance)

Date structure(s) on lot constructed (including any additions):

N/A

Date lot created:

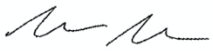
N/A

A certified plot plan, prepared by a registered surveyor, must be attached to each of the thirteen (13) copies of this application at time of filing. Application will be returned if a copy of the plot plan is not attached to each application.

•Applications for Comprehensive permits under M.G.L. Ch. 40B require thirteen (13) copies of plot plan (two reduced to 8 ½ by 11), plus additional submissions.

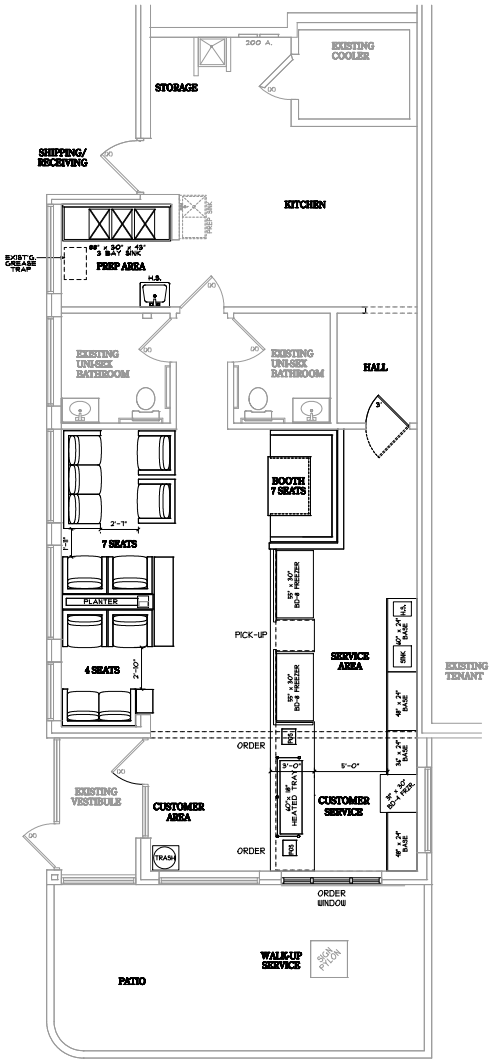
Please feel free to attach any additional information/photos relative to the application.
Additional information may be requested by the Board at any time during the application or hearing process.
A hearing before the Board of Appeals, with reference to the above noted application or appeal, is requested by

Melissa Gale / The Cookie Monstah Company,
By their attorney,



Signed _____

George Giunta, Jr., Esq.
281 Chestnut Street
Needham, MA 02492
781-449-4520
george.giuntajr@needhamlaw.net



FIXTURE PLAN

CUSTOMER SEATING 18

SCALE: 1/4" = 1'-0"

WALL LEGEND

EXISTING CONSTRUCTION TO REMAIN.

TYPICAL INTERIOR WALL — 3 5/8" METAL STUDS (20ga) @ 16" O.C. WITH 1/2" GYPSUM WALL BOARD TO UNDERSIDE OF EXISTING CEILING GRID, TAPED SANDED AND FINISHED, PRIME + 2 COATS FINISH PAINT 3 COATS TOTAL (BRACE AS REQUIRED ABOVE FINISH CEILINGS)

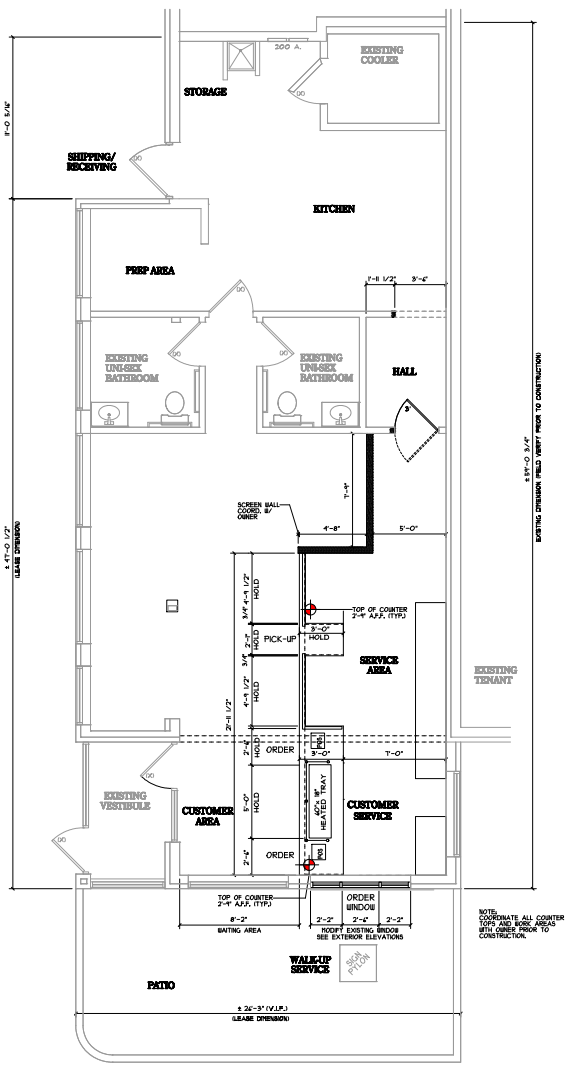
GENERAL NOTES:
ALL PENETRATIONS THROUGH FIRE RATED WALLS SHALL BE PACKED WITH MINERAL WOOL AT ALL EDGES AND SEALED WITH A U.L. APPROVED FIRE SEALANT.

NOTE TO CONTRACTOR:
EXISTING EXTERIOR WALLS, DOORS AND WINDOWS TO REMAIN, NO EXTERIOR CHANGES ARE SHOWN OR PROPOSED.

ALL NEW INTERIOR PARTITIONS ARE 3 5/8" MTL. STUDS AT 1'-4" O.C. TYPICAL, UNLESS NOTED OR DIMENSIONED OTHERWISE (5" TYP.).
ALL INTERIOR GYPSUM WALL BOARD SHALL BE 1/2" THICKNESS. (TYP. UNLESS OTHERWISE NOTED)
ALL WOOD BLOCKING, NAILERS, AND PLYWOOD FURRING TO BE USED AS A SUBSTRATE MATERIAL SHALL BE F.R.T. (AS REQUIRED BY TYPE 2B CONSTRUCTION)
F.R.T. = (FIRE RETARDANT TREATED LUMBER)

CODE INFORMATION (780cmr 9th EDITION MASS. BUILDING CODE)

OCCUPANCY CALCULATION:
USE GROUP = BUSINESS (B) 100 S.F. PER OCCUPANT
1,450 S.F. / 100 = 14.50 (5 OCCUPANTS CALCULATED, 21 ACTUAL)
TWO EGRESS DOORS REQUIRED FOR SPACES LESS THAN 500 OCCUPANTS.
EXISTING STEEL FRAME BUILDING (NON-SPRINKLERED)
MAX. TRAVEL DISTANCE ALLOWED 200'/40' MAX. PROVIDED.



FLOOR PLAN

TOTAL GROSS SQUARE FOOTAGE = 1,450 S.F.

SCALE: 1/4" = 1'-0"

Main Street Architecture & Planning Inc.
1327 Elliot Street
Dedham, MA 02026
Tel./Fax: (978) 774-0026
main-street@comcast.net

SHEET TITLE: FLOOR PLAN AND DETAILS

RENOVATIONS TO:

COOKIE MONSTAH
1257 HIGHLAND AVE
NEEDHAM, MA

REVISIONS
1.
2.
3.
4.
5.
6.

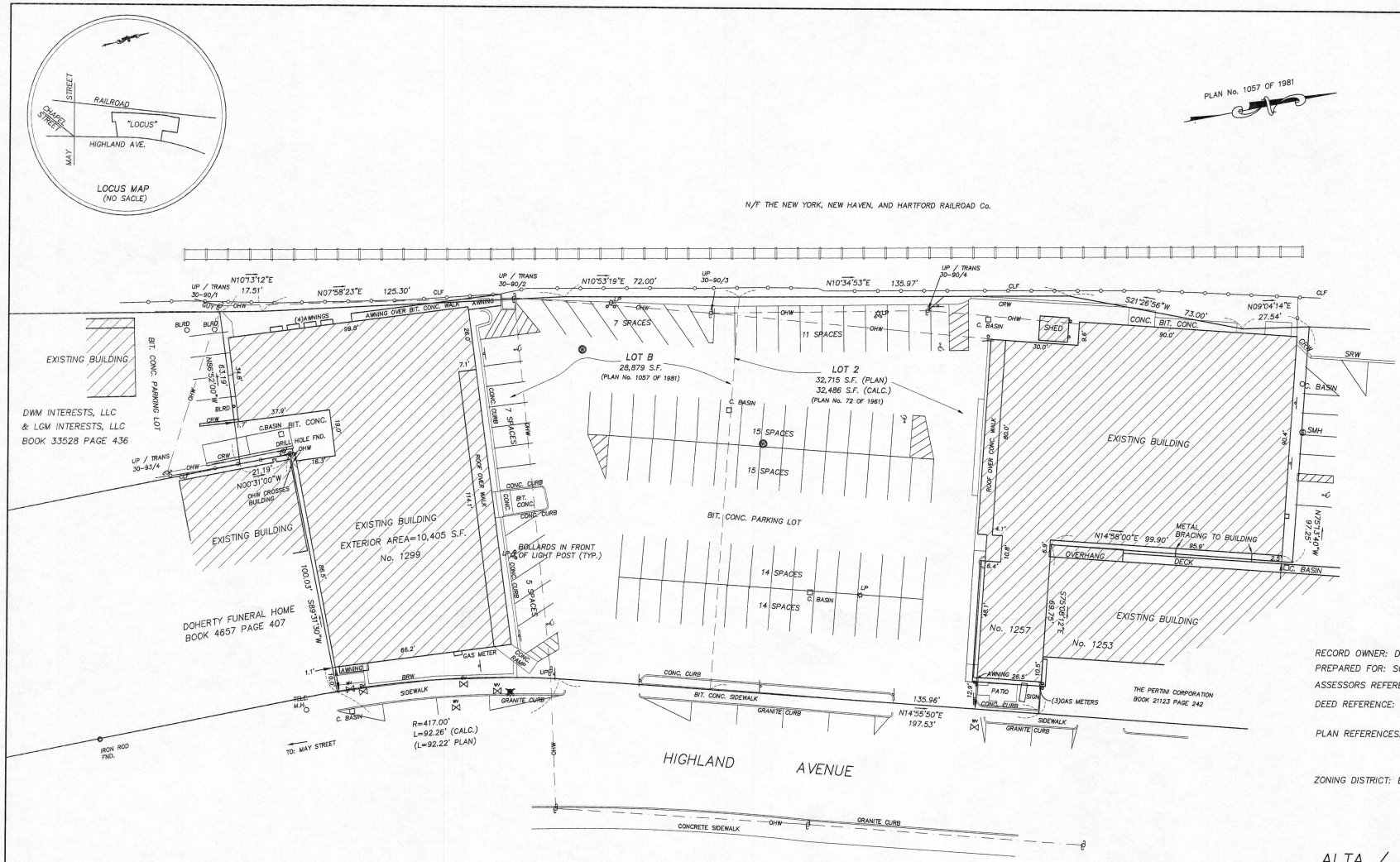
PROJECT NO. 21-02
DATE ISSUE: REV 1-21-21
DRAWN BY: P.F.
CHECKED BY: P.F.

ARCHITECTS SEAL:

ENGINEERS SEAL:

SHEET NO.
A1.1

PLOT DATE: 1/21/2021 PLOT TIME: 3:8 PM PATH/NAME: C:\MA-MAIN STREET ARCHITECTS-M1A_JOBS\JOBS 2021\21-02 CM NEEDHAM MA\AE FLOOR PLAN - COOKIE MONSTAH 1257 HIGHLAND AVE, NEEDHAM, MA-AEC



RECORD OWNER: DWM INTERESTS, LLC & LGM INTERESTS, LLC

PREPARED FOR: SOUTH STREET 4414 HOLDINGS, LLC.

ASSESSORS REFERENCE: MAP 52 PARCEL 3 & 4

DEED REFERENCE: NORFOLK COUNTY REGISTRY OF DEEDS
BOOK 33528 PAGE 436

PLAN REFERENCES: PLAN No. 1057 OF 1981
PLAN No. 72 OF 1961
PLAN No. 1750 PLAN BOOK 37

ZONING DISTRICT: BUSINESS

ALTA / ACSM LAND TITLE SURVEY
1257 & 1299 HIGHLAND AVENUE
NEEDHAM, MASSACHUSETTS

SCALE: 1"=20' JANUARY 20, 2017

THIS IS TO CERTIFY THAT THIS PLAN AND THE SURVEY ON WHICH IT WAS BASED WERE MADE IN ACCORDANCE WITH THE 2011 MINIMUM STANDARD DETAIL REQUIREMENTS FOR ALTA/ASCM LAND TITLE SURVEYS, JOINTLY ESTABLISHED AND ADOPTED BY ALTA AND NSPS, AND INCLUDEDS ITEMS 2-4, 6-9, 11, AND 13-14, 16-18 OF TABLE A THEREOF.

THE FIELD WORK WAS COMPLETED ON JANUARY 20, 2017.

THE PROPERTY SHOWN DOES NOT LIE WITHIN A SPECIAL FLOOD HAZARD ZONE.

David A. O'Driscoll JAN. 20, 2017
PROFESSIONAL LAND SURVEYOR DATE
COMMONWEALTH OF MASSACHUSETTS PLS No. 39050

COMMONWEALTH OF MASSACHUSETTS
DANIEL A. O'DRISCOLL
No. 39050
PROFESSIONAL LAND SURVEYOR
1/20/2017

O'DRISCOLL
LAND SURVEYING Co.
LAND SURVEYING GPS MAPPING LAND CONSULTING
46 COTTAGE STREET MEDWAY, MASSACHUSETTS 02053 (508) 533-3314

FILE No.1109

128 BUSINESS COUNCIL

MEMORANDUM

DATE: March 12, 2021

TO: Lee Newman, Director of Planning and Community Development, Town of Needham

FROM: Monica Tibbits-Nutt, Executive Director, 128 Business Council

SUBJECT: Needham Shuttle Permit Requirements

The purpose of this memorandum is to update the Town of Needham's Planning and Community Development department on the 128 Business Council's Needham Shuttle service that connects Needham businesses with Newton Highlands MBTA Green Line station. The Needham Shuttle is in its 21st year of serving businesses, residents, and reducing traffic congestion in the area. The success of this program is due to the continued participation of all members. Before March 2020, the service consisted of two 30-passenger vehicles that provided seven morning departures from the Newton Highlands Green Line Station and seven evening departures back to the station. As a result of the pandemic, in June 2020, we had to reduce service operations to less equipment (one bus) and add significant disease prevention protocols. We plan to operate the same way through at least Q2 2021.

In Needham, nine member sites have special permit requirements. Six of the member sites are successfully participating in the shuttle service. Three of the nine sites are not. In Q1 2021, this has resulted in a significant financial loss to our non-profit organization. Also, as we move to Q2 2021, the remaining members will be left to cover the resulting loss of participation dollars to keep the service going - this means a 53% increase in their shuttle costs. We cannot ask this of our faithful members, especially while the pandemic is still going on.

We are working diligently to ensure our service is available for commuters who need it in 2021 and beyond. We expect that traffic congestion levels will worsen post-COVID and need to be ready to meet that demand. This service is not something we can "shut off" while ridership is light and "turn on" when the rider demand increases. It took over twenty years to build the exceptional pre-COVID Needham Shuttle service. Quarterly reassessment of service and budget estimates help us to adjust to the reduced demand caused by the pandemic. However, we also need to keep in mind the

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larger picture and how minimal costs to preserve our service now will guarantee it will be available for those who need it in the future.

Specifics:
Total budget planned for 2020 service: $501,992 (Operations = two-vehicle service, 20 HOS per day)
Total actual expense for 2020 service: $305,271 (Operations = Q1 as planned, Q2, Q3, and Q4 was one vehicle service, 8 HOS per day, plus the non-operational cost for the preservation of the second vehicle)
Total budget planned for 2021 service: $336,985 (Operations = one vehicle service, 8 HOS per day, plus the non-operational cost for the preservation of the second vehicle)
Q1 2021 total cost of the shuttle service: $84,246 (Operations = one vehicle service, 8.25 HOS per day, plus the non-operational cost for the preservation of the second vehicle)
Q2 2021 estimated total cost of the shuttle service: $75,337 (Operations = one vehicle service, 8.25 HOS per day, with no non-operational cost for the preservation of the second vehicle)

Income Lost:
Estimated Q4 2020 income lost due to members not participating: $50,000
Estimated Q1 2021 income lost due to members not participating: $35,000
Estimated Q2 2021 income lost due to members not participating: $35,000

We are looking for guidance on how to work with those companies that are not meeting their permit requirements.

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