CITY OF DOVER

DOVER PLANNING BOARD – AGENDA

Meeting Type:	Regular Meeting
Meeting Location:	Council Chambers, City Hall, 288 Central Ave, Dover NH 03820
Meeting Date:	**Tuesday, February 23, 2021**
Meeting Time:	**7:00 pm**

Certain members of the Planning Board may be participating in this meeting remotely. In addition, the Chair of the Planning Board may, per NH RSA 91-A:2, III (b), declare an "emergency" within the meaning of that statute and waive the requirement that a quorum be physically present at the meeting. In either event, remote members will identify their location and any person present with them at that location. All votes will be by roll call.

The City of Dover has taken extra steps to ensure the physical location of this meeting conforms with all safety provisions during the pandemic, including social distancing, face coverings, and frequently sanitized facilities. Although qualified members of the public can participate in the meeting by speaking at the physical location, the public is encouraged to leave comments in advance by calling 516-MEET (6338), emailing Dover-Planning@dover.nh.gov, or mailing written comments to Planning Board, Dover City Hall, 288 Central Ave., Dover, NH 03820. Messages must be received no later than 4 p.m. the day of the meeting and should identify the name and Dover address of the person leaving the message or providing the comment

1. CITIZENS' FORUM

2. APPROVAL OF THE PRIOR MINUTES

- February 9, 2021 Regular Meeting Minutes

3. OLD BUSINESS

4. NEW BUSINESS

A. Consideration and acceptance of a Minor Subdivision for Townsquare Media Portsmouth, LLC., Assessor's Map M, Lot 91A, zoned R-40, and located at 292 Middle Road. (1 new lot). *(P21-06)

B. Consideration and acceptance of a Conditional Use Permit for 54 BRR, LLC., Assessor's Map I, Lot 6, zoned R-12, and located at 54 Back River Road. (Proposal is to allow road and utility construction, stormwater treatment, and structures including units and retaining walls, with steep slope impacts of 18,799 s.f). *(P21-01)

C. Consideration and acceptance of a Transfer of Development Request for 54 BRR LLC, Assessor's Map I, Lot 6, zoned R-12, located at 54 Back River Road. (Proposal is to increase development density allowed by 35 HUD-rate restricted units). *(P20-61)

D. Consideration and acceptance of a Site Review for 54 BRR, LLC, Assessor's Map I, Lot 6, zoned R-12, located at 54 Back River Road. (Proposal is to develop an affordable housing community with 44 detached 384 s.f. one-bedroom units). *(P20-60)

E. Consideration and adoption of Street Tree Policy

5. STAFF COMMENT

6. MEMBER COMMENTS

7. ADJOURNMENT

*Indicates that if the application is accepted for discussion, the public hearing will be held the same evening. Note that some hearings will be continued from one meeting to another and some may be postponed. Since this is only a partial description of the proposal and may change, persons with questions or wishing to see the plans are invited to visit the Planning Office, Monday through Thursday from 8:30 am to 5:30 pm and Friday 8:30 am to 4:00 pm or email Dover-Planning@dover.nh.gov. You may also view materials at www.dover.nh.gov. Follow us on Twitter @DoverNHPlanning and find us on Facebook at https://www.facebook.com/DoverNHPlanning.

CITY OF DOVER

DOVER PLANNING BOARD – MINUTES

Meeting Type:	Regular Meeting, continued
Meeting Location:	City Council Chamber's 288 Central Avenue
Meeting Date:	**Tuesday, February 09, 2021**
Meeting Time:	**7:00 pm**

Members Present: Gina Cruikshank (Chair), Dennis Ciotti (Councilor), Dave White

The following Board members called into the meeting: Frank Torr, Tom Clark, Lisa McGunnigle Tapp (Alternate), Jackson Kaspari, Dave Landry, Kyle Pimental (Alternate), Erin Allgood (Alternate), Hayley Harmon (Vice Chair)

Members Not Present (excused): None

Members Not Present (un-excused): None

Staff Present: Christopher Parker, Assistant City Manager, Dave Carpenter, Community Development Planner

Chair G. Cruikshank called the meeting to order at 7:00 p.m. She noted that certain members of the Planning Board are participating in this meeting remotely, and as the Chair of the Planning Board she has, per NH RSA 91-A:2, III (b), declared an "emergency" within the meaning of that statute and waive the requirement that a quorum be physically present at the meeting. Remote members will identify their location and any person present with them at that location. All votes will be by roll call.

The City of Dover has taken extra steps to ensure the physical location of this meeting conforms with all safety provisions during the pandemic, including social distancing, face coverings, and frequently sanitized facilities. Although qualified members of the public can participate in the meeting by speaking at the physical location, the public is encouraged to leave comments in advance by calling 516-MEET (6338), emailing Dover-Planning@dover.nh.gov, or mailing written comments to Planning Board, Dover City Hall, 288 Central Ave., Dover, NH 03820. Messages must be received no later than 4 p.m. the day of the meeting and should identify the name and Dover address of the person leaving the message or providing the comment.

The Chair announced that K. Pimental will sit in the vacant regular seat tonight.

1. CITIZENS' FORUM

Citizens Forum Open. No one spoke. *Citizens Forum Closed.*

2. APPROVAL OF THE PRIOR MINUTES

January 26, 2021 Regular Meeting Minutes

Motion: D. Ciotti moved to approve the minutes as presented. Seconded by D. White.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari -yes, D. White-yes, T. Clark-yes, F. Torr-yes

3. OLD BUSINESS

A. Public hearing on the Proposed FY22 CDBG Annual Action Plan. All persons wishing to speak on Plan are urged to attend.

Motion: D. White moved to remove the item from the table. Seconded by D. Ciotti.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari -yes, D. White-yes, T. Clark-yes, F. Torr-yes

D. Carpenter reviewed the Annual Action Plan which are the proposed allocations for the anticipated funding to be received for FY22. The Planning board will make a recommendation to the City Council who will also

hold a public hearing and make a final local decision. Public comments are still received after that point and will be sent with the Council's decision to HUD.

He proposed to amend what was in the packet regarding a contingency funding plan that's normally included.

Public hearing reopened.
No one spoke. No emails or calls were received by the office.
Public Hearing closed.

C. Parker advised the board members that no questions were sent to him, and none were asked of the applicant. The Board is free to discuss the Action Plan and can decide if changes are necessary, or if it wishes to recommend the Plan as presented to the City Council.

C. Parker read the amended language Dave Carpenter referred to so the board could decide whether to approve it.

Motion: D. White moved that the Planning Board strike the Contingency Funding Formula portion of Section 2 of the proposed FY22 Dover CDBG Action Plan and replace it with the following:
In the event that the actual FY22 Entitlement Grant amount and/or the actual FY21 Program Income results in a Public Services Funding Formula cap that is greater or less than $46,500.00, the approved Public Service allocations shall each be adjusted by an equal percentage to achieve a total Public Service allocation amount that does not exceed the HUD mandated Public Services CAP. Additionally, after accounting for a revised Public Services CAP, any further adjustments that are necessary due to a funding pool that is greater or less than $318,000.00 shall be accounted for by making the necessary adjustment to the General Administration and City Hall Barrier Removal FY22 Activity allocations.

Seconded by D. Ciotti.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari-yes, D. White-yes, T. Clark-yes, F. Torr-yes

Motion: D. White moved that the Planning Board finds the proposed FY22 Dover CDBG Action Plan is consistent with the Dover CDBG Consolidated Plan and recommends to the City Council approval of the proposed FY22 Dover CDBG Action Plan. Seconded by D. Ciotti.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari -yes, D. White-yes, T. Clark-yes, F. Torr-yes

B. Public hearing on a Proposed Amendment to the FY21-25 CDBG Citizen Participation Plan. All persons wishing to speak on the Amendment are urged to attend.

Motion: D. Ciotti moved to remove the item from the table. Seconded by D. White.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari -yes, D. White-yes, T. Clark-yes, F. Torr-yes

Dave Carpenter gave an overview of the proposed amendments to the 5-year plan for allocations for funds and priority projects. The amendments are in the Citizen Participation Plan portion of the plan.

Public hearing reopened.
No one spoke. No emails or calls were received by the office.

Public Hearing recessed.

C. Parker advised the board members that no questions were sent to him, and none were asked of the applicant. The Board is free to discuss the Action Plan and can decide if changes are necessary, or if it wishes to recommend the Plan as presented to the City Council.

Motion: D. White moved that the Planning Board finds the proposed amendment to Section XI of the Dover CDBG Citizen Participation Plan is consistent with the Dover CDBG Consolidated Plan and recommends to the City Council approval of the revised Dover CDBG Citizen Participation Plan. Seconded by D. Ciotti.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari -yes, D. White-yes, T. Clark-yes, F. Torr-yes

4. NEW BUSINESS

A. Discussion of citizen request to amend regulations regarding helicopter landing areas in the R-20 District.

C. Parker explained the history of this item and encouraged the Board to have the Citizen Present and then determine if the Board wants to:

- Have the amendment move forward on its own
- Couple the amendment with other zoning amendments
- Determine that it is not an amendment the Board supports at all.

Karl Leinsing, 77 Spur Road presented his proposal to the board again.
He is currently landing the helicopter on a boat in the river which is located at his property.
There are 2 other people he knows of who land helicopters in Dover.
There is currently criteria for getting a special exemption for landing a helicopter in the R20 Zone. He is proposing some modifications including:

- changing language from helicopter to aircraft since there are additional types now
- Change 1000 ft to 200 ft
- Change "Any existing residential structure" so that the owner's residence is not included
- Proposing a time restriction change from 9pm to 11pm
- Helipad needs to be approved by the FAA

One misconception is that helicopters are noisy. They are actually similar and quieter than leaf blowers and lawnmowers. A helicopter lands within five minutes so the sound is short-lived.

There are three people who sent letters in support of the modifications and a petition signed by his neighbors in favor of allowing the change.

His proposal is safer – to land on his property rather than on the river. He does have permission from DOT and FAA that approves landing in his backyard.
60 of 141 towns in NH have aircraft regulations and 32 require a special permit and 3 of those indicate a distance. Dover is 1000 ft, Bedford is 500 ft and North Hampton is 200 ft.

NH Fish and Game reported the closest bald eagle is 2 miles away and they don't see any issues there.

There are three neighbors not in favor of the proposal. He has worked with his neighbors to find out what he can do to ease their issues. He has installed a new motor with less decibels. His neighbor with horses is in favor and will testify the horses are not bothered by the landings.

He would like the board to wrap the amendments he is proposing into the amendments they will be reviewing tonight.

Chair Cruikshank asked if the neighbors who signed the petition are aware of the time change from 9pm to 11pm. No, he has not discussed that with them.

K. Pimental asked for more information about some topics that were sent in from the public:

- noise measurement is calculated from 500 ft in the air
- if approved by the FAA, is there any time restrictions to using it

Mr. Leinsing refuted both of those statements.

C. Parker asked for the distance between where he's landing now to where he wants to land- it is about 50 ft.

C. Parker noted some corrections to Mr. Leinsing's handout: he's seeking a special exception, not a special exemption; Bedford does not have a 500 ft distance requirement, but a minimum 1.5-acre lot size and landing area requires screening; many of the towns have lot sizes that are much larger which is why they may not have a distance requirement.

T. Clark commented his initial thought is that the Planning Board and City Council should consider zoning amendments when there are multiple people experiencing the same issues. Though there may be others, he is the only one coming forward with the issue and that doesn't call for a zoning amendment.

He respects his intentions but is not in favor of the City supporting these changes nor reducing restrictions.

D. Landry commented this is a unique situation and an amendment would affect such a broad area. Is there another route he can take to allow landing 50 ft closer to solve his issue without changing all of the R20 zone? C. Parker explained the history Mr. Leinsing has gone through ending in a variance he sought being denied and the ZBA suggesting he go before the Planning Board because of the 1000 ft restriction.

E. Allgood mentioned the precedent that would be set since we can't know what the future will hold and how this change may affect the zone. She appreciates all the work he has done but is not in support of changing the zoning for this one resident.

K. Pimental commented he considered how granting the amendment would move the City's master plans forward and he didn't find evidence of how this would benefit the City.

C. Parker provided the Board with a brief summary of the use in Dover and some research he had reviewed from other communities. He also mentioned the three abutters who sent letters in opposition and two voicemails were received to the office opposed to the changes.

He summarized an email that was received to the office in opposition.

D. White believes the proposal should stand alone and be sought by the citizen rather than put with the other amendments for review tonight. The Planning Dept should research and provide to the board information about the nuances and scope of the proposal. It may work well on Mr. Leinsing's property and his aircraft may be quiet, but what happens on someone else's property with a different aircraft?

He would be in favor of tabling the proposal to seek more information.

J. Kaspari does not think tabling the issue is necessary. Enough of the board members have spoken against the zoning change. He does not think the 50' benefit to the citizen is worth the Board's support of changing the zoning for that whole zone.

Mr. Leinsing commented that some changes can still be beneficial such as changing "helicopter" to "aircraft" and reducing the 1000 ft which is not even feasible, even if the time restriction stays at 9pm.

C. Parker commented that he agrees with J. Kaspari to say no to the proposal now, but, like K. Pimental said, if it's a topic the board wants or the community needs, it should be in a long-range planning document and then create a set of rules and regulations that can be applied.

D. Landry thinks we should keep this issue on the list for the Planning Board to look at in the future but he doesn't think we need to table this specific request for further review.

D. Ciotti, D. White, C. Cruikshank and J. Kaspari all agree with D. Landry that the issue needs to be looked at and planned out for the future.

C. Parker clarified for K. Pimental that the 1,000 ft restriction is intended to include the existing property and the surrounding properties.

Motion: J. Kaspari moved to deny the request. The Planning Board should not change the zoning regulations based on a single case. Seconded by T. Clark.

Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari -yes, D. White-yes, T. Clark-yes, F. Torr-no

The proposal was denied in a majority vote 8-1 with F. Torr opposed.

B. Consideration and possible vote on posting the proposed Amendments to Chapter 153. The full text of the amendments is available in Planning Department & at www.dover.nh.gov located under meeting materials and on the Planning Department page.*

C. Parker explained the amendments, as follows:

- Update Zones to match Council approved amendments from 2020
  - Already posted
- Clarify that unsigned plans are expired
- Electric Vehicle Charging and overlap parking
  - No recommendations yet
  - Subcommittee meets soon
- Parking Lot locations

- Revise regs to encourage more parking behind and to the side of buildings.
- Architectural Regulations
  - Add references to Design Guidelines
  - Update purpose of IT zone
- Add some guidance for Outdoor Dining

Public hearing opened.
No one spoke. No emails or calls were received by the office.
Public Hearing closed.

Motion: D. White moved to post items 1, 2, 3 minus the electric vehicle, 4 and 5. Seconded by D. Ciotti.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari -yes, D. White-yes, T. Clark-yes, F. Torr-yes

C. Consideration and possible vote on posting the proposed Amendments to Chapter 157. The full text of the amendments is available in Planning Department & at www.dover.nh.gov located under meeting materials and on the Planning Department page. *

C. Parker explained the amendments, as follows:

- Clarify that unsigned plans are expired
- Update required width of easements from 20' to 30'
- Update required sizes of boundary monumentation
  - Already posted
- Update reference for traffic signs
  - MUTCD
- Private Roads as a separate lot
  - No amendments yet, but working with Assessing to review

Public hearing opened.
No one spoke. No emails or calls were received by the office.
Public Hearing closed.

Motion: D. White moved to post the items. Seconded by D. Ciotti.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari -yes, D. White-yes, T. Clark-yes, F. Torr-yes

D. Consideration and possible vote on posting the proposed Amendments to Chapter 170 and the associated Zoning Tables. The full text of the amendments is available in Planning Department & at www.dover.nh.gov located under meeting materials and on the Planning Department page.*

D. Parker explained the amendments, as follows:

- Revise Definition of Accessory Structure
  - to increase sf from 100 to 200, per building code
- Area rezoning around Bellamy/Cold Springs Roads
  - To bring lots on Bellamy Road into compliance with the zoning dimensions
- Review options to remove barriers to housing
  - Allow conversion of single family homes to duplexes

DRAFT

  - Allow duplexes by right as part of a new subdivision
- Add a note to the tables referring to 17.27D
  - Create linkage to conservation district language when lots are created
- Consolidate both "Non-Conforming lot" sections
  - To create one spot for users to review
- Review swimming pools to update applicability of regs
  - To include temporary pools
- Revise Customary Home Occupations
  - To account for contractors or tradesmen using residential land for storage
- Revise Non-residential requirements, and amenities in CBD
  - Allow more fluid mixture of uses
  - Require Recycling bins downtown
- Accessory Dwelling Unit
  - Allow more than one ADU if rent restricted
- Update Floodplain Ordinance
  - No amendments yet, but working with Strafford Regional to review
- Update Wetlands Regulations
  - Update regulations and include floodplain language
- Update RCM
  - Encourage more affordable housing
- Update Groundwater Protection Regulations
  - No amendments yet, but working with Community Services to review
- Update non-conforming structures
  - To bring parity with non-conforming lot dimensions

Public hearing opened.
No one spoke. No emails or calls were received by the office.
Public Hearing closed.

Motion: D. Ciotti moved to post all items except 11, 12 and 14. Seconded by D. Landry.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari -yes, D. White-yes, T. Clark-yes, F. Torr-yes

5. STAFF COMMENTS

- TRC on a subdivision on 239 Knox Marsh Road
- Presentation to the City Council on March 3 on Master Plan, Waterfront and Strategic Plans
- Going forward, staff will assume the members on zoom tonight will continue to attend meetings via zoom unless they let staff know otherwise

6. MEMBER COMMENTS

- G. Cruickshank noted that Dave Landry will serve as Frank Torr's back up to TRC
- D. White is concerned about some cities rushing to convert commercial property to residential. He wants the board to remember, once that change is made, it cannot be reversed and there is minimal commercial properties in the City.
- D. Ciotti noted commercial and residential need to be balanced. It's been a long struggle to get back to the 80%-20% balance we have now.

DRAFT

7. ADJOURNMENT

Motion: D. White made a motion to adjourn at 9:20 p.m. Seconded by D. Ciotti.
Roll Call Vote: K. Pimental-yes, D. Ciotti-yes, G. Cruikshank-yes, H. Harmon-yes, D. Landry- yes, J. Kaspari - yes, D. White-yes, T. Clark-yes, F. Torr-yes

DRAFT

CITY OF DOVER

PLANNING BOARD - STAFF MEMO FILE #P21-06

Application Type:	Minor Subdivision
Applicant(s):	Townsquare Media Portsmouth, LLC
Owner(s):	Townsquare Media Portsmouth, LLC
Location:	292 Middle Road (Tax Map M, Lot 91A)
Meeting Date:	February 23, 2021

INTENT: To subdivide one lot into 2 lots

LOTS/UNITS PROPOSED: 1 new

AGENDA ITEM #: 4-A

ACREAGE: 65+/- acres

ZONING DISTRICT: R-40

EXISTING LAND USE: Office/Radio Station

PROPOSED LAND USE: N/A

SURROUNDING LAND USE: Residential and Piscataqua River

ZBA ACTION:
Z97-11 Variance granted for setback for addition
Z85-54 Variance granted

ATTACHMENTS: Application materials including subdivision plan

APPLICATION IS COMPLETE: Yes

DECLARE REGIONAL IMPACT: No

NOTICES SENT: Abutter notices were sent by certified mail to all abutters for this meeting

PERMITS REQUIRED: State subdivision

WAIVERS REQUESTED: Section 157-30: Location of Wetlands and Buffers

Summary of Request and Background
The site is proposed to be serviced by municipal water and private septic. As a Minor Subdivision, this application did not appear before the TRC.

The applicant is requesting the Board grant a waiver to Section 157-30 requiring wetland survey of the entire parent lot.

Consistency with Land Use Regulations
The plan is consistent with Chapter 157-15 of the City's Land Subdivision Regulations, which provides for subdivision of existing lots.

Chapter 157-51 states a waiver may be granted if the Board finds that

"(1) Strict conformity would pose an unnecessary hardship to the applicant and the waiver would not be contrary to the spirit and intent of the regulations; or
(2) Specific circumstances relative to the subdivision, or conditions of the land in such subdivision, indicate that the waiver will properly carry out the spirit and intent of the regulations."

Staff believes criterion 2 has been met for this request.

STAFF RECOMMENDATION- Waiver:
The Planning Department recommends that the Planning Board accept the application for review, open the public hearing, and vote to grant the waiver with the following condition:
Conditions to Be Met Prior to Signing of Plans:

1. Add a note to the plat that the Board granted a waiver to Chapter 157-13 (wetlands survey) and that the Board found the criteria of Chapter 157-51.A have been met.
2. Add a note to the plat that any further subdivision or development will require applicable wetland survey.

The applicant is requesting three waivers with justification indicated on the application. One is for road grade, one for road length, and one for the 100' external buffer.

STAFF RECOMMENDATION- Minor Subdivision
The Planning Department recommends that the Planning Board vote to approve the application with the following conditions:
Conditions to Be Met Prior to Signing of Plans:

1. The applicant shall provide the Planning Department with a digital version of the final plat.
2. Provide a CAD file to the satisfaction of the Asset Management Administrator's satisfaction.
3. The applicant shall revise the plat to:
    a. Add signature and stamp of LLS
    b. Add owners' signatures for recording at Strafford County Registry of Deeds
    c. Add Planning File # P21-06
    d. Show utility locations

Property Information

Property ID	M0091-A00000
Location	292 MIDDLE RD
Owner	TOWNSQUARE MEDIA PORTSMOUTH LLC
Land Use	433

MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT

City of Dover, NH makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Geometry updated 5/20/2020
Data updated Daily

City of Dover, New Hampshire
SUBDIVISION APPLICATION

[Revision Date: September 17, 2020]

Office Use Only	Project #:		Date Received:	
	Amount Paid:		Time Received:	

APPLICANT AND OWNER INFORMATION

Name of Applicant: Townsquare Media Portsmouth, LLC Telephone # 203-861-0900

Address of Applicant: One Manhattanville Road, Suite 202 Purchase, NY 10577

Name of Property Owner (*if different from applicant*): SAME Telephone #_____

Address of Property Owner: _____

E-Mail Address: lisa@townsquaremedia.com

PROPERTY INFORMATION

Address of Property: 292 Middle Road

Assessor's Map # M Lot(s) # 91A

Zoning District(s) R-40 Overlay District(s) N/A

Size of Parcel: 65± Acres Property Deed: Book 4236 Page: 706

Existing Use of Property: Commercial Office/Communications/Radio Station

SUBDIVISION INFORMATION

Subdivision Type: ~~Major (4 + net new lots):~~ Minor X Open Space: _____ TDR: _____

Existing Number of Lots: 1 Proposed Number of Lots: 2

City Water? X Yes ___ No How far is city water from the property? at Middle Road

City Sewer? ___Yes X No How far is city sewer from the property? _____

Highway Access (check where applicable): X City Street ____ State Highway

Estimated Length of Proposed Roads: N/A feet Public or Private Road? N/A

Estimated value of construction: N/A Refuse removal: Public/Private (circle one)

New impervious area (in s.f.): N/A

WAIVER REQUESTS

Subdivision Regulations section(s) to be waived: Section 157-30 General Requirements; Minimum Standards

Subdivision Application Checklist Item: Location of Wetlands & Buffers

Justification for waiver request(s) (*attach additional sheets as needed*): ~~N/A~~ SEE ATTACHED

SURVEYOR INFORMATION

Name of Surveyor and Company (Licensed in N.H.) Kevin M. McEneaney, LLS McEneaney Survey Associates

Address 24 Chestnut Street Dover, NH 03820 Telephone #: 603-742-0911

Professional License #: Kevin M. McEneaney NH LLS #661 E-mail address: kevin@surveynh.com

ENGINEER INFORMATION

Name of Engineer and Company (Licensed in N.H.) N/A

Address _____ Telephone #: _____

Professional License #: _____ E-mail address: _____

LANDSCAPE ARCHITECT INFORMATION

Name of Landscape Architect and Company (Licensed in N.H.) N/A

Address _____ Telephone #: _____

Professional License #: _____ E-mail address: _____

SOIL SCIENTIST INFORMATION

Name of Soil Scientist and Company (Licensed in N.H.) N/A

Address _____ Telephone #: _____

Professional License #: _____ E-mail address: _____

CONSERVATION EASEMENT HOLDER N/A

Name of Easement Holder: _____ Telephone #_____

Address Easement Holder: _____

SIGNATURES

I/We hereby submit this application to the City of Dover Planning Board and attest that to the best of my knowledge all of the information on this application form and in the accompanying application materials and documentation is true and accurate. Furthermore, I/We submit that the existing conditions sheet of the plan represents the lot in question, and that no alteration of the site shall take place during Planning Board review up to and including the pre-construction meeting. As applicant or as agent, I attest that I am duly authorized to act in this capacity.

x Signature of Property Owner: _____ Date: 1/29/21

Signature of Applicant (*if different from owner*): _____ Date: _____

Signature of Agent: _____ Date: _____

AUTHORIZATION TO ENTER SUBJECT PROPERTY

I, and my successors, hereby authorize members of the Dover Planning Board, Planning Department and other pertinent City Departments and boards to enter my property for the purpose of evaluating this application, including performing inspections during the application phase, post-approval phase, construction phase and occupancy phase. It is understood that these individuals must use all reasonable care, courtesy, and diligence when on the property.

x Signature of Property Owner: _____ Date: 1/29/21

AUTHORIZATION TO COMPLETE THE PROJECT ON SUBJECT PROPERTY

I, and my successors, hereby authorize the City of Dover and its assigns to enter my property for the purpose of completing the site work as required by the approved plan should the letter or credit or other surety be called. It is understood that these individuals must use all reasonable care, courtesy, and diligence when on the property.

x Signature of Property Owner: _____ Date: 1/29/21

Signature of Applicant (*if different from owner*): _____ Date: _____

CERTIFICATION OF FEES

I, and my successors, hereby certify that I understand that the City of Dover collects impact fees, utility investment fees and inspection fees for projects developed in Dover. Said fees must be paid before a Certificate of Occupancy can be obtained for a structure, unless a different payment schedule is agreed to by the applicant and the City prior to approvals being issued by the Dover Planning Board. Additionally, should the property be in "Current Use" it will be subject to the Land Use Change Tax.

x Signature of Property Owner: _____ Date: 1/29/21

Signature of Applicant (*if different from owner*): _____ Date: _____

CERTIFICATION OF PUBLIC ROADWAY ACCEPTANCE

I, and my successors, hereby certify that I understand that the acceptance of a roadway as a public road is an action of the City Council in its sole and complete discretion. In order for the City Council to consider accepting a road as public, it must be free of encumbrances. No roadway with private utility easements shall be accepted as a public road by the City unless the easements are expunged prior to the transfer of land to the City. License agreements for any and all private utilities within the right of way may be granted by the City upon acceptance of the unencumbered roadway consistent with applicable state law.

Signature of Property Owner: N/A Date: _____

Signature of Applicant (*if different from owner*): _____ Date: _____

City of Dover, New Hampshire
MINOR SUBDIVISION SUBMISSION CHECKLIST

[Revision Date: May 18, 2019]

This review checklist is intended to assist the applicant in the planning process of preparing a Subdivision application for Planning Board action. The size of the project will determine the types of information required for review, therefore, a **pre-application conference** with the Planning Department to determine the list of items that must be completed is strongly encouraged.

Plan Review Fees are due along with three (3) full size and twelve (12) half size (11x17), folded, copies of the plan set and materials, 3 weeks prior to the Planning Board meeting. Abutter/Notice Fees will be invoiced and are due 28 hours prior to Planning Board.

The applicant is cautioned that this checklist is only a guide and is not intended to be a complete list of all subdivision requirements. Please refer to the Subdivision Regulations for full details.

APPLICANT: Townsquare Media Portsmouth, LLC File Number: P21-_____

PROJECT TITLE: Minor Subdivision of Land

PROPERTY LOCATION: 292 Middle Road Tax Map: M Lot: 91A

	Where/How Provided	Reviewed
1. Completed and signed Application form	✓	
2. Plan Review Fees are provided	✓	
3. Electronic copy of the surveyed plat layout	✓	
4. Electronic copy of supplementary materials and application	✓	
5. Waiver requests to the Subdivision Regulations, with written justification	✓	
6. Conditional Use Permit applications	N/A	
7. ~~Fifteen~~ folded copies of subdivision plan w/scale of not less than 1"=50' or 1"=100' for larger subdivisions. Plans shall contain the following items as appropriate:	5 copies provided (1 full size, 4 11x17)	
Location map at appropriate scale	✓	
Proposed subdivision name and title and Planning File #	✓	
Date, north arrow and scale	✓	
Names of all abutting property owners	✓	
Name and address of owners and/or applicants	✓	
Signature & stamp of NH licensed land surveyor and/or engineer	✓	
Zoning District boundaries, including any special or overlay districts	N/A	
Location of Conservation District areas	✓	
Location, names and widths of existing and proposed streets, including pavement widths, grades, curbs and crosswalks	✓	
Location and widths of existing & proposed easements & right of ways	✓	
Location and widths of existing and proposed sidewalks	N/A	
Existing and proposed property lines with dimensions and bearings tied into Dover's Geographic Information System coordinate system	Partial Waiver	
Existing and proposed lot areas in square feet	✓	
Existing and proposed topographic information at two foot intervals	✓	
Existing and proposed buildings and structure locations	✓	
Minimum building setbacks or build to lines on all lots	✓	
Location and size of existing and proposed electric, telephone, gas cable and other underground utilities	N/A	

	Explain How Provided	Reviewed
Existing and proposed water lines and fire hydrants, including materials and capacity needed	N/A	
Location and materials of sanitary sewage facilities within project site and projected additional peak hour sewer load	N/A	
Existing and proposed septic system, including test pit locations and results and NHDES subdivision permit number	✓	
Existing and proposed stormwater lines and facilities	N/A	
Location of Flood Hazard Zone	N/A	
Location of all bodies of water and watercourses	✓	
Location of wetlands and buffers	Waiver	
Existing natural features and/or significant vegetation on property	N/A	
Soil types	N/A	
Map and lot numbers for existing and proposed lots as assigned by Tax Assessor	✓	
Location of all land offered for dedication for public use or land to be held in common by property owners of the subdivision	N/A	
Location, material and size of existing and proposed permanent monuments	✓	
Existing railroad lines	N/A	
Note regarding solid waste disposal	N/A	
All applicable Dover Common Subdivision notes	✓	
8. Construction Detail Sheets shall contain the following information (if appropriate): N/A		
Profiles showing existing & proposed elevations along the center lines of proposed streets & within 100' of intersections with existing streets		
Profiles showing the locations & a typical cross-section detail of streets		
Location of street trees, street lighting poles and street signs		
Location, size and invert elevations of existing and proposed sanitary sewers, stormwater drains and fire hydrants		
Location and size of all water, gas and other underground utilities		
9. Additional Information if appropriate N/A		
Stormwater Management Plan depicting the existing and proposed storm drainage system and engineered drainage analysis		
Stormwater Management System Operation and Maintenance Plan		
Letter to Serve from Public and Private Utilities		
Erosion and Sedimentation Control Plan		
Proposed restrictive covenants or homeowners association documents		
Dates and permit numbers of all required state and federal permits		
If wetland buffer, indicate placards locations, as applicable		
Provide additional exhibits/technical data determined appropriate by the Planning Board or its staff as required		

REVIEWED BY: _____ DATE_____

WAIVER REQUESTS:

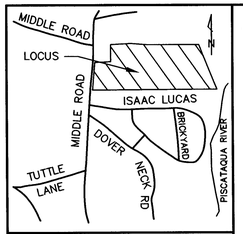
Arcticle VII: General Requirements & Design Standards

157-30 Minimum Standards; Waivers

A. Character of Land: Boundary line bearing and distances have been provided for the smaller of the two lots (8± acres) while the remaining land consists of 57± acres. There is no immediate plan to develop the 57± acre parcel. This intent of this subdivision is to separate the broadcast facility and associated communication towers from the undeveloped land.

Subdivision Application Checklist Item: Location of Wetlands & Buffers

The smaller of the two lots (8± acres) is currently serviced by a 2012 septic system. There is no immediate plan to further develop either parcel and therefore we are asking for relief from providing a wetlands inventory at this time. A full wetland delineation will occur at such time new development takes place.



LOCATION PLAN
(NO SCALE)

REFERENCE PLANS:

1.) PLAN OF LAND OF GEORGE & DOROTHY PRESCOTT, DOVER, N.H. SHOWING PARCEL SOLD TO ALAN R. & PATRICIA WILSON. SCALE: 1" = 100'; DATED: AUGUST 1972; BY: RICHARD P. TOWLE, NOT RECORDED, ON FILE WITH CITY OF DOVER PLANNING OFFICE.

2.) LOT LINE REVISION – ISAAC LUCAS CIRCLE, DOVER, N.H. FOR CITADEL BROADCASTING COMPANIES AND NELSON MILES COOK, III. SCALE: 1" = 40'; DATED: MARCH 13, 2002; BY: NORWAY PLAINS ASSOCIATES, INC. RECORDED S.C.R.D. PLAN 66–70.

3.) FINAL PLAN – BRICKYARD ESTATES – MIDDLE ROAD, DOVER, N.H. SCALE: 1" = 100'; DATED: OCTOBER 1, 1985, REVISED THROUGH 04/17/1986; BY: G.L. DAVIS & ASSOCIATES. RECORDED S.C.R.D. PLAN 29–35.

4.) MINOR SUBDIVISION PLAN OF PROPERTY IN THE NAME OF VALEIRE A. CHENEVERT IRREVOCABLE TRUST SHOWN AS TAX MAP M / LOT 102 LOCATED AT 277 MIDDLE ROAD, COUNTY OF STRAFFORD, DOVER, NH. SCALE: 1" = 50'; DATED: MARCH 19, 2019, REVISED THROUGH 5/2/19; BY: DAVID W. VINCENT, LLS LAND SURVEYING SERVICES. RECORDED S.C.R.D. PLAN 11895.

5.) SUBDIVISION OF LAND FOR EDMUND J. O'BRIEN, JR. IN DOVER, N.H. SCALE: 1" = 60'; DATED: MAY 9, 1981; BY: BRUCE J. POHOPEK, LAND SURVEYOR. RECORDED S.C.R.D. PLAN 21A–87.

125' WIDE P.S.N.H. EASEMENT 442 / 414 (11/06/30)

P.S.N.H. EASEMENT 942 / 408 (03/21/74) [M/92B]

P.S.N.H. EASEMENT 952 / 248 (07/16/74) [M/104]

P.S.N.H. EASEMENT 956 / 265 (12/03/74) SEE NOTE 10D

M / 92A
PATRICIA LANGS
10 HAWTHORN ROAD
DOVER, NH 03820
1019 / 352

P/O M / 104

1,961'± ALONG BARBED WIRE LINE

BACK ROAD

MIDDLE ROAD

M / 91B

M / 102

M / 91

M/102-11

M / 89C

M / 89E

M / 89D

M / 89

225.32'

407.95'

206.06'

658.24'

PROPOSED LOT
354,429 S.F.
8.14 Ac.

SEE SHEET 2 FOR DETAIL

M / 91A

268.70'

125.00'

#292

394.86'

304.91'

668.02'

268.77'

216.31'

150' WIDE P.S.N.H. EASEMENT 619 / 392 (7/28/53) (SEE NOTE 10B)

35' WIDE G.S. GAS & TRANSMISSION EASEMENT 845 / 406 (6/18/68)

TEST PIT #1

M / 91C
REMAINING LAND
57 Ac.±

125' WIDE P.S.N.H. EASEMENT 442 / 413 (11/06/30)

M / 104
ALAN G. DEXTER, TRUSTEE
WILLIAM O. NICHOLS, JR.
4217 BLACK SYCAMORE DRIVE
CHARLOTTE, NC 28226
391 / 359
801 / 289

218' WIDE P.S.N.H. EASEMENT 446 / 301 (08/19/31)

675'±

35' WIDE G.S. GAS & TRANSMISSION EASEMENT 804 / 377 (11/20/69)

1,480'± ALONG HIGH WATER LINE

PISCATAQUA RIVER
EBB TIDAL FLOOD

NH STATE PLANE NAD 83 – GPS OBS.

984.65'

787.23'

44.72'

873.65'

120'±

M / 90D-1
N. MILES COOK, III
AMANDA COOK
22 ISAAC LUCAS CIRCLE
DOVER, NH 03820
3723 / 776

M / 90X | M/90A-8 | M/90A-10 | M/90A-6 | M / 90K | M / 90N | M/90A-5 | M / 90E | M/90A-3

MIDDLE ROAD
{PUBLIC; VARIABLE WIDTH R.O.W.}

OWNER SIGNATURES

NOTES:

1.) OWNER OF RECORD:
TOWNSQUARE MEDIA PORTSMOUTH LLC
P.O. Box 576
DOVER, NEW HAMPSHIRE 03821
S.C.R.D. VOLUME 4236, PAGE 706

2.) M / 91A – DENOTES TAX MAP AND PARCEL NUMBER.

3.) TOTAL PARCEL AREA = 65.0 Ac.±

4.) THE INTENT OF THIS PLAN IS TO DEPICT A MINOR SUBDIVISION OF THE SUBJECT PARCEL INTO TWO (2) LOTS AS SHOWN.

5.) ZONING DISTRICT IS RURAL RESIDENTIAL (R–40) DISTRICT
DIMENSIONAL REQUIREMENTS:

MINIMUM LOT SIZE	= 40,000 S.F.
MINIMUM LOT COVERAGE	= 10 PERCENT
MINIMUM FRONTAGE	= 150 FEET
BUILDING SETBACK REQUIREMENTS:	
FRONT SETBACK	= 40 FEET
SIDE SETBACK	= 25 FEET
REAR SETBACK	= 30 FEET
MAXIMUM BUILDING HEIGHT	= 35 FEET MAXIMUM

6.) PORTIONS OF THE SUBJECT PARCEL ARE LOCATED WITHIN THE SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1 PERCENT ANNUAL CHANCE FLOOD, ZONE AE (BASE FLOOD ELEVATIONS DETERMINED, ELEVATION 8); AND AREAS DETERMINED TO BE INSIDE THE 0.2 PERCENT ANNUAL CHANCE FLOODPLAIN, AS SHOWN ON FLOOD INSURANCE RATE MAP, COMMUNITY NUMBER 330145; PANEL 0340; SUFFIX E; MAP NUMBER 33017C0340E; EFFECTIVE DATE SEPTEMBER 30, 2015.

7.) BASIS OF BEARING IS NH STATE PLANE (NAD83) BASED ON GPS OBSERVATION DATED JANUARY 14, 2021. VERTICAL DATUM IS NAVD88 BASED ON GPS OBSERVATION DATED JANUARY 14, 2021.

8.) PROPERTY LINE INFORMATION FOR PARCEL M/91A HAS BEEN OBTAINED FROM A SURVEY PERFORMED BY MCENEANEY SURVEY ASSOCIATES OF NEW ENGLAND DURING JANUARY 2021 WITH AN ERROR NOT GREATER THAN 1 IN 10,000. PROPERTY LINE INFORMATION FOR PARCEL M/91C IS COMPILED FROM EXISTING SURVEY PLANS.

9.) PORTIONS OF THE PARCEL IS SUBJECT TO THE RULES OF THE SHORELAND WATER QUALITY PROTECTION ACT (NH RSA 483–B), THOSE AREAS WITHIN TWO HUNDRED AND FIFTY (250) FEET OF THE PISCATAQUA RIVER HIGHEST OBSERVABLE TIDE LINE (REFERENCE LINE).

10.) REFERENCE IS MADE TO THE FOLLOWING TITLE ITEMS:

A.) 17,633 S.F. OF LAND GRANTED TO N. MILES COOK, III AS DESCRIBED IN S.C.R.D. VOLUME 2534, PAGE 567.

B.) 150' WIDE EASEMENT GRANTED TO PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE AS DESCRIBED IN S.C.R.D. VOLUME 619, PAGE 392.

C.) TOWER, ACCESS, UTILITY AND GUY EASEMENTS GRANTED TO VERTICAL BRIDGE TOWERS, LLC AS DESCRIBED IN S.C.R.D. VOLUME 4350, PAGE 514.

D.) EASEMENT GRANTED TO PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE AS DESCRIBED IN S.C.R.D. VOLUME 956, PAGE 265.

11.) SEE SHEET 2 OF 2 FOR ABUTTER LIST.

"I HEREBY CERTIFY THAT THIS PLAN IS BASED ON AN ACTUAL GROUND SURVEY PERFORMED WITH A TOTAL STATION, BY ME OR THOSE UNDER MY DIRECT SUPERVISION AND THAT, TO THE BEST OF MY KNOWLEDGE AND BELIEF, SAID SURVEY MEETS OR EXCEEDS THE MINIMUM PRECISION REQUIREMENTS FOR SURVEY CLASSIFICATION "U" AS SET FORTH IN TABLE 500.1 OF THE NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES OF THE BOARD OF LICENSURE FOR LAND SURVEYORS."

NO.	DATE	DESCRIPTION	BY	CHK
		REVISIONS		

20–2331	SUBDIVISION	20–13	50–61
PROJECT NO	TYPE	FIELDBOOK & PAGES	

SHEET 1 OF 2

MINOR SUBDIVISION OF LAND
PREPARED FOR
TOWNSQUARE MEDIA PORTSMOUTH LLC
TAX MAP M, LOT No. 91A
292 MIDDLE ROAD
CITY of DOVER
COUNTY of STRAFFORD
STATE of NEW HAMPSHIRE

DOVER PLANNING FILE No. P 21–___

DRAWN BY: RJM	FILE: \2331\DWGS\2331 GPS
SCALE: 1" = 150'	DATE: JANUARY 22, 2021

150 75 0 75 150 300 450 600

STATE OF NEW HAMPSHIRE No. 661 KEVIN M. McENEANEY LICENSED LAND SURVEYOR SIGNATURE

McEneaney Survey Associates of NEW ENGLAND
P.O. Box 681 – 24 CHESTNUT STREET
DOVER, NH 03820 (603) 742–0911
SURVEYING – PLANNING – CONSULTING

LIST OF ABUTTERS

	NAME	ADDRESS	BOOK / PAGE
M/90A-3	DAVID K. DICKSON DIANE N. DICKSON	20 ISAAC LUCAS CIRCLE DOVER, NH 03820	1645 / 128
M / 90E	JANE M. DUGAS, TRUSTEE JANE M. DUGAS 2011 REVOCABLE TRUST	18 ISAAC LUCAS CIRCLE DOVER, NH 03820	3910 / 984
M/90A-5	ERIC A. SPURLING, TRUSTEE ERIC A. SPURLING LIVING TRUST	16 ISAAC LUCAS CIRCLE DOVER, NH 03820	4252 / 539 4607 / 570
M / 90N	CHRISTOPHER L. STEVENS	14 ISAAC LUCAS CIRCLE DOVER, NH 03820	4316 / 786
M / 90K	SETH RAFAEL GABARRO ANTHONY PHILIP GABARRO	12 ISAAC LUCAS CIRCLE DOVER, NH 03820	4204 / 48
M/90A-6	P KARL SCHELLER PATRICIA A. SCHELLER, TRUSTEES SCHELLER FAMILY TRUST	10 ISAAC LUCAS CIRCLE DOVER, NH 03820	4586 / 392
M/90A-10	KEVIN F. HOLDEN DEBORAH E. HOLDEN DOVER, NH 03820	8 ISAAC LUCAS CIRCLE	3901 / 433
M/90A-8	WILLIAM D. COVERT PAIGE C. COVERT	6 ISAAC LUCAS CIRCLE DOVER, NH 03820	4047 / 814
M / 90X	JEFFREY R. ROCHEFORT DOVER, NH 03820	320 MIDDLE ROAD	4284 / 970
M / 89	SCOTT C. GAGNON, TRUSTEE SCOTT C. GAGNON REVOCABLE TRUST	315 MIDDLE ROAD DOVER, NH 03820	3757 / 56
M / 89D	THEODORE S. HACKETT CYNTHIA A. HACKETT	309 MIDDLE ROAD DOVER, NH 03820	1853 / 667
M / 89E	CARL H. MAMIGONIAN SHARON J. MAMIGONIAN, TRUSTEES CARL H. MAMIGONIAN SHARON J. MAMIGONIAN REVOCABLE LIVING TRUST	297 MIDDLE ROAD DOVER, NH 03820	4524 / 529
M / 89C	MELISSA SPALDING DOVER, NH 03820	291 MIDDLE ROAD	4223 / 128
M/102-11	HAPPY MOUNTAIN HOLDINGS, LLC	901 N MARKET STREET, SUITE 705 WILMINGTON, DE 09801	4775 / 485

M / 104

ALAN G. DEXTER, TRUSTEE
WILLIAM O. NICHOLS, JR.
4217 BLACK SYCAMORE DRIVE
CHARLOTTE, NC 28226
391 / 359
801 / 289

M / 91B

JAMES F. MCKENNA &
JOANNE E. MCKENNA, TRUSTEES
JAMES F. MCKENNA AND JOANNE E. MCKENNA
REVOCABLE LIVING TRUST
278 MIDDLE ROAD, DOVER, NH 03820
4520 / 683

M / 91

EDWARD S. STRANGE
286 MIDDLE ROAD
DOVER, NH 03820
2733 / 123

M/102-11

M / 89C

M / 89E

MIDDLE ROAD {PUBLIC; VARIABLE WIDTH R.O.W.}

89.0'±
51.7'±
25.1'±
78.1'±
204.3'±
47.0'±
188.5'±
68.7'±
87.5'±
BROOK
BROOK
REMNANTS OF BARB WIRE FENCE LINE IN TREES AND ON GROUND

N00°41'16"W 225.32'
N00°41'23"W 407.95'
N00°41'23"W 206.09'
N01°13'59"W 384.86'

268.70'
N89°50'37"E
125.00'
N89°50'37"E

S66°39'11"E
658.24'

S53°01'43"W
668.02'

S61°41'43"W
266.77'

S88°46'01"W
216.31'

M / 91A

PROPOSED LOT
354,429 S.F.
8.14 Ac.

M / 91C

REMAINING LAND
57 Ac.±

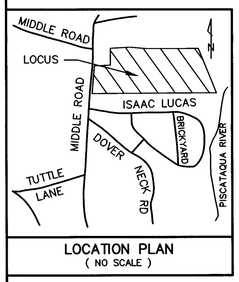
25' FROM ANCHOR
20' FROM ANCHOR
PROPANE TANK
TOWER HEIGHT = 490'±
TOWER EASEMENT (SEE NOTE 10C)
TOWER GUY LINES (TYP.)
SHED (TYP.)
SATELLITE DISH ANTENNA
5'x25' FENCE ENCLOSURE (TYP. OF 6)
GUY EASEMENT (TYP. OF 6) (SEE NOTE 10C)
UTILITY EASEMENT (SEE NOTE 10C)
ACCESS EASEMENT (SEE NOTE 10C)
ILLUMINATED SIGN
WALKWAY
BITUMINOUS CONCRETE DRIVEWAY AND PARKING AREAS
EXISTING BUILDING 12,500 S.F. FOOTPRINT #292 MIDDLE ROAD
EQUIPMENT ENCLOSURE
PROPANE TANKS
DUMPSTER
EXISTING SEPTIC SYSTEM NHDES CA2012110238
SEPTIC SYSTEM TOE OF SLOPE
150' WIDE P.S.N.H. EASEMENT
619 / 392 (7/28/53)
(SEE NOTE 10B)
35' WIDE G.S. GAS & TRANSMISSION EASEMENT
ON SOUTHERLY SIDE OF PSNH EASEMENT
845 / 408 (6/18/68)
TEST PIT #1

NH STATE PLANE
NAD 83 - GPS OBS.

NOTES:

1.) SEE SHEET 1 OF 2 FOR NOTES AND REFERENCE PLANS.

OWNER SIGNATURES



LOCATION PLAN
(NO SCALE)

NO.	DATE	DESCRIPTION	BY	CHK
		REVISIONS		

20-2331	SUBDIVISION	20-13	50-61
PROJECT NO	TYPE	FIELDBOOK & PAGES	

SHEET 2 OF 2

MINOR SUBDIVISION OF LAND
PREPARED FOR
TOWNSQUARE MEDIA PORTSMOUTH LLC
TAX MAP M, LOT No. 91A
292 MIDDLE ROAD
CITY of DOVER
COUNTY of STRAFFORD
STATE of NEW HAMPSHIRE

DOVER PLANNING FILE No. P 21-___

DRAWN BY: RJM	FILE: \2331\DWGS\2331 GPS
SCALE: 1" = 50'	DATE: JANUARY 22, 2021

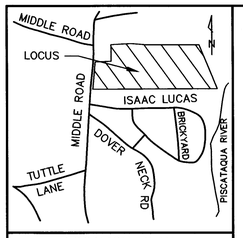
50 25 0 25 50 100 150 200

"I HEREBY CERTIFY THAT THIS PLAN IS BASED ON AN ACTUAL GROUND SURVEY PERFORMED WITH A TOTAL STATION, BY ME OR THOSE UNDER MY DIRECT SUPERVISION AND THAT, TO THE BEST OF MY KNOWLEDGE AND BELIEF, SAID SURVEY MEETS OR EXCEEDS THE MINIMUM PRECISION REQUIREMENTS FOR SURVEY CLASSIFICATION "U" AS SET FORTH IN TABLE 500.1 OF THE NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES OF THE BOARD OF LICENSURE FOR LAND SURVEYORS."

STATE OF NEW HAMPSHIRE LICENSED LAND SURVEYOR
NO. 661
KEVIN M. McENEANEY
SIGNATURE

McEneaney Survey Associates
of NEW ENGLAND
P.O. Box 681 – 24 CHESTNUT STREET
DOVER, NH 03820 (603) 742-0911

SURVEYING – PLANNING – CONSULTING



LOCATION PLAN
(NO SCALE)

REFERENCE PLANS:

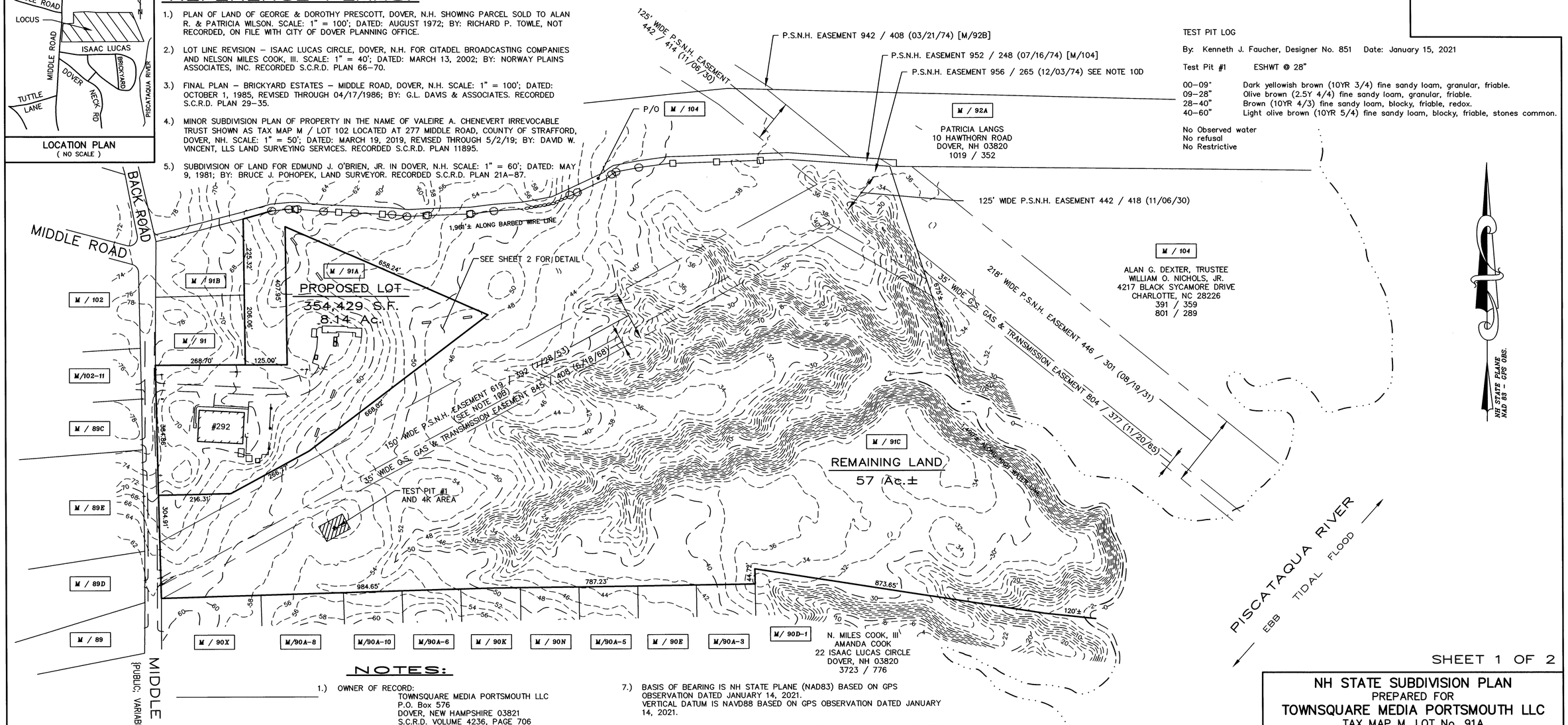
1.) PLAN OF LAND OF GEORGE & DOROTHY PRESCOTT, DOVER, N.H. SHOWING PARCEL SOLD TO ALAN R. & PATRICIA WILSON. SCALE: 1" = 100'; DATED: AUGUST 1972; BY: RICHARD P. TOWLE, NOT RECORDED, ON FILE WITH CITY OF DOVER PLANNING OFFICE.

2.) LOT LINE REVISION – ISAAC LUCAS CIRCLE, DOVER, N.H. FOR CITADEL BROADCASTING COMPANIES AND NELSON MILES COOK, III. SCALE: 1" = 40'; DATED: MARCH 13, 2002; BY: NORWAY PLAINS ASSOCIATES, INC. RECORDED S.C.R.D. PLAN 66–70.

3.) FINAL PLAN – BRICKYARD ESTATES – MIDDLE ROAD, DOVER, N.H. SCALE: 1" = 100'; DATED: OCTOBER 1, 1985, REVISED THROUGH 04/17/1986; BY: G.L. DAVIS & ASSOCIATES. RECORDED S.C.R.D. PLAN 29–35.

4.) MINOR SUBDIVISION PLAN OF PROPERTY IN THE NAME OF VALEIRE A. CHENEVERT IRREVOCABLE TRUST SHOWN AS TAX MAP M / LOT 102 LOCATED AT 277 MIDDLE ROAD, COUNTY OF STRAFFORD, DOVER, NH. SCALE: 1" = 50'; DATED: MARCH 19, 2019, REVISED THROUGH 5/2/19; BY: DAVID W. VINCENT, LLS LAND SURVEYING SERVICES. RECORDED S.C.R.D. PLAN 11895.

5.) SUBDIVISION OF LAND FOR EDMUND J. O'BRIEN, JR. IN DOVER, N.H. SCALE: 1" = 60'; DATED: MAY 9, 1981; BY: BRUCE J. POHOPEK, LAND SURVEYOR. RECORDED S.C.R.D. PLAN 21A–87.



TEST PIT LOG

By: Kenneth J. Faucher, Designer No. 851 Date: January 15, 2021

Test Pit #1 ESHWT @ 28"

00–09"	Dark yellowish brown (10YR 3/4) fine sandy loam, granular, friable.
09–28"	Olive brown (2.5Y 4/4) fine sandy loam, granular, friable.
28–40"	Brown (10YR 4/3) fine sandy loam, blocky, friable, redox.
40–60"	Light olive brown (10YR 5/4) fine sandy loam, blocky, friable, stones common.

No Observed water
No refusal
No Restrictive

NH STATE PLANE
NAD 83 – CPS OBS.

NOTES:

1.) OWNER OF RECORD:
TOWNSQUARE MEDIA PORTSMOUTH LLC
P.O. Box 576
DOVER, NEW HAMPSHIRE 03821
S.C.R.D. VOLUME 4236, PAGE 706

OWNER SIGNATURES

2.) M / 91A – DENOTES TAX MAP AND PARCEL NUMBER.

3.) TOTAL PARCEL AREA = 65.0 Ac.±

4.) THE INTENT OF THIS PLAN IS TO DEPICT A MINOR SUBDIVISION OF THE SUBJECT PARCEL INTO TWO (2) LOTS AS SHOWN.

5.) ZONING DISTRICT IS RURAL RESIDENTIAL (R–40) DISTRICT
DIMENSIONAL REQUIREMENTS:

MINIMUM LOT SIZE	= 40,000 S.F.
MINIMUM LOT COVERAGE	= 10 PERCENT
MINIMUM FRONTAGE	= 150 FEET
BUILDING SETBACK REQUIREMENTS:	
FRONT SETBACK	= 40 FEET
SIDE SETBACK	= 25 FEET
REAR SETBACK	= 30 FEET
MAXIMUM BUILDING HEIGHT	= 35 FEET MAXIMUM

6.) PORTIONS OF THE SUBJECT PARCEL ARE LOCATED WITHIN THE SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1 PERCENT ANNUAL CHANCE FLOOD, ZONE AE (BASE FLOOD ELEVATIONS DETERMINED, ELEVATION 8); AND AREAS DETERMINED TO BE INSIDE THE 0.2 PERCENT ANNUAL CHANCE FLOODPLAIN, AS SHOWN ON FLOOD INSURANCE RATE MAP, COMMUNITY NUMBER 330145; PANEL 0340; SUFFIX E; MAP NUMBER 33017C0340E; EFFECTIVE DATE SEPTEMBER 30, 2015.

7.) BASIS OF BEARING IS NH STATE PLANE (NAD83) BASED ON GPS OBSERVATION DATED JANUARY 14, 2021.
VERTICAL DATUM IS NAVD88 BASED ON GPS OBSERVATION DATED JANUARY 14, 2021.

8.) PROPERTY LINE INFORMATION FOR PARCEL M/91A HAS BEEN OBTAINED FROM A SURVEY PERFORMED BY MCENEANEY SURVEY ASSOCIATES OF NEW ENGLAND DURING JANUARY 2021 WITH AN ERROR NOT GREATER THAN 1 IN 10,000.
PROPERTY LINE INFORMATION FOR PARCEL M/91C IS COMPILED FROM EXISTING SURVEY PLANS.

9.) PORTIONS OF THE PARCEL IS SUBJECT TO THE RULES OF THE SHORELAND WATER QUALITY PROTECTION ACT (NH RSA 483–B), THOSE AREAS WITHIN TWO HUNDRED AND FIFTY (250) FEET OF THE PISCATAQUA RIVER HIGHEST OBSERVABLE TIDE LINE (REFERENCE LINE).

10.) REFERENCE IS MADE TO THE FOLLOWING TITLE ITEMS:

A.) 17,633 S.F. OF LAND GRANTED TO N. MILES COOK, III AS DESCRIBED IN S.C.R.D. VOLUME 2534, PAGE 567.

B.) 150' WIDE EASEMENT GRANTED TO PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE AS DESCRIBED IN S.C.R.D. VOLUME 619, PAGE 392.

C.) TOWER, ACCESS, UTILITY AND GUY EASEMENTS GRANTED TO VERTICAL BRIDGE TOWERS, LLC AS DESCRIBED IN S.C.R.D. VOLUME 4350, PAGE 514.

D.) EASEMENT GRANTED TO PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE AS DESCRIBED IN S.C.R.D. VOLUME 956, PAGE 265.

11.) SEE SHEET 2 OF 2 FOR ABUTTER LIST.

12.) PARCEL M / 91A CONTAINS AN APPROVED SEPTIC SYSTEM NHDES #CA2012110238.

NO.	DATE	DESCRIPTION	BY	CHK
		REVISIONS		

20–2331	SUBDIVISION	20–13	50–61
PROJECT NO	TYPE	FIELDBOOK & PAGES	

"I HEREBY CERTIFY THAT THIS PLAN IS BASED ON AN ACTUAL GROUND SURVEY PERFORMED WITH A TOTAL STATION, BY ME OR THOSE UNDER MY DIRECT SUPERVISION AND THAT, TO THE BEST OF MY KNOWLEDGE AND BELIEF, SAID SURVEY MEETS OR EXCEEDS THE MINIMUM PRECISION REQUIREMENTS FOR SURVEY CLASSIFICATION "U" AS SET FORTH IN TABLE 500.1 OF THE NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES OF THE BOARD OF LICENSURE FOR LAND SURVEYORS."

SHEET 1 OF 2

NH STATE SUBDIVISION PLAN
PREPARED FOR
TOWNSQUARE MEDIA PORTSMOUTH LLC
TAX MAP M, LOT No. 91A
292 MIDDLE ROAD
CITY of DOVER
COUNTY of STRAFFORD
STATE of NEW HAMPSHIRE

DOVER PLANNING FILE No. P 21–__

DRAWN BY: RJM	FILE: \2331\DWGS\2331 GPS
SCALE: 1" = 150'	DATE: JANUARY 22, 2021

150 75 0 75 150 300 450 600

STATE OF NEW HAMPSHIRE LICENSED LAND SURVEYOR No. 661 KEVIN M. McENEANEY SEAL

McEneaney Survey Associates of NEW ENGLAND
P.O. Box 681 – 24 CHESTNUT STREET
DOVER, NH 03820 (603) 742–0911

SURVEYING – PLANNING – CONSULTING

LIST OF ABUTTERS

	NAME	ADDRESS	BOOK / PAGE
M/90A-3	DAVID K. DICKSON DIANE N. DICKSON	20 ISAAC LUCAS CIRCLE DOVER, NH 03820	1645 / 128
M / 90E	JANE M. DUGAS, TRUSTEE JANE M. DUGAS 2011 REVOCABLE TRUST	18 ISAAC LUCAS CIRCLE DOVER, NH 03820	3910 / 984
M/90A-5	ERIC A. SPURLING, TRUSTEE ERIC A. SPURLING LIVING TRUST	16 ISAAC LUCAS CIRCLE DOVER, NH 03820	4252 / 539 4607 / 570
M / 90N	CHRISTOPHER L. STEVENS	14 ISAAC LUCAS CIRCLE DOVER, NH 03820	4316 / 786
M / 90K	SETH RAFAEL GABARRO ANTHONY PHILIP GABARRO	12 ISAAC LUCAS CIRCLE DOVER, NH 03820	4204 / 48
M/90A-6	P KARL SCHELLER PATRICIA A. SCHELLER, TRUSTEES SCHELLER FAMILY TRUST	10 ISAAC LUCAS CIRCLE DOVER, NH 03820	4586 / 392
M/90A-10	KEVIN F. HOLDEN DEBORAH E. HOLDEN DOVER, NH 03820	8 ISAAC LUCAS CIRCLE	3901 / 433
M/90A-8	WILLIAM D. COVERT PAIGE C. COVERT	6 ISAAC LUCAS CIRCLE DOVER, NH 03820	4047 / 814
M / 90I	JEFFREY R. ROCHEFORT DOVER, NH 03820	320 MIDDLE ROAD	4284 / 970
M / 89	SCOTT C. GAGNON, TRUSTEE SCOTT C. GAGNON REVOCABLE TRUST	315 MIDDLE ROAD DOVER, NH 03820	3757 / 56
M / 89D	THEODORE S. HACKETT CYNTHIA A. HACKETT	309 MIDDLE ROAD DOVER, NH 03820	1853 / 667
M / 89E	CARL H. MAMIGONIAN SHARON J. MAMIGONIAN, TRUSTEES CARL H. MAMIGONIAN SHARON J. MAMIGONIAN REVOCABLE LIVING TRUST	297 MIDDLE ROAD DOVER, NH 03820	4524 / 529
M / 89C	MELISSA SPALDING DOVER, NH 03820	291 MIDDLE ROAD	4223 / 128
M/102-11	HAPPY MOUNTAIN HOLDINGS, LLC	901 N MARKET STREET, SUITE 705 WILMINGTON, DE 09801	4775 / 485

M / 104
ALAN G. DEXTER, TRUSTEE
WILLIAM O. NICHOLS, JR.
4217 BLACK SYCAMORE DRIVE
CHARLOTTE, NC 28226
391 / 359
801 / 289

M / 91B
JAMES F. MCKENNA &
JOANNE E. MCKENNA, TRUSTEES
JAMES F. MCKENNA AND JOANNE E.
MCKENNA REVOCABLE LIVING TRUST
278 MIDDLE ROAD, DOVER, NH 03820
4520 / 683

M / 91
EDWARD S. STRANGE
286 MIDDLE ROAD
DOVER, NH 03820
2733 / 123

M/102-11

M / 89C

M / 89E

MIDDLE ROAD {PUBLIC; VARIABLE WIDTH R.O.W.}

89.0'±
51.7'±
25.1'±
78.1'±
204.3'±
47.0'±
188.5'±
68.7'±
87.5'±
BROOK
REMNANTS OF BARB WIRE FENCE LINE IN TREES AND ON GROUND

N00°41'16"W 225.32'
N00°41'23"W 407.95'
N00°41'23"W 209.05'
268.70' N89°50'37"E
125.00' N89°50'37"E
N01°13'39"W 384.86'
S66°39'11"E 658.24'
S53°01'43"W 666.02'
S61°41'43"W 266.77'
S88°46'01"W 216.31'
304.91'

25' FROM ANCHOR
20' FROM ANCHOR

PROPOSED LOT
354,429 S.F.
8.14 Ac.

M / 91A

PROPANE TANK
TOWER HEIGHT = 490'±
TOWER GUY LINES (TYP.)
TOWER EASEMENT (SEE NOTE 10C)
SHED (TYP.)
SATELLITE DISH ANTENNA
5'x25' FENCE ENCLOSURE (TYP. OF 6)
GUY EASEMENT (TYP. OF 6) (SEE/NOTE 10C)
UTILITY EASEMENT (SEE NOTE 10C)
ACCESS EASEMENT (SEE NOTE 10C)
ILLUMINATED SIGN
WALKWAY
BITUMINOUS CONCRETE DRIVEWAY AND PARKING AREAS
EXISTING BUILDING 12,500 S.F. FOOTPRINT #292 MIDDLE ROAD
EQUIPMENT ENCLOSURE
PROPANE TANKS
DUMPSTER
EXISTING SEPTIC SYSTEM NHDES CA2012110238
SEPTIC SYSTEM TOE OF SLOPE
150' WIDE P.S.N.H. EASEMENT 619 / 392 (7/28/53) (SEE NOTE 10B)
35' WIDE G.S. GAS & TRANSMISSION EASEMENT ON SOUTHERLY SIDE OF PSNH EASEMENT 408 (6/18/68) 845
TEST PIT #1 AND 4K AREA

M / 91C
REMAINING LAND
57 Ac.±

NH STATE PLANE NAD 83 - GPS OBS.

NOTES:

1.) SEE SHEET 1 OF 2 FOR NOTES AND REFERENCE PLANS.

OWNER SIGNATURES

SHEET 2 OF 2

LOCATION PLAN
(NO SCALE)
MIDDLE ROAD, LOCUS, ISAAC LUCAS, BRICKYARD, DOVER NECK RD, TUTTLE LANE, PISCATAQUA RIVER

NO.	DATE	DESCRIPTION	BY	CHK
		REVISIONS		

20-2331	SUBDIVISION	20-13	50-61
PROJECT NO	TYPE	FIELDBOOK & PAGES	

NH STATE SUBDIVISION PLAN
PREPARED FOR
TOWNSQUARE MEDIA PORTSMOUTH LLC
TAX MAP M, LOT No. 91A
292 MIDDLE ROAD
CITY of DOVER
COUNTY of STRAFFORD
STATE of NEW HAMPSHIRE

DOVER PLANNING FILE No. P 21-___

DRAWN BY: RJM	FILE: \2331\DWGS\2331 GPS
SCALE: 1" = 50'	DATE: JANUARY 22, 2021

50 25 0 25 50 100 150 200

"I HEREBY CERTIFY THAT THIS PLAN IS BASED ON AN ACTUAL GROUND SURVEY PERFORMED WITH A TOTAL STATION, BY ME OR THOSE UNDER MY DIRECT SUPERVISION AND THAT, TO THE BEST OF MY KNOWLEDGE AND BELIEF, SAID SURVEY MEETS OR EXCEEDS THE MINIMUM PRECISION REQUIREMENTS FOR SURVEY CLASSIFICATION "U" AS SET FORTH IN TABLE 500.1 OF THE NEW HAMPSHIRE CODE OF ADMINISTRATIVE RULES OF THE BOARD OF LICENSURE FOR LAND SURVEYORS."

STATE OF NEW HAMPSHIRE No. 661 KEVIN M. McENEANEY LICENSED LAND SURVEYOR

McEneaney Survey Associates
of NEW ENGLAND
P.O. Box 681 – 24 CHESTNUT STREET
DOVER, NH 03820 (603) 742-0911

SURVEYING – PLANNING – CONSULTING

P21-06 **292 Middle Road**

Property ID	Location	Owner 1	Owner 2	Owner Address 1	City	State	Zip
M0089-000000	315 MIDDLE RD	GAGNON SCOTT C TRUSTEE	GAGNON SCOTT REVOCABLE TRUST	315 MIDDLE RD	DOVER	NH	03820
M0089-C00000	291 MIDDLE RD	SPALDING MELISSA		291 MIDDLE RD	DOVER	NH	03820
M0089-D00000	309 MIDDLE RD	HACKETT THEODORE S &	HACKETT CYNTHIA A	309 MIDDLE ROAD	DOVER	NH	03820
M0089-E00000	297 MIDDLE RD	MAMIGONIAN CARL H & SHARON J TRUSTEE	MAMIGONIAN CARL AND SHARON REVOCABLE LIV	297 MIDDLE RD	DOVER	NH	03820
M0089-F00000	319 MIDDLE RD	GITSCHIER HELEN C		319 MIDDLE RD	DOVER	NH	03820
M0090-A00003	20 ISAAC LUCAS CR	DICKSON DAVID K	DICKSON DIANE N	20 ISAAC LUCAS CR	DOVER	NH	03820
M0090-A00005	16 ISAAC LUCAS CR	SPURLING ERIC A TRUSTEE	SPURLING ERIC A LIVING TRUST	16 ISAAC LUCAS CR	DOVER	NH	03820
M0090-A00006	10 ISAAC LUCAS CR	SCHELLER P KARL & PATRICIA A TRUSTEES	SCHELLER FAMILY TRUST	10 ISAAC LUCAS CR	DOVER	NH	03820-4910
M0090-A00008	6 ISAAC LUCAS CR	COVERT WILLIAM D &	COVERT PAIGE C	6 ISAAC LUCAS CR	DOVER	NH	03820
M0090-A00010	8 ISAAC LUCAS CR	HOLDEN KEVIN F &	HOLDEN DEBORAH E	8 ISAAC LUCAS CIRCLE	DOVER	NH	03820
M0090-D00009	ISAAC LUCAS CR	BRICKYARD ESTATES/DOCK OWNERS	C/O REGINALD FITZGERALD	10 BRICKYARD DR	DOVER	NH	03820
M0090-D00010	22 ISAAC LUCAS CR	COOK N MILES III &	COOK AMANDA	22 ISAAC LUCAS CR	DOVER	NH	03820-4910
M0090-D00013	22 A ISAAC LUCAS CR	CITY OF DOVER		288 CENTRAL AV	DOVER	NH	03820
M0090-E00000	18 ISAAC LUCAS CR	DUGAS JANE M TRUSTEE	DUGAS JANE 2011 REVOCABLE TRUST	18 ISAAC LUCAS CR	DOVER	NH	03820
M0090-H00000	24 ISAAC LUCAS CR	EVERETT DONNA MARIE		24 ISAAC LUCAS CIR	DOVER	NH	03820
M0090-K00000	12 ISAAC LUCAS CR	GABARRO SETH RAFAEL &	GABARRO ANTHONY PHILIP	12 ISAAC LUCAS CR	DOVER	NH	03820-4910
M0090-N00000	14 ISAAC LUCAS CR	STEVENS CHRISTOPHER L		14 ISAAC LUCAS CR	DOVER	NH	03820
M0090-S00000	2 ISAAC LUCAS CR	BURLAGE KENNETH &	BURLAGE JACQUELYN KC	2 ISAAC LUCAS CR	DOVER	NH	03820-4910
M0090-X00000	320 MIDDLE RD	ROCHEFORT JEFFREY R		320 MIDDLE ROAD	DOVER	NH	03820
M0091-000000	286 MIDDLE RD	STRANGE EDWARD S		286 MIDDLE RD	DOVER	NH	03820
M0091-B00000	278 MIDDLE RD	MCKENNA JAMES F & JOANNE E TRUSTEES	MCKENNA JAMES AND JOANNE REVOCABLE LIVIN	278 MIDDLE ROAD	DOVER	NH	03820
M0092-A00000	BACK RD	LANGS PATRICIA		10 HAWTHORN ROAD	DOVER	NH	03820
M0092-B00000	CULLEN BAY RD	CULLEN BAY HOMEOWNERS ASSC	C/O LORI LANDER-TREASURER	135 BAY SHORE DR	CAPE CORAL	FL	33904-5808
M0092-H00000	CULLEN BAY RD	HEBERT MARIE V TRUSTEE	HEBERT MARIE V REVOCABLE TRUST	6 CULLEN BAY RD	DOVER	NH	03820
M0102-000000	277 MIDDLE RD	DRISCOLL BRENDAN C		277 MIDDLE RD	DOVER	NH	03820
M0102-011000	283 MIDDLE RD	HAPPY MOUNTAIN HOLDINGS LLC		901 N MARKET STREET	WILMINGTON	DE	09801
M0104-000000	BACK RD	DEXTER ALAN G TRUSTEE &	NICHOLS WILLIAM O JR	4217 BLACK SYCAMORE	CHARLOTTE	NC	28226
M0091-A00000	292 MIDDLE RD	TOWNSQUARE MEDIA PORTSMOUTH LLC		PO BOX 576	DOVER	NH	03821-0576
		MCENEANEY SURVEY ASSOCIATES	KEVIN M MCENEANEY LLS	24 CHESTNUT STREET	DOVER	NH	03820

CITY OF DOVER

PLANNING BOARD - STAFF MEMO FILE #P21-01

Application Type:	Conditional Use Permit
Applicant(s):	54 BRR, LLC
Owner(s):	54 BRR, LLC
Location:	54 Back River Road (Assessor's Map I, Lot 6)
Meeting Date:	February 23, 2021

INTENT: To allow road and utility construction, stormwater treatment, and structures including units and retaining walls, with steep slope impacts of 18,799 s.f

LOTS/UNITS PROPOSED: 44

AGENDA ITEM: # 4-B

ACREAGE: 7.162 acres

ZONING DISTRICT: R-12

EXISTING LAND USE: Residential

PROPOSED LAND USE: Residential

SURROUNDING LAND USE: Residential and River

ZBA ACTION: None

ATTACHMENTS:

- Conditional Use Permit Application and Materials and TRC minutes from 10/8/20 and 1/14/21 and Conservation Commission minutes from 02/08/21

APPLICATION IS COMPLETE: Yes

DECLARE REGIONAL IMPACT: No

NOTICES SENT: Abutter notices were sent by verified or first class mail to all abutters for this meeting

PERMITS REQUIRED: AOT, Shoreland, CUP, and SWPPP

WAIVER REQUESTED: None for this case

Summary of Request and Background
The applicant is requesting a conditional use permit to affect 18,799 s.f. of steep slopes.

The units would be served by private forcemain to public sanitary sewer and public water. The street is intended to be private.

The Technical Review Committee reviewed the application at their October 8, 2020 and January 14, 2021 meetings (minutes attached).

The Conservation Commission endorsed this project at their February 8, 2021 meeting.

The applicant has provided a written narrative explaining how they meet the criteria of the conditional use permits for the Conservation District including how the avoid, minimize, mitigate, and the efficacy of the soil erosion and sedimentation control plan.

Consistency with Land Use Regulations
The Conservation District ordinances provide for Conditional Use Permits to allow impacts to the Conservation District if standards related to demonstration of need, avoidance, minimization, mitigation, and efficacy of the soil erosion and sedimentation control plan are met. This proposal is consistent with those standards.

STAFF RECOMMENDATION:
The Planning Department recommends that the Planning Board open the public hearing, accept the application, and vote to approve the Conditional Use Permit with the following conditions:

Condition to Be Met Prior to the Issuance of the CUP:

1. The Site Plan (P20-60) be approved.
2. TDR request (P20-61) be approved.
3. Copy of the Shoreland permit be submitted to the Planning Department.

CITY OF DOVER

PLANNING BOARD - STAFF MEMO FILE #P20-61

Application Type:	Transfer of Development Rights
Applicant(s):	54 BRR LLC
Owner(s):	54 BRR LLC
Location:	54 Back River Road (Tax Map I, Lot 6)
Meeting Date:	February 23, 2021

INTENT: Proposal is to increase development density allowed by 35 HUD-rate restricted units for a total of 44 units

LOTS/UNITS PROPOSED: TDR to buy 35 units

AGENDA ITEM #: 4-C

ACREAGE: 7.162 acres

ZONING DISTRICT: R-12

EXISTING LAND USE: Residential

PROPOSED LAND USE: Residential

SURROUNDING LAND USE: Residential and river

ZBA ACTION: None

ATTACHMENTS: Application materials and TDR Plan, staff memo regarding TDR review

APPLICATION IS COMPLETE: Yes

DECLARE REGIONAL IMPACT: No

NOTICES SENT: Abutter notices were sent by certified mail to all abutters for this meeting

PERMITS REQUIRED: AOT, Shoreland, CUP, and SWPPP

WAIVERS REQUESTED: None for this case

Summary of Request and Background
Per Chapter 170-27.2.G(3)(b), the applicant is requesting that the Board vote on the plan indicating the units can be purchased to total 44 units. While the homes are proposed to be single-family detached, due to the size of the units and scope of the project, staff is treating this as a multi-family site plan. Since the units being purchased will be HUD rental rate restricted, the formula was not necessary.

The applicant has agreed that due to the unique nature of the project that they will remain as a single ownership entity or return for further review.

Consistency with Land Use Regulations
Chapter 170-27.2 of the Zoning Ordinance allows for developments to buy additional units through the process of Transfer of Development Rights.

STAFF RECOMMENDATION-TDR:
The Planning Department recommends that the Planning Board accept the application, open the public hearing, close the public hearing, and vote to approve the application of TDR to the Site Plan with the following conditions:

Condition to be Met Prior to Granting the TDR:

1. Payment of the TDR fee (which is waived for HUD rent restricted units)
2. The Conditional Use Permit (P20-61) be granted.
3. Applicant shall enter into a development agreement with the HUD rental rate and how it will be annually reviewed.

To: Mike Sievert
From: Christopher Parker, AICP
Cc: Staff
Date: October 8, 2020
Re: TDR 54 Back River Road

ISSUE:
In February of 2020 the Board recommended amendments to the Transfer of Development Rights (TDR) Ordinance. In June 2020 the Planning Board approved the amendments and on July 22, 2020, the City Council ratified them. One elements is the requirement for staff to draft a review statement on determine the need for a sketch plan.

INTENT:
This memo will serve as the staff report

GOALS:
Provide background of the current housing shortage, and describe the TDR applications in Dover.

Background

In September, 2020, you submitted a plan for purchasing 35 units on a lot on Back River Road for concept review. The proposed new unit may be reviewed as per section 170-27.2 G 3) of the city Code.

Staff performed this review based upon the information below, and is now providing the required staff report {170-27.2 E) 4) a}.

Project Information

Project:	54 BRR, LLC
Where:	23 Back River Road
What:	Develop a cottage size single family project
Acres:	7
Zone:	R-12
Public Water:	Yes
Public Sewer:	Yes
Units:	9 by right, 35 purchased
CUP?	Yes

Staff Comment

When reviewing projects, staff visit the site, review the context, discuss options with the applicant and advises if it makes sense to request the purchase before or after designing a fully laid out plan. Furthermore, staff discuss the cost/benefit analyses on the proposal with the applicant.

In reviewing this project we note:

- Traffic
    - This area of Dover has a history of periods of high traffic volume especially when school is in session.
- Existing layout/topography
    - The existing single story structure has been on the property for decades.
    - The lot has a slope to the river behind the house,
- Environmental
    - There are wetlands and steep slopes, especially as you come closer to the Bellamy River.

The applicant is looking to repurpose the existing single family home and create a residential neighborhood with affordable cottage style homes. These homes would be owned by the LLC and rented to employees and to people looking for smaller units to live within the City.

Homes are laid out on common areas, with parking in a central location with walkways leading to the parking. Additionally, the existing home will be common space for the enjoyment of residents.

The abutting area contains diverse housing including single families, 2 family units, multi-family units and assisted living.

Staff Recommendation

Staff recommends that this does not need a sketch plan submitted for review. The project is large and should be reviewed once and within the context of a fully engineered site. The Planning Board has reviewed the site previously and has an idea of the limitations and context.

CITY OF DOVER

PLANNING BOARD - STAFF MEMO FILE #P20-60

Application Type: TDR Site Plan
Applicant(s): 54 BRR LLC
Owner(s): 54 BRR LLC
Location: 54 Back River Road (Assessor's Map I, Lot 6)
Meeting Date: February 23, 2021

INTENT: To develop an affordable housing community with 44 detached, 384 s.f., one-bedroom single-family dwellings

LOTS/UNITS PROPOSED: 44

AGENDA ITEM: # 4-D

ACREAGE: 7.162 acres

ZONING DISTRICT: R-12

EXISTING LAND USE: Residential

PROPOSED LAND USE: Residential

SURROUNDING LAND USE: Residential and River

ZBA ACTION: None

ATTACHMENTS:

- Site Plan Application and Materials and TRC minutes from 10/8/20 and 1/14/21 and Conservation Commission minutes from 02/08/21

APPLICATION IS COMPLETE: Yes

DECLARE REGIONAL IMPACT: No

NOTICES SENT: Abutter notices were sent by verified or first class mail to all abutters for this meeting

PERMITS REQUIRED: AOT, Shoreland, CUP, and SWPPP

WAIVER REQUESTED:
153-14 E (2)(b) Lighting
153 -14.G(2)(b) Landscaping

Summary of Request and Background
The applicant met with staff this summer and then attended two official TRCs to review (minutes attached) and design this project with 44 detached residential units around 384 s.f. each with walking trails, parking, and accessed by a private roadway. These proposed units would be served by public water and private forcemain to public sanitary sewer.

The Planning Board held a site walk on this site for a previous proposal in 2019.

The Conservation Commission endorsed this project (minutes also attached).

The applicant is requesting two waivers: (1) for lighting and (2) a second for landscaping to be a smaller caliper of tree than the regulations require for parking lot areas.

Consistency with Land Use Regulations
Chapter 153-4 of the Site Review Regulations of the City Code provides for site review by the Planning Board of new construction of various types. This plan is consistent with those regulations.

The applicant has provided a narrative expressing how they meet the criteria of Chapter 153-21 (Waivers) have been met which states:

The Planning Board may waive specific provisions of these regulations. The Planning Board may only grant a waiver if the Planning Board finds, by majority vote, that:

(1) Strict conformity would pose an unnecessary hardship to the applicant and the waiver would not be contrary to the spirit and intent of the regulations; or

(2) Specific circumstances relative to the subdivision, or conditions of the land in such site plan, indicate that the waiver will properly carry out the spirit and intent of the regulations.

Staff believe criterion 2 has been met for the lighting waiver and landscaping (tree location) waiver. Staff does not feel a waiver is necessary for the planting location and appreciates the applicant's narrative.

STAFF RECOMMENDATION-Waivers:
The Planning Department recommends that the Planning Board accept the application for review, hold a public hearing, and vote to grant the waivers with the following conditions:

Conditions to Be Met Prior to Signing of Plans:

1. A note be added to the plan that the waivers from sections 153-14.E(2)(b)(Lighting) and 153-14.G(2)(b)

have been met and the Board found the criteria to be met.

STAFF RECOMMENDATION-Site Plan:
The Planning Department recommends that the Planning Board vote approve the application with the following conditions:

Conditions to Be Met Prior to Signing of Plans:

1. The CUP (P21-01) be approved.
2. The TDR request (P20-61) be approved.
3. The applicant shall provide the Planning Department:
    a. A digital version of the plan
    b. A CAD file to the satisfaction of the Asset Management Administrator.
    c. Documentation that Postmaster is fine with mail kiosk
4. The applicant shall revise the plat to:
    a. Add the owners' signatures
    b. Add the Licensed Land Surveyor, Professional Engineer, and Landscape Architect stamps and signatures
    c. Add permit numbers and dates to the permit status notes
    d. Address Engineering drainage and utility concerns
    e. Add accessible regulation note to plan and revise accessible parking spaces and route to the satisfaction of the Building Official.
    f. Update parking calculation on C-101 to 44 units
    g. Add note about TDR purchasing 35 units at HUD rental rate and the restrictions of 27.2 and annual certification of HUD rental rates
    h. Update note 25 with permit numbers

Conditions to Be Met Prior to Any Construction Activity:

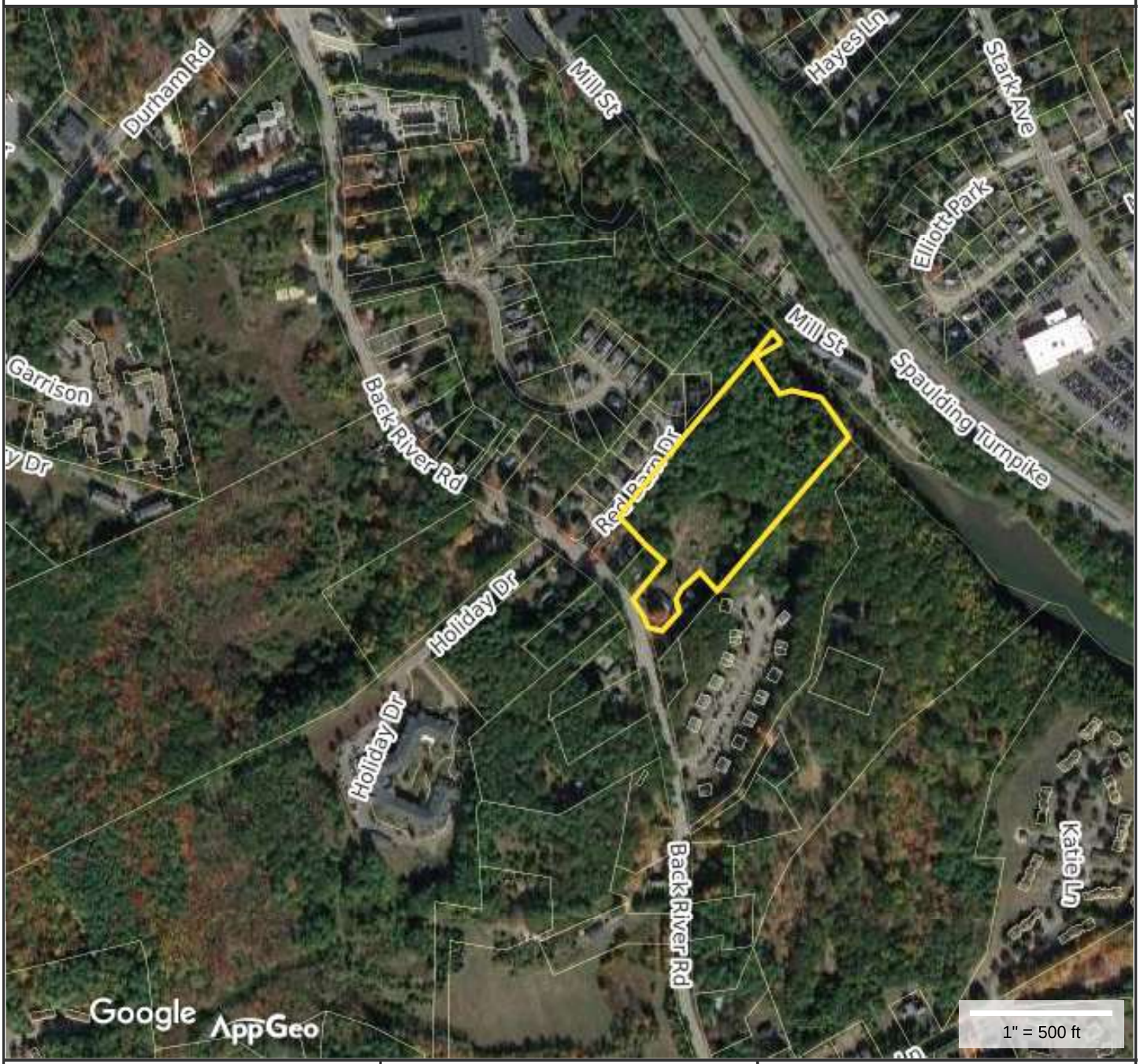
5. A site construction sign with the contact information for the general contractor must be located and approved by the City Engineer or Assistant City Manager.

Conditions to Be Met Prior to Issuance of a Building Permit:

6. Water and sewer investment fees shall be paid at the time of request of service.

Conditions to Be Met Prior to Occupancy:

7. Issuance of a Certificate of Occupancy.
8. The applicant shall provide a letter of credit or other form of security acceptable to the City for any unfinished work.
9. Impact fees for any new unit shall be paid per the invoice provided with the Notice of Decision.



Property Information

Property ID	I0006-000000
Location	54 BACK RIVER RD
Owner	54 BRR LLC
Land Use	101

MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT

City of Dover, NH makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Geometry updated 5/20/2020
Data updated Daily

City of Dover, New Hampshire
CONDITIONAL USE PERMIT APPLICATION

[Revision Date: October 19, 2020]

Office Use Only	Project #:		Date Received:	
	Amount Paid:		Time Received:	

APPLICANT AND OWNER INFORMATION

Name of Applicant: ____54 BRR, LLC (John Randolph)_____ Telephone #_603-834-2317_____

Address of Applicant: __1 Stagecoach Road, Durham, NH 03824_____

E-Mail Address: ____finallyhomeproperties@hotmail.com_____

Name of Property Owner (if different from applicant): _____ Telephone #_____

Address of Property Owner: _____

PROPERTY INFORMATION

Assessor's Map # _____I_____ Lot(s) # _____6_____

Address of Property: ____54 Back River Road_____

Zoning District(s) ____R-12_____ Overlay District(s) Wetlands, Conservation, Tidal, TDR_

Existing Use of Property: ___One single-family home_____

CONDITIONAL USE PERMIT INFORMATION

Type of Conditional Use Permit (Check All That Apply):

X Conservation District	☐ RCM Use Overlay District	☐ Gateway District
☐ Groundwater Protection	☐ Off-Street Parking and Loading	☐ Alternative Treatment Center
☐ Wetland Protection District	☐ Central Business District	☐ Heritage Residential District

Describe Proposed Use or Activity That Requires Conditional Use Permit and Describe Any Impacts:

The proposed uses include road and utility construction, filling and stormwater treatment, and structures including units and retaining walls. The impacts are only to steep slopes. Proper erosion control, revegetation, and minimization of the impacts are being used to the maximum extent._____

_____

List Any Associated State or Federal Permits That Have Been or Will Be Applied For and Indicate Their Status: ___NHDES Shoreland permit will be filed in January_____

Name of Professional That Prepared Plans: ____Michael Sievert, P.E._____

Address _MJS Engineering, P.O. Box 359, Newmarket, NH 03857_____Telephone #: 603-659-4979_

Professional License #: ___8397_____ E-mail address: _mjs@mjs-engineering.com_____

SIGNATURES

I/We hereby submit this application to the City of Dover Planning Board and attest that to the best of my knowledge all of the information on this application form and in the accompanying application materials and documentation is true and accurate. As applicant or as agent, I attest that I am duly authorized to act in this capacity.

Signature of Property Owner: _____ Date: 4 Jan 21

Signature of Applicant (if different from owner): _____ Date: _____

Signature of Agent: _____ Date: _____

AUTHORIZATION TO ENTER SUBJECT PROPERTY

I, and my successors, hereby authorize members of the Dover Planning Board, Planning Department and other pertinent City Departments and boards to enter my property for the purpose of evaluating this application, including performing inspections during the application phase, post-approval phase, construction phase and occupancy phase. It is understood that these individuals must use all reasonable care, courtesy, and diligence when on the property.

Signature of Property Owner: _____ Date: _____

CITY OF DOVER CONDITIONAL USE
LIST OF ABUTTERS

Pursuant to RSA 676:4, the State Law of New Hampshire, the City of Dover is required to notify the applicant, abutters (including holders of conservation easements), and any professional whose seal is on the plan, of the public hearing by certified mail, return receipt requested. Staff will provide the abutter information, while the applicant must provide accurate contact information for the owner, applicant and professional agents representing the project.

Owner:

TAX MAP	LOT #	PROPERTY OWNER	MAILING ADDRESS

Applicant (if different from owner):

APPLICANT NAME	APPLICANT COMPANY	MAILING ADDRESS

Surveyor and/or Engineer/Professional Agent:

NAME	COMPANY	MAILING ADDRESS

Conservation Easement Holder:

TAX MAP	LOT #	NAME OF EASEMENT HOLDER	MAILING ADDRESS

City of Dover, New Hampshire
TRANSFER OF DEVELOPMENT RIGHTS APPLICATION

[Revision Date: August 16, 2018]

Office Use Only	Project #:		Date Received:	
	Amount Paid:		Time Received:	

APPLICANT AND OWNER INFORMATION

Name of Applicant: 54BRR, LLC (John Randolph) Telephone # 603-834-2317

Address of Applicant: 1 Stagecoach Road, Durham, NH 03824

E-Mail Address: finallyhomeproperties@hotmail.com

Name of Property Owner (if different from applicant): _____ Telephone # _____

Address of Property Owner: _____

PROPERTY INFORMATION

Assessor's Map # I Lot(s) # 6

Address of Property: 54 Back River Road

Zoning District(s) R-12 Overlay District(s) Wetlands, conservation, tidal, TDR

Existing Use of Property: One single family residence

TRANSFER OF DEVELOPMENT RIGHTS INFORMATION

Type of TRANSFER OF DEVELOPMENT RIGHT REQUEST (Check All That Apply):

X Residential ☐ Residential (reduced size) ☐ Industrial | ☐ Purchase ☐ Land Preservation

Relief sought (Check All That Apply):

☐ Lot Size ☐ Frontage ☐ Setback X Increase by 35 units

Describe Proposed Use or Activity that requires TDR; describe any impacts and document mitigation:

The proposal is to develop single family detached units totally 384sf each. The intent is to provide workforce housing conforming to the HUD Fair Market Rent rates for Dover.

List Any Associated State or Federal Permits That Have Been or Will Be Applied For and Indicate Their Status: Alteration of Terrain, Shoreland and SWPPP

All permits will be applied for in this process.

Name of Professional That Prepared TDR Plans: Michael Sievert MJS Engineering, P.C.

Address P.O. Box 359 Newmarket, NH 03857 Telephone #: 659-4979

Professional License #: 8397 E-mail address: mikesievert@mjs-engineering.com

SIGNATURES

I/We hereby submit this application to the City of Dover Planning Board and attest that to the best of my knowledge all of the information on this application form and in the accompanying application materials and documentation is true and accurate. As applicant or as agent, I attest that I am duly authorized to act in this capacity.

Signature of Property Owner: _____ Date: 17 Sep 2020

Signature of Applicant (if different from owner): _____ Date: _____

Signature of Agent: _____ Date: 9-17-20

AUTHORIZATION TO ENTER SUBJECT PROPERTY

I, and my successors, hereby authorize members of the Dover Planning Board, Planning Department and other pertinent City Departments and boards to enter my property for the purpose of evaluating this application, including performing inspections during the application phase, post-approval phase, construction phase and occupancy phase. It is understood that these individuals must use all reasonable care, courtesy, and diligence when on the property.

Signature of Property Owner: _____ Date: 17 Sep 2020

CITY OF DOVER TRANSFER OF DEVELOPMENT RIGHTS
LIST OF ABUTTERS

Pursuant to RSA 676:4, the State Law of New Hampshire, the City of Dover is required to notify the applicant, abutters (including holders of conservation easements), and any professional whose seal is on the plan, of the public hearing by certified mail, return receipt requested. Staff will provide the abutter information, while the applicant must provide accurate contact information for the owner, applicant and professional agents representing the project.

Owner:

TAX MAP	LOT #	PROPERTY OWNER	MAILING ADDRESS
		54BRR, LLC	1 Stagecoach Road, Durham, NH 03824

Applicant (if different from owner):

APPLICANT NAME	APPLICANT COMPANY	MAILING ADDRESS

Surveyor and/or Engineer/Professional Agent:

NAME	COMPANY	MAILING ADDRESS
Michael Sievert	MJS Engineering, P.C.	P.O. Box 359, Newmarket, NH 03857
Robert Stowell	Tritech Engineering Corp.	755 Central Ave., Dover, NH 03820

Conservation Easement Holder:

TAX MAP	LOT #	NAME OF EASEMENT HOLDER	MAILING ADDRESS

City of Dover, New Hampshire
SITE REVIEW APPLICATION

[Revision Date: June 4, 2019]

Office Use Only	Project #:		Date Received:	
	Amount Paid:		Time Received:	

APPLICANT AND OWNER INFORMATION

Name of Applicant: 54 BRR, LLC (John Randolph) Telephone # 603-834-2317

Address of Applicant: 1 Stagecoach Road, Durham, NH 03824

E-Mail Address: finallyhomeproperties@hotmail.com

Name of Property Owner (*if different from applicant*): _____ Telephone # _____

Address of Property Owner: _____

PROPERTY INFORMATION

Address of Property: 54 Back River Road, Dover, NH 03820

Assessor's Map # I Lot(s) # 6

Zoning District(s) R-12 Overlay District(s) Wetlands, conservation, tidal, TDR

Size of Parcel: 311,970 sq. ft. 7.2 ac. Property Deed: Book 4764 Page: 977

Existing Use of Property: One single family residence

SITE PLAN INFORMATION

Describe Proposed Use: Develop an affordable housing community with one bedroom units

Area of Parcel to be Developed: 174,240+/- sq. ft.

If Multi-family Residential, Specify Number of Units & Buildings Proposed: 44

Number of Parking Spaces: Existing 0 Propose 58

Highway Access (check where applicable): X City Street _____ State Highway

Number of Employees Total: N/A In Maximum Shift: N/A

Disposition of Parcel:

Building Footprint 1,667 sq. ft.

Total Building Area 1,667 sq. ft.

Paved Area 5,050 sq. ft.

Building Setbacks:

Front Yard 56 ft.

Rear Yard 823 ft.

Side Yard: 28 Right ft. 160 Left ft.

City Water? X Yes ___No How far is city water from the property? @ frontage

City Sewer? X Yes ___No How far is city sewer from the property? @ frontage

BUILDING INFORMATION

Type of Building to be Built: Multiple single family detached one bedroom units

Height of Building: 17' Finished Floor Elevation: varies

Number of Seats (where applicable) N/A

Estimated value of construction: $3,000,000+/- Refuse removal: Public/Private (circle one)

WAIVER REQUESTS

Site Review Regulations section(s) to be waived: 149-14(D) Parking

Justification for waiver request(s) (*attach additional sheets as needed*):

The reduced parking is a function of the type of housing unit. All of these cottages are 1-bedroom units with a total footprint of 384sf. The majority of the units will have only one occupant.

SURVEYOR INFORMATION

Name of Surveyor and Company (Licensed in N.H.) Robert J. Stowell Tritech Engineering Corp.

Address 755 Central Ave., Dover, NH 03820 Telephone #: 742-8107

Professional License #: 884 E-mail address: rjs@tritecheng.com

ENGINEER INFORMATION

Name of Engineer and Company (Licensed in N.H.) Michael J. Sievert MJS Engineering, PC

Address P.O. Box 359, Newmarket, NH 03857 Telephone #: 659-4979

Professional License #: 8397 E-mail address: mikesievert@mjs-engineering.com

ARCHITECT INFORMATION

Name of Architect and Company (Licensed in N.H.) Margaret Randolph GSD Studios

Address 22 Jady Hill Ave., Exeter, NH 03833 Telephone #: 207-347-1504

Professional License #: 04225 E-mail address: maggierandolph19@gmail.com

LANDSCAPE ARCHITECT INFORMATION

Name of Landscape Architect and Company (Licensed in N.H.) Roberta Woodburn Woodburn & Co.

Address 103 Kent Place, Newmarket, NH 03857 Telephone #: 659-5949

Professional License #: 002 E-mail address: robbi@woodburnandcompany.com

SOIL SCIENTIST INFORMATION

Name of Soil Scientist and Company (Licensed in N.H.) Joseph Noel

Address P.O. Box 174, South Berwick, ME 03908 Telephone #: 207-384-5587

Professional License #: 017 E-mail address: jwnoel@aol.com

CONSERVATION EASEMENT HOLDER

Name of Easement Holder:_____ Telephone #_____

Address Easement Holder: _____

SIGNATURES

I/We hereby submit this application to the City of Dover Planning Board and attest that to the best of my knowledge all of the information on this application form and in the accompanying application materials and documentation is true and accurate. Furthermore, I/we submit that the existing conditions sheet of the plan represents the lot in question, and that no alteration of the site shall take place during Planning Board review up to and including the pre-construction meeting. As applicant or as agent, I attest that I am duly authorized to act in this capacity.

Signature of Property Owner: _____ Date: 17 Sep 2020

Signature of Applicant (*if different from owner*): _____ Date: _____

Signature of Agent: _____ Date: 9-17-20

AUTHORIZATION TO ENTER SUBJECT PROPERTY

I, and my successors, hereby authorize members of the Dover Planning Board, Planning Department and other pertinent City Departments and boards to enter my property for the purpose of evaluating this application, including performing inspections during the application phase, post-approval phase, construction phase and occupancy phase. It is understood that these individuals must use all reasonable care, courtesy, and diligence when on the property.

Signature of Property Owner: _____ Date: 17 Sep 2020

AUTHORIZATION TO COMPLETE THE PROJECT ON SUBJECT PROPERTY

I, and my successors, hereby the City of Dover or its assigns to enter my property for the purpose of completing the site work as required by the approved plan should the letter or credit or other surety be called. It is understood that these individuals must use all reasonable care, courtesy, and diligence when on the property.

Signature of Property Owner: _____ Date: 17 Sep 2020

Signature of Applicant (*if different from owner*): _____ Date: _____

CERTIFICATION OF FEES

I, and my successors, hereby certify that I understand that the City of Dover collects impact fees, utility investment fees and inspection fees for projects developed in Dover. Said fees must be paid before a Certificate of Occupancy can be obtained for a structure, unless a different payment schedule is agreed to by the applicant and the City prior to approvals being issued by the Dover Planning Board. Additionally, should the property be in "Current Use" it will be subject to the Land Use Change Tax.

Signature of Property Owner: _____ Date: 17 Sep 2020

Signature of Applicant (*if different from owner*): _____ Date: _____

PLANNING BOARD FEE SCHEDULE

(Revised July 1, 2020)

Below are the fees associated with plan review and are subject to a nonrefundable application fee to cover administrative expenses. Please complete the information below and provide payment with your application submittal. **Plan review fees shall be paid prior to technical review committee (TRC) being scheduled.** For plans not requiring TRC review, **fees are due 21 days prior** to the Planning Board meeting. Staff will coordinate abutter/notice fees, which will be invoiced and must be paid 28 hours before the Planning Board meeting for an application to be heard. Fees shall be paid by cash or check made payable to "City of Dover."

A. Plan Review Fees

1. Application fee for the following **(SELECT ALL THAT APPLY):**

- ☐ SUBDIVISION Application fee $200.00 + $150.00 x #_____new lots created = $_____
- ☐ LOT LINE ADJUSTMENT Application fee $200.00 + $100.00 X #____of lots involved = $_____
- ☐ TRANSFER OF DEVELOPMENT RIGHTS Application fee $200.00 = $ 200.00
- ☐ SITE REVIEW – RESIDENTIAL Application fee $200.00+ $100.00 x # 44 per dwelling unit =$ 4,600.00
- ☐ SITE REVIEW – NON-RESIDENTIAL Application fee $200.00 + (not to exceed $10,000)
  - New construction $.15 sq. ft. x #_____sq. ft.= $_____
  - Additions (new floor space) $.10 per sq. ft. x #_____sq. ft.= $_____
- ☐ MOTEL/HOTEL $35.00 x #____per lodging unit= $_____
- ☐ CHANGE OF USE Application fee $200.00 + (not to exceed $5,000)
  - Existing floor spaces $.10 per sq. ft. x #_____sq. ft. = $_____
- ☐ CONDITIONAL USE PERMIT Application fee $200.00 x #_____per Application = $_____
- ☐ GRAVEL PIT/ EXCAVATIONS
  - Application fee $50.00= $_____
  - Permit fee $75.00= $_____
- ☐ EXTENSIONS/AMENDMENTS/WAIVERS FOR AN APPROVED PLAN Application fee $200.00 =$_____

REQUEST FOR REZONING Application fee $200.00 = $_____

DRIVEWAY WAIVER Application fee $200.00 = $_____

SUB TOTAL= $ 4,800.00

AND

2. IMPERVIOUS PAVED AREA (for new development or additions to existing parking lots (not to exceed $10,000) Application fee $200.00 + $.07 sq. ft. x #_____= $_____

TOTAL PLAN REVIEW FEE= $ 4,800.00

B. Abutter Notification/Mailing Labels

- this office will create and print the abutter list and provide labels in triplicate for each abutter. The applicant/owner will need to review the list and provide to this office the engineer, architect, licensed land surveyor (LLS), licensed landscape architect (LLA) and/or soil scientist whose professional seal appears on the plan with names and addresses for notices.

Applicant & Owner, engineer, architect, LLS, LLA and/or soil scientist

- Certified letters fee #_____of x $8.00= $_____

Certified letters fee: # of abutters_____X $8.00= $_____

First Class Mail fee (for individual owner of units within a condominium or other collective form of ownership): # of abutters_____X $1.00= $_____

Creating/Printing Abutter Labels in triplicate per sheet_____x $10.00= $_____

SUB TOTAL= $_____

C. Foster's newspaper public notice fee $100.00 x #_____applications = $_____

TOTAL NOTICE FEE= $_____

The above amount must be paid 28 hours prior to the Planning Board meeting, to be heard.

September 17, 2020

City of Dover
Planning Board
288 Central Avenue
Dover, NH 03820

Dear Chairperson:

I hereby authorize Michael J. Sievert, P.E of MJS Engineering, P.C. to represent me at the Dover Planning Board and technical review committee meetings for site plan review approval. The subject parcel is shown on Tax Map I as Lot 6 located on 54 Back River Road.

Sincerely;

_____
John Randolph, Owner

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL

5 Railroad Street • P. O.Box 359
Newmarket, NH 03857
Phone: (603) 659-4979
Email: mjs@mjs-engineering.com

Letter of Intent – Site Plan Review, TDR Application and Conditional Use Application

For

54 BRR, LLC

Workforce Housing Development

Tax Map I Lot 6

January 4, 2021

The Subject Property

The subject parcel is located at 54 Back River Road within the R-12 district. The 7.36 acre parcel is bordered on the west by a residential development on Red Barn Drive, the south by Back River Road, the north by the Bellamy River and east by lots. The property is serviced by municipal water and sewer. Overhead utilities are also currently provided to the site from Back River Road. Natural gas is provided available on Back River Road.

The parcel is currently developed with one single family home. This building will be retained and remodeled and used as a community space for the development. The remainder of the parcel is mostly wooded with the exception of a small area directly behind the house. This area was previously used as a contractor storage yard and has been filled significantly to level the area. The northerly and westerly part of the parcel has steep slopes some in excess of 20% which have been identified on the existing conditions plan. The parcel is also subject to the Riverfront Overlay District and Conservation District from the Bellamy River.

54 BRR, LLC Workforce Housing Cottage Development Proposal

The proposal by 54 BRR, LLC is to develop the existing property into a workforce housing development. The style of the development will be small single family detached "Cottages" in clusters. Each cluster will have a central green space for community use. There is a main access road with parking situated along the road and in a small parking lot between two of the northerly clusters. The developed area encompasses approximately 3.4 acres of the subject parcel with the remaining 4.0 acres to remain as open space. The units are 384sf, with kitchen/living, bedroom and bath. There is a small front porch and attached storage shed.

The development is in accordance with the City of Dover Zoning Ordinance Section 170-27.2 Transfer of Development Rights. This project specifically falls under section G(3)(a). The

submission includes a Yield plan prepared by Tritech Engineering. This yield plan meets the minimum requirements for develop in the R-12 District and establishes the base number of units. The transfer meets the requirements of section ii.1 because of the size of the units. These units will be rental units and will meet the HUD Fair Market Rent rates for Dover, NH.

In accordance with the City of Dover Zoning Ordinance Section 170-15, it appears the required usable recreation space for this development would be 4400 SF. Incorporated into the proposed site plan are active recreation areas within the "pods" that total approximately 12,650 SF. This area is intended to be green space for recreation including sports, outdoor grilling, sitting areas and the walkways are also included. In addition to this area, there is approximately 4 acres of open space, that will be restricted from future development with a 600 – 700 LF walking trail and platform overlooking the river.

In accordance with the City of Dover Zoning Ordinance Section 170-27 B.4, a condition use permit is required for construction activities within the Conservation District where areas in excess of 20% slope exists. The impacts for this proposed project include filling for road and utility construction, structures including 6 units, retaining wall and a wooden platform and filling to construct the stormwater treatment pond. The total area impacted within the Conservation District is 0.40 acres. All of the impacted areas are located at the upper limits of the slopes greater than 200' from the river. Proper erosion controls will be used and the fills for development are being minimized by using retaining walls to minimize fill slopes and tree removal. The grading, drainage and erosion control plan and detail sheet C501 & 502 address the construction management, soil stabilization, drainage design, inlet and outlet protection and perimeter controls for erosion control in accordance with best management practices. In addition, a shoreland permit is required for construction within the 250 shoreland setback and an Alteration of Terrain AOT permit is required for construction activities over 100,000 Sf of disturbance.

A. *Request for Technical Review Committee and Site Plan Approval*

In accordance with the Dover Code chapter 149, Site Review Regulations, this revised submission package includes the Application for Conditional Use, Fees, and the following plans and supporting documentation are included:

1. Cover Sheet
2. Existing Conditions Plan
3. Yield Plan
4. Site Plan
5. Grading, Drainage, & Erosion Control Plan
6. Utility Plan
7. Road Plan and Profile
8. Neighborhood Plan
9. Construction Details
10. Proposed Building Floor Plans and Elevations

11. Site Perspectives
12. Street Perspectives
13. Drainage Report
14. Traffic Report

If you have any questions or need additional information, please do not hesitate to contact me.

Sincerely;

Michael J. Sievert PE
MJS Engineering

CITY OF DOVER

TECHNICAL REVIEW COMMITTEE MINUTES – P20-60

Application Type:	Open Space Subdivision Review
Applicant(s):	54 BRR, LLC
Owner(s):	54 BRR, LLC
Location:	54 Back River Road (Tax Map I, Lot 6)
Date:	January 14, 2021

INTENT: To develop an affordable housing community with 44 detached, 384 s.f., one-bedroom single-family dwellings

UNITS PROPOSED: 44

AGENDA ITEM #: 1

ACREAGE: 7.162 acres

ZONING DISTRICT: R-12

EXISTING LAND USE: Residential

PROPOSED LAND USE: Residential

SURROUNDING LAND USE: Residential and River

ZBA ACTION: None

PERMITS REQUIRED: AOT, Shoreland, CUP, and SWPPP

WAIVERS REQUESTED:
153-14.D: Parking TBD

ATTENDANCE:
Members:
Donna Benton, Planning
Elena Piekut, Zoning
Jim Maxfield, Inspections/Fire
Dave White, Engineering
Dan Barufaldi, Economic Development
Sgt. Marn Speidel, Police
Others:
Chris Parker
Max Kenney
Mike Sievert
John and Maggie Randolph
Robbi Woodburn

Approval of the 12/17/2020 Minutes:
D.White made a motion to approve the December 17, 2020 minutes. Seconded by J.Maxfield. Vote: U/A

PLAN REVIEW:
Planning:

- *Water and Sewer Investment Fees*
- *Impact Fees ($391,380)*
- CUP will go to Conservation Commission then Planning Board
- *Reach out to Postmaster about mail kiosk*
- Keeping existing house? Road goes through it? Revise and note.
- Traffic study-
  - How was the 1.41 and 1.18 COVID-19 adjustment factor found?
  - Did this analysis considered 40 additional units off Leathers Lane?
- *Provide:*
  - One combined plan set with engineering, landscape, lighting, architectural renderings in one package
  - *Draft Rental agreement/lease regarding HUD rental rates and draft of deed restriction on low-rental*
  - *Letters to Serve*
  - *Waiver requests for lighting and landscaping*
- *Revise plan to:*
  - *Add note about ride-sharing, shuttles, etc.*
  - *Add note about deeded conservation space*
  - *Finalize renderings (ie add shed, color palate, beams, pavilions removed, etc)*
  - *Indicate how cars maneuver dumpster*
  - *Add visitor parking by existing house*
  - *Add owner's signatures*
  - *Add professional signature and stamps*
  - Provide different road name
  - *Consider relocating the attached sheds to the rear of the units*
  - *Reduce from 3 curb cuts to 2*
  - Where is the PTAPP note?
  - Revise spelling of owner of Lot 6C-6
  - Fix Map numbers on Red Barn to I not I-2
  - Provide easement between neighboring open space
  - Can plantings along the Red Barn Drive side, be moved to the top of the hillside on Red Barn to take advantage of the elevation and enhance the screening
  - Add note on plan that should this develop ever be turned into condominiums then Planning Board approval would be necessary

Engineering Comments:

- Use SMHs on the dead end of the services instead of cleanouts
- Show the inverts of the existing SMH in Back River Rd
- I assume this gravities to the proposed SMH that the FM ties into
- Note outside drops on plan view at the smhs

CITY OF DOVER

TECHNICAL REVIEW COMMITTEE MINUTES – P20-60

Application Type:	Open Space Subdivision Review
Applicant(s):	54 BRR, LLC
Owner(s):	54 BRR, LLC
Location:	54 Back River Road (Tax Map I, Lot 6)
Date:	January 14, 2021

- On C504 change sewer MH invert to show brick masonry only. Not concrete under the shelf
- Show Neenah hinged covers
- The city requires the stone to extend over the pipe on the sewer trench typical
- Bed the FM in stone also
- The HOA must have a maintenance agreement in place for the sewer pump station
- The pump station must have a transfer switch and outlet to tie a generator into it for emergency use
- Have a downward tee or wye into the pump station for the gravity flow
- Show drainage lines on the utilities plan
- The sewer/drain line may have a conflict from cb6 and smh2
- Include in the drainage report the pre/post volume
- Show UGE on the plans
- Will there be gas? That will need to be shown
- Use DI for the 6inch main to the hydrant. You can use HDPE for the rest after the hydrant.
- Spec CTS (copper tubing size) poly for ¾ to 2 inch services
- Install curb boxes to each unit. Show them behind the curb line or sidewalk where possible
- Spec 12x6 stainless steel tapping and gate in Back River Road
- Isolate the side mains with gate valves and install a main gate after the first set of gates and after the hydrant
- Water details
- Hydraulic analysis on 6 inch sewer
- 2x2 sign post
- Stones under manholes
- Flood valves?

Police Department Comments:

- Lack of sufficient guest/overflow parking remains a concern. (Concern about future overflow onto Back River Road)
- Traffic Impact Analysis:
  - Page 8: What is the source of the COVID-19 adjustment factors applied?
  - Page 20: intersection capacity analysis summary for NH108/Back River Road is based on turning movement counts from October 2020. Even with COVID adjustment factors, this cannot duplicate the pre-COVID conditions.
  - During AM peak, this intersection does not operate at LOS C or A for Route 108 NB Thru, Route 108 SB Thru, or Back River Road queues. It's already at F for these approaches.

Fire/Inspections Comments:

- Provide alternative street name as there is already a Cottage Drive. Revise stamped plan set
- Discussion regarding standby power source for the dwelling units waste water in utility loss of power scenario.
- Provide revised building plans
- Signage at Fire Access "No Parking Area Maintain 20' Fire Access" or similar
- Add accessibility note
- Detail accessible parking

Economic Development:

- Are true color renderings available for the units? Will they all be the same or will designs vary?

Planning Board Comments:

- *Back-up generator needed*
- *Hazardous waste?*
- *Snow storage?*
- *Fire suppression*
- *Where are the mechanicals?* Show utility closet on floorplans
- *Salt management to be included in Maintenance Plan*
- *Emergency access to Red Barn feasible?*
- *Re-use stonewall*
- *How are buildings constructed-onsite or pre-fab?*

Application Type:	Open Space Subdivision Review
Applicant(s):	54 BRR, LLC
Owner(s):	54 BRR, LLC
Location:	54 Back River Road (Tax Map I, Lot 6)
Date:	January 14, 2021

Next Steps:
Resubmit full Planning Board package by February 1 (CC deadline) for February 23 meeting. Attend Conservation Commission meeting on 2/8/21.

Adjournment:
D.Barufaldi moved to adjourn the meeting at 11:21am Seconded by D.White. Vote: U/A

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL

5 Railroad Street • P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-4979
Email: mjs@mjs-engineering.com

February 1, 2021

Mr. Chris Parker
Asst. City Manager/Dir. of Planning
288 Central Avenue
Dover, NH 03820

Re: 54 Back River Road request for waiver of lighting requirements

Dear Mr. Parker,

MJS Engineering on behalf of 54 BRR, LLC formally requests a waiver from the lighting standards in the site plan regulations. The proposed lighting plan does not meet the prescribed requirements in section 153-14 E(2)(b) parking area lighting standards.

Comparing to the only residential zones listed, this plan does not meet the uniformity ratio for the parking lot area. However. the ratio is only 4.5:1 so it is very close. This will provide slightly more light in this direct area which adequately provide for safe pedestrian use. In addition, this area is surrounded by woods and will not impact neighbors with the slight discrepancy.

If you require additional information or have any questions or comments, please call (603) 659-4979 x302.

Sincerely,

Michael J. Sievert PE
President

woodburn & company
LANDSCAPE ARCHITECTURE
Since 1994 reflecting your vision.

January 26, 2021

Mr. Chris Parker
Director of Planning
City of Dover
288 Central Avenue
Dover, New Hampshire 03820

Re: 54 BACK RIVER ROAD
REQUEST FOR WAIVER
MINIMUM TREE CALIPER

Dear Mr. Parker:

This letter is to request a waiver for the requirement of minimum tree caliper of 3.5-4" caliper for 54 Back River Road project.

Our request is based on two factors.

First, it is our experience that trees of smaller caliper (2-2.5" caliper) generally establish themselves more quickly and begin to produce new growth sooner and with less maintenance than those of the required caliper of 3.5- 4" caliper. For a local example, the City of Portsmouth now requires trees planted within the City right of way to be no larger than 2-2.5" caliper so that maintenance required by the City is minimized with the best chance of long-term tree survival as possible. As this is a development of affordable rental units, we'd like to give the proposed plantings as much of a head start as possible and not wait the extra year of two that may be required for the larger plant material to become established and thrive. Our plans currently call for 2.5-3" caliper shade trees which we offer as a compromise from the 3.5 – 4' caliper requirement.

Secondly, as this development will provide affordable living spaces that are highly encouraged by the City, we request that consideration of the ultimate cost of larger plant material be made and the waiver granted.

Sincerely,

Roberta N. Woodburn

Robbi Woodburn ASLA
Principal

103 KENT PLACE
NEWMARKET, NH 03857
603.659.5949
woodburnandcompany.com

woodburn & company
LANDSCAPE ARCHITECTURE
Since 1994 reflecting your vision.

January 26, 2021

Mr. Chris Parker
Director of Planning
City of Dover
288 Central Avenue
Dover, New Hampshire 03820

Re: 54 BACK RIVER ROAD
Buffer Planting Location

Dear Mr. Parker:

At the January 14th TRG meeting the City relayed a request from the neighbors in the Red Barn neighborhood to the north of the project to move the proposed buffer plantings from the south side of the existing woodland, onto the slope on the Red Barn property. This request is meant to gain added height and buffer coverage.

Following the TRG meeting I visited the site to and review the conditions of that area to see if could be accommodated. See adjacent photo.

Unfortunately, there are two aspects of the site which limit this idea.

First, there is a guardrail at the edge of the street then a very steep slope down to the existing forest floor as seen in the photo below. The slope is just too step on which to install the proposed buffer plantings and there is insufficient room at the edge of the road for the width of the proposed evergreens.

Then, if the plants were planted at the bottom of the slope any height advantage would be lost. Additionally, the growth of the plantings, if planted in this location, would be limited due to root competition and shade from the existing woodland to the south.

103 KENT PLACE
NEWMARKET, NH 03857
603.659.5949
woodburnandcompany.com

woodburn & company
LANDSCAPE ARCHITECTURE
Since 1994 reflecting your vision.

Although I understand the desire of the abutters for a buffer closer and higher than the proposed location, the buffer plantings will have the best chance to thrive planted in the proposed location along the southside of the existing woodland where they will receive adequate sunlight.

Sincerely,

Roberta N. Woodburn

Robbi Woodburn ASLA
Principal

103 KENT PLACE
NEWMARKET, NH 03857
603.659.5949
woodburnandcompany.com

Stephen G. Pernaw & Company, Inc.

P.O. Box 1721 • Concord, NH 03302
tel: (603) 731-8500 • fax: (866) 929-6094 • sgp@ pernaw.com

Transportation: Engineering • Planning • Design

M E M O R A N D U M

Ref: 2037A

To: Michael J. Sievert, P.E.
MJS Engineering, P.C.

From: Stephen G. Pernaw, P.E., PTOE

Subject: Proposed Affordable Housing Development - Response to Comments

Date: February 1, 2021

On December 23, 2020 our office published the report entitled *"Traffic Impact Assessment-Proposed Affordable Housing Development"* relative to proposed residential development on Back River Road in Dover, New Hampshire. We are now in receipt of the comments from the City of Dover-Technical Review Committee data January 14, 2021. The purpose of this memorandum is to provide responses to each comment. Each comment is paraphrased below, for brevity:

TRC Comment 1: *"How was the 1.41 and 1.18 Covid-19 adjustment factor found?"*

SGP & Co. Inc. Response: The derivation of these factors is included in Appendix D, and is attached to this memorandum.

TRC Comment 2: *"Did this analysis consider 40 additional units off Leathers Lane?"*

SGP & Co. Inc. Response: Yes. Appendix E includes a diagram showing the site traffic associated with this other development project.

TRC Comment 3: *"Page 8: What is the source of the Covid-19 adjustment factors applied?"*

SGP & Co. Inc. Response: See response to TRC Comment 1 above, and the attachment to this memorandum.

TRC Comment 4: *"Page 20: intersection capacity analysis summary for NH 108/Back River Road is based on turning movement counts from October 2020. Even with Covid adjustment factors this cannot duplicate the pre-Covid conditions."*

SGP & Co. Inc. Response: Comment acknowledged. Predicting pre-Covid conditions is not always straightforward; recent changes at nearby schools, for instance, are not easily predictable nor quantifiable. The submitted analysis does provide the Committee and Planning Board with a No-Build vs. Build comparison that shows the net change in both traffic demand and traffic operations due to the +11 (AM) and +21 (PM) additional vehicles that will enter this intersection during the worst-case peak hour periods. Stated another way, adding +21 vehicles to an intersection that accommodates over 2,200 vehicles during the PM peak hour will not significantly alter the prevailing traffic conditions, regardless of the pandemic's impact.

TRC Comment 5: *"During AM peak, this intersection does not operate at LOS C or A for Route 108 NB Thru, Route 108 SB Thru, or Back River Road queues. It's already at F for these approaches."*

SGP & Co. Inc. Response: Comment acknowledged. Unfortunately, turning movement count data collected at an intersection is not capacity constrained. In over-capacity situations (LOS F), we are only able to report the output from the Highway Capacity Manual methodology, and it's algorithms. Again, it is reasonable to conclude that adding single-digit increases to the hourly traffic volumes on these approaches will not significantly alter whatever the prevailing traffic conditions are during over-capacity periods.

Attachment

Landscape Operation & Maintenance Plan For 54 Back River Road

Weekly Tasks

1. Mow and edge lawns if needed. Lawns to be cut to 3.5" height.
2. Prune back any shrubs overhanging curbs or sidewalks.
3. Prune back any groundcover overhanging curbs or sidewalks.
4. Remove litter and leaves from plants, planters, and parking lots.
5. Remove any broken or fallen branches from trees. Remove sucker growth from tree trunks.
6. Remove any weeds larger than 2 inches (5 cm) high or wide from planters. Weeds 2 inches (5 cm) and larger must be removed, not just killed.
7. Replace bark mulch which has been knocked or washed out of planters. Smooth mulch layer if it has been disturbed.
8. Replace decorative rock which has been knocked or washed out of drip strips. Smooth decorative rock surface if it has been disturbed.
9. Check plants for signs of stress, pests or disease. Request authorization to replace other dead or missing plants. Note: Maintenance contractor must request authorization to make replacements within one week of the damage becoming evident.
10. Sweep or blow clean all walkways, curbs, and gutters.
11. Treat for any signs of disease or pest infestation.
12. Complete any items required on the Monthly Checklist.
13. Hand water any plants that are dry and stressed.
14. Check the irrigation system (if there is a system). Make emergency repairs as needed or request authorization to make major repairs. Note: Maintenance contractor must request authorization for repairs within one week of the damage becoming evident.
15. Adjust the irrigation controllers for current water needs of plants.
16. **Gently prune shrubs at appropriate time of year based on species, for shape and form. DO NOT shear.**

Yearly Tasks

Early Spring

1. Prune any tree branches that interfere with public safety. Prune all parking lot and street trees yearly to encourage strong growth.
2. Apply granular fertilizer to shrubs beds and lawns. Be sure to make application prior to a moderate rainfall in drip-irrigated planters so the rain will wash the fertilizer in.
3. Submit receipts to owner's authorized representative as proof of fertilizer purchase.
4. Trim any perennial foliage left in the fall for winter interest to within six inches of the ground.
5. Add new mulch to planters where the mulch depth has been reduced to less than 2 inches (5 cm) thick. Mulch depth shall not exceed 2". Additional mulch not required where shrubs or groundcover completely hide the soil surface from view.

6. Where there is irrigation and after threat of frost is gone, flush out irrigation systems as needed and check for proper operation of each valve zone.
7. Clean or replace plugged sprinkler nozzles. Replace plugged drip emitters.
8. Replace irrigation controller program back-up batteries.

June:

No additional items

July:

No additional items

August:

No additional items

September:

1. Inventory all plant materials. Inventory shall include an exact count of all shrubs and trees, itemized by planter. Replace any dead or missing plants.

October:

1. Prepare irrigation system for winter. Make sure backflow preventer is well insulated or drained prior to first freeze. Blow out pipes using compressed air in areas where freezing could result in breakage.
2. Mow field areas.

November:

1. “WILT-PRUF” broadleaf evergreens when temperature permits.

December:

1. Prune any tree branches that interfere with public safety. Prune all parking lot and street trees yearly to encourage strong growth.

EVERSOURCE ENERGY

January 29, 2021

1700 Lafayette Road
Portsmouth, NH 03801

Michael J Busby
603-436-7708 x555-5678
michael.busby@eversource.com

John Randolph
54 BRR LLC
1 Stagecoach Rd
Durham, NH 03824

Dear John:

I am responding to your request to confirm the availability of electric service for the proposed 54 Back River Road project being constructed for/by Finally Home Properties HM LLC.

The proposed project consists of 44 one-story single-family residential buildings, with each residential unit being approximately 450 s/f. The proposed development will be constructed along Back River Road.

The developer will be responsible for the installation of all underground facilities and infrastructure required to service the new building. The service will be as shown on attached marked up Utility Plan C103. The proposed building service will be fed from ….. to be determined by Eversource Engineering as depicted on utility plan C-103. The developer will work with Eversource to obtain all necessary easements and licenses for the proposed overhead/underground facilities listed above.

This letter serves as confirmation that Eversource has sufficient capacity in the area to provide service to this proposed development. The cost of extending service to the aforementioned location and any associated infrastructure improvements necessary to provide service will be borne by the developer unless otherwise agreed upon.

The attached drawing titled "Utilities Plan 54 BRR, LLC" dated 02/012021, shows transformer locations to service your proposed project.

Eversource approves the locations shown; assuming the final installed locations meet all clearances, physical protection, and access requirements as outlined in Eversource's "Information & Requirements For Electric Supply" (https://www.eversource.com/content/docs/default-source/pdfs/requirements-for-electric-service-connections.pdf?sfvrsn=2).

If you require additional information or I can be of further assistance please do not hesitate to contact me at our Portsmouth Office, 603-436-7708 Ext. 555-5678

Respectfully.

Michael J. Busby, PE
NH Eastern Regional Engineering and Design Manager, Eversource

cc: (via e-mail)
Timothy Kenney, Eastern Region Operations Manager, Eversource
Mary Jo Hanson, Field Supervisor, Electric Design, Eversource

January 20, 2021

John Randolph
54 BRR LLC
1 Stagecoach Rd
Durham NH 03824

RE: Natural Gas Availability to 54 Back River Rd Dover NH Project

Dear John,

Unitil's natural gas division has reviewed the requested site for natural gas service.

Unitil hereby confirms natural gas service will be available to 54 Back River Rd Dover Project, off Back River Rd Dover NH to serve single family homes.

Installation is pending an authorized installation agreement with 54 BRR LLC and street opening approval from the City of Dover DPW.

Let me know if you have any questions. You can email me at oliver@unitil.com. My phone number is 603-294-5174.

Sincerely,

Janet Oliver
Senior Business Development Representative

CUSTOMER ENERGY SOLUTIONS
325 West Road
Portsmouth, NH 03801

T 888.486.4845 www.unitil.com

54 BRR LLC LEASE AGREEMENT

This Agreement is made this _____, by and between 54 BRR LLC, hereinafter referred to as "Landlord", and the following individual, jointly and severally:

Name	Telephone	Permanent Address
Resident Names		1 Uncommon Dr Dover NH 03820

Hereinafter collectively referred to as "Tenant".

1. DESIGNATED AGENT:

Landlord and Tenant agree that **XXXXXX** is hereby named the Designated Agent for the Tenants for the purposes of all notices to Tenants and all services of process necessary under this lease. A check for return of balance of the security deposit at the end of the lease will be made payable to all to whom such deposit was received and returned to the Designated Agent at the conclusion of the lease and shall be deemed deliverable on the date sent first class and postmarked. Tenants are responsible for the equitable division of the deposit in accordance with any arrangements which they made among themselves with regard to their various contributions to any rent payments or delinquencies, the deposit, or their individual responsibilities for the damages, breaches or failure to perform any and all of the obligations jointly and severally assumed by Tenants under this agreement. It is expressly agreed that all Tenants shall hold Landlord harmless for the failure of the Designated Agent tenant to properly perform his or her duties and shall look only to the Designated Agent Tenant or to each other for redress of such failure.

2. PREMISES RENTED:

Landlord agrees to hereby rent to Tenants, jointly and severally, a 1-bedroom, unfurnished apartment, the address of which is **1 Uncommon Drive Dover, NH 03820.** Jointly and severally means that all Tenants are responsible to Landlord together as a group and also separately or individually for all obligations of this lease agreement.

3. TERM:

Landlord agrees to rent the above premises and Tenant agrees to occupy them for a lease term of 1 year, starting **9:00 A.M. on XXX ____, 2021** and ending at **12:00 noon on** XXX ___, **2022.**

4. DELIVERY OF PREMISES:

If Landlord is unable, through no fault of its own, (including, but not limited to, the holdover of a prior Tenant in violation of their lease, the uncertainties of necessary cleaning, or for repairs that were unanticipated or could not be started or finished prior to the commencement

of lease) to deliver the premises to the Tenants at the time called for herein, the rent shall be abated on a prorated basis until such time as occupancy can be obtained. This abatement shall constitute full settlement of all damages caused by such delay: If possession cannot be delivered within thirty (30) days from the beginning of this lease term, either the Landlord or the Tenant may then terminate this lease by five (5) days written notice, and all payments theretofore made under this agreement shall be returned.

5. SECURITY/DAMAGE DEPOSIT:

The receipt of a security/damage deposit hereinafter referred to as "Deposit" in the amount of **Nine Hundred Fifty Dollars and No Cents ($850.00)** is hereby Scheduled before moving in. Such deposit shall be returned to Tenants (in a check written to the group as a whole) when the premises are vacated in a timely manner, all of the personal property of Tenants, subtenants and guests is removed, the premises are cleaned, all rent, fees, damage charges and interest owing have been paid in accordance with the provisions of this Lease, and all keys to the apartment have been returned to the Landlord. Damages incurred by the Landlord for breach of the obligations of this section or any other section of this lease by Tenants may be deducted from the deposit, as permitted by New Hampshire law. If, at the option of the Landlord, the security/damage deposit is used during the term of this Lease to cover damages or other unpaid monies as permitted by New Hampshire law, Tenants agree that upon notice from Landlord they will pay such sums to Landlord as are necessary to restore the deposit to its original amount within thirty (30) days of notice from Landlord. The parties expressly agree that Landlords' damages for which the security/damage deposit may be used expressly include all categories permitted by New Hampshire law. It is agreed that Tenant's liability for breach of this lease shall not be limited to the amount of the deposit. It is also agreed that Tenants shall not use any part of the deposit in lieu of agreed rent for the last or any other month's rent, and that to do so is a material violation of this agreement. If this agreement is terminated prior to the expiration date provided herein, the deposit is forfeited.

6. RENT:

Tenant agrees to pay, without demand, as rent for the premises the following amounts:

Rent for the lease, in the amount of **Nine Hundred fifty Dollars and No Cents ($950.00)** is due on the first of each month. Rent will stay at or below HUD rental rates for Dover, NH.

A check or money order payable to **54 BRR LLC** for the full rent shall be paid before or on the first day of each month to **40 Briggs Way Durham, NH 03824**. The rent check should have the apartment address and the Tenant's name printed on it. **If any portion of the monthly rent has not been received by Landlord on the fifth day of any month, a late fee of Fifty dollars ($50.00) shall be due from the Tenant, without demand by Landlord. If any portion of the monthly rent has not been received by Landlord on the fifteenth day of any month, a late fee of One Hundred and Fifty Dollars ($150.00) shall be due from the Tenant, without demand by Landlord**. Full agreed rent means the amount due as agreed to by all parties signing this lease regardless of the manner in which the Tenants decide to divide the rent or the number of checks they send to the Landlord to make up the full rent. If the bank for any reason returns a check, Tenant agrees to pay a handling charge of **twenty-five dollars ($25.00)** and rent thereafter will be paid by money order or cashier's check. Payment or receipt of rent less than the amount stated in the lease shall be deemed to be nothing more than partial payment on

account. Under no circumstances shall Landlord's acceptance of a partial payment constitute accord and satisfaction or forfeit Landlord's right to collect what would otherwise be the balance due, despite any endorsement, stipulation, or other statement on any check.

Tenants agree to pay as additional rent, due on or before the first of the month following notice from Landlord, the amount of any shortage in agreed security deposit due to any deduction for damage, unpaid rent, or the amount necessary to pay for any damage caused by Tenants or their guests to the apartment, common areas or property. Damages not charged during the term of this lease shall be charged at termination. If Landlord must obtain Subtenants to mitigate damages caused by Tenants' failure to pay rent as agreed, Tenants also specifically agree to pay as additional rent the amounts customarily charged by Realtors for such re-rental, whether such re-rental is affected by Landlords personally, or by their employees or agents.

7. NUMBER OF OCCUPANTS:

Tenants agree that the rented premises shall not be occupied by more than Two **(2)** persons and those persons will only be the individuals named on this lease who have signed this lease. Individual guests of Tenants may occupy the premises for not more than seven (7) days during this lease unless written permission is given in advance by the Landlord. If you wish to add a resident please contact John and request this change, an increase in rent for additional resident is likely.

8. CONDITION OF PREMISES:

Tenants stipulate that they have examined the rented premises and that they are, at the time of this lease, in good order, repaired, and in safe, clean and tenantable condition. Tenants acknowledge that Landlord has provided a Conditions List form and Tenants agree to inspect the apartment upon moving in to note on the Conditions List any items in need of repair or cleaning. Tenants agree to deliver the completed Conditions List to landlord within three (3) days of taking possession of the premises and also agree that failure to do so shall mean that the Tenants have inspected the premises and agree that the premises are accepted without any defects.

9. UTILITIES:

Water and Sewer are provided at Landlord's expense. At no time will Tenants allow electricity to be turned off or heating fuel to be turned off thereby endangering the heating plant, plumbing or other parts of the leased premises. Heat must never be set below 55 degrees Fahrenheit in the winter, including during vacation. Tenants must promptly notify Landlord of any utility shut off. Tenants will pay for all cable and telephone installation or repair charges. New service or wiring will be done at Tenants expense but only with the specific written consent of Landlord. Configurations of telephone hookups are tenant's responsibility.

10. PETS:

If you wish to add any pets you will need to ask the landlord before hand for approval. Tenants agree to take all reasonable steps to protect the condition of the apartment against pet

related damage, and Tenants acknowledge that pet related damage that has not been repaired or cleaned at the end of the tenancy shall be charged back to Tenants under the Security Deposit.

11. ALTERATIONS AND IMPROVEMENTS:

Tenants shall make no alterations on the rented premises (including painting) without prior written consent of Landlord. Tenants shall not deface or damage the walls or woodwork in any manner. No nails, hooks, screws, staples, toggles, mollies or any similar objects shall be inserted into the walls, woodwork, paneling, ceiling, doors or cabinets. No adhesives, drilling of holes, or dart boards are allowed. Tenants shall not remove or replace any major appliances nor add any major appliances without written consent of Landlord. Request for repairs must be sent in writing to Landlord.

12. LEAD WARNING STATEMENT AND DISCLOSURE: Properties were all built in 2021 so no lead disclosure is required.

13. INSURANCE:

Landlord shall keep the building insured but shall not be responsible for contents belonging to Tenants. Tenants shall insure and hold Landlord harmless for any loss or damage to furnishings, furniture, or other personal property belonging to Tenants, their Subtenants, guests and visitors, and tenants shall insure and hold Landlord harmless for any loss or damage resulting in injury to tenants, their guests or invitees, within the leased premises except for loss, damage or injury resulting from Landlord Negligence.

14. USE OF THE PREMISES AND COMMON AREAS:

a. USE OF PREMISES BY TENANTS: The rented premises shall not be used or occupied by Tenants except as a private residence. Tenants shall not use the premises or any part thereof to carry on any business, profession, or trade of any kind or for any purpose other than as a private residence at any time during the term of this lease. Tenants shall keep all food and garbage in closed containers so as not to attract ants, bugs or other pests. If Tenants fail to do so and pests are attracted to the apartment or to other areas in the building, the Tenants in the apartment that has failed to comply with this provision will be liable for the cost of any necessary treatment or extermination undertaken for any part of the building or premises by Landlord or Landlord's agents.

b. RESTICTION AGAINST EXCESSIVE NOISE: Tenants, their guests and visitors, shall not make, cause or permit any loud, improper or annoying noises (including, but not limited to, their stereo, television, radio, playing of instruments), smells or lights inside or outside of the rented premises, nor interfere in any way with the quiet use and enjoyment by others in the building or neighborhood. Tenants will respect a quiet period daily between 11:00PM and 7:00AM.

c. COMPLIANCE WITH LAWS: Tenants will comply with all fire safety regulations, sanitary laws, ordinances, rules and orders of appropriate governmental authorities affecting the protection, cleanliness, occupancy, and preservation of the rented premises during the term of the lease.

d. SMOKE DETECTORS: Smoke detectors have been installed for the safety of the occupants and the premises and they are not to be made nonfunctional by any person. Smoke detectors are to be inspected by Tenants at the beginning of their occupancy of the premises. Nonfunctioning detectors are to be reported immediately to Landlord.

e. TRASH REMOVAL/RECYCLING: Tenants shall be responsible for the disposal of all trash and garbage, and recycling, in accordance with city/town ordinances and regulations. Tenants shall not keep or store garbage or trash loose or in containers in hallways, stairways, porches, yards, parking areas or other common areas of the house or lot. Trash not taken by the city/town must be removed from the exterior of the premises no later than the day after collection day. If not removed, Landlord may haul the items and charge Tenant.

f. SNOW/ICE REMOVAL: Tenants shall be responsible for the removal of snow and/or ice from the driveways, parking areas, stairways and all walkways on the property.

g. PARKING: Your unit comes with 1 assigned parking spots. If additional spots are available due to another tenant not using their spot it can be used on a case-by-case basis. All vehicles must be registered with the landlord. Any change in the Tenant's vehicle information must be immediately provided to Landlord. Parking is on a first come, first served basis, and the availability of a parking spot is not guaranteed at any time. Vehicles must be registered with the government, bear an appropriate License Plate, have a current inspection sticker, display any parking sticker required by Landlord, and be operable for use on the street. Parking spaces are not provided for guests and visitors. Vehicles that are not registered with Landlord may be towed without additional notice and at the expense of the vehicle owner or the Tenants of the apartment being visited. No storage of vehicles that are unregistered, inoperable or not regularly used by Tenants is permitted.

Tenant Vehicle: Year: _____ Make: _____ Model: _____

Color: _____ State of Registration: ____ License Plate #: _____

h. KEYS AND LOCKS: Tenants agree not to change or add any locks to the premises without the written permission of Landlord. Unauthorized locks will be removed without notice and at Tenants' expense. Tenants agree to pay a charge of **Twenty-Five dollars ($25.00)** if any keys remain unreturned at the termination of the tenancy.

i. STORAGE: Tenants shall not place, keep, or store any items in hallways, stairways, or other common areas, except that customary laundry cleaning supplies may be kept in the laundry room. Items in common areas in violation of this provision are deemed abandoned and may be disposed of by the Landlord without notice to anyone. Tenants are specifically advised that the basement door is locked and no storage of personal property is permitted. Should Tenants gain unauthorized access to the basement and place Tenants personal property therein, Tenants shall hold Landlord harmless regarding damage or loss to any personal property of Tenant stored in the basement.

j. WATERBEDS: Waterbeds and large aquariums are prohibited.

k. ROOFS: Roofs are not to be used for sitting, walking, or for any purpose.

l. CARPETS: Carpets within the apartment, if any, shall be vacuumed regularly by the Tenant. Burns in the carpet, spills and stains that are not removed upon vacating will be considered damages and not ordinary wear and tear. Damaged carpet will be repaired or replaced at Tenant's cost.

15. ENTRY FOR INSPECTION, REPAIRS AND SHOWING:

Landlord and Landlord's agents shall have the right to enter the leased premises at reasonable times to inspect the premises, make necessary repairs or changes, and supply the services or utilities that Landlord has agreed to supply. They also shall have the right to enter within 90 days of lease termination date to show the apartment to prospective tenants, and to enter at any time to show the apartment to prospective purchasers, mortgage lenders, workmen or for routine inspections. They shall have the right to enter whenever necessary in the case of an emergency. In non-emergency situations, every effort shall be made (by calling the telephone number listed above) to provide at least three (24) hour advance notice for permission to enter the premises. If, however, such permission cannot be obtained, then Landlord or Landlord's agents may enter the premises without permission and conduct the proposed showing. If repairs are needed, Contact the owner directly via the email or cell number provided to you**.**

16. SURRENDER OF PREMISES:

At the expiration of the lease term, tenants shall quit and surrender the premises in a clean and rentable condition and return all apartment keys. Tenants are expected to remove all personal property, dispose of all trash properly, and clean refrigerator, stove and oven. Floors are to be washed and carpets vacuumed. If Tenant fails to return keys and surrender the premises by noon on the last day of the lease, then Tenant shall be considered a holdover tenant at the will of Landlord. Such a tenancy shall be governed by the same conditions and obligations as set forth in this agreement, except for Section 3, "TERM", and provided that, as a holdover Tenant at will, commencing at 12:01 P.M. on the last day of the lease, the rent under Section 6 shall be immediately increased to the sum of **Two Thousand Two Hundred Dollars and No Cents ($2200.00) per month**, unless otherwise agreed upon in writing by Landlord and Tenant, and the Landlord may terminate the holdover tenancy upon 30 days written notice to Tenant. Landlord shall also be entitled to all costs, including reasonable attorneys' fees, in effecting an eviction and the collection of rent and any other amounts due under the terms of this agreement. This paragraph does not give Tenants any right to remain in the premises after the termination of the lease but is intended to expand upon the penalties for failure to vacate at the time originally provided in the agreement.

17. ASSIGNMENT AND SUBLETTING:

Tenants shall not assign this lease, or sublet, or grant any concession or license to use the premises or any part thereof without prior written consent of Landlord. A consent by Landlord to one assignment, subletting, concession or license shall not be deemed to be a consent to any subsequent assignment, subletting, concession or license. Any unauthorized assignment or subletting shall be void and shall be grounds for Landlord to terminate this lease agreement. Given proper notice, Landlord will consider approval of a sublet request by tenants. Subletters may assume all or some of the rent and other obligations originally assumed by Tenants. However, sublet agreements shall in no event be construed by Tenants as terminating this lease prior to the date in Section 3 of this agreement or terminating the ultimate responsibility of Tenants for the rent and other obligations provided in this lease. Tenants agree to pay the

amount customarily charged for any subletting of the premises during the period of this lease, whether such subletting is due to the personal labor of Landlord or their agents.

18. INDEMNIFICATION OF LANDLORD:

Tenants shall indemnify Landlord and hold them harmless for any death, injury, or damage to persons or property which at any time may be suffered or sustained by Tenants or by any person who may be using, occupying, visiting the rented premises or the common areas or land surrounding said leased premises in connection with such visit, or be in, on, or about the same, whether such loss, injury, death or damage shall be caused by or in any way result from or arise out of any act, omission, or negligence of tenants or of any occupant, subtenant or visitor except for loss, damage or injury resulting from Landlord Negligence. Landlord shall not be liable for latent defects in the premises. There shall be no diminution or abatement of any rent due under this agreement because of making repairs or improvements, etc. Landlord shall not be liable for any failure of water supply, electricity, mechanical refrigeration or other services. The exceptions to this paragraph are provided in RSA 540-A:3,I; RSA 540;13-a; and RSA 540:13-d.

19. DEFAULT:

If Tenants shall fail or neglect to observe or perform any of the covenants, terms, or conditions herein contained, Landlord shall have the right, at his option, on written notice to Tenants, to terminate this lease and all Tenants' rights hereunder shall thereupon cease. Upon any termination of the lease through default by the Tenants, the Landlord may hold the Tenants responsible for such damages as the Landlord may incur. In the event of an eviction, Tenants give the Landlord permission to remove promptly any personal property left on the premises or common area and agree to pay for the costs of removal and storage of such property.

20. WAIVER:

The failure of Landlord to insist on strict performance of any provision of this lease, or the acceptance by Landlord of any payment or installment in full or partial fulfillment of any obligation under this lease, or the failure to exercise any option contained in this agreement shall not be construed as a waiver of any breach or relinquishment of any right to enforce any provision of this agreement in the future.

21. SEPARABILITY AND BINDING EFFECT:

If any provision of this lease agreement or the application thereof to any person or circumstance is held to be invalid for any reason, the remainder of the lease agreement (or of such provision) and the application thereof to other persons or circumstances shall not be affected thereby. The covenants and conditions herein contained shall apply to and bind not only the parties hereto, and all covenants are to be construed as conditions of this lease. All signatories acknowledge that they have read the provisions of this agreement, including the disclosure in Section 12 require by the Federal Government, and that the information provided is accurate to the best of their knowledge.

22. EMERGENCY CONTACT

In the event of an emergency, Tenants request and give permission to Landlord to notify _____, at telephone number: _____.

IN WITNESS THEREOF, the parties have executed this agreement the day and year first above written and each individual signing this lease certifies that he or she is over the age of eighteen (18) years.

Landlord:

By _____Date:_____

John Randolph

Tenants:

_____Date:_____

_____Date:_____

_____Date:

_____Date:_____

P21-01, P20-60, & P20-61 **54 Back River Road**

Property ID	Location	Owner 1	Owner 2	Owner Address 1	City	State	Zip
16020-000OPN	PICNIC ROCK DR	PICNIC RIVERS PARTNERS OF DOVER LLC	FOY WILLIAM T MEMBER	29 MENDUM AVE	PORTSMOUTH	NH	03801
16020-017000	47 PICNIC ROCK DR	LINVILLE JOHN THOMAS II & HEIMAN MALISA	LINVILLE JOHN T II REVOCABLE TRUST OF 20	PO BOX 956	DOVER	NH	03821
16020-018000	45 PICNIC ROCK DR	WU ZIWEI		GSS 13194 83 MAIN ST	DURHAM	NH	03824
16020-019000	43 PICNIC ROCK DR	WARREN STEVEN MICHAEL		43 PICNIC ROCK DR	DOVER	NH	03820-4709
16020-020000	41 PICNIC ROCK DR	HATFIELD DANIEL P &	HATFIELD ALISON L	41 PICNIC ROCK DR	DOVER	NH	03820-4709
16030-000000	50 MILL ST	GREAT BRIDGE DOVER LIMITED PARTNERSHIP	C/O STEWART PROPERTY MGMT INC	P O BOX 10540	BEDFORD	NH	03110-0540
16032-000000	39 40 MILL ST	GROSSMAN KENNETH W & HOLLY TRUSTEES	GROSSMAN FAMILY 2003 REVOCABLE TRUST	435 SCRUTON POND RD	BARRINGTON	NH	03825
I0005-000000	BACK RIVER RD	CAMPBELL WAYNE P TRUSTEE	CAMPBELL REALTY TRUST	64C HORNETOWN RD	FARMINGTON	NH	03835
I0005-000016	24 WINGATE LN	ECHO PROPERTY MANAGEMENT LLC		16 NASON RD	HAMPTON FALLS	NH	03844
I0005-000017	22 WINGATE LN	FLETCHER ROBIN G		22 WINGATE LN	DOVER	NH	03820
I0005-000018	20 WINGATE LN	HALPERN JUDITH ANN TRUSTEE	HALPERN JUDITH ANN LIVING TRUST	20 WINGATE LN	DOVER	NH	03820
I0005-000019	18 WINGATE LN	SMITH CHARLES R		18 WINGATE LN	DOVER	NH	03820
I0006-A00000	50 BACK RIVER RD	CROSSMAN FRANK JR		50 BACK RIVER RD	DOVER	NH	03820
I0006-B00000	44 BACK RIVER RD	PELCHAT WILLIAM H &	SAUCIER LINDA M	44 BACK RIVER RD	DOVER	NH	03820
I0006-C00000	46 BACK RIVER RD	TSAKIRIS NATHAN 95% &	TSAKIRIS TINA 5%	46 BACK RIVER ROAD	DOVER	NH	03820
I0006-C00001	8 RED BARN DR	MCGUANE TIMOTHY J &	LEBEL MCGUANE LAURALEE	8 RED BARN DR	DOVER	NH	03820
I0006-C00002	12 RED BARN DR	ROY SCOTT L &	ROY AMY M	12 RED BARN DR	DOVER	NH	03820
I0006-C00003	16 RED BARN DR	ROBINSON SHARI &	ROBINSON TERRY	16 RED BARN DR	DOVER	NH	03820
I0006-C00004	20 RED BARN DR	DEOLIVEIRA SEBASTIAO H &	MERRETT-DEOLIVEIRA DEBRA A	20 RED BARN DR	DOVER	NH	03820
I0006-C00005	24 RED BARN DR	KELLER JOSHUA		24 RED BARN DR	DOVER	NH	03820
I0006-C00006	28 RED BARN DR	HARBRON WILLIAM R &	HARBRON MARILYN	28 RED BARN DR	DOVER	NH	03820
I0006-C00DRV	RED BARN DR	RIDGESTONE BUILDERS & DEVELOPERS LLC		15 STARFISH DR	WELLS	ME	04090-4158
I0006-C00OPN	RED BARN DR	RIDGESTONE BUILDERS & DEVELOPERS LLC		9 KINGS GRANT DR	ATKINSON	NH	03811
I0006-D00000	BACK RIVER RD	HELLMAN LANCE W TRUSTEE	HELLMAN LANCE W REVOCABLE TRUST	228 HIGHLAND AVENUE	PORTSMOUTH	NH	03801
I0006-I00001	56 BACK RIVER RD	SWEATT ARTHUR		56 BACK RIVER RD	DOVER	NH	03820
I0057-000000	49 BACK RIVER RD	STEVENS WALLACE B		49 BACK RIVER RD	DOVER	NH	03820
I0058-000000	51 BACK RIVER RD	HOLGATE LIMITED PARTNERSHIP		130 CENTRAL AVE	DOVER	NH	03820
I0059-000000	53 BACK RIVER RD	HOLGATE LIMITED PARTNERSHIP		130 CENTRAL AVE	DOVER	NH	03820
I0060-000000	55 55A BACK RIVER RD	TURGEON KEVIN &	TURGEON LISA	225 GREEN ST	SOMERSWORTH	NH	03878
I0061-000000	57 BACK RIVER RD	SMITH MATTHEW J & FLEISCHMANN AMANDA A T	FLEISCHSMITH FAMILY REVOCABLE TRUST OF 2	57 BACK RIVER ROAD	DOVER	NH	03820
I0062-000000	58 BACK RIVER RD	DAVIS TIMOTHY A &	DAVIS ERIN M	58 BACK RIVER RD	DOVER	NH	03820
I0067-B00000	62 BACK RIVER RD	TOWLE JONATHAN P TRUSTEE	TOWLE JONATHAN P 2008 TRUST	62 BACK RIVER RD	DOVER	NH	03820
I0006-000000	54 BACK RIVER RD	54 BRR LLC		1 STAGECOACH RD	DURHAM	NH	03824
		MJS ENGINEERING	MICHAEL SIEVERT, P.E.	P.O. BOX 359	NEWMARKET	NH	03857
		TRITECH ENGINEERING CORP.	ROBERT STOWELL	755 CENTRAL AVENUE	DOVER	NH	03820
		GSD STUDIOS	ROBERTA WOODBURN	103 KENT PLACE	NEWMARKET	NH	03857
		WOODBURN & COMPANY	JOSEPH NOEL	P.O. BOX 174	SOUTH BERWICK	ME	03908

CITY OF DOVER

TECHNICAL REVIEW COMMITTEE MINUTES – P20-60

Application Type:	Open Space Subdivision Review
Applicant(s):	54 BRR, LLC
Owner(s):	54 BRR, LLC
Location:	54 Back River Road (Tax Map I, Lot 6)
Date:	October 8, 2020

INTENT: To develop an affordable housing community with 44 detached, 384 s.f., one-bedroom single-family dwellings

UNITS PROPOSED: 44

AGENDA ITEM #: 2

ACREAGE: 7.162 acres

ZONING DISTRICT: R-12

EXISTING LAND USE: Residential

PROPOSED LAND USE: Residential

SURROUNDING LAND USE: Residential and River

ZBA ACTION: None

PERMITS REQUIRED: AOT, Shoreland, CUP, and SWPPP

WAIVERS REQUESTED:
153-14.D: Parking TBD

ATTENDANCE:
Members:
Donna Benton, Planning
Elena Piekut, Zoning
Jim Maxfield, Fire/IS
Sgt. Speidel, Police
Dave White, Engineering
Frank Torr, Planning Board
Dan Barufaldi, Economic Development

Others:
Mike Sievert
Max Schrapper
Robbi Woodburn
John and Maggie Randolph
Erin and Tim Davis
Chris Parker

PLAN REVIEW:
Planning:

- Water and Sewer Investment Fees
- Impact Fees ($391,380)
- Any steep slopes? CUP needed? Show calculation on plan
- Will the open space be deed restricted to prevent further development?
- Reach out to Postmaster about mail kiosk
- Provide :
  - Rental agreement/lease regarding HUD rental rates and draft of deed restriction on low-rental
  - Traffic Impact Analysis and Parking Study
  - Lighting Plan
  - Landscaping Plan that meets regulations (ie min 3.5"-4" caliper and shrubs/plantings)
  - Landscaping Operation and Maintenance Plan
  - Letters to Serve
- Revise plan to:
  - Add note about ride-sharing, shuttles, etc.
  - Finalize renderings (ie add shed, color palate, beams, pavilions removed, etc)
  - Indicate how cars maneuver mail/dumpster
  - Add visitor parking by existing house
  - Add owner's signatures
  - Add professional signature and stamps
  - Correct Map from I-2 to I
  - Add more screening around middle two units between the northern two units
  - Provide a road name, which ends in "Drive"
  - Add the distance between the units
  - Consider relocating the attached sheds to the rear of the units
  - Change note 31 from required parking to allowed
  - Stripe spaces next to crosswalk to allow for site distance
  - Consider the value of the crosswalk in the project
  - Move sidewalk to parking lot side and bring to Back River Road
  - Widen and Pave sidewalk/walkways
  - Add proposed plan to neighborhood plan
  - Reduce from 3 curb cuts to 2
  - Indicate the plan # is P20-60 on all title blocks
  - Add note about or show proposed trails
  - Add notes about the 30' no cut, no disturb buffers remaining
  - Relocate the walking paths off the accessory driveway to be opposite each other
  - Add common site plan notes 9, 17 and 29
  - Add Accessible parking spaces

- Add a note regarding the use of the existing home
- Remove pool if it has been removed
- Update Neighborhood plan to show the project

Engineering Comments:

- Consider wider walking paths to allow drop off-of groceries, handicap drop off and emergency vehicle access
- Relocate the two middle houses to make a nice common that could be left open or broken up with grading and trees
- Move sidewalk along the parking side vs the non-parking side

Police Department Comments:

- Correct note 22 on Sheet C-101 pertaining to site construction hours
- Traffic Assessment Memorandum?
  - When submitted, be sure this covers potential impact on BRR/Route 108 signals and how you will help mitigate
- Means/method of solid waste disposal?
- None of the units appear to be ADA accessible, no accessible parking is provided
- Lack of sufficient guest/overflow parking is a concern
- Snow storage?
- How will the existing home be used as a community space for the development?
- Change site driveway of existing home to access via new proposed road.
- How will residents access open space? Any steps or pathways to riverfront proposed?

Fire/Inspections Comments:

- Provide a proposed street name
- Clarify the distance between adjacent structures and projections
- Provide apparatus turnaround
- Several structures appear to be located beyond the permitted distance from the access road.
- Discuss the choice of the stone dust path and how this will be maintained.
- Add unloading zone at mail kiosk
- Classification of wastewater disposal system tying into Municipal Sewer line
- Add "No parking/fire lane" signs
- Discuss utilities
- Snow storage?
- Review alternative power source for wastewater pumping
- Clarify future use of existing SF unit
- Address overall accessibility of site (ie mailbox, recycle/waste, van spaces)

Economic Development:

- Who is your target audience?
- Discuss winter maintenance
- Policy for vacant units (ie snow birds, students)

Planning Board Comments:

- Back-up generator needed
- Hazardous waste?
- Snow storage?
- Fire suppression
- Where are the mechanicals?
- Salt management to be included in Maintenance Plan
- Emergency access to Red Barn feasible?
- Re-use stonewall
- How are buildings constructed-onsite or pre-fab?

Next Steps:

Resubmit for a second full TRC before going to Conservation Commission and Planning Board.

Adjournment:

D.White moved to adjourn the meeting at 12:26pm Seconded by J.Maxfield
Vote: U/A

DOVER CONSERVATION COMMISSION – MINUTES

CITY OF DOVER

Meeting Type:	Regular Meeting
Meeting Location:	Second Floor Conference Room – 288 Central Ave.., Dover, NH
Meeting Date:	Monday, February 8, 2021
Meeting Time:	5:30 pm

MEMBERS PRESENT: Bill Hunt (Chair)

MEMBERS REMOTE: Steve Fellows (Vice Chair), Richard Erickson, Jason Aube, Abigail Lyon, Kristen Murphy (Alternate), Bruce Batchelder (Alternate)

Absent (Excused): Robert Atwood (Secretary), Amy Kramer-Perry

Absent (Un-excused):

STAFF PRESENT: Steve Bird

OTHERS PRESENT: Michael Sievert (remotely), Liz Durfee (remotely), Kyle Pimental (remotely), others

1. **CALL TO ORDER AND ROLL CALL**

   The meeting was convened at 5:30 PM.

   Bill Hunt opened the meeting and read the following statement:

   I find an 'emergency" exists within the meaning of RSA 91-A:2, III(b). Immediate action is imperative and the physical presence of a quorum is not reasonably practical within the period of time requiring action. The facts on which my finding of an 'emergency' is based are the ongoing COVID-19 pandemic, the need to accommodate social distancing and minimization of in-person contacts, and this body's ongoing, immediate need to address the important matters on the agenda for this meeting.

   Hunt conducted a roll call to determine which members were present and he asked each member to state that the reason they could not attend was the COVID-19 pandemic and to indicate if they were alone at their location.

   Fellows: I am not attending due to COVID-19 and am alone in my location.
   Erickson: I am not attending due to COVID-19 and am alone in my location.
   Aube: I am not attending due to COVID-19 and am alone in my location
   Lyon: I am not attending due to COVID-19 and am alone in my location.
   Murphy: I am not attending due to COVID-19 and am alone in my location.
   Batchelder: I am not attending due to COVID-19 and am alone in my location.

2. **CITIZEN'S FORUM: NONE**
3. **APPROVAL OF THE PRIOR MEETING MINUTES** – January 11, 2021

Erickson moved to approve the January 11, 2021 minutes, Lyon seconded. Roll Call Vote: Hunt Yes, Fellows Yes, Atwood Yes, Erickson Yes, Aube Yes, Lyon Yes, Batchelder Yes, Murphy Yes. Motion passes 7-0

4. **OLD BUSINESS:** NONE
5. **NEW BUSINESS:**

   A. City of Dover Conditional Use Permit for John Randolph of 54 BRR, LLC, (Agent: Michael Sievert, MJS Engineering), Assessor's Map I, Lot 6, zoned R-12, located at 54 Back River Road.

   Michael Sievert of MJS Engineering presented the proposal to develop an affordable housing community with 44 detached one-bedroom units. The project proposes 18,799 square feet of impact to the 20% slope Conservation District for grading and filling for construction of roads, utilities, six units, a retaining wall, a wooded platform and a stormwater treatment pond. Houses are for workers

DRAFT

from Harmony Homes in Durham. Retaining wall will minimize impacts on steep slopes. The undisturbed areas will be put into conservation.

Lyon: What DES permits are required? Is wetlands permit needed?

Sievert: There is some development within 250 feet of the tidal river so a DES Shoreland Permit is required, but nothing is within 100 feet so no wetlands permits is required.

Murphy: Some of the units appear to be very close together. What is the reason for that?

Sievert: During the TRC process it was pointed out that any units more than 50 feet from fire access would have to have a sprinkler, so we shifted some units to reduce the amount and also some units are a little larger to address ADA requirements.

Murphy: Did you look at relocating some units to reduce steep slope impacts?

Sievert: Yes we went through many efforts to minimize the encroachment but there are two fingers of steep slopes that were not possible to avoid.

Murphy: Are the recreation areas in the interior also used for storm water treatment?

Sievert: Yes the grassed areas used for recreation will handle runoff from sidewalks. The path to the viewing platform will have low impact and not be paved, likely wood chips.

Hunt: Will the steep slope impacts be cut or fill?

Sievert: There will be fill placed to build up some areas and a few areas of cut. About 10-12,000 square feet will be fill.

Fellows: What is the size of the conservation area?

Sievert: It is about 4 acres.

Murphy: Are you using matting for soil stabilization in the areas of disturbance?

Sievert: For the bio retention area we are putting in a berm with jute matting to stabilize, with rip rap at end of outfalls and the retaining wall will limit erosion issues.

Murphy: What about the water coming out of the drain pipes?

Sievert: The water will be traveling at a slight slope with low velocity.

Hunt: How long after completion of the work will monitoring taking place?

Sievert: It depends on the time of year, but SWPPP inspections go through the revegetation process.

Murphy: With no homeowners association, who is responsible for maintenance of site?

Sievert: The owners will be required to hire the maintenance companies.

Bird: Would you say the steep slopes are mostly manmade or natural?

Sievert: The areas further to the south are manmade, with fill being pushed over the edge over time.

Fellows moved to endorse the application as presented, Erickson seconded. Roll Call Vote: Hunt Yes, Fellows Yes, Atwood Yes, Erickson Yes, Aube Yes, Lyon Yes, Batchelder Yes, Murphy Yes. Motion passes 7-0

DRAFT

STORMWATER SYSTEMS INSPECTION & MAINTENANCE MANUAL

Prepared for:

54 BRR LLC

1 Stagecoach Road

Durham, NH 03824

Tax Map I Lot 6

Prepared on:

February 1, 2021

Prepared by:

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL

1.0 TABLE OF CONTENTS

1.0 TABLE OF CONTENTS 2
2.0 EXECUTIVE SUMMARY 3
3.0 CONTACT INFORMATION 3
4.0 PERMANENT BEST MANAGEMENT PRACTICES 3
4.1 OUTLET PROTECTION 3
4.2 CONVEYANCE SWALES 3
4.3 BIORETENTION SYSTEM 3
4.4 SEDIMENT FOREBAYS 3
4.5 CONTROL OF INVASIVE PLANTS 3
5.0 LONG TERM MAINTENANCE OF PERMANENT BMPS 4
5.1 OUTLET PROTECTION 4
5.2 CONVEYANCE SWALES 4
5.3 BIORETENTION SYSTEM 4
5.4 SEDIMENT FOREBAYS 4
5.5 CONTROL OF INVASIVE PLANTS 4
6.0 REFERENCES 4

LIST OF APPENDICES APPENDIX

STORMWATER SYSTEMS OVERVIEW PLAN ..... A
MAINTENANCE MATRIX ..... B
MAINTENANCE REPORTS C
CONTROL OF INVASIVE SPECIES ..... D

2.0 EXECUTIVE SUMMARY

The Stormwater Systems Inspection and Maintenance Manual (SSIMM) provides a complete reference guide for use by the property owner and their chosen maintenance subcontractor for the inspection and maintenance of the storm water best management practices (BMPs) associated with the proposed residential development at 54 Back River Road. The SSIMM describes each BMP and identifies necessary inspection activities, schedules and record keeping requirements. Compliance with the recommendations in the SSIMM will assure expected operation, performance, and life cycle of the BMPs which have a common purpose of collecting and treating storm water runoff in an effort to protect the quality of public waters.

3.0 CONTACT INFORMATION

The individual responsible for the required reporting, inspection, and maintenance activities specified in this manual is;

John Randolph
(603 834 2317

4.0 PERMANENT BEST MANAGEMENT PRACTICES

The section identifies the BMPs employed on this development and provides a brief summary to establish their purpose in the collection and treatment train within the storm water system. See the included Storm Water Systems Overview Plan for the location(s) of each of the BMPs.

4.1 OUTLET PROTECTION

Erosion control matting is used as spillway protection for the bioretention system to reduce the velocity of stormwater and prevent erosion at the outlet.

4.2 CONVEYANCE SWALES

Conveyance swales are vegetated channels that collect and transport runoff to pre-treatment and treatment practices. Conveyance swales do not provide stormwater treatment.

4.3 BIORETENTION SYSTEM

A bioretention system is a landscaped depression that allows runoff to pond before it filters through an 15 inch deep soil mix, and infiltrates in to the ground or is collected by an underdrain system. The rain garden incorporates vegetation specifically planned for the uptake of runoff.

The rain garden is designed to temporarily hold runoff like a detention pond and allow time for the vegetation to uptake the runoff. The rain garden incorporates a spillway outlet stabilized with erosion control matting.

4.4 SEDIMENT FOREBAYS

A sediment forebay is a pre-treatment practice that consists of a small basin designed to dissipate the energy of incoming runoff and allow for settling of suspended solids. A staff gage (wood stake) marked at 6-inch increments shall be permanently installed to measure the depth of sediment accumulation. Runoff outlets through a spillway.

4.5 CONTROL OF INVASIVE PLANTS

Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as "hitchhikers" among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by:

- becoming weedy and overgrown;
- killing established shade trees;

- obstructing pipes and drainage systems;
- forming dense beds in water;
- lowering water levels in lakes, streams, and wetlands;
- destroying natural communities;
- promoting erosion on stream banks and hillsides; and
- resisting control except by hazardous chemical.

5.0 LONG TERM MAINTENANCE OF PERMANENT BMPS

This section will be useful to the property owner and their maintenance subcontractor to establish a systematic approach for the inspection and maintenance of the on-site storm water system components. Included in Appendix B is an Inspection Matrix which summarizes the inspection needs described below. An Inspection Report is provided in Appendix C. Completion of the Inspection Report and Matrix is required, and a record shall be kept on site of each inspection.

5.1 OUTLET PROTECTION

Inspect rip rap aprons annually for damage and repair as needed. Ensure outlet is free of debris.

5.2 CONVEYANCE SWALES

Inspect annually for sediment accumulation, erosion, and condition of vegetation. Remove sediment and debris, repair eroded areas, and reseed bare areas as necessary. Channel should be mowed at least once per year to a minimum height of 4 inches.

5.3 BIORETENTION SYSTEM

The Bioretention system should be inspected at least twice annually and following any rainfall event exceeding 2.5 inches in a 24 hour period, with maintenance or rehabilitation conducted as warranted by such inspection. At least once annually the bioretention system should be inspected for drawdown time. If bioretention system does not drain within 72 hours following a rainfall event, then a qualified professional should assess the system, to determine required measures to restore infiltration and filtration capacity which may include removal of sediment or reconstruction of filter media.

The vegetation and riverstone mulch will be the major visible features of this BMP. Mow and cut back the vegetation to the extent necessary and practical to prevent overgrowth. Augmentation of the riverstone mulch may be needed every two or three years. Any fallen leaves, branches, and other detritus material should be removed each fall prior to the winter season with a final clean-up in the spring. Watering may be necessary during extended periods of extremely hot and/or dry weather.

5.4 SEDIMENT FOREBAYS

Inspect annually for sediment accumulation, erosion, and condition of vegetation. Sediment should be removed and properly disposed of from the forebay at least once per year and more if accumulation exceeds 1 foot in depth as noted on the staff gage. Embankments should be mowed at least twice per year. Inspect spillway outlet annually and repair as necessary.

5.5 CONTROL OF INVASIVE PLANTS

During maintenance activities, check for the presence of invasive plants and remove in a safe manner as described in Appendix D. They should be controlled as described in Appendix D.

6.0 REFERENCES

The Storm Water Systems Management Plan incorporates many standard and accepted practices. Specifically, the following references were utilized:

The New Hampshire Stormwater Manual, December 2008, Revision 1.0.

Stormwater Management and Erosion and Sediment Control Handbook for Urban and Developing Areas in New Hampshire. Rockingham County Conservation District, August 1992, or latest edition.

APPENDIX A:

STORMWATER SYSTEMS OVERVIEW PLAN

APPENDIX B:

MAINTENANCE MATRIX

LONG TERM BMP INSPECTION / MAINTENANCE MATRIX

		Inspection / Maintenance Interval				
BMP	**Major Inspection / Maintenance Criterion [1]**	**Spring [2]**	**Summer**	**Fall [3]**	**Winter**	**Other / Notes**
Outlet Protection	I - check damage to rip rap apron M - remove debris including accumulated leaves and branches M - Repair rip rap apron	I - RQ M - RQ	I - O	I - R M - R	I - O	
Conveyance Swale	I - check for sediment accumulation M - remove debris and sediment M - mow once per year M - reseed bare areas M - repair eroded areas	I - RQ M - RQ	I - O	I - R M - R	I - O	Grass shall be mowed to a height of 4 inches minimum. Reseed with grass mix noted on sheet D1.
Bioretention System	I - check for drawdown time I - check earthen dam for settlement, rodent damage, failures M - augment riverstone mulch as needed M - remove fallen leaves, branches, etc M - mow, head, prune to control overgrowth. Cut back ground cover if necessary. M - remove accumulated sediment	I - RQ M - R	I - O	I - RQ M - RQ	I - O	
Sediment Forebay	I - read staff gage to determine depth of sediment accumulation M - remove accumulated sediment. M - mow embankments at least twice per year	I - RQ M - RQ	I - O	I - R M - R	I - O	Remove sediment annually or more if over 1 foot depth as measured with staff gage.

Notes

(1) The BMP should be inspected as recommended and maintenance shall be performed as needed. Maintenance may be needed at shorter or longer intervals depending on weather conditions, and use of the property and contributing watershed

(2) Early Spring as vegetation begins to blossom or earlier

(3) Late Fall after majority of leaf fall, but prior to snow fall

Abbreviations

I - Inspection
M - Maintenance
O - Optional
R - Recommended
RQ - Required

APPENDIX C:

MAINTENANCE REPORTS

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL

BMP Maintenance Report

Site Name:	54 Back River Road
Site Location:	54 Back River Road
Installation Date:	

Owner:	John Randolph	Contractor:	TBD
Contact Name:	John Randolph	Contact Name:	
Company Name:		Company Name:	
Telephone:	(603) 834 2317	Telephone:	
Fax:		Fax:	
Address:		Address:	

Maintenance Log

Items Inspected	Checked		Maintenance Needed		Comments
	Yes	No	Yes	No	
Conveyance Swale					
Sediment Forebay					
Bioretention System					
Outlet Protection					

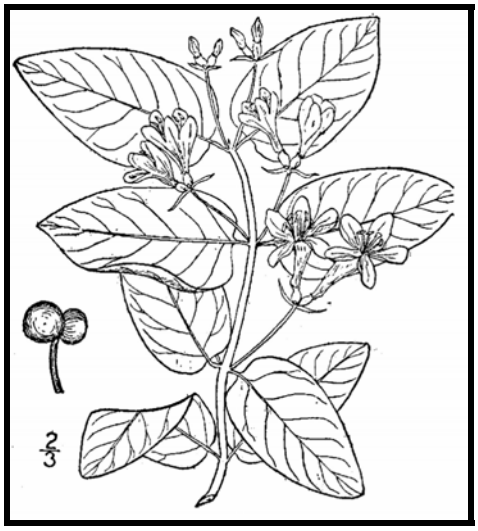
APPENDIX D:

CONTROL OF INVASIVE SPECIES

UNIVERSITY of NEW HAMPSHIRE COOPERATIVE EXTENSION

Methods for Disposing Non-Native Invasive Plants

Prepared by the Invasives Species Outreach Group, volunteers interested in helping people control invasive plants. Assistance provided by the Piscataquog Land Conservancy and the NH Invasives Species Committee. Edited by Karen Bennett, Extension Forestry Professor and Specialist.



Tatarian honeysuckle
Lonicera tatarica
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 3: 282.

Non-native invasive plants crowd out natives in natural and managed landscapes. They cost taxpayers billions of dollars each year from lost agricultural and forest crops, decreased biodiversity, impacts to natural resources and the environment, and the cost to control and eradicate them.

Invasive plants grow well even in less than desirable conditions such as sandy soils along roadsides, shaded wooded areas, and in wetlands. In ideal conditions, they grow and spread even faster. There are many ways to remove these non-native invasives, but once removed, care is needed to dispose the removed plant material so the plants don't grow where disposed.

Knowing how a particular plant reproduces indicates its method of spread and helps determine the appropriate disposal method. Most are spread by seed and are dispersed by wind, water, animals, or people. Some reproduce by vegetative means from pieces of stems or roots forming new plants. Others spread through both seed and vegetative means.

Because movement and disposal of viable plant parts is restricted (see NH Regulations), viable invasive parts can't be brought to most transfer stations in the state. Check with your transfer station to see if there is an approved, designated area for invasives disposal. This fact sheet gives recommendations for rendering plant parts non-viable.

Control of invasives is beyond the scope of this fact sheet. For information about control visit www.nhinvasives.org or contact your UNH Cooperative Extension office.

New Hampshire Regulations

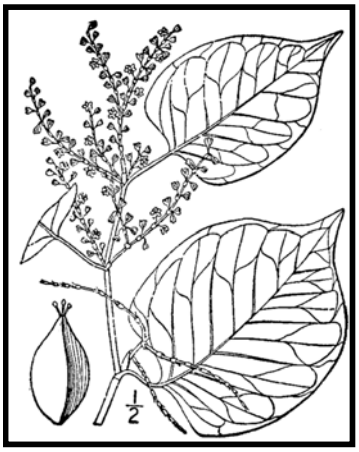
Prohibited invasive species shall only be disposed of in a manner that renders them nonliving and nonviable. (Agr. 3802.04)

No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species, which includes all of their cultivars and varieties, listed in Table 3800.1 of the New Hampshire prohibited invasive species list. (Agr 3802.01)

How and When to Dispose of Invasives?

To prevent seed from spreading remove invasive plants before seeds are set (produced). Some plants continue to grow, flower and set seed even after pulling or cutting. Seeds can remain viable in the ground for many years. If the plant has flowers or seeds, place the flowers and seeds in a heavy plastic bag "head first" at the weeding site and transport to the disposal site. The following are general descriptions of disposal methods. See the chart for recommendations by species.

Burning: Large woody branches and trunks can be used as firewood or burned in piles. For outside burning, a written fire permit from the local forest fire warden is required unless the ground is covered in snow. Brush larger than 5 inches in diameter can't be burned. Invasive plants with easily airborne seeds like black swallow-wort with mature seed pods (indicated by their brown color) shouldn't be burned as the seeds may disperse by the hot air created by the fire.



Japanese knotweed
Polygonum cuspidatum
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 1: 676.

Bagging (solarization): Use this technique with softer-tissue plants. Use heavy black or clear plastic bags (contractor grade), making sure that no parts of the plants poke through. Allow the bags to sit in the sun for several weeks and on dark pavement for the best effect.

Tarping and Drying: Pile material on a sheet of plastic and cover with a tarp, fastening the tarp to the ground and monitoring it for escapes. Let the material dry for several weeks, or until it is clearly nonviable.

Chipping: Use this method for woody plants that don't reproduce vegetatively.

Burying: This is risky, but can be done with watchful diligence. Lay thick plastic in a deep pit before placing the cut up plant material in the hole. Place the material away from the edge of the plastic before covering it with more heavy plastic. Eliminate as much air as possible and toss in soil to weight down the material in the pit. Note that the top of the buried material should be at least three feet underground. Japanese knotweed should be at least 5 feet underground!

Drowning: Fill a large barrel with water and place soft-tissue plants in the water. Check after a few weeks and look for rotted plant material (roots, stems, leaves, flowers). Well-rotted plant material may be composted. A word of caution- seeds may still be viable after using this method. Do this before seeds are set. This method isn't used often. Be prepared for an awful stink!

Composting: Invasive plants can take root in compost. Don't compost any invasives unless you know there is no viable (living) plant material left. Use one of the above techniques (bagging, tarping, drying, chipping, or drowning) to render the plants nonviable before composting. Closely examine the plant before composting and avoid composting seeds.

Be diligent looking for seedlings for *years* in areas where removal and disposal took place.

Suggested Disposal Methods for Non-Native Invasive Plants

This table provides information concerning the disposal of removed invasive plant material. If the infestation is treated with herbicide and left in place, these guidelines don't apply. Don't bring invasives to a local transfer station, unless there is a designated area for their disposal, or they have been rendered non-viable. This listing includes wetland and upland plants from the New Hampshire Prohibited Invasive Species List. The disposal of aquatic plants isn't addressed.

<table>
<tr><th>Woody Plants</th><th>Method of Reproducing</th><th>Methods of Disposal</th></tr>
<tr><td rowspan="2">Norway maple
(Acer platanoides)
European barberry
(Berberis vulgaris)
Japanese barberry
(Berberis thunbergii)
autumn olive
(Elaeagnus umbellata)
burning bush
(Euonymus alatus)
Morrow's honeysuckle
(Lonicera morrowii)
Tatarian honeysuckle
(Lonicera tatarica)
showy bush honeysuckle
(Lonicera x bella)
common buckthorn
(Rhamnus cathartica)
glossy buckthorn
(Frangula alnus)</td><td rowspan="2">Fruit and Seeds
 </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Use as firewood.
▪ Make a brush pile.
▪ Chip.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip once all fruit has dropped from branches.
▪ Leave resulting chips on site and monitor.</td></tr>
<tr><td rowspan="2">oriental bittersweet
(Celastrus orbiculatus)
multiflora rose
(Rosa multiflora)</td><td rowspan="2">Fruits, Seeds, Plant Fragments
 </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Make a brush pile.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip – only after material has fully dried (1 year) and all fruit has dropped from branches. Leave resulting chips on site and monitor.</td></tr>
</table>

Non-Woody Plants	Method of Reproducing	Methods of Disposal
garlic mustard *(Alliaria petiolata)* spotted knapweed *(Centaurea maculosa)* ▪ Sap of related knapweed can cause skin irritation and tumors. Wear gloves when handling. black swallow-wort *(Cynanchum nigrum)* ▪ May cause skin rash. Wear gloves and long sleeves when handling. pale swallow-wort *(Cynanchum rossicum)* giant hogweed *(Heracleum mantegazzianum)* ▪ Can cause major skin rash. Wear gloves and long sleeves when handling. dame's rocket *(Hesperis matronalis)* perennial pepperweed *(Lepidium latifolium)* purple loosestrife *(Lythrum salicaria)* Japanese stilt grass *(Microstegium vimineum)* mile-a-minute weed *(Polygonum perfoliatum)*	**Fruits and Seeds** 	**Prior to flowering** Depends on scale of infestation Small infestation ▪ Pull or cut plant and leave on site with roots exposed. Large infestation ▪ Pull or cut plant and pile. (You can pile onto or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material. **During and following flowering** Do nothing until the following year or remove flowering heads and bag and let rot. Small infestation ▪ Pull or cut plant and leave on site with roots exposed. Large infestation ▪ Pull or cut plant and pile remaining material. (You can pile onto plastic or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material.
common reed (*Phragmites australis*) Japanese knotweed *(Polygonum cuspidatum)* Bohemian knotweed *(Polygonum x bohemicum)*	**Fruits, Seeds, Plant Fragments** Primary means of spread in these species is by plant parts. Although all care should be given to preventing the dispersal of seed during control activities, the presence of seed doesn't materially influence disposal activities.	**Small infestation** ▪ Bag all plant material and let rot. ▪ Never pile and use resulting material as compost. ▪ Burn. **Large infestation** ▪ Remove material to unsuitable habitat (dry, hot and sunny or dry and shaded location) and scatter or pile. ▪ Monitor and remove any sprouting material. ▪ Pile, let dry, and burn.

January 2010

UNH Cooperative Extension programs and policies are consistent with pertinent Federal and State laws and regulations, and prohibits discrimination in its programs, activities and employment on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sex, sexual orientation, or veteran's, marital or family status. College of Life Sciences and Agriculture, County Governments, NH Dept. of Resources and Economic Development, Division of Forests and Lands, NH Fish and Game ,and U.S. Dept. of Agriculture cooperating.

TRAFFIC IMPACT ASSESSMENT

PROPOSED AFFORDABLE HOUSING DEVELOPMENT

Dover, New Hampshire

December 2020

Prepared for

MJS Engineering, P.C.

Stephen G. Pernaw
& Company, Inc.

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721 • Concord, NH 03302
tel: (603) 731-8500 • fax: (866) 929-6094 • sgp@ pernaw.com
Transportation: Engineering • Planning • Design

TRAFFIC IMPACT ASSESSMENT
PROPOSED AFFORDABLE HOUSING DEVELOPMENT
DOVER, NEW HAMPSHIRE
December 23, 2020

INTRODUCTION

This study has been prepared for MJS Engineering, P.C. on behalf of their client John Randolph to assess the traffic impacts associated with a proposed affordable housing development project located on the east side Back River Road in Dover, New Hampshire. The purpose of this report is to summarize the traffic count data collected, the trip generation characteristics of the proposed residential development, the future traffic projections, the technical analyses, and our findings relative to traffic operations, capacity, and safety.

Based on input from the City of Dover, the study area includes the Back River Road/Proposed Site Access Road intersection, as well as the Back River Road and Mast Road intersections on NH Route 108 (NH108) and the Back River Road/Mast Road/Leathers Lane intersection. The analysis periods include the typical weekday morning and evening commuter periods, and the analysis years were set at 2022 and 2032.

PROPOSAL

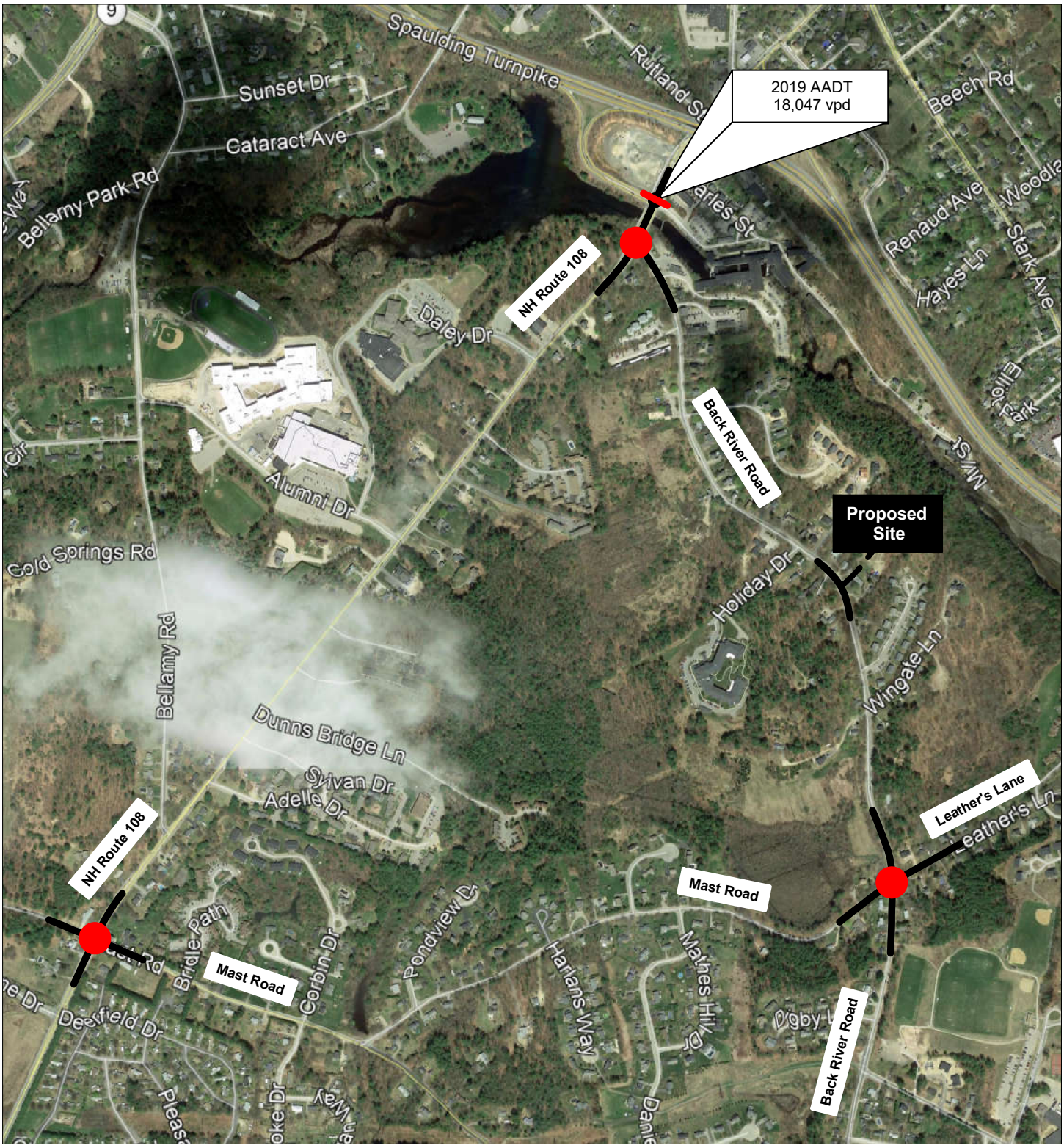
The development proposal involves the construction of 44 workforce housing "cottages," each with a gross floor area of approximately 384 square feet, along a Proposed Site Access Road that will create a new three-leg T-intersection on Back River Road, located approximately 250-feet south of the Red Barn Drive intersection. The location of the subject site with respect to the area roadway system, along with the study area intersections, are shown on Figure 1. The plan entitled: "*Grading Plan,"* Sheet C-102, prepared by MJS Engineering, P.C., dated 6/12/20 shows the layout of the proposed dwelling units and is found in Appendix A.

EXISTING CONDITIONS

ROADWAYS

Back River Road functions as a rural two-lane collector roadway that extends in a general northwest-southeast direction between NH108 and the Piscataqua Road/Drew Road intersection. In addition to providing access to NH108 for through traffic, this roadway also provides direct access to several intersecting streets and numerous residences. The horizontal alignment is curvilinear and the vertical profile follows a rolling terrain. The pavement is delineated with a four-inch double yellow centerline (passing maneuvers prohibited) and four-inch white edge lines.

In the vicinity of the subject site, the pavement width measures approximately 35-feet and is delineated with two 11' travel lanes and 6'-7' foot paved shoulders. The speed limit is posted at 30 mph on Back River Road.



= AUTOMATIC TRAFFIC RECORDER LOCATION (NHDOT)

= INTERSECTION TURNING MOVEMENT COUNT LOCATION

NORTH

2037A

Figure 1

Site Location

Traffic Impact Assessment, Proposed Affordable Housing Development, Dover, New Hampshire

INTERSECTIONS

The **NH108/Back River Road** intersection functions as a signalized high-type "T" intersection with raised median islands on each leg of the intersection. The existing travel lane configuration at this intersection is as follows:

NH108 (SB) Approach: One exclusive left-turn lane and one exclusive through lane
NH108 (NB) Approach: One exclusive through lane and one exclusive right-turn lane
Back River Road (WB) Approach: One exclusive left-turn lane and one exclusive right-turn lane

The signal controller operates with three basic signal phases: 1) northbound and southbound movements (with permitted left-turns), 2) westbound left and right turns (with a northbound right-turn overlap) and 3) a pedestrian actuated pedestrian phase. The pedestrian phase was not heavily used; it was actuated twice during the AM peak hour, and three times during the PM peak hour.

The **NH108/Mast Road** intersection functions as a standard four-leg intersection that operates under traffic signal control. The existing travel lane configuration at this intersection is as follows:

Mast Road (EB) Approach: One exclusive left-turn lane and one shared through-right lane
Mast Road (WB) Approach: One exclusive left-turn lane and one shared through-right lane
NH108 (NB) Approach: One shared left-through lane and one exclusive right-turn lane
NH108 (SB) Approach: One exclusive left-turn lane and one shared through-right lane

This signal controller operates with four basic signal phases: 1) southbound lead phase, 2) northbound and southbound movements, 3) eastbound and westbound movements, and 4) a pedestrian actuated pedestrian phase. The pedestrian phase was not utilized during the AM peak hour and only in two instances during the PM peak hour.

The **Back River Road/Mast Road-Leathers Lane** intersection functions as a standard four-leg intersection that operates under STOP sign control on the minor approaches. The existing travel lane configuration at this intersection is as follows:

Mast Road (EB) Approach: One shared left-through-right lane
Leathers Lane (WB) Approach: One shared left-through-right lane
Back River Road (NB) Approach: One shared left-through-right lane
Back River Road (SB) Approach: One shared left-through-right lane

TRAFFIC VOLUMES

Research at the New Hampshire Department of Transportation (NHDOT) revealed that a short-term automatic traffic recorder (ATR) count was conducted on NH108 (North of Back River Road) in September 2019. This count station is located approximately 0.5 miles northwest of the subject site and the data confirmed that the rate of traffic flow typically reached peak levels during the typical weekday AM and PM commuter periods. The daily and hourly variations in traffic demand at this location are summarized graphically on Page 5. Appendix B contains the summary and detail sheets pertaining to this count station.

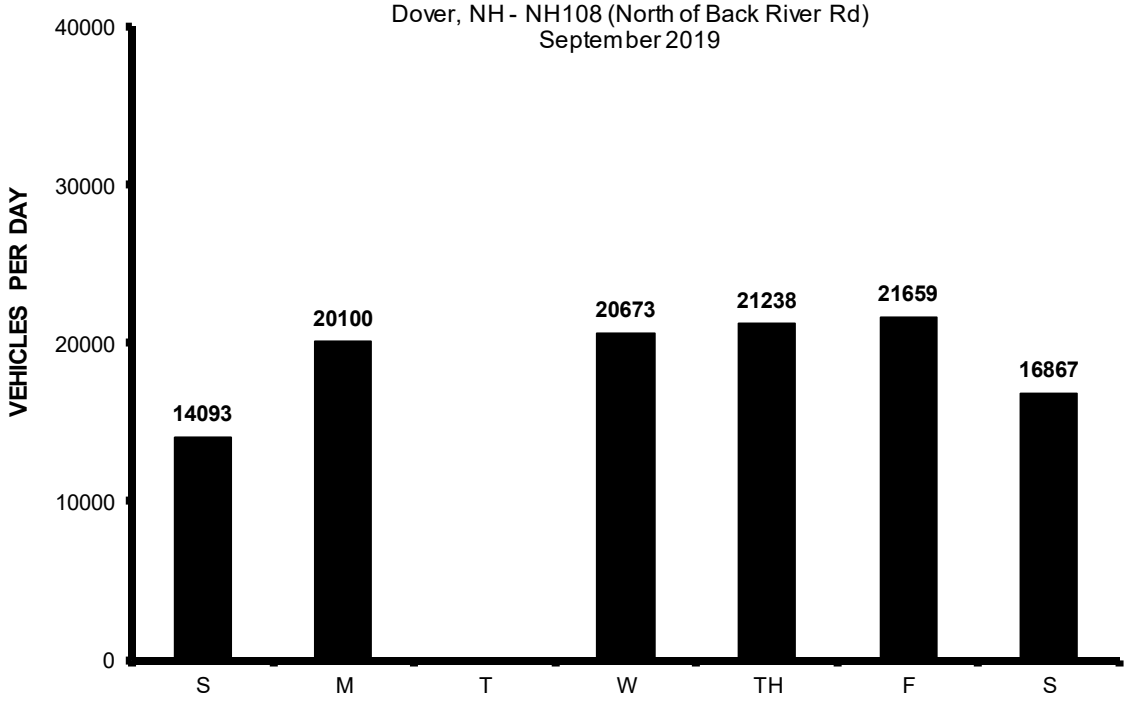
To supplement this data, Pernaw & Company, Inc. conducted intersection turning movement and vehicle classification counts at the NH108/Back River Road, NH108/Mast Road signalized intersections and the Back River Road/Mast Road-Leathers Lane unsignalized intersection on two separate weekdays in October 2020. These counts were conducted on Wednesday, October 7, 2020 and Thursday, October 8, 2020 from 7:00 to 9:00 AM and from 3:00 to 6:00 PM. The new 2020 count data for the study area is summarized on Figure 2. Several facts and conclusions are evident from this data.

- The Wednesday AM peak hour and Thursday PM peak hour traffic volumes represented the higher of the two count days, and were therefore selected for analysis purposes.
- The highest hourly traffic volumes in the study area occurred from 7:15 to 8:15 or 7:30 to 8:30 AM and from 3:30 to 4:30 or 4:30 to 5:30 PM. The traffic volumes during the PM peak hour were generally higher than those that occurred during the AM peak hour on NH108. Traffic volumes on Back River Road at the subject site were slightly higher during the AM peak hour, presumably due to the nearby school.
- NH108 traffic volumes, north of Back River Road, totaled 1,438 (AM) and 1,655 (PM) during the peak hour periods. The higher directional flow was southbound during both the AM peak hour (54% - from downtown Dover) and the PM peak hour (52% - from downtown Dover).
- The traffic volume on Back River Road (east of NH108) totaled 707 (AM) and 675 (PM) vehicles during the peak hour periods. The directional flow on Back River Road is relatively even during the both AM and PM peak hour periods.
- The traffic flow on Back River Road passing the subject site totaled 583 vehicles (AM) and 572 vehicles (PM) during the peak hour periods. The higher directional flow was eastbound during the AM peak hour (52%) and eastbound during the PM peak hour (52%) periods.

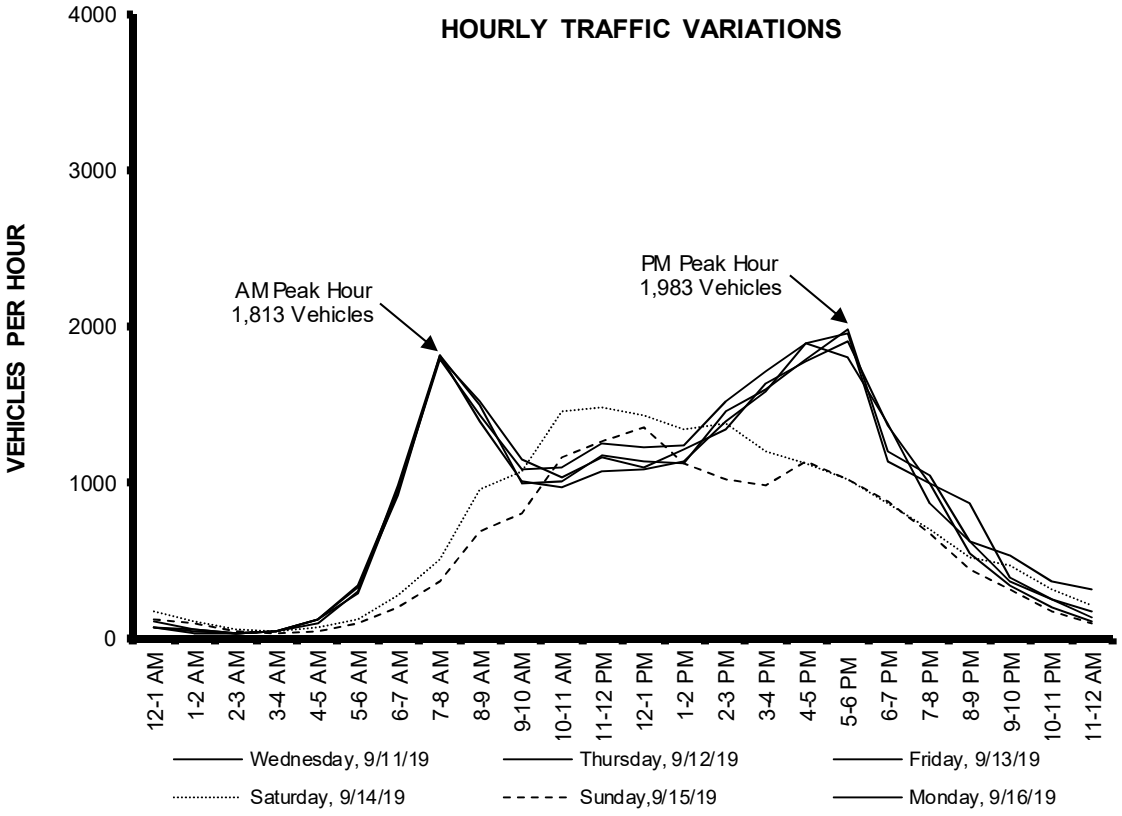
Appendix C contains detail sheets pertaining to all of the raw turning movement count data.

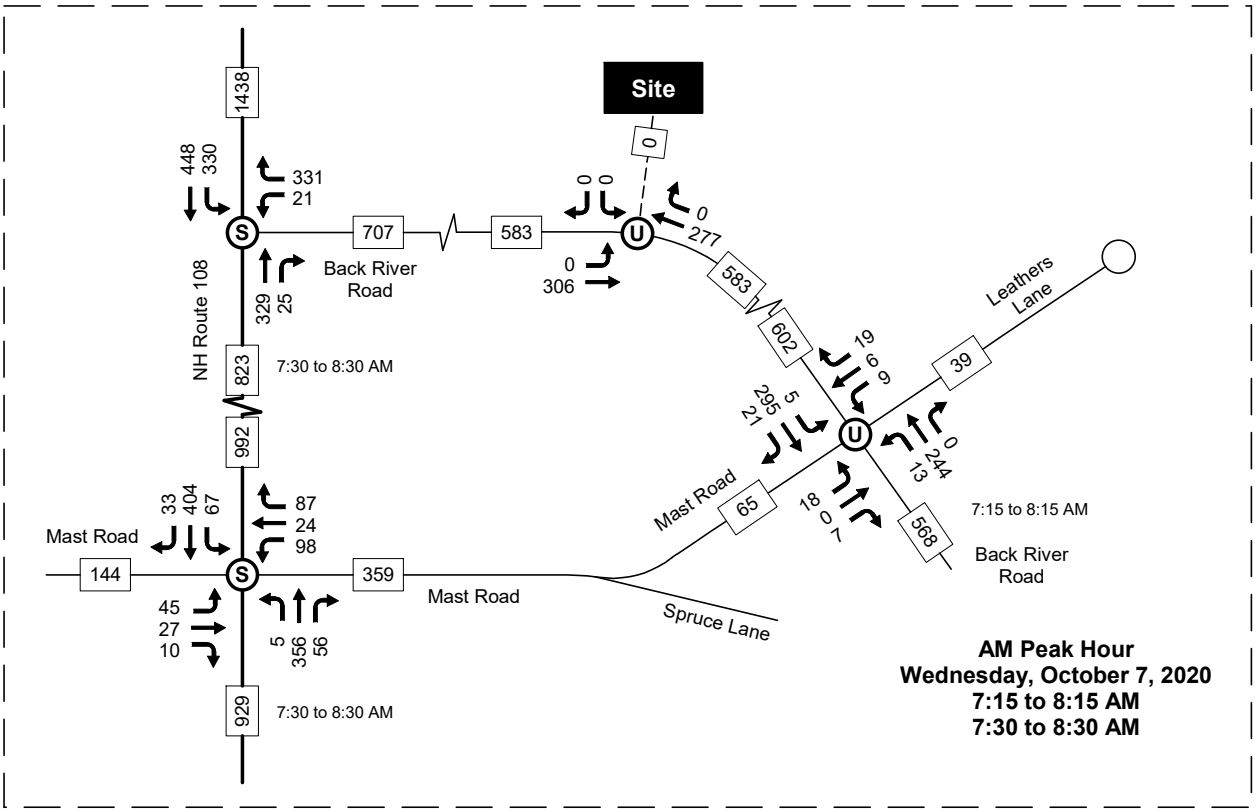
DAILY TRAFFIC VARIATIONS

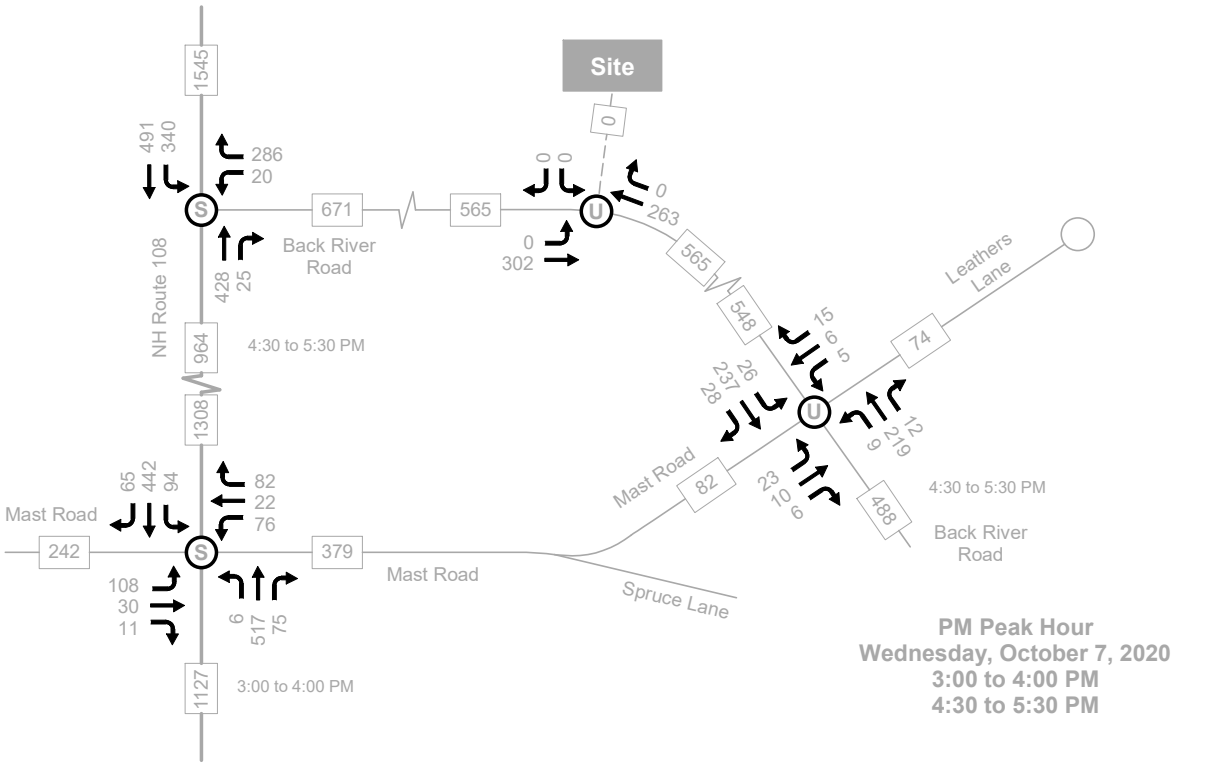
Dover, NH - NH108 (North of Back River Rd)
September 2019



HOURLY TRAFFIC VARIATIONS







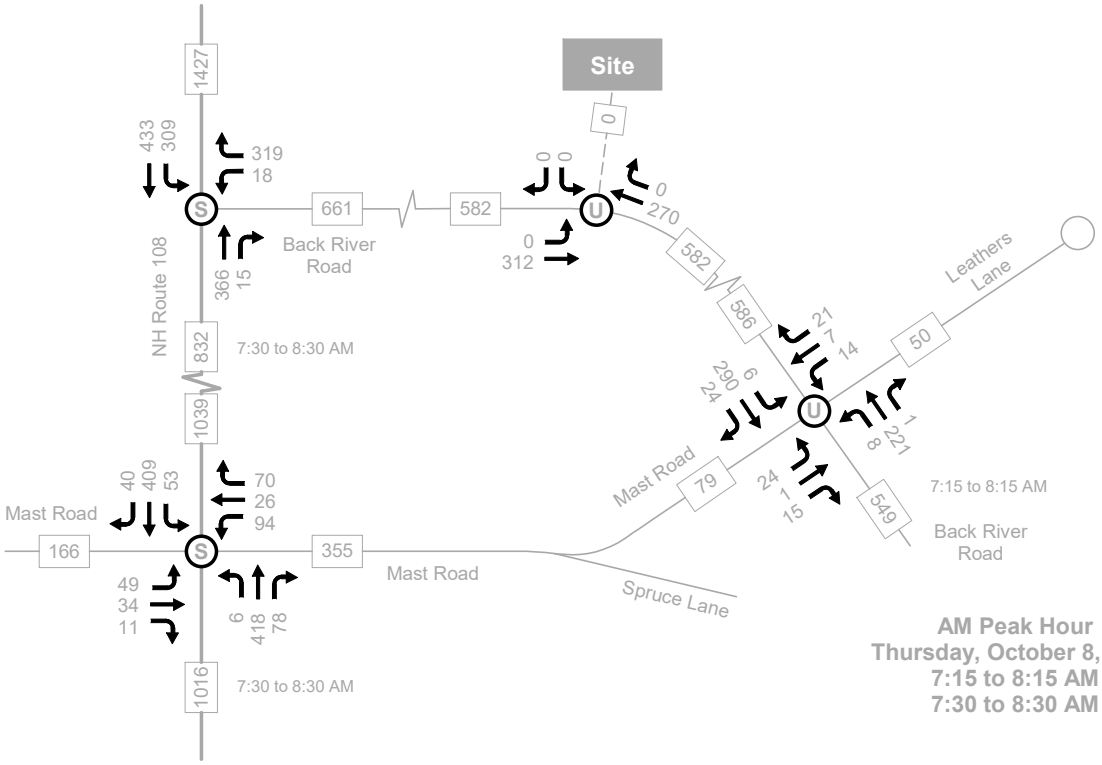
NORTH

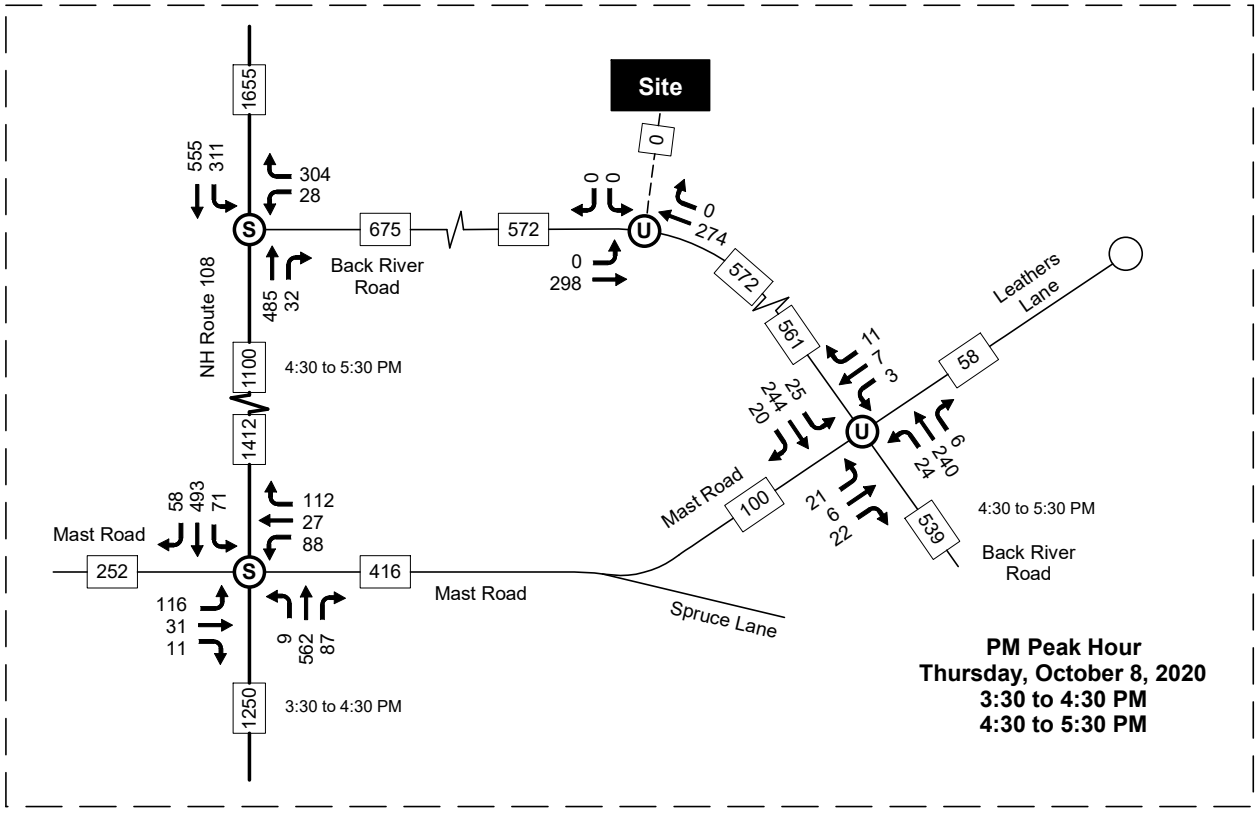
2037A

Figure 2A

2020 Existing Traffic Volumes - Wednesday, October 7, 2020

Traffic Evaluation, Proposed Affordable Housing Development, Dover, New Hampshire





NORTH

2037A

Figure 2B

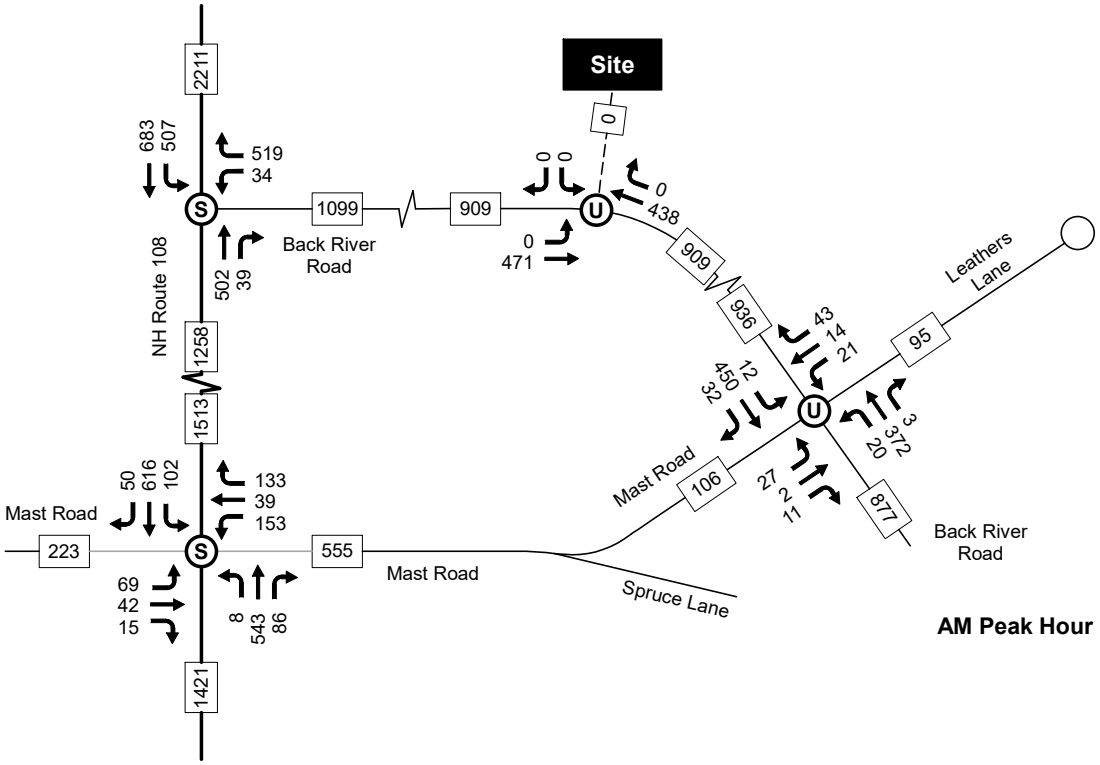
2020 Existing Traffic Volumes - Thursday, October 8, 2020

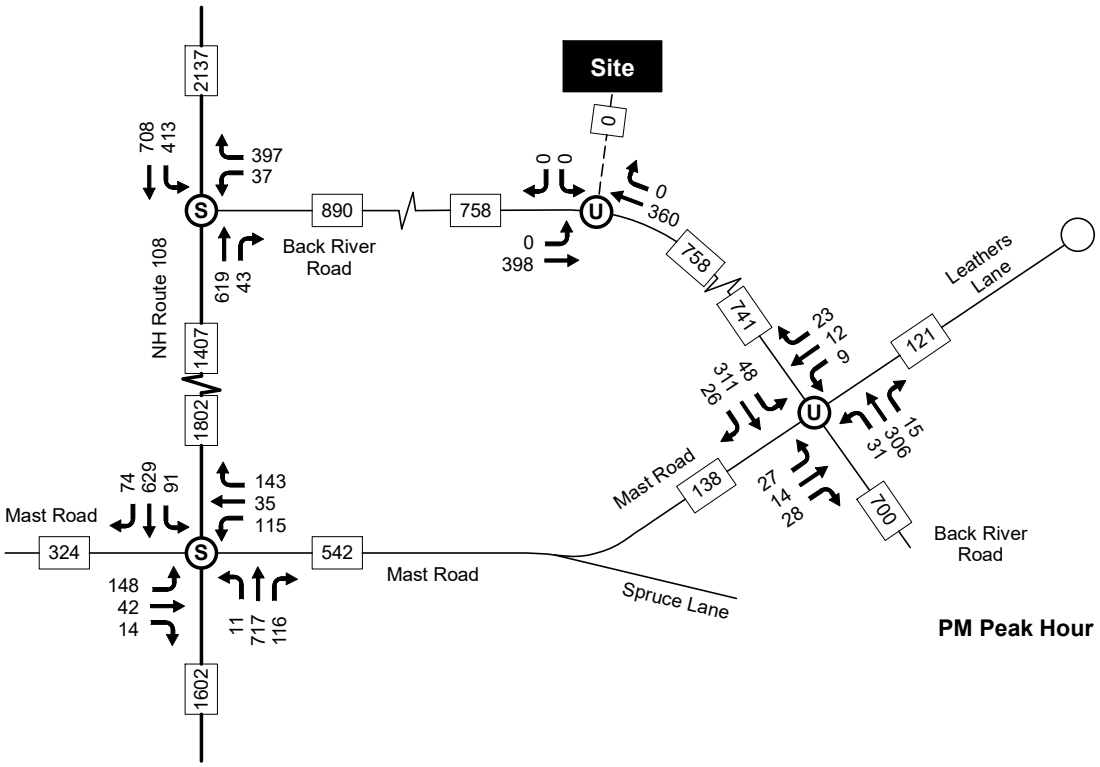
Traffic Evaluation, Proposed Affordable Housing Development, Dover, New Hampshire

NO-BUILD TRAFFIC VOLUMES

The No-Build traffic projections (without the proposed residential development) for 2022 and 2032 are summarized on Figures 3 and 4, respectively. These projections are based on the October 2020 traffic count data, a one-percent annual background traffic growth rate (compounded annually) to account for normal background traffic growth, a seasonal adjustment factor of 1.06 to reflect peak-month conditions, and a COVID-19 adjustment factor of 1.41 (AM) and 1.18 (PM) due to recent travel conditions as a result of the pandemic. The No-Build projections also account for a recently approved residential development project on Leathers Lane proposed by others. Appendix E contains a diagram that summarizes the distribution of the other development traffic volumes.

The future traffic projections contained herein are intended to reflect worst-case, peak-month, peak-hour conditions. The calculations pertaining to the derivation of the annual background traffic growth rate, the seasonal adjustment factor, and the Covid-19 factor are contained in Appendix D.





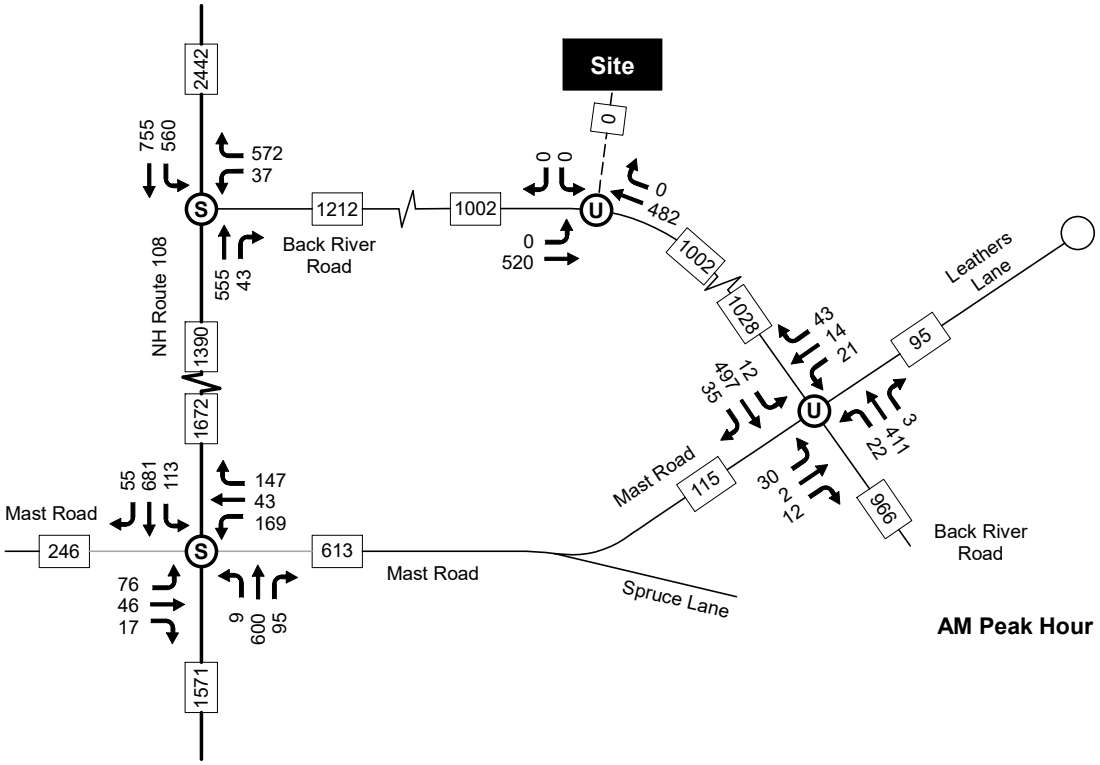
NORTH

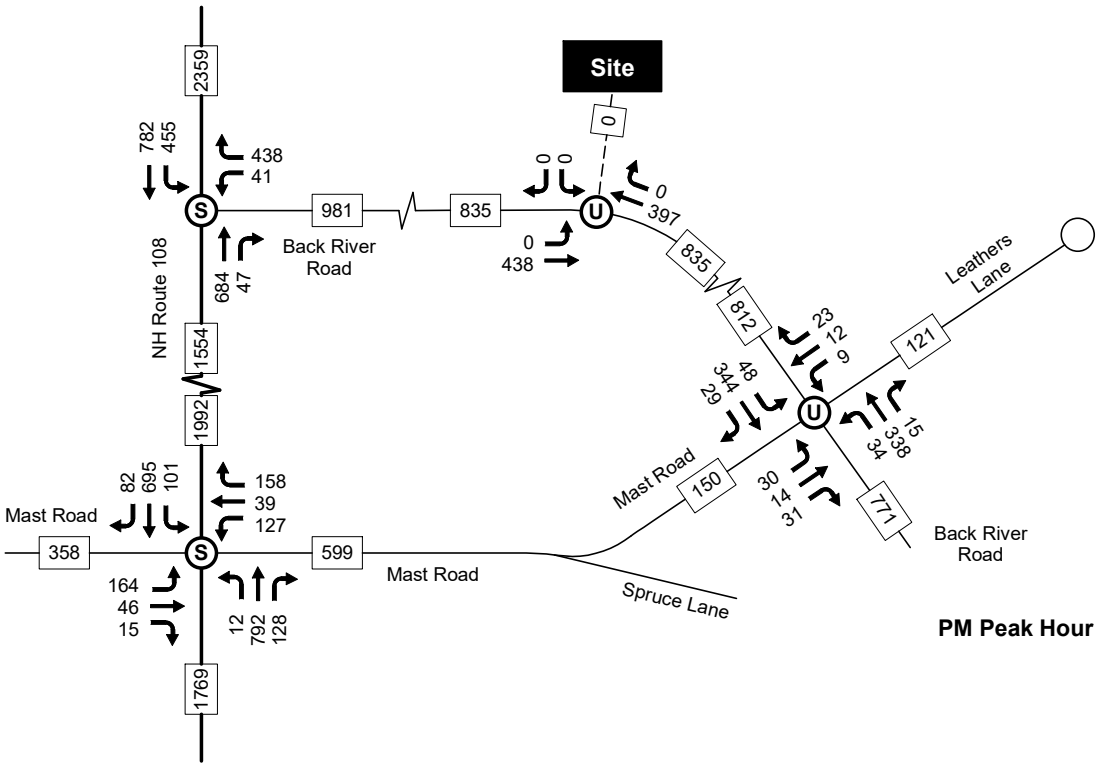
2037A

Figure 3

2022 No-Build Traffic Volumes

Traffic Evaluation, Proposed Affordable Housing Development, Dover, New Hampshire





NORTH

2037A

Figure 4

2032 No-Build Traffic Volumes

Traffic Evaluation, Proposed Affordable Housing Development, Dover, New Hampshire

SITE GENERATED TRAFFIC

To estimate the quantity of vehicle-trips that will be produced by the proposed affordable housing development Pernaw & Company, Inc. considered the standardized trip-generation rates and equations published by the Institute of Transportation Engineers (ITE)[1]. To account for the unique size of each dwelling unit (384 sf), the number of residents was utilized rather than the number of dwelling units. In this case, some units will be occupied by one person; others by two persons. Utilizing a ratio of 1.5 persons per unit results in 66 residents.

According to ITE Land Use Code 210 (Single-Family Housing) trip rates per resident, the overall development is expected to generate approximately 14 vehicle-trips during the weekday AM peak hour and 27 vehicle-trips during the weekday PM peak hour, on an average weekday basis. The following table summarizes the anticipated trip-generating characteristics of the proposed affordable housing development based on the ITE "trip rate" and "trip equation" methods. The higher of the two estimates was utilized for traffic projections and analysis purposes.

Table 1 — Trip Generation Summary

	Estimate A ITE Trip Rate Method [1]	Estimate B ITE Trip Equation Method [1]
Weekday Total (24 hours)		
Entering	88 veh	116 veh
Exiting	88 veh	116 veh
Total	176 trips	232 trips
Weekday AM Peak Hour		
Entering	4 veh	4 veh
Exiting	10 veh	10 veh
Total	14 trips	14 trips
Weekday PM Peak Hour		
Entering	12 veh	18 veh
Exiting	6 veh	9 veh
Total	18 trips	27 trips

[1] ITE Land Use Code 210 - Single-Family Detached Housing - 66 Residents (44 Units X 1.5 = 66 Residents)

All vehicle-trips associated with the proposed residential development constitute "primary" trips, or new trips to the area. Appendix F contains the trip generation computations for the proposed affordable housing development, along with a diagram that summarizes the distribution of the primary trips at the various roadway segments within the study area.

[1] Institute of Transportation Engineers, *Trip Generation Manual,* tenth edition (Washington, D.C., 2017).

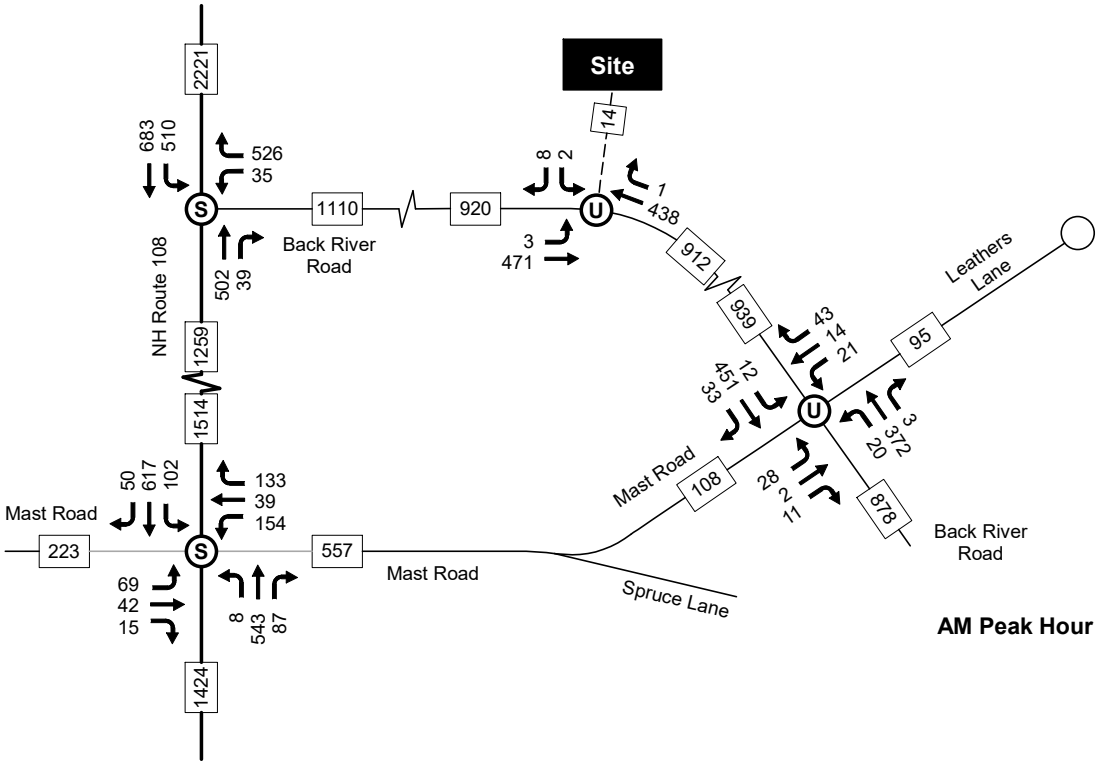
BUILD PROJECTIONS

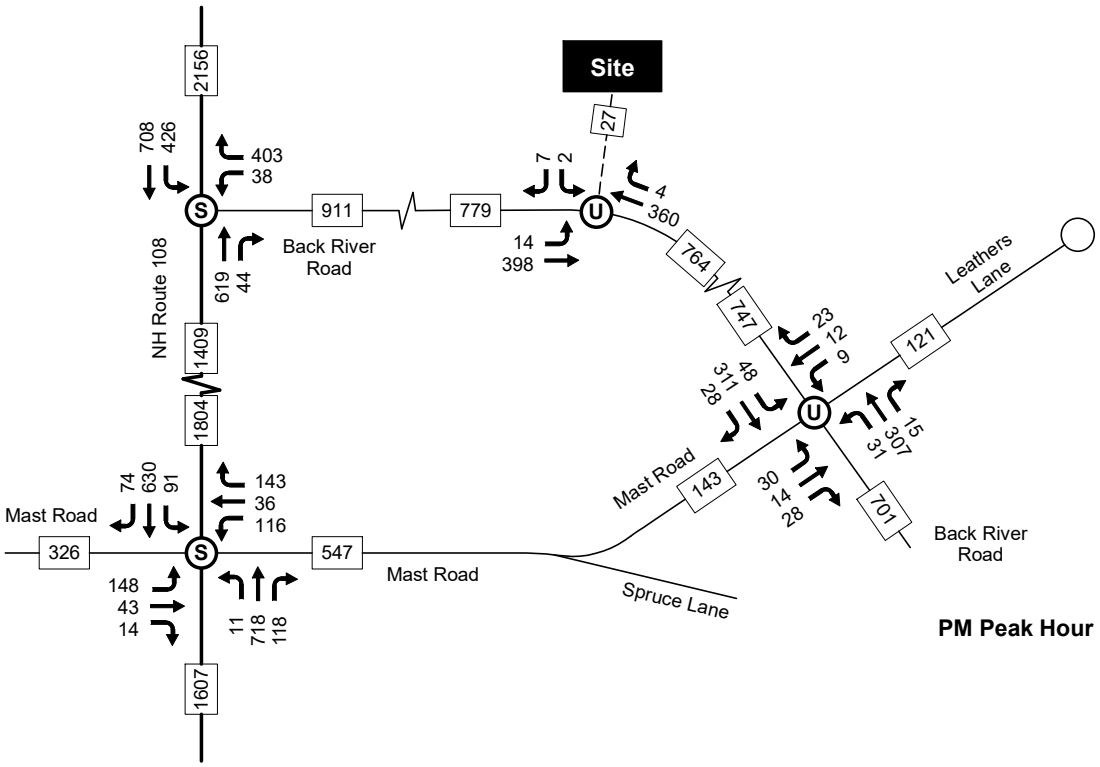
The Build traffic projections with the proposed affordable housing development fully occupied are summarized on Figures 5 and 6. These projections are based on the No-Build traffic volumes, the higher of the two trip generation estimates in Table 1, and the expectation that the primary trips will be distributed in the following manner:

Trip Distribution Patterns

Gateway	Travel Routes	Percentage
A	To / From points north on NH108	72%
B	To / From points south via Back River Road	5%
C	To / From points south via NH108	18%
D	To / From points west via Mast Road	5%
		100%

These travel patterns were based on analysis of the "journey to work" data from the latest census, the traffic patterns observed at the nearby Back River Road/Wingate Lane intersection, and our familiarity of the study area.





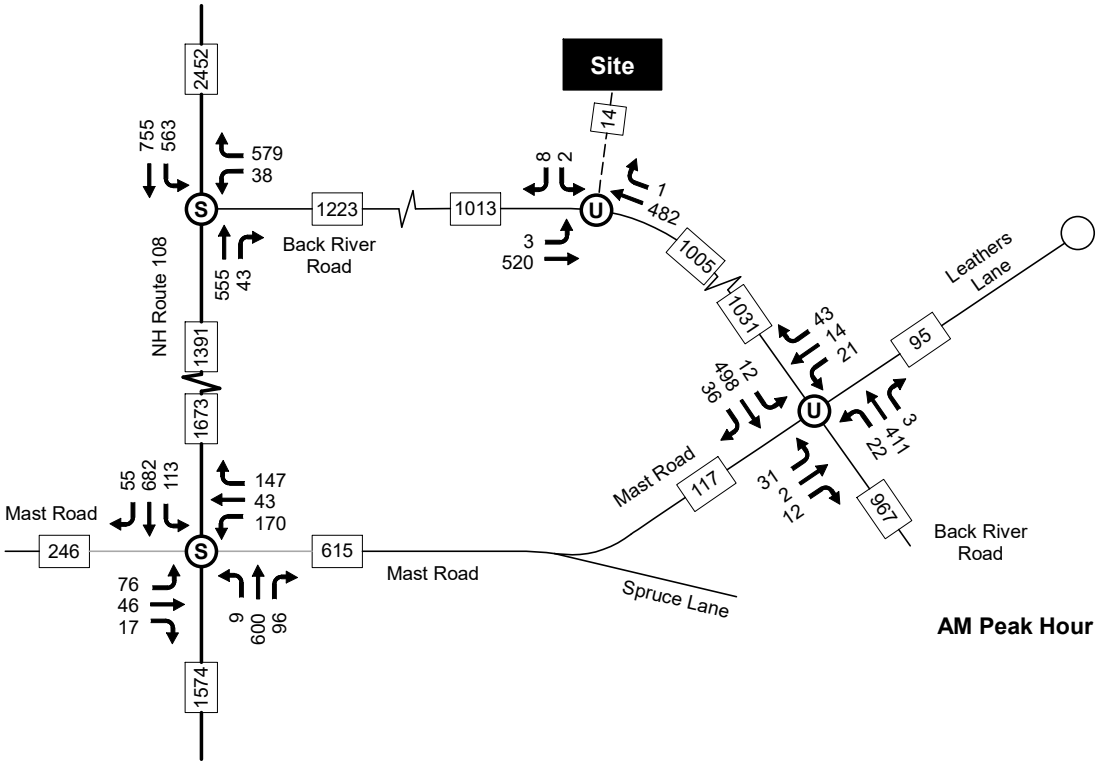
NORTH

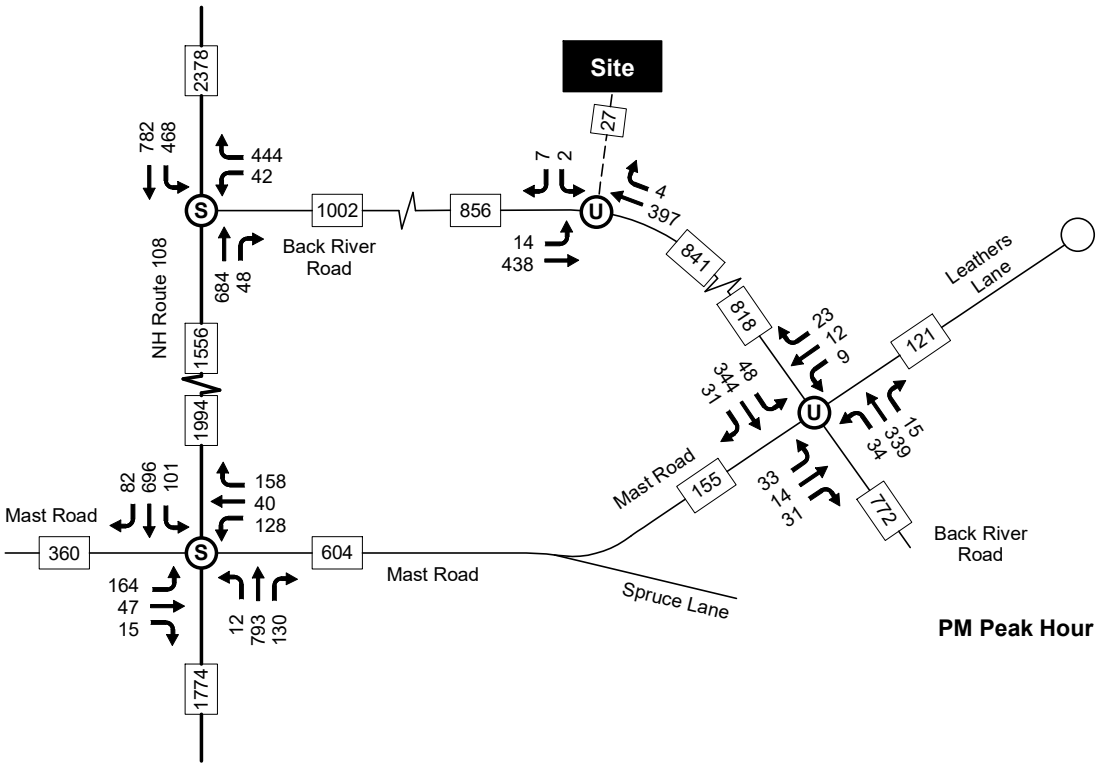
2037A

Figure 5

2022 Build Traffic Volumes

Traffic Evaluation, Proposed Affordable Housing Development, Dover, New Hampshire





NORTH

2037A

Figure 6

2032 Build Traffic Volumes

Traffic Evaluation, Proposed Affordable Housing Development, Dover, New Hampshire

IMPACT SUMMARY

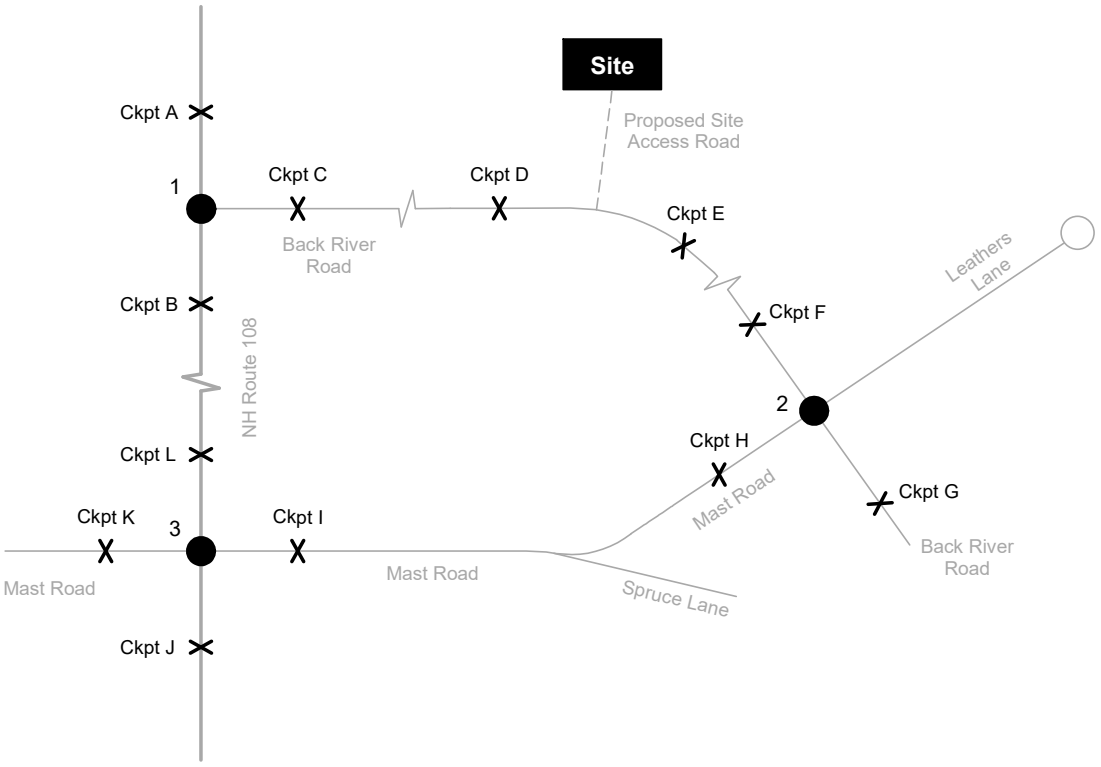
TRAFFIC VOLUME INCREASES

The net impact that the proposed residential development will have on area roadway and intersection traffic volumes can be estimated by comparing the No-Build traffic projections with the Build projections. A comparison for the two peak hour cases is summarized on Figure 7.

In terms of roadway segments, this analysis shows that the greatest impact will occur during the PM peak hour period on the section of Back River Road between NH108 and the subject site. The traffic volume on this roadway segment is projected to increase +2% (+21 vehicles) during the worst-case PM peak hour period. The increase on Back River Road south of the site is projected to increase by +1% (+6 vehicles) during the PM peak hour. Similarly, the traffic volume on NH108 during the PM peak hour is expected to increase by +1% north of Back River Road, and less than 1% south of Mast Road.

In terms of intersection volumes (total vehicles entering) the NH108/Back River Road intersection is expected to accommodate approximately +21 additional vehicles during the PM peak hour period, or by +1%. This translates into approximately one additional vehicle every three minutes on average, during this hour. The NH108/Mast Road intersection will accommodate increases of less than 1%. The net increases during the AM peak hour will be lower than during the PM peak hour.

Oftentimes, random traffic flow from one day to the next accounts for “impacts” that are much greater than will occur due to the 44 proposed cottages. This is evident from both the automatic traffic recorder data in Appendix B and a comparison between the volumes found on Figure 2A and Figure 2B (consecutive count days).



AM Peak Hour					PM Peak Hour				
Location	2022 No-Build	2022 Build	Change	% Change	Location	2022 No-Build	2022 Build	Change	% Change
Intersection 1	2284	2295	+11 veh	<1%	Intersection 1	2217	2238	+21 veh	1%
Intersection 2	1007	1010	+3 veh	<1%	Intersection 2	850	856	+6 veh	1%
Intersection 3	1856	1859	+3 veh	<1%	Intersection 3	2135	2142	+7 veh	<1%
Checkpoint A	2211	2221	+10 veh	<1%	Checkpoint A	2137	2156	+19 veh	1%
Checkpoint B	1258	1259	+1 veh	<1%	Checkpoint B	1407	1409	+2 veh	<1%
Checkpoint C	1099	1110	+11 veh	1%	Checkpoint C	890	911	+21 veh	2%
Checkpoint D	909	920	+11 veh	1%	Checkpoint D	758	779	+21 veh	3%
Checkpoint E	909	912	+3 veh	<1%	Checkpoint E	758	764	+6 veh	1%
Checkpoint F	936	939	+3 veh	<1%	Checkpoint F	741	747	+6 veh	1%
Checkpoint G	877	878	+1 veh	<1%	Checkpoint G	700	701	+1 veh	<1%
Checkpoint H	106	108	+2 veh	2%	Checkpoint H	138	143	+5 veh	4%
Checkpoint I	555	557	+2 veh	<1%	Checkpoint I	542	547	+5 veh	1%
Checkpoint J	1421	1424	+3 veh	<1%	Checkpoint J	1602	1607	+5 veh	<1%
Checkpoint K	223	223	0 veh	<1%	Checkpoint K	324	326	+2 veh	1%
Checkpoint L	1513	1514	+1 veh	<1%	Checkpoint L	1802	1804	+2 veh	<1%

NORTH

2037A

Figure 7

2022 Impact Summary

Traffic Evaluation, Proposed Affordable Housing Development, Dover, New Hampshire

TRAFFIC OPERATIONS AND SAFETY

INTERSECTION CAPACITY – UNSIGNALIZED INTERSECTIONS

The short-range (2022) and long-range (2032) traffic projections form the basis for assessing traffic operations at the Back River Road/Proposed Site Access Road intersection from a capacity and delay standpoint. This intersection was analyzed according to the methodologies of the *Highway Capacity Manual 2010*[2] as replicated by the latest edition of the *Synchro Signal Timing Software (Version 10),* which is capable of analyzing unsignalized intersections as well.

Capacity and Level of Service (LOS) calculations pertaining to unsignalized intersections address the quality of service for those vehicles turning into and out of the intersecting side street or driveway. The availability of adequate gaps in the traffic stream on the major street (Back River Road) actually controls the potential capacity for vehicle movements to and from the minor approach (Proposed Site Access Road). Levels of Service are simply letter grades (A-F) which categorize the vehicle delays associated with specific turning maneuvers. The following table describes the criteria used in this analysis.

Table 2 – Level-of-Service Criteria for Unsignalized Intersections

Control Delay (seconds/vehicle)	Level of Service by Volume-to-Capacity Ratio	
	v/c ≤ 1.0	v/c > 1.0
0 - 10	A	F
> 10 - 15	B	F
> 15 - 25	C	F
> 25 - 35	D	F
> 35 - 50	E	F
> 50	F	F

Source: Transportation Research Board, Highway Capacity Manual 2010.

Back River Road/Proposed Site Access Road – The analysis of this intersection is summarized on Table 3 and indicates that the departure movement from the subject site will operate at LOS C during the peak hour periods in 2032 with the subject site fully occupied. The left-turn arrival movement from Back River Road into the access road will operate at LOS A during all hours of the day through the horizon year and beyond with all dwelling units fully occupied. These are the highest or best levels attainable, and mean that vehicle delays and queuing will be minimal. In all cases, this intersection will operate well below capacity through 2032 and beyond with the subject site fully occupied. Traffic congestion will not result. Appendix G contains the computations pertaining to the unsignalized intersection capacity and Level of Service analyses.

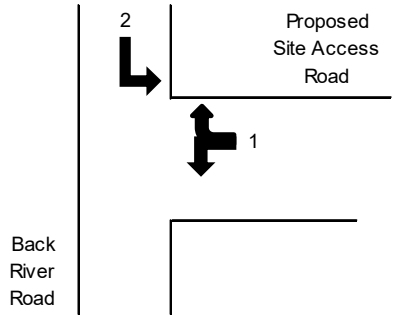
[2] Transportation Research Board, *Highway Capacity Manual* (Washington, D.C., 2010).

Table 3

STOP-Controlled Intersection Capacity Analysis
Back River Road / Proposed Site Access Road

	Weekday AM Peak Hour				Weekday PM Peak Hour			
	Delay [1]	V/C [2]	LOS [3]	Queue [4]	Delay [1]	V/C [2]	LOS [3]	Queue [4]
1. Proposed Site Driveway - WB Departures								
2022 Build	14.1	0.03	B	<1	12.6	0.02	B	<1
2032 Build	15.2	0.03	C	<1	13.3	0.02	B	<1
2. Back River Road - SB LT-Turn Arrivals								
2022 Build	8.5	0.00	A	<1	8.2	0.02	A	<1
2032 Build	8.7	0.00	A	<1	8.4	0.02	A	<1

[1] HCM Control Delay (seconds per vehicle), [2] HCM Volume to Capacity Ratio, [3] HCM Level of Service, [4] HCM 95th Percentile Queue (vehicles)



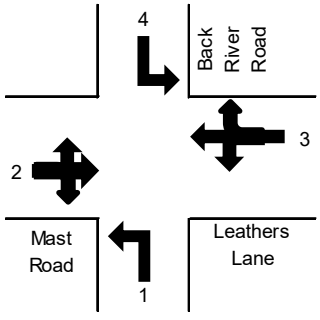
Back River Road/Mast Road-Leathers Lane – Table 4 summarizes the results of the analysis for this intersection, and shows that this intersection will continue to operate well below capacity through 2032, both with and without the proposed affordable housing development in operation. By 2032, eastbound departures from Mast Road are expected to operate at LOS E during the AM peak hour and LOS D during the PM peak hour. Site traffic is not of sufficient magnitude to significantly alter the Level of Service or queuing situation at this intersection. The capacity and Level of Service analyses are contained in Appendix G.

Table 4

STOP-Controlled Intersection Capacity Analysis
Back River Road / Mast Road / Leathers Lane

	Weekday AM Peak Hour				Weekday PM Peak Hour			
	Delay [1]	V/C [2]	LOS [3]	Queue [4]	Delay [1]	V/C [2]	LOS [3]	Queue [4]
1. Back River Road - NB Left Turn Arrivals								
2020 Existing	8.3	0.02	A	<1	7.8	0.02	A	<1
2022 No Build	9.0	0.03	A	<1	8.1	0.03	A	<1
2022 Build	9.1	0.03	A	<1	8.1	0.03	A	<1
2032 No Build	9.3	0.03	A	<1	8.2	0.03	A	<1
2032 Build	9.3	0.03	A	<1	8.2	0.03	A	<1
2. Mast Road - EB Departures								
2020 Existing	16.3	0.08	C	<1	14.0	0.14	B	1
2022 No Build	35.5	0.28	E	1	20.7	0.28	C	1
2022 Build	36.4	0.29	E	1	21.5	0.30	C	1
2032 No Build	48.3	0.38	E	2	24.4	0.35	C	2
2032 Build	49.8	0.39	E	2	25.5	0.37	D	2
3. Leathers Lane - WB Departures								
2020 Existing	13.6	0.10	B	<1	12.8	0.06	B	<1
2022 No Build	26.7	0.40	D	2	17.0	0.16	C	1
2022 Build	26.8	0.40	D	2	17.0	0.16	C	1
2032 No Build	33.7	0.47	D	2	18.8	0.18	C	1
2032 Build	33.7	0.47	D	2	18.8	0.18	C	1
4. Back River Road - SB Left Turn Arrivals								
2020 Existing	7.9	0.01	A	<1	7.9	0.02	A	<1
2022 No Build	8.3	0.02	A	<1	8.2	0.04	A	<1
2022 Build	8.3	0.02	A	<1	8.2	0.04	A	<1
2032 No Build	8.5	0.02	A	<1	8.3	0.04	A	<1
2032 Build	8.5	0.02	A	<1	8.3	0.04	A	<1

[1] HCM Control Delay (seconds per vehicle), [2] HCM Volume to Capacity Ratio, [3] HCM Level of Service, [4] HCM 95th Percentile Queue (vehicles)



INTERSECTION CAPACITY – SIGNALIZED INTERSECTIONS

The two signalized study area intersections were analyzed utilizing the methods of the *Highway Capacity Manual*[3], as replicated by the *Synchro Traffic Signal Coordination Software (Version 10).* A traffic flow rate, capacity, Level of Service (LOS), delay estimate, and average and 95th queue lengths (given in feet) was determined for each traffic movement, and for the overall intersection. Levels of Service are simply letter grades (A-F), which categorize the vehicle delays associated with specific turning maneuvers. Table 5 describes the criteria used in this analysis.

Table 5 — Level-of-Service Criteria for Signalized Intersections

Control Delay (seconds/vehicle)	Level of Service by Volume-to-Capacity Ratio	
	v/c ≤ 1.0	v/c > 1.0
≤ 10	A	F
> 10 - 20	B	F
> 20 - 35	C	F
> 35 - 55	D	F
> 55 - 80	E	F
> 80	F	F

Source: Transportation Research Board, Highway Capacity Manual 2010.

Table 6 summarizes the results of the analysis for the NH108/Back River Road intersection, and the 2022 analyses show that the overall intersection will be capacity-deficient during the AM peak hour under the No-Build case, and will operate below capacity during the PM peak hour. Although additional approach lanes would typically address this type of deficiency, it appears that physical constraints (bridge, river crossing, and interchange proximity) does not make widening feasible. Favorably, the impact from the proposed development project is minimal: the overall volume-capacity ratio of the intersection increases by only one percentage point during the worst-case AM peak hour, and the overall Level of Service remains unchanged. During the PM peak hour, this intersection is projected to operate close to capacity (v/c = 0.99) by 2032 with the development occupied.

[3] Transportation Research Board, *Highway Capacity Manual* (Washington, D.C., 2010).

Stephen G. Pernaw & Company, Inc.

Table 6

Signal-Controlled Intersection Capacity Analysis Summary
NH108/Back River Road

	2020 Existing				2022 No-Build				2022 Build				2032 No-Build				2032 Build			
	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]
Weekday AM Peak Hour																				
NH108 - NB TH	0.31	5.2	A	36 (146)	0.45	5.4	A	58 (239)	0.45	5.4	A	58 (239)	0.41	3.9	A	86 (265)	0.41	3.9	A	86 (265)
NH108 - NB RT	0.02	0.9	A	0 (7)	0.03	0.9	A	0 (8)	0.03	0.9	A	0 (8)	0.03	0.5	A	0 (6)	0.03	0.5	A	0 (6)
NH108 - SB LT	0.62	8.6	A	57 (211)	1.17	106.5	F	267 (522)	1.18	109.4	F	270 (527)	1.12	86.8	F	604 (847)	1.13	89.2	F	610 (855)
NH108 - SB TH	0.48	6.2	A	68 (216)	0.71	8.8	A	124 (399)	0.71	8.8	A	124 (399)	0.65	6.2	A	192 (457)	0.65	6.2	A	192 (457)
Back River Road - NW LT-Turn	0.14	26.3	C	8 (33)	0.27	29.3	C	13 (47)	0.28	29.4	C	14 (48)	0.37	58.1	E	32 (77)	0.37	58.2	E	32 (79)
Back River Road - NW RT-Turn	0.23	26.9	C	0 (114)	0.36	30.3	C	0 (155)	0.42	30.9	C	2 (163)	1.62	379.3	F	172 (430)	1.70	412.6	F	185 (445)
Overall	**0.54**	**11.2**	**B**		**1.03**	**36.0**	**D**		**1.04**	**37.0**	**D**		**1.13**	**106.4**	**F**		**1.14**	**114.9**	**F**	
Cycle Length (Lost Time)	**90 (14.0)**				**90 (14.0)**				**90 (14.0)**				**150 (14.0)**				**150 (14.0)**			
Weekday PM Peak Hour																				
NH108 - NB TH	0.42	5.7	A	59 (226)	0.52	5.9	A	76 (308)	0.52	5.9	A	76 (308)	0.48	4.3	A	114 (345)	0.48	4.3	A	114 (345)
NH108 - NB RT	0.02	0.9	A	0 (7)	0.03	0.9	A	0 (8)	0.03	0.9	A	0 (8)	0.03	0.5	A	0 (6)	0.03	0.5	A	0 (6)
NH108 - SB LT	0.64	9.3	A	50 (283)	1.03	60.4	E	112 (456)	1.06	69.6	E	123 (472)	0.96	40.0	D	214 (722)	0.99	47.3	D	242 (750)
NH108 - SB TH	0.51	6.2	A	77 (296)	0.63	7.3	A	105 (426)	0.63	7.3	A	105 (426)	0.58	5.2	A	158 (485)	0.58	5.2	A	158 (485)
Back River Road - NW LT-Turn	0.21	27.9	C	12 (38)	0.33	29.8	C	16 (48)	0.34	29.9	C	17 (49)	0.45	59.3	E	39 (81)	0.46	59.4	E	40 (82)
Back River Road - NW RT-Turn	0.24	28.2	C	0 (45)	0.31	29.8	C	0 (63)	0.32	29.9	C	0 (63)	1.31	250.4	F	122 (224)	1.38	280.7	F	135 (237)
Overall	**0.56**	**11.3**	**B**		**0.90**	**21.6**	**C**		**0.93**	**23.5**	**C**		**0.96**	**61.7**	**E**		**0.99**	**69.6**	**E**	
Cycle Length (Lost Time)	**90 (14.0)**				**90 (14.0)**				**90 (14.0)**				**150 (14.0)**				**150 (14.0)**			

1) Volume-to-capacity ratio, 2) Delay in vehicles per seconds, 3) Level of Service, 4) Queue length in feet

Table 7 summarizes the results of the analysis for the NH108/Mast Road intersection, and the 2022 analyses show that the overall intersection will be capacity-deficient during the PM peak hour under the No-Build case, and will operate below capacity during the AM peak hour. This type of deficiency could be addressed by widening the intersection to provide additional approach lanes. Favorably, the impact from the proposed development project is minimal: there is no change to the overall volume-capacity ratio of the intersection or the Level of Service in the opening year (2022). By the horizon year (2032) the volume-capacity ratio increases by only one percentage point during the peak hour periods, and the overall Level of Service remains unchanged.

The capacity and Level of Service analyses are contained in Appendix H.

Stephen G. Pernaw & Company, Inc.

Table 7

Signal-Controlled Intersection Capacity Analysis Summary
NH108/Mast Road

	2020 Existing				2022 No-Build				2022 Build				2032 No-Build				2032 Build			
	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]	V/C [1]	Delay [2]	LOS [3]	Queue Avg/95th [4]
Weekday AM Peak Hour																				
Mast Road - EB LT	0.33	18.1	B	14 (46)	0.72	37.0	D	24 (87)	0.72	37.0	D	24 (87)	0.78	52.2	D	45 (114)	0.78	52.2	D	45 (114)
Mast Road - EB TH&RT	0.14	16.7	B	8 (32)	0.23	18.9	B	13 (43)	0.23	18.9	B	13 (43)	0.23	25.1	C	26 (60)	0.23	25.1	C	26 (60)
Mast Road - WB LT	0.55	22.5	C	26 (123)	0.99	87.8	F	46 (199)	1.00	89.8	F	46 (200)	0.89	62.0	E	82 (251)	0.89	63.1	E	82 (253)
Mast Road - WB TH&RT	0.18	18.6	B	6 (53)	0.30	21.1	C	10 (81)	0.30	21.1	C	10 (81)	0.30	27.3	C	21 (92)	0.30	27.3	C	21 (92)
NH108 - NB LT&TH	0.55	11.9	B	75 (279)	0.83	20.7	C	137 (493)	0.83	20.7	C	137 (493)	0.78	20.4	C	216 (590)	0.78	20.4	C	216 (590)
NH108 - NB RT	0.04	9.9	A	0 (0)	0.06	10.3	B	0 (1)	0.06	10.3	B	0 (2)	0.07	11.3	B	0 (20)	0.07	11.3	B	0 (21)
NH108 - SB LT	0.17	5.4	A	5 (38)	0.36	8.0	A	8 (54)	0.36	8.0	A	8 (54)	0.42	11.4	B	16 (65)	0.42	11.4	B	16 (65)
NH108 - SB TH&RT	0.49	6.3	A	46 (232)	0.73	9.5	A	89 (489)	0.73	9.5	A	89 (490)	0.77	13.0	B	192 (646)	0.77	13.1	B	193 (647)
Overall	**0.52**	**11.3**	**B**		**0.80**	**21.6**	**C**		**0.80**	**21.8**	**C**		**0.80**	**22.4**	**C**		**0.81**	**22.5**	**C**	
Cycle Length (Lost Time)	**65 (14.0)**				**65 (14.0)**				**65 (14.0)**				**90 (14.0)**				**90 (14.0)**			
Weekday PM Peak Hour																				
Mast Road - EB LT	1.04	98.8	F	50 (132)	1.64	334.2	F	95 (185)	1.65	339.1	F	95 (185)	1.14	148.5	F	259 (283)	1.15	152.1	F	261 (285)
Mast Road - EB TH&RT	0.18	17.9	B	11 (33)	0.25	17.6	B	16 (41)	0.25	17.6	B	16 (42)	0.18	33.9	C	54 (76)	0.18	33.9	C	55 (76)
Mast Road - WB LT	0.60	25.3	C	28 (104)	0.80	41.0	D	38 (143)	0.82	44.0	D	39 (146)	0.47	39.5	D	112 (182)	0.47	39.6	D	113 (184)
Mast Road - WB TH&RT	0.24	19.8	B	8 (47)	0.30	19.6	B	11 (54)	0.31	19.6	B	11 (54)	0.33	37.2	D	78 (136)	0.34	37.4	D	83 (142)
NH108 - NB LT&TH	0.85	21.4	C	143 (521)	1.11	81.2	F	261 (692)	1.11	81.6	F	261 (693)	1.00	61.1	E	713 (1250)	1.00	61.4	E	715 (1252)
NH108 - NB RT	0.06	9.8	A	0 (2)	0.08	10.0	A	0 (16)	0.08	10.0	A	0 (18)	0.13	18.2	B	27 (79)	0.13	18.2	B	28 (81)
NH108 - SB LT	0.24	7.6	A	5 (39)	0.30	9.5	A	6 (48)	0.30	9.5	A	6 (48)	0.73	49.7	D	36 (165)	0.73	49.8	D	36 (165)
NH108 - SB TH&RT	0.53	6.4	A	52 (301)	0.69	8.7	A	77 (497)	0.69	8.8	A	77 (498)	0.76	23.3	C	443 (895)	0.76	23.3	C	444 (897)
Overall	**0.84**	**23.4**	**C**		**1.17**	**67.8**	**E**		**1.17**	**68.5**	**E**		**1.02**	**51.4**	**D**		**1.03**	**51.8**	**D**	
Cycle Length (Lost Time)	**65 (14.0)**				**65 (14.0)**				**65 (14.0)**				**150 (14.0)**				**150 (14.0)**			

1) Volume-to-capacity ratio, 2) Delay in vehicles per seconds, 3) Level of Service, 4) Queue length in feet

AUXILIARY TURN LANE WARRANTS ANALYSIS

Left-Turn Treatment – The type of treatment needed to accommodate a left-turning vehicle from any street or highway to an intersecting side street can range from no treatment, where turning volumes are low; to the provision of a bypass lane for through traffic to travel around left-turning vehicles; to the addition of a formal center turn lane used exclusively by left-turning vehicles for deceleration and storage while waiting to complete their maneuvers.

Analysis of the Proposed Site Access Road intersection on Back River Road using NCHRP 457 guidelines is summarized on Table 8 and it indicates that left-turn treatment is not warranted on Back River Road to accommodate left-turns into the subject site. This means that the existing eastbound travel lane on Back River Road will function safely and adequately as a shared left-through lane. This finding is due in part to the low number of turning vehicles and the moderate traffic volumes found on Back River Road during the peak hour periods.

Table 8 — **Left-Turn Lane Warrants Analysis**
Back River Road / Proposed Site Access Road

	2032 AM Build Volumes	2032 PM Build Volumes
Peak Hour Inputs		
Left-Turn Volume (EB)	3	14
Advancing Volume (EB)	523	452
Opposing Volume (WB)	483	401
Percent Lefts	0.6%	3.1%
Speed (mph)	30	30
Limiting Advancing Volume (veh/h)	1502	711
Conclusion		
Left-Turn Treatment Warranted	**NO**	**NO**

Right-Turn Treatment – At unsignalized intersections, the type of treatment needed to accommodate right-turning vehicles from any street or highway to any intersecting side street can range from radius only, where turning volumes are low; to the provision of a short 10:1 taper; to the addition of an exclusive right-turn lane, where turning volumes and through traffic volumes are significant.

Analysis of the Proposed Site Access Road intersection on Back River Road using NCHRP 457 guidelines is summarized on Table 9 and it confirms that right-turn treatment on Back River Road is not warranted at this intersection. This means that the existing westbound travel lane on Back River Road will function safely and adequately as a shared through-right lane.

Table 9	Right-Turn Lane Warrants Analysis Back River Road / Proposed Site Access Road	
	2032 AM Build Volumes	2032 PM Build Volumes
Peak Hour Inputs		
Right-Turn Volume (WB)	1	4
Total Approach Volume (WB)	483	401
Speed (mph)	30	30
Limiting Right-Turn Volume (veh/h)	652	1597
Conclusion		
Add Right-Turn Bay	**NO**	**NO**

Minor-Road Approach Analysis – The type of treatment needed to accommodate exiting vehicles from the minor-road approach at a stop-controlled intersection can range from a single lane (shared left-right lane) in low-volume conditions, to two exit lanes (exclusive left-turn lane and exclusive right-turn lane) where turning volumes and through traffic volumes are significant, to multiple exit lanes in extreme cases.

Analysis of the Proposed Site Access Road intersection using NCHRP 457 guidelines confirmed that one exit lane on the access road approach to Back River Road is sufficient for the anticipated traffic volumes. The results of these analyses are summarized on Table 10.

Table 10	Minor-Road Approach Geometry Back River Road / Proposed Site Access Road	
	2032 AM Build Volumes	2032 PM Build Volumes
Peak Hour Inputs		
Major-Road Volume (WB-EB)	1006	853
% Right-Turns on Minor (SB)	80	78
Minor-Road Approach Volume	10	9
Limiting Minor-Road Volume (veh/h)	289	325
Conclusion		
Consider TWO Approach Lanes	**NO**	**NO**

The computations pertaining to all of the auxiliary turn lane warrants analyses are contained in Appendix I.

SIGHT DISTANCE

The sight distance looking left and right from the new minor approach to Back River Road is an important safety consideration. Appendix J contains photographs showing the view looking left and right from the Proposed Site Access Road location. The available sight distances exceed the safe stopping sight distance requirements for the posted speed limit (30 mph = 200-feet) and a reasonable "design speed" (40 mph = 305-feet). To maximize sight distances, roadside vegetation (and snow banks) should be maintained, and any signage should not restrict the line of sight looking left and right.

PARKING GENERATION

To estimate the peak parking demand that will occur at the affordable housing development site Pernaw & Company, Inc. considered the standardized parking generation rates and equations published by the Institute of Transportation Engineers (ITE)[4]. This publication contains various parking generation rates and equations using either the number of dwelling units or the number of bedrooms as the independent variable. According to Land Use Code 223 (Affordable Housing – Income Limits), the results below range from 24-44 parked vehicles (occupied parking stalls).

Peak Period Parking Demand per Dw elling Unit	
Average Rate = 0.99 X 44 units =	44 parked vehicles
Fitted Curve Equation: P = 1.13 (44) - 21.94 =	28 parked vehicles
Peak Period Parking Demand per Bedroom	
Average Rate = 0.54 X 44 bedrooms =	24 parked vehicles
Fitted Curve Equation: P = 0.47 (44) + 6.17 =	27 parked vehicles

Given the unique size of each dwelling unit (384 sf), our experience suggests that the bedroom-based estimates are the more credible estimates.

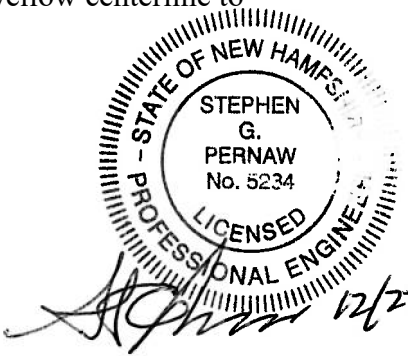
[4] Institute of Transportation Engineers, *Parking Generation Manual,* fifth edition (Washington, D.C., 2019).

STUDY FINDINGS AND RECOMMENDATIONS

Based upon the existing conditions data collected at the three existing study area intersections, the anticipated traffic increases from the proposed affordable housing development, and the analysis of future traffic levels in the study area, Pernaw & Company, Inc. concludes that:

1. Vehicular access to the affordable housing development is proposed via one two-way site access road that will intersect the east side of Back River Road approximately 250-feet south of Red Barn Drive.
2. The recent traffic count data collected revealed that the traffic flow on Back River Road passing the subject site totaled 583 vehicles (AM) and 572 vehicles (PM) during the peak hour periods. The heavier directional flow was eastbound during the AM peak hour (52%) and eastbound during the PM peak hour (52%) periods.
3. The trip generation analysis indicates that, on an average weekday basis, the overall development will generate approximately 14 vehicle-trips (4 arrivals, 10 departures) during the weekday AM peak hour; and 27 vehicle-trips (18 arrivals, 9 departures) during the weekday PM peak hour. These trip estimates take into consideration the fact that each dwelling unit is small (384-sf) and will be occupied by one or two persons. The use of carpooling has the potential to reduce these trip estimates further. By way of comparison, a conventional subdivision with 13 homes generates approximately 14 vehicle-trips during the peak hour periods.
4. The trip distribution analysis indicates that approximately 75% of the site traffic will travel to/from the northwest on Back River Road, towards NH108.
5. The comparison between the Build and No-Build traffic volumes revealed that site traffic will increase the utilization of the NH108/Back River Road signalized intersection by approximately +0.5% (AM) and +1.0% (PM) during the peak hour periods. This corresponds to increases of +11 vehicles during the morning peak hour, and +21 vehicles during the PM peak hour.
6. Analysis of the two study area signalized intersections on NH108 confirms that these intersections will be capacity-deficient during peak periods in 2022 with or without the proposed development. Favorably, the impacts from the proposed development are minimal at these locations; with no change in the overall intersection Level of Service.
7. Analysis of the proposed Site Access Road intersection on Back River Road confirmed that auxiliary turn lanes are not needed to safely accommodate the anticipated traffic levels. This means that the existing travel lanes on Back River Road will function adequately as a shared left-through lane and shared through-right lane at the subject intersection. Similarly, one exit lane on the Site Access Road is sufficient for the anticipated number of departures from the site.
8. Ample sight distance exists looking left and right from the Proposed Site Access Road approach to Back River Road. Proper maintenance of roadside vegetation and winter snow banks is advisable.

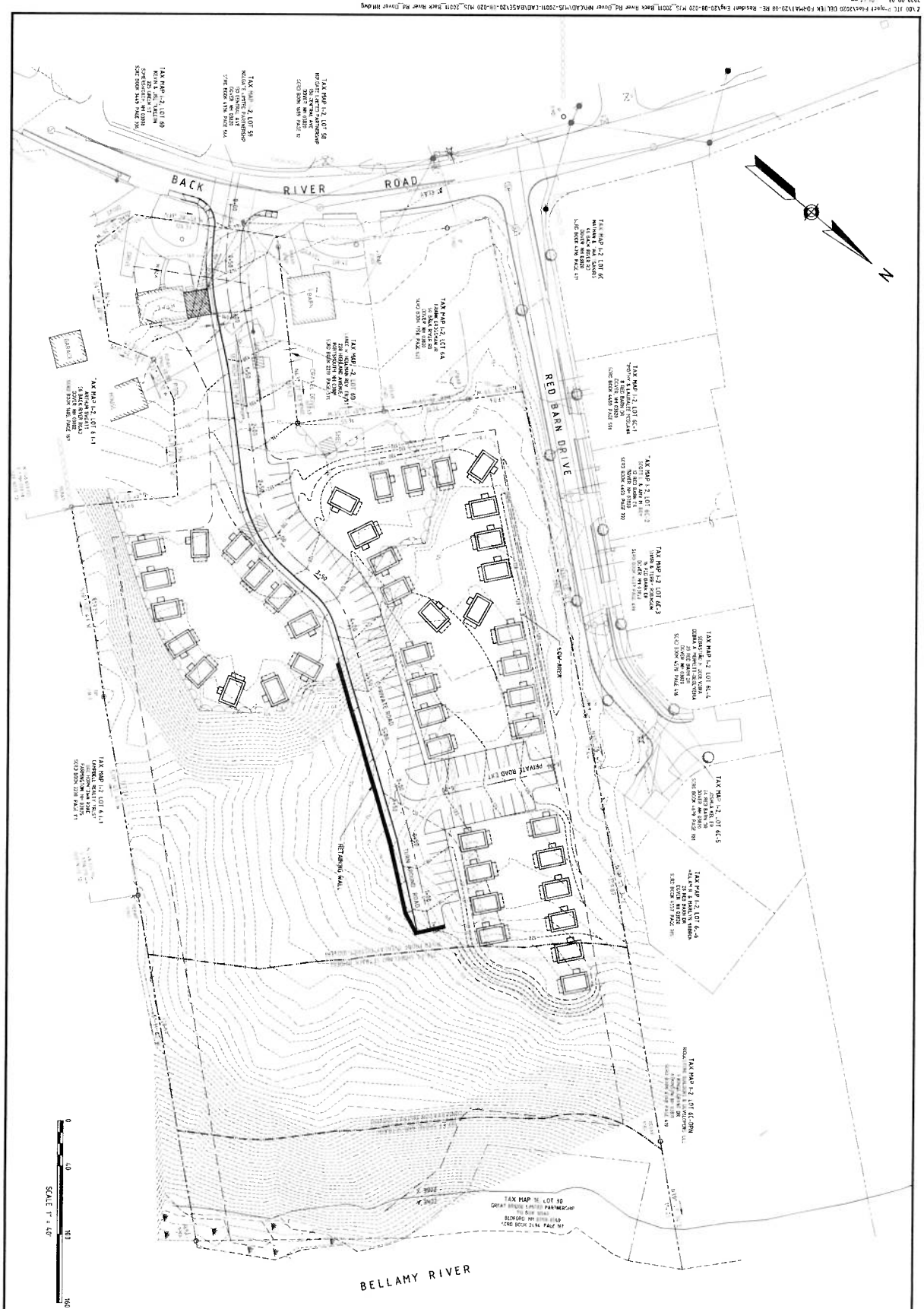
The appropriate forms of traffic control at the Proposed Site Access Road approach to Back River Road includes the installation of: 1) a stop sign (MUTCD #R1-1) on the minor approach, 2) an 18-inch white stop line, and 3) a short section of four-inch double-yellow centerline to separate ingress and egress vehicles.



APPENDIX

Appendix A	Site Plan
Appendix B	Automatic Traffic Recorder Counts
Appendix C	Intersection Turning Movement Counts
Appendix D	Adjustment Factors
Appendix E	Other Development Traffic Volumes
Appendix F	Site Generated Traffic Volumes / Trip Distribution
Appendix G	Capacity and Level of Service Calculations – Unsignalized
Appendix H	Capacity and Level of Service Calculations - Signalized
Appendix I	Auxiliary Turn Lane Warrants Analysis
Appendix J	Sight Distance Photographs

Appendix A **Site Plan**



C-102

JOB 20-011

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
1 Railroad St., P.O. Box 150
Newmarket NH 03857
Phone (603) 659-4951 Fax (603) 659-4627
E-mail mjs@mjs-engineering.com

GRADING PLAN

prepared for
JOHN RANDOLPH
TAX MAP 1, LOT 6
54 BACK RIVER ROAD, DOVER, NH

DATE ISSUED	6/12/20
SCALE	1"=40'
DESIGNED BY	XXX
DRAWN BY	XXX
APPROVED BY	MJS
DWG FILE	20-08-020 MJS_2001 Back River Rd_Dover NH

SEAL

NO	REVISIONS	DATE	INT
0	XXXXXX	7/6/20	XXX

Appendix B **Automatic Traffic Recorder Counts**

New Hampshire DOT Department of Transportation

MS2

Transportation Data Management System

Excel Version

Weekly Volume Report			
Location ID:	82125077	**Type:**	SPOT
Located On:	Central Ave	:	
Direction:	2-WAY		
Community:	DOVER	**Period:**	Mon 9/9/2019 - Sun 9/15/2019
AADT:	18047		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg	Graph
12:00 AM			63	65	103	177	120	106	0.6%
1:00 AM			30	57	50	111	97	69	0.4%
2:00 AM			26	32	26	58	45	37	0.2%
3:00 AM			42	47	45	46	32	42	0.2%
4:00 AM			97	117	122	69	48	91	0.5%
5:00 AM			297	340	290	122	98	229	1.2%
6:00 AM			981	950	944	278	203	671	3.6%
7:00 AM			1813	1798	1792	501	367	1,254	6.6%
8:00 AM			1485	1514	1425	951	689	1,213	6.4%
9:00 AM			994	1142	1078	1068	794	1,015	5.4%
10:00 AM			1008	1030	1095	1447	1158	1,148	6.1%
11:00 AM			1173	1154	1242	1473	1261	1,261	6.7%
12:00 PM			1134	1095	1217	1428	1350	1,245	6.6%
1:00 PM			1123	1209	1239	1336	1125	1,206	6.4%
2:00 PM			1447	1343	1517	1376	1012	1,339	7.1%
3:00 PM			1593	1632	1714	1196	975	1,422	7.5%
4:00 PM			1784	1774	1895	1124	1127	1,541	8.1%
5:00 PM			1983	1907	1797	1018	1019	1,545	8.2%
6:00 PM			1202	1367	1377	868	881	1,139	6.0%
7:00 PM			1037	991	864	701	671	853	4.5%
8:00 PM			614	868	623	523	440	614	3.2%
9:00 PM			368	388	530	470	315	414	2.2%
10:00 PM			245	250	368	311	166	268	1.4%
11:00 PM			134	168	306	215	100	185	1.0%
Total	**0**	**0**	**20,673**	**21,238**	**21,659**	**16,867**	**14,093**		
24hr Total			20673	21238	21659	16867	14093	18,906	
AM Pk Hr			7:00	7:00	7:00	11:00	11:00		
AM Peak			1813	1798	1792	1473	1261	1,627	
PM Pk Hr			5:00	5:00	4:00	12:00	12:00		
PM Peak			1983	1907	1895	1428	1350	1,713	
% Pk Hr			9.59%	8.98%	8.75%	8.73%	9.58%	9.13%	

New Hampshire DOT Department of Transportation

MS2

Transportation Data Management System

Excel Version

Weekly Volume Report			
Location ID:	82125077	**Type:**	SPOT
Located On:	Central Ave	:	
Direction:	2-WAY		
Community:	DOVER	**Period:**	Mon 9/16/2019 - Sun 9/22/2019
AADT:	18047		

Start Time	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Avg	Graph
12:00 AM	67							67	0.3%
1:00 AM	37							37	0.2%
2:00 AM	31							31	0.2%
3:00 AM	49							49	0.2%
4:00 AM	119							119	0.6%
5:00 AM	319							319	1.6%
6:00 AM	912							912	4.5%
7:00 AM	1806							1,806	9.0%
8:00 AM	1391							1,391	6.9%
9:00 AM	1000							1,000	5.0%
10:00 AM	963							963	4.8%
11:00 AM	1063							1,063	5.3%
12:00 PM	1085							1,085	5.4%
1:00 PM	1128							1,128	5.6%
2:00 PM	1386							1,386	6.9%
3:00 PM	1579							1,579	7.9%
4:00 PM	1892							1,892	9.4%
5:00 PM	1958							1,958	9.7%
6:00 PM	1131							1,131	5.6%
7:00 PM	989							989	4.9%
8:00 PM	547							547	2.7%
9:00 PM	338							338	1.7%
10:00 PM	199							199	1.0%
11:00 PM	111							111	0.6%
Total	**20,100**	**0**	**0**	**0**	**0**	**0**	**0**		
24hr Total	20100							20,100	
AM Pk Hr	7:00								
AM Peak	1806							1,806	
PM Pk Hr	5:00								
PM Peak	1958							1,958	
% Pk Hr	9.74%							9.74%	

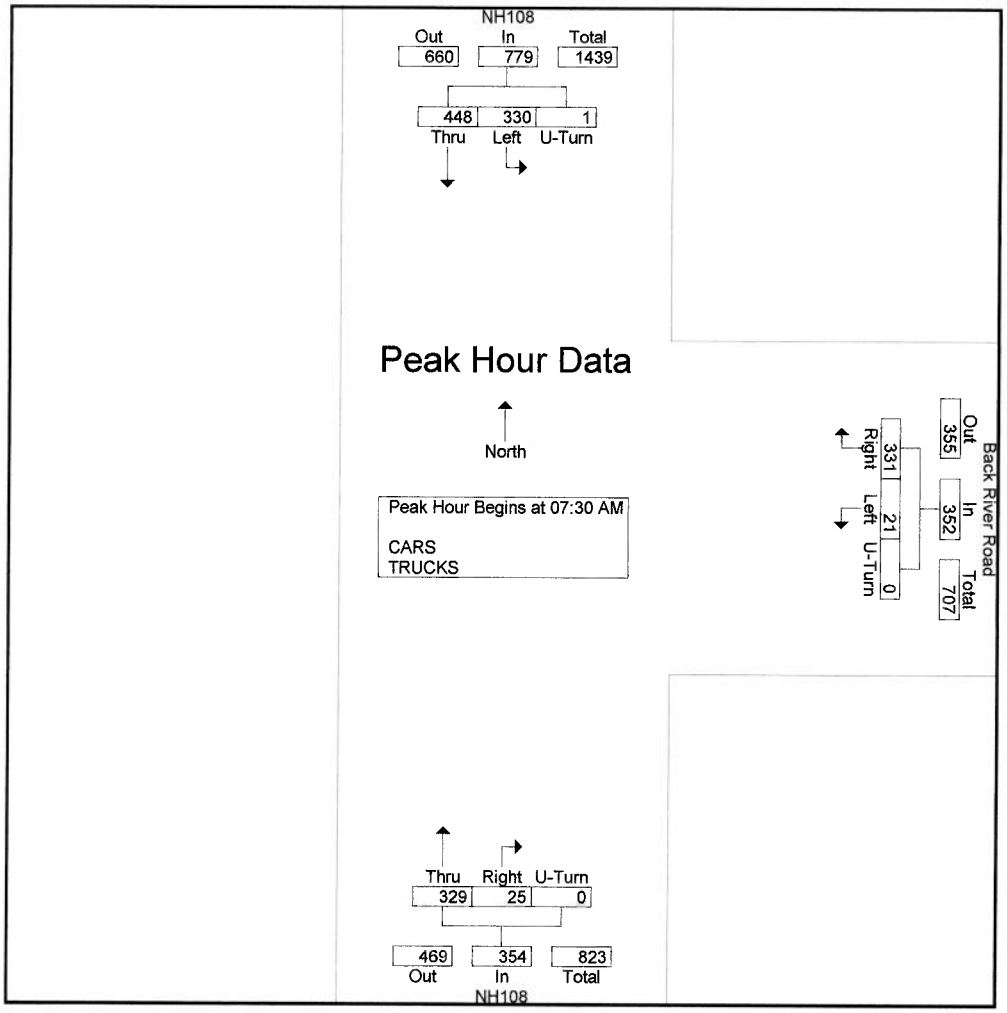
Appendix C **Intersection Turning Movement Counts**

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	NH108 From North				Back River Road From East				NH108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	122	99	0	221	78	**7**	0	85	**9**	84	0	93	399
07:45 AM	**133**	**111**	**1**	**245**	**95**	2	0	97	7	75	0	82	**424**
08:00 AM	93	68	0	161	92	7	0	**99**	5	**89**	0	**94**	354
08:15 AM	100	52	0	152	66	5	0	71	4	81	0	85	308
Total Volume	448	330	1	779	331	21	0	352	25	329	0	354	1485
% App. Total	57.5	42.4	0.1		94	6	0		7.1	92.9	0		
PHF	.842	.743	.250	.795	.871	.750	.000	.889	.694	.924	.000	.941	.876

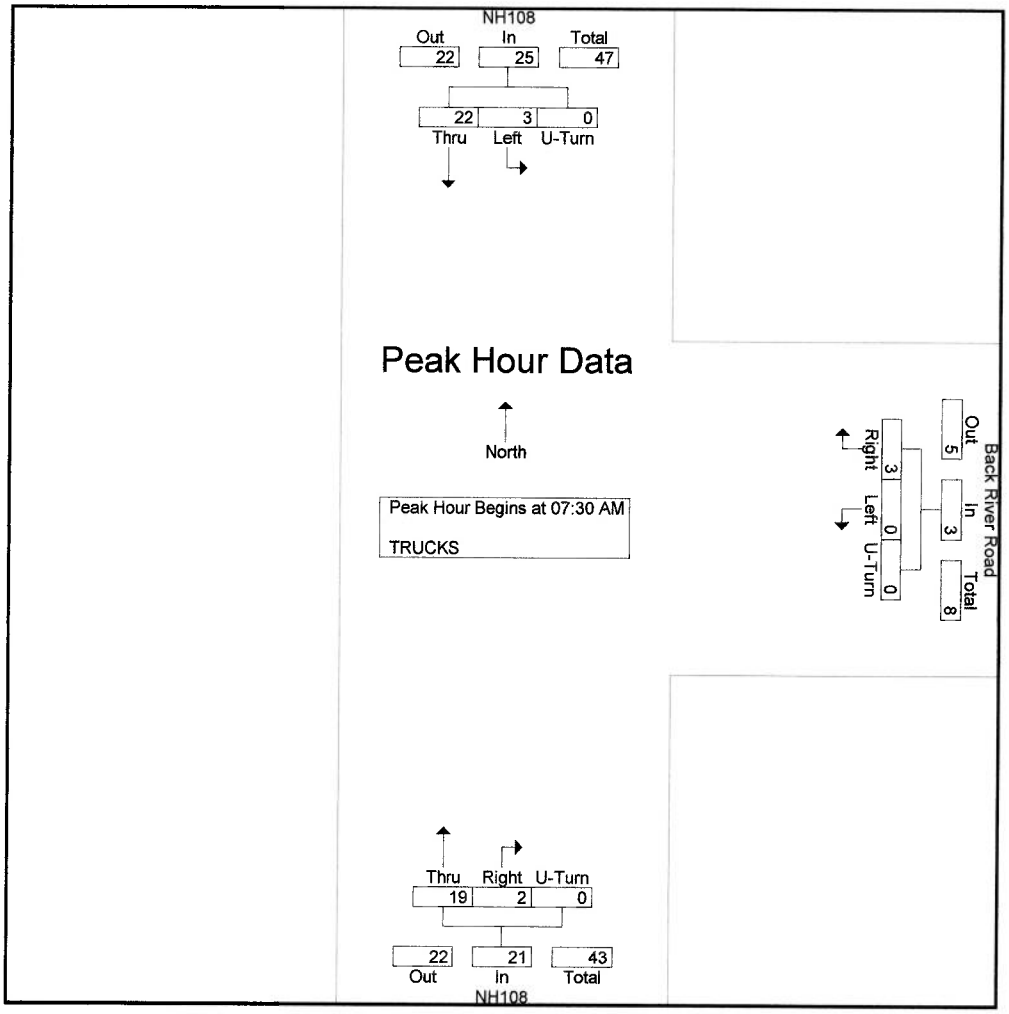


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	NH108 From North				Back River Road From East				NH108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	4	**2**	0	6	**1**	0	0	**1**	0	4	0	4	11
07:45 AM	6	0	0	6	1	0	0	1	**1**	5	0	6	13
08:00 AM	5	1	0	6	1	0	0	1	0	4	0	4	11
08:15 AM	**7**	0	0	**7**	0	0	0	0	1	**6**	0	**7**	**14**
Total Volume	22	3	0	25	3	0	0	3	2	19	0	21	49
% App. Total	88	12	0		100	0	0		9.5	90.5	0		
PHF	.786	.375	.000	.893	.750	.000	.000	.750	.500	.792	.000	.750	.875



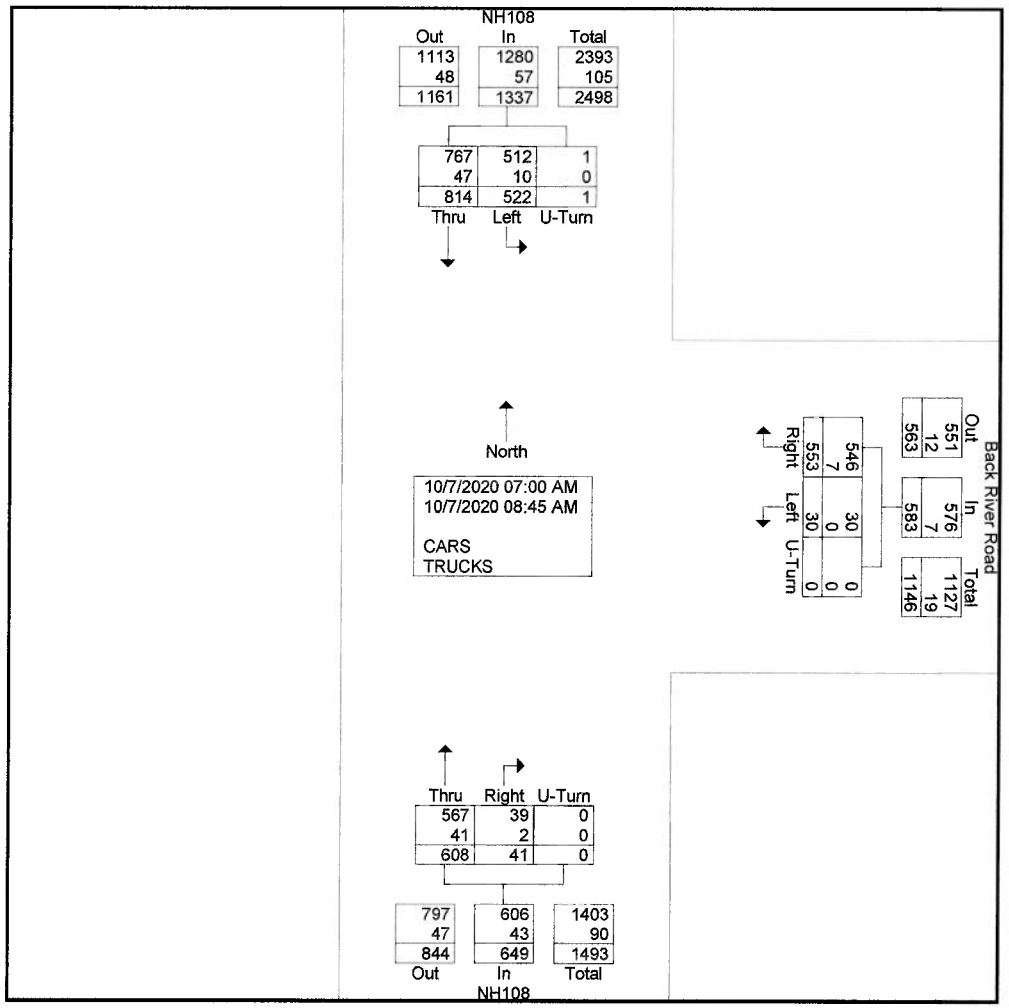
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- CARS - TRUCKS

	NH108 From North				Back River Road From East				NH108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	68	41	0	109	51	3	0	54	1	53	0	54	217
07:15 AM	90	67	0	157	70	3	0	73	2	63	0	65	295
07:30 AM	122	99	0	221	78	7	0	85	9	84	0	93	399
07:45 AM	133	111	1	245	95	2	0	97	7	75	0	82	424
Total	413	318	1	732	294	15	0	309	19	275	0	294	1335
08:00 AM	93	68	0	161	92	7	0	99	5	89	0	94	354
08:15 AM	100	52	0	152	66	5	0	71	4	81	0	85	308
08:30 AM	101	46	0	147	48	1	0	49	8	87	0	95	291
08:45 AM	107	38	0	145	53	2	0	55	5	76	0	81	281
Total	401	204	0	605	259	15	0	274	22	333	0	355	1234
Grand Total	814	522	1	1337	553	30	0	583	41	608	0	649	2569
Apprch %	60.9	39	0.1		94.9	5.1	0		6.3	93.7	0		
Total %	31.7	20.3	0	52	21.5	1.2	0	22.7	1.6	23.7	0	25.3	
CARS	767	512	1	1280	546	30	0	576	39	567	0	606	2462
% CARS	94.2	98.1	100	95.7	98.7	100	0	98.8	95.1	93.3	0	93.4	95.8
TRUCKS	47	10	0	57	7	0	0	7	2	41	0	43	107
% TRUCKS	5.8	1.9	0	4.3	1.3	0	0	1.2	4.9	6.7	0	6.6	4.2



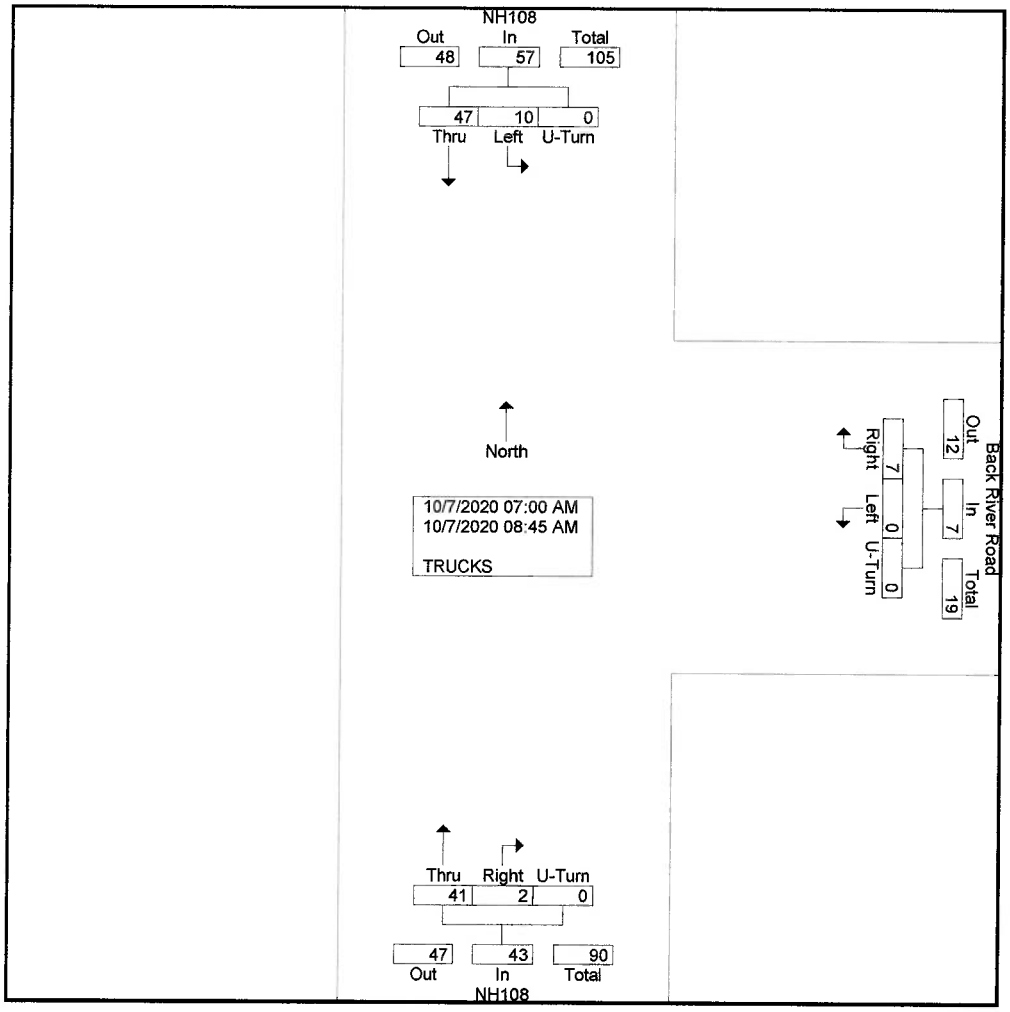
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- TRUCKS

	NH108 From North				Back River Road From East				NH108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	1	2	0	3	1	0	0	1	0	11	0	11	15
07:15 AM	4	2	0	6	0	0	0	0	0	2	0	2	8
07:30 AM	4	2	0	6	1	0	0	1	0	4	0	4	11
07:45 AM	6	0	0	6	1	0	0	1	1	5	0	6	13
Total	15	6	0	21	3	0	0	3	1	22	0	23	47
08:00 AM	5	1	0	6	1	0	0	1	0	4	0	4	11
08:15 AM	7	0	0	7	0	0	0	0	1	6	0	7	14
08:30 AM	12	3	0	15	1	0	0	1	0	4	0	4	20
08:45 AM	8	0	0	8	2	0	0	2	0	5	0	5	15
Total	32	4	0	36	4	0	0	4	1	19	0	20	60
Grand Total	47	10	0	57	7	0	0	7	2	41	0	43	107
Apprch %	82.5	17.5	0		100	0	0		4.7	95.3	0		
Total %	43.9	9.3	0	53.3	6.5	0	0	6.5	1.9	38.3	0	40.2	

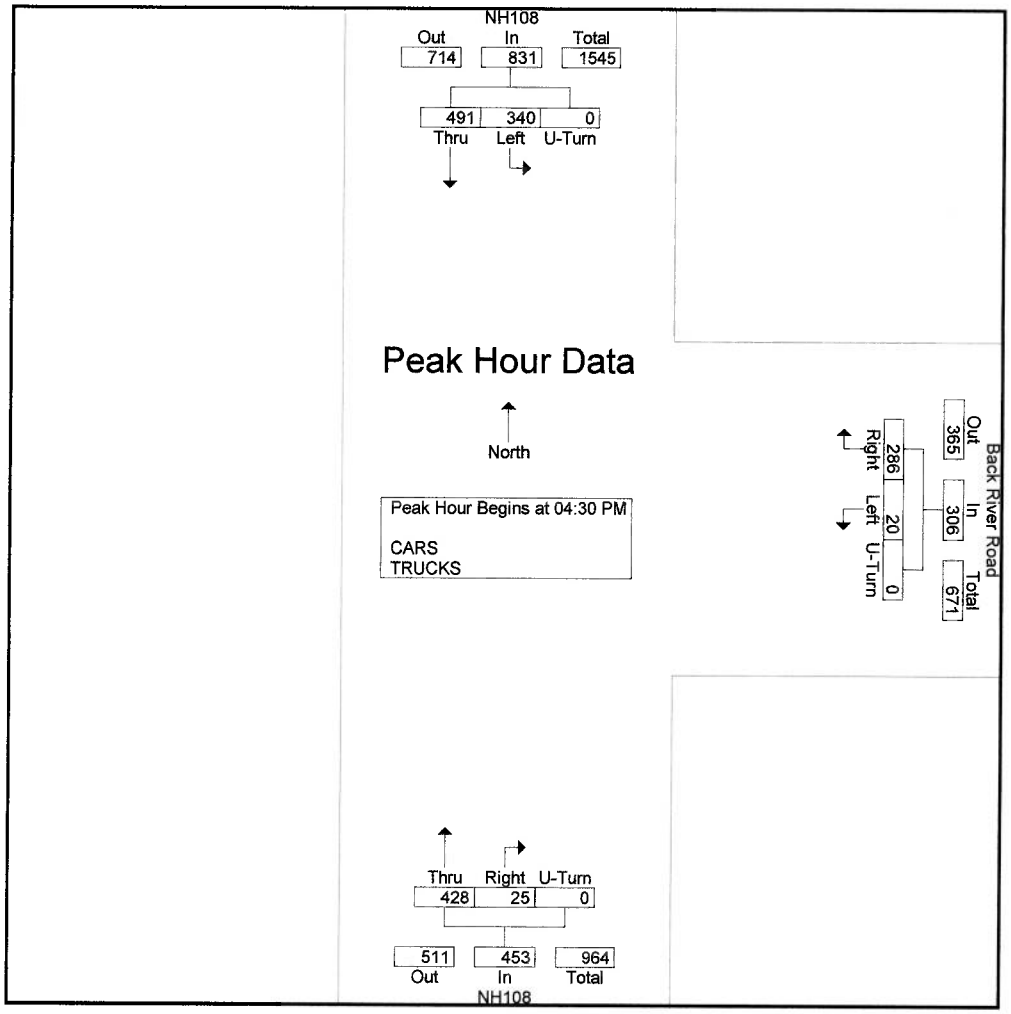


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 3

	NH108 From North				Back River Road From East				NH108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	**136**	85	0	**221**	75	4	0	79	6	107	0	113	**413**
04:45 PM	125	**95**	0	220	59	7	0	66	3	**112**	0	115	401
05:00 PM	119	75	0	194	**77**	0	0	77	5	102	0	107	378
05:15 PM	111	85	0	196	75	**9**	0	**84**	**11**	107	0	**118**	398
Total Volume	491	340	0	831	286	20	0	306	25	428	0	453	1590
% App. Total	59.1	40.9	0		93.5	6.5	0		5.5	94.5	0		
PHF	.903	.895	.000	.940	.929	.556	.000	.911	.568	.955	.000	.960	.962

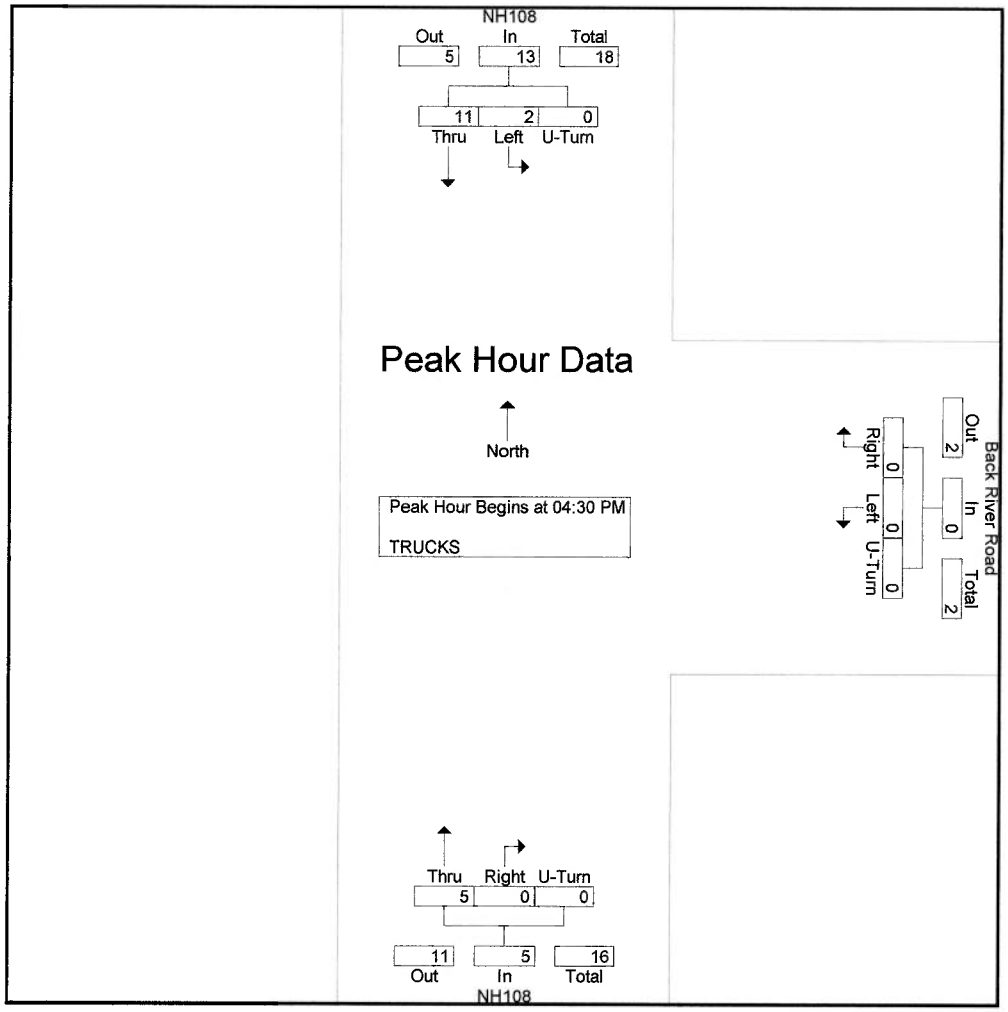


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	NH108 From North				Back River Road From East				NH108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	2	**2**	0	4	0	0	0	0	0	**3**	0	**3**	**7**
04:45 PM	**5**	0	0	**5**	0	0	0	0	0	1	0	1	6
05:00 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
05:15 PM	3	0	0	3	0	0	0	0	0	1	0	1	4
Total Volume	11	2	0	13	0	0	0	0	0	5	0	5	18
% App. Total	84.6	15.4	0		0	0	0		0	100	0		
PHF	.550	.250	.000	.650	.000	.000	.000	.000	.000	.417	.000	.417	.643



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

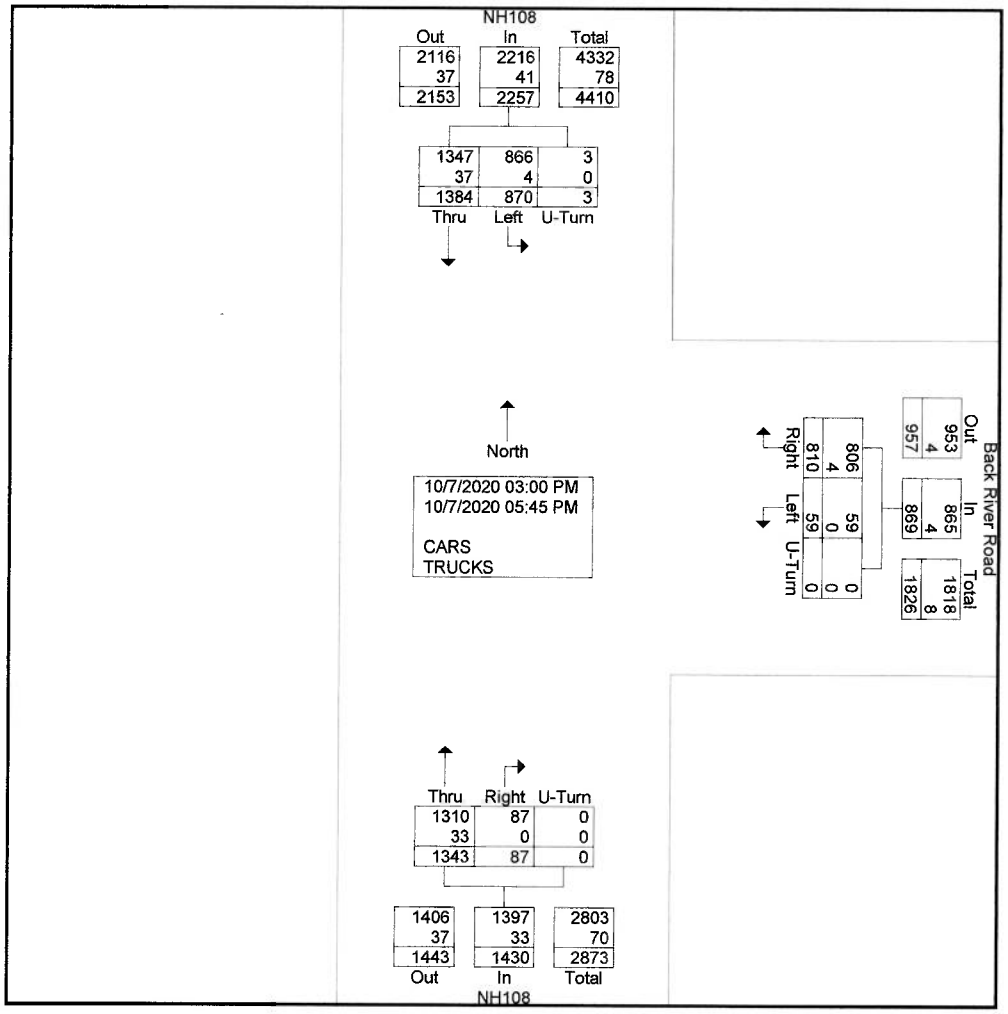
Groups Printed- CARS - TRUCKS

	NH108 From North				Back River Road From East				NH108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	94	86	2	182	65	7	0	72	9	129	0	138	392
03:15 PM	100	71	0	171	74	4	0	78	8	105	0	113	362
03:30 PM	119	51	0	170	89	9	0	98	8	129	0	137	405
03:45 PM	144	59	0	203	65	5	0	70	7	145	0	152	425
Total	457	267	2	726	293	25	0	318	32	508	0	540	1584
04:00 PM	115	71	0	186	63	2	0	65	9	102	0	111	362
04:15 PM	111	61	0	172	57	4	0	61	6	96	0	102	335
04:30 PM	136	85	0	221	75	4	0	79	6	107	0	113	413
04:45 PM	125	95	0	220	59	7	0	66	3	112	0	115	401
Total	487	312	0	799	254	17	0	271	24	417	0	441	1511
05:00 PM	119	75	0	194	77	0	0	77	5	102	0	107	378
05:15 PM	111	85	0	196	75	9	0	84	11	107	0	118	398
05:30 PM	98	65	1	164	59	5	0	64	5	95	0	100	328
05:45 PM	112	66	0	178	52	3	0	55	10	114	0	124	357
Total	440	291	1	732	263	17	0	280	31	418	0	449	1461
Grand Total	1384	870	3	2257	810	59	0	869	87	1343	0	1430	4556
Apprch %	61.3	38.5	0.1		93.2	6.8	0		6.1	93.9	0		
Total %	30.4	19.1	0.1	49.5	17.8	1.3	0	19.1	1.9	29.5	0	31.4	
CARS	1347	866	3	2216	806	59	0	865	87	1310	0	1397	4478
% CARS	97.3	99.5	100	98.2	99.5	100	0	99.5	100	97.5	0	97.7	98.3
TRUCKS	37	4	0	41	4	0	0	4	0	33	0	33	78
% TRUCKS	2.7	0.5	0	1.8	0.5	0	0	0.5	0	2.5	0	2.3	1.7

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2



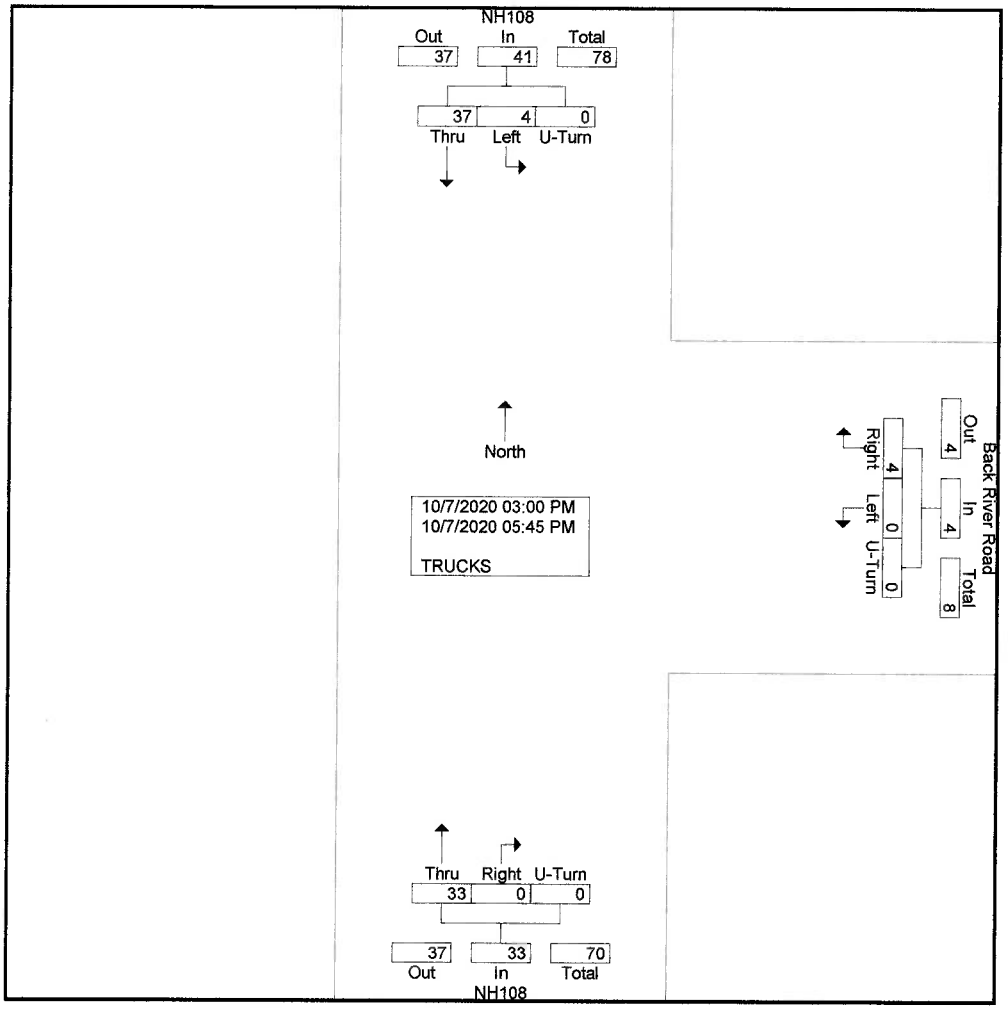
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- TRUCKS

	NH108 From North				Back River Road From East				NH108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	6	0	0	6	0	0	0	0	0	7	0	7	13
03:15 PM	2	2	0	4	1	0	0	1	0	3	0	3	8
03:30 PM	3	0	0	3	0	0	0	0	0	7	0	7	10
03:45 PM	8	0	0	8	1	0	0	1	0	2	0	2	11
Total	19	2	0	21	2	0	0	2	0	19	0	19	42
04:00 PM	3	0	0	3	0	0	0	0	0	3	0	3	6
04:15 PM	2	0	0	2	2	0	0	2	0	0	0	0	4
04:30 PM	2	2	0	4	0	0	0	0	0	3	0	3	7
04:45 PM	5	0	0	5	0	0	0	0	0	1	0	1	6
Total	12	2	0	14	2	0	0	2	0	7	0	7	23
05:00 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
05:15 PM	3	0	0	3	0	0	0	0	0	1	0	1	4
05:30 PM	2	0	0	2	0	0	0	0	0	3	0	3	5
05:45 PM	0	0	0	0	0	0	0	0	0	3	0	3	3
Total	6	0	0	6	0	0	0	0	0	7	0	7	13
Grand Total	37	4	0	41	4	0	0	4	0	33	0	33	78
Apprch %	90.2	9.8	0		100	0	0		0	100	0		
Total %	47.4	5.1	0	52.6	5.1	0	0	5.1	0	42.3	0	42.3	

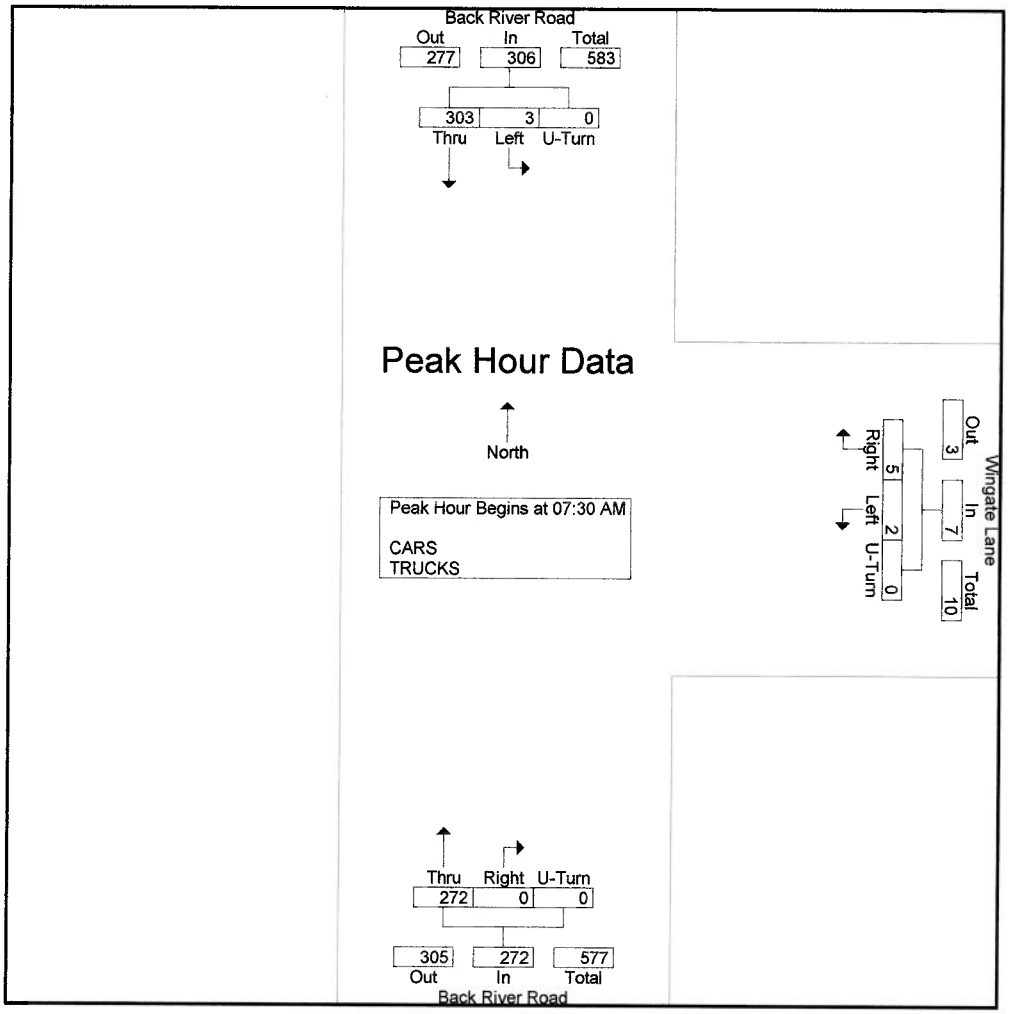


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_2_Wed_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	92	1	0	93	**2**	0	0	2	0	58	0	58	153
07:45 AM	**107**	0	0	**107**	2	**1**	0	**3**	0	81	0	81	**191**
08:00 AM	68	0	0	68	0	1	0	1	0	**85**	0	**85**	154
08:15 AM	36	**2**	0	38	1	0	0	1	0	48	0	48	87
Total Volume	303	3	0	306	5	2	0	7	0	272	0	272	585
% App. Total	99	1	0		71.4	28.6	0		0	100	0		
PHF	.708	.375	.000	.715	.625	.500	.000	.583	.000	.800	.000	.800	.766

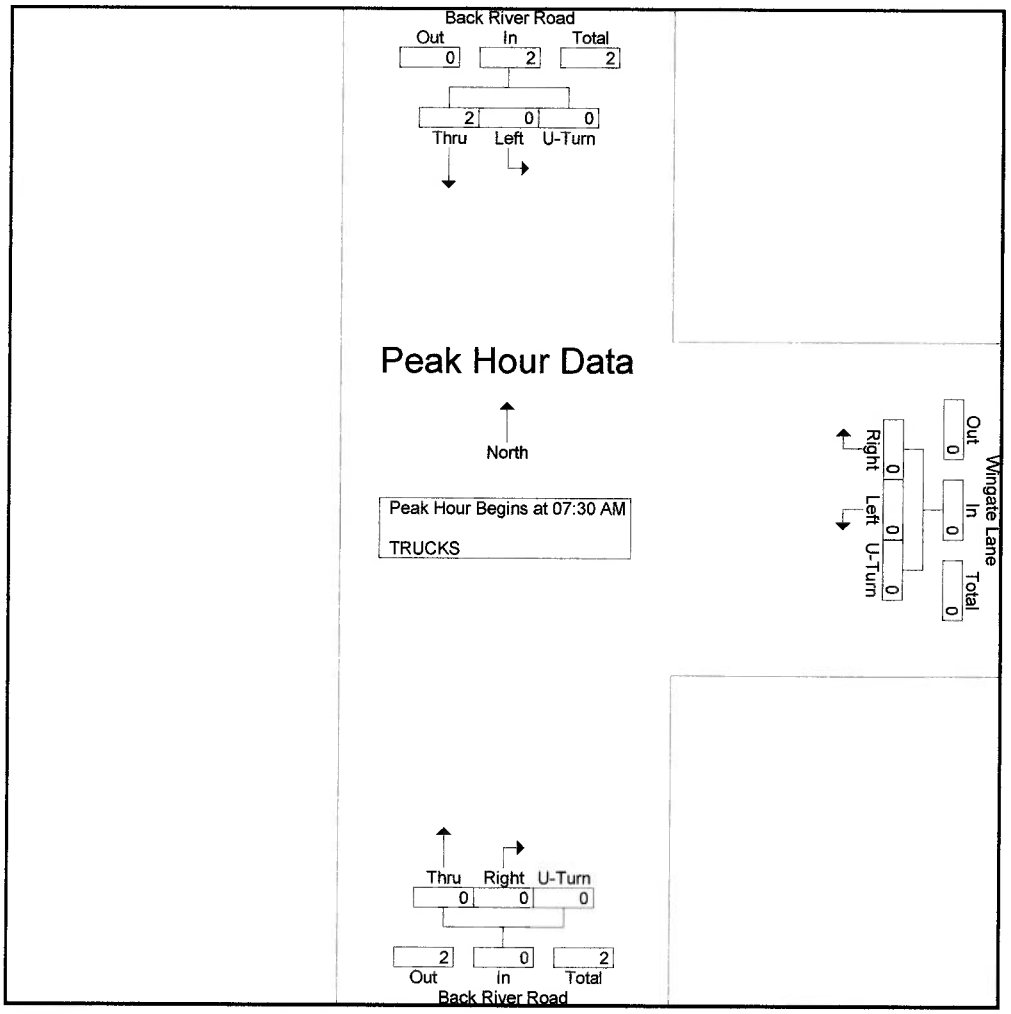


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_2_Wed_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	**1**	0	0	**1**	0	0	0	0	0	0	0	0	**1**
08:00 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	2	0	0	2	0	0	0	0	0	0	0	0	2
% App. Total	100	0	0		0	0	0		0	0	0		
PHF	.500	.000	.000	.500	.000	.000	.000	.000	.000	.000	.000	.000	.500



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

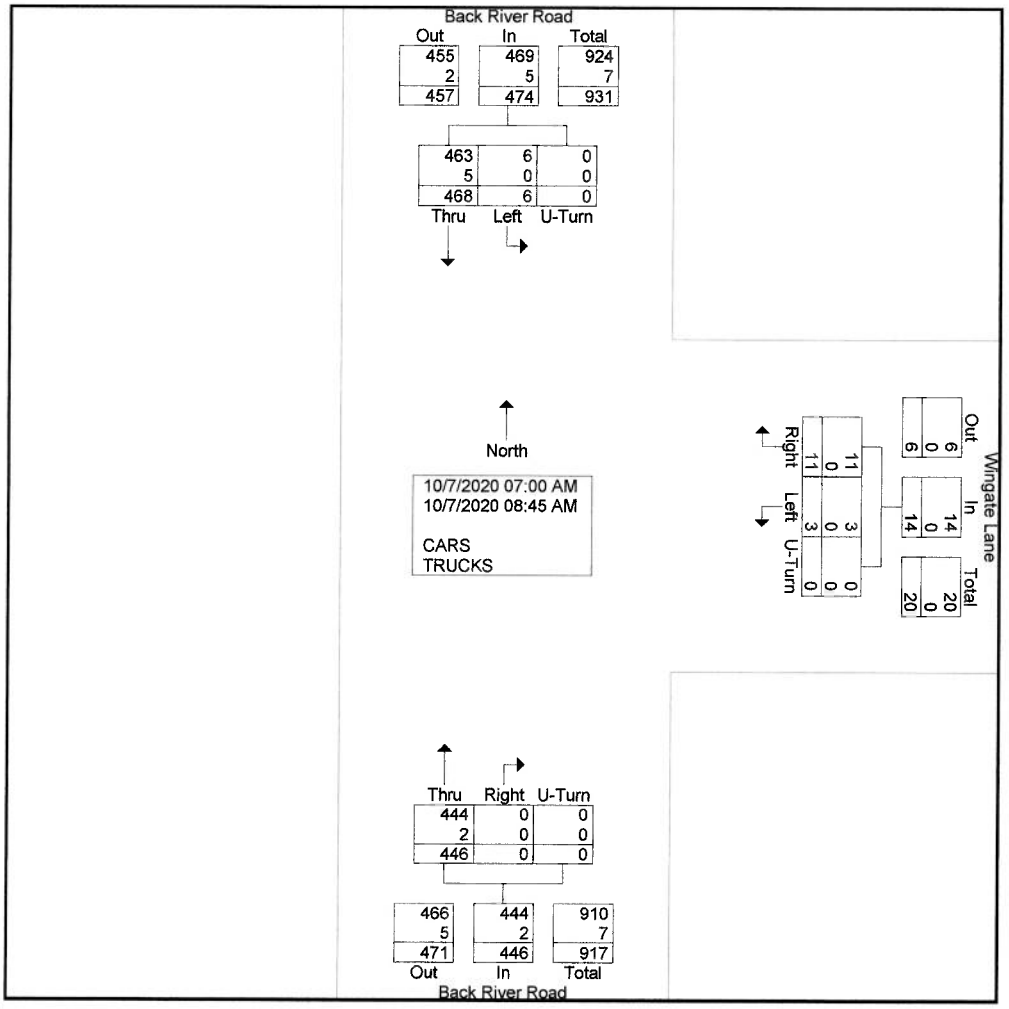
WED

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_2_~~Tues~~_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- CARS - TRUCKS

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	33	0	0	33	1	0	0	1	0	41	0	41	75
07:15 AM	55	1	0	56	1	0	0	1	0	55	0	55	112
07:30 AM	92	1	0	93	2	0	0	2	0	58	0	58	153
07:45 AM	107	0	0	107	2	1	0	3	0	81	0	81	191
Total	287	2	0	289	6	1	0	7	0	235	0	235	531
08:00 AM	68	0	0	68	0	1	0	1	0	85	0	85	154
08:15 AM	36	2	0	38	1	0	0	1	0	48	0	48	87
08:30 AM	43	2	0	45	4	1	0	5	0	36	0	36	86
08:45 AM	34	0	0	34	0	0	0	0	0	42	0	42	76
Total	181	4	0	185	5	2	0	7	0	211	0	211	403
Grand Total	468	6	0	474	11	3	0	14	0	446	0	446	934
Apprch %	98.7	1.3	0		78.6	21.4	0		0	100	0		
Total %	50.1	0.6	0	50.7	1.2	0.3	0	1.5	0	47.8	0	47.8	
CARS	463	6	0	469	11	3	0	14	0	444	0	444	927
% CARS	98.9	100	0	98.9	100	100	0	100	0	99.6	0	99.6	99.3
TRUCKS	5	0	0	5	0	0	0	0	0	2	0	2	7
% TRUCKS	1.1	0	0	1.1	0	0	0	0	0	0.4	0	0.4	0.7



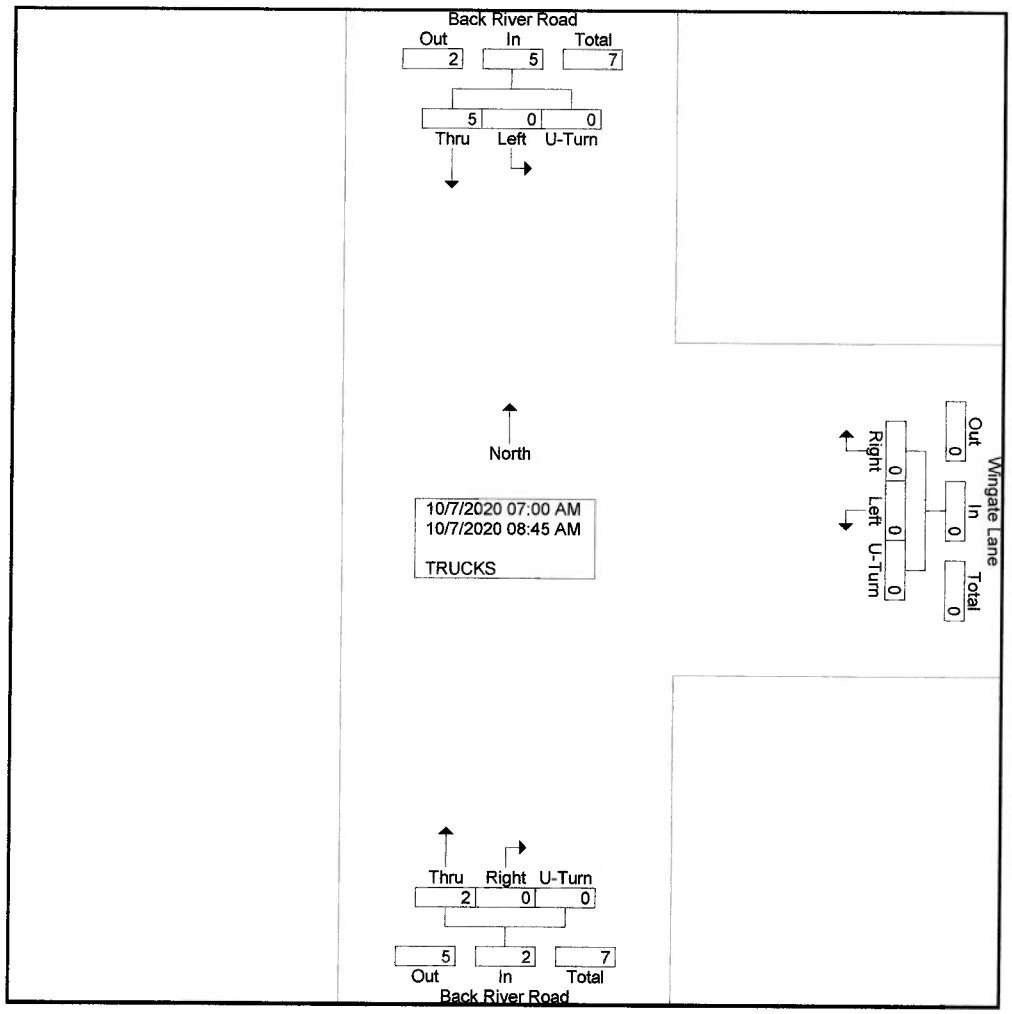
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_2_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- TRUCKS

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	1	0	0	1	0	0	0	0	0	1	0	1	2
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
Total	2	0	0	2	0	0	0	0	0	1	0	1	3
08:00 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	2	0	0	2	0	0	0	0	0	0	0	0	2
08:45 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	3	0	0	3	0	0	0	0	0	1	0	1	4
Grand Total	5	0	0	5	0	0	0	0	0	2	0	2	7
Apprch %	100	0	0		0	0	0		0	100	0		
Total %	71.4	0	0	71.4	0	0	0	0	0	28.6	0	28.6	



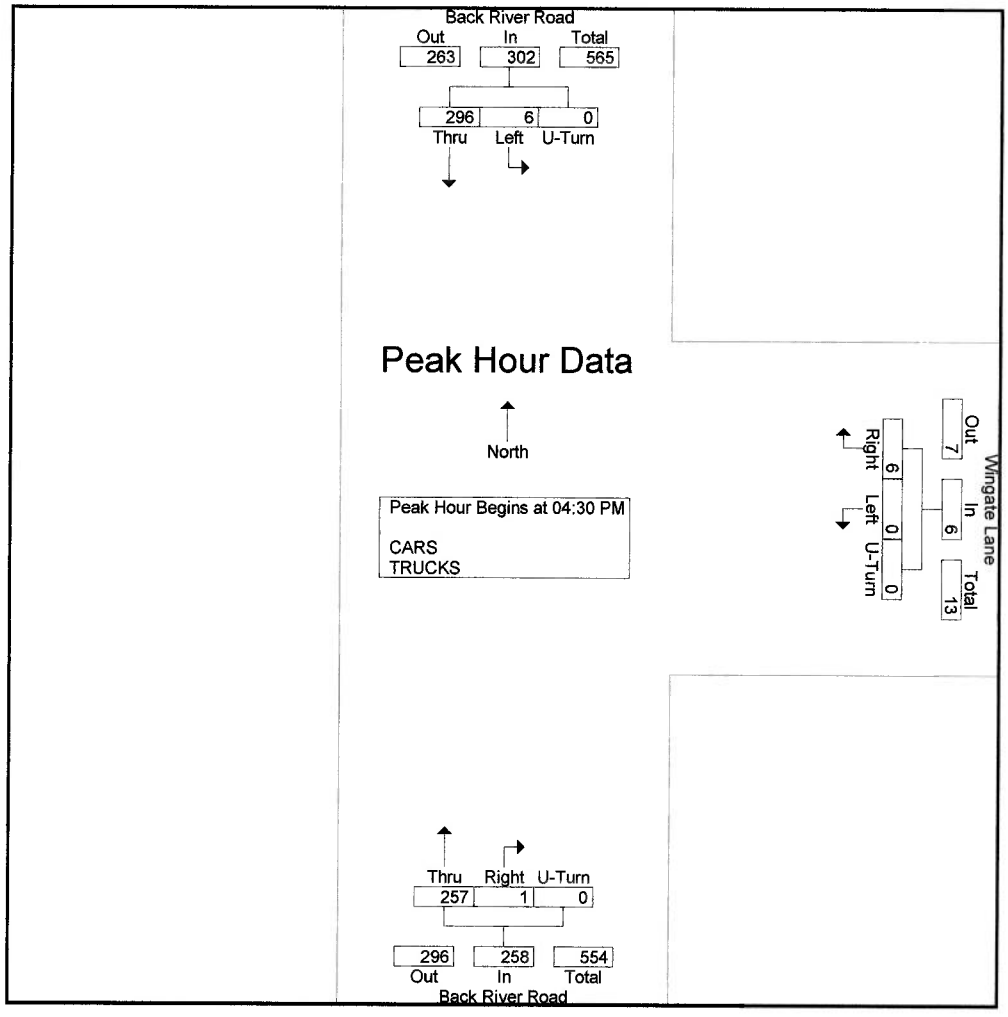
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

WED

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_2_~~Tues~~_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 3

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	75	1	0	76	2	0	0	2	0	67	0	67	145
04:45 PM	**85**	**2**	0	**87**	1	0	0	1	0	49	0	49	137
05:00 PM	64	2	0	66	**3**	0	0	**3**	**1**	61	0	62	131
05:15 PM	72	1	0	73	0	0	0	0	0	**80**	0	**80**	**153**
Total Volume	296	6	0	302	6	0	0	6	1	257	0	258	566
% App. Total	98	2	0		100	0	0		0.4	99.6	0		
PHF	.871	.750	.000	.868	.500	.000	.000	.500	.250	.803	.000	.806	.925

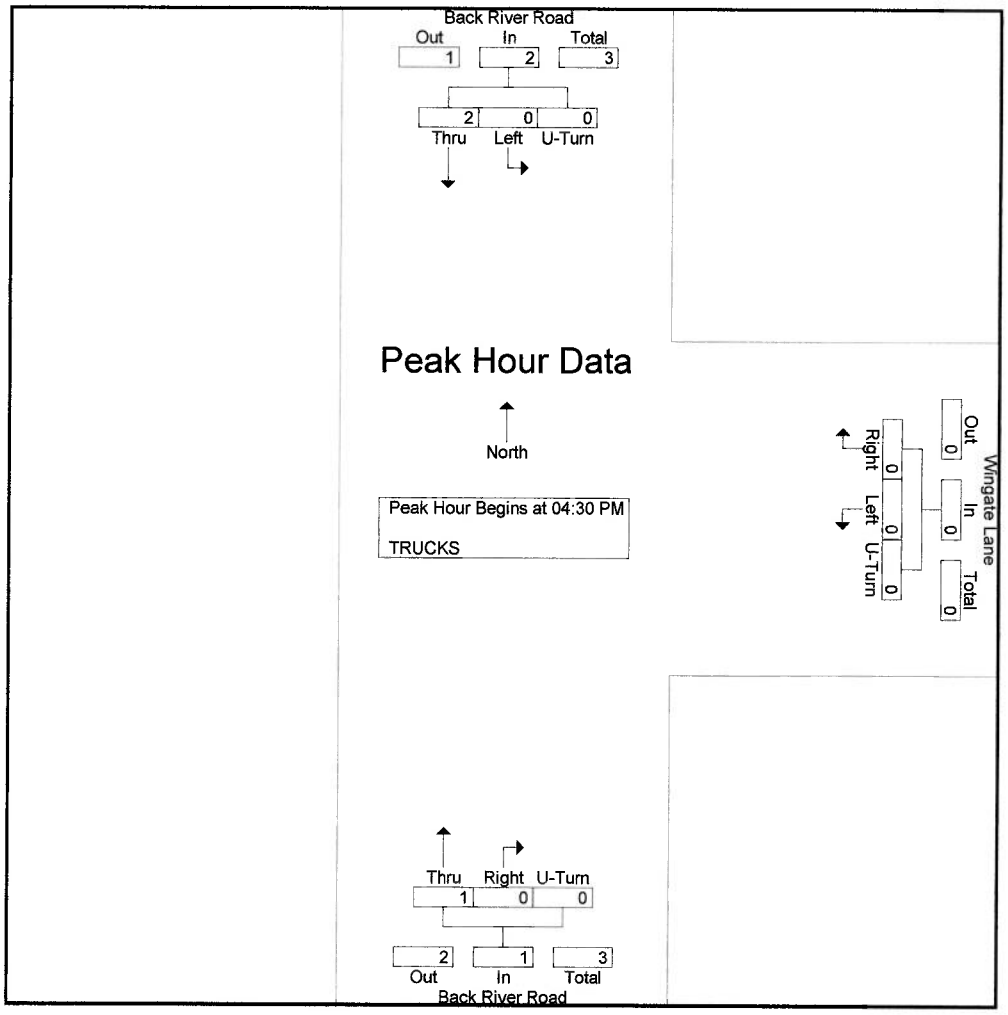


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_2_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	**2**	0	0	**2**	0	0	0	0	0	**1**	0	**1**	**3**
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	2	0	0	2	0	0	0	0	0	1	0	1	3
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.250	.000	.000	.250	.000	.000	.000	.000	.000	.250	.000	.250	.250



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_2_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

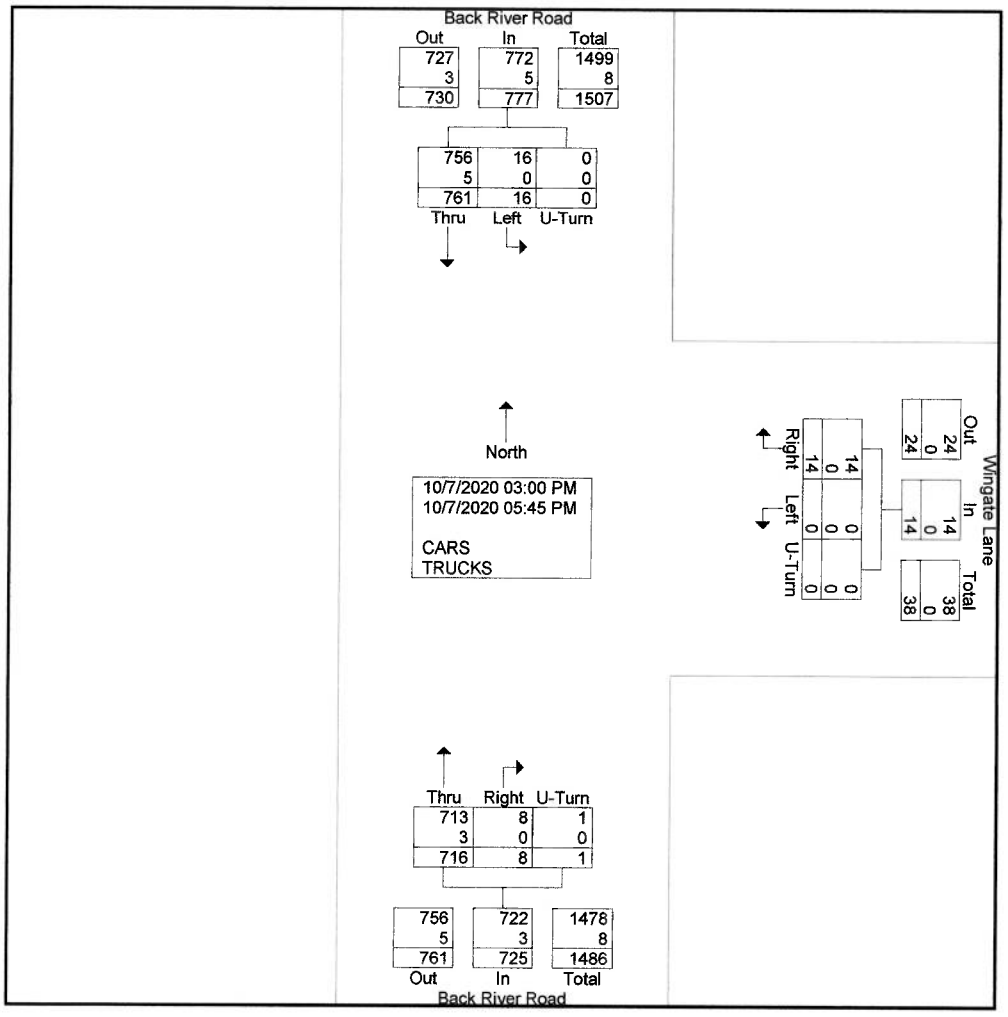
Groups Printed- CARS - TRUCKS

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	78	2	0	80	1	0	0	1	2	58	0	60	141
03:15 PM	64	0	0	64	1	0	0	1	1	80	0	81	146
03:30 PM	47	1	0	48	1	0	0	1	0	77	1	78	127
03:45 PM	55	0	0	55	2	0	0	2	1	52	0	53	110
Total	244	3	0	247	5	0	0	5	4	267	1	272	524
04:00 PM	53	2	0	55	2	0	0	2	0	56	0	56	113
04:15 PM	56	1	0	57	0	0	0	0	1	45	0	46	103
04:30 PM	75	1	0	76	2	0	0	2	0	67	0	67	145
04:45 PM	85	2	0	87	1	0	0	1	0	49	0	49	137
Total	269	6	0	275	5	0	0	5	1	217	0	218	498
05:00 PM	64	2	0	66	3	0	0	3	1	61	0	62	131
05:15 PM	72	1	0	73	0	0	0	0	0	80	0	80	153
05:30 PM	57	2	0	59	1	0	0	1	0	47	0	47	107
05:45 PM	55	2	0	57	0	0	0	0	2	44	0	46	103
Total	248	7	0	255	4	0	0	4	3	232	0	235	494
Grand Total	761	16	0	777	14	0	0	14	8	716	1	725	1516
Apprch %	97.9	2.1	0		100	0	0		1.1	98.8	0.1		
Total %	50.2	1.1	0	51.3	0.9	0	0	0.9	0.5	47.2	0.1	47.8	
CARS	756	16	0	772	14	0	0	14	8	713	1	722	1508
% CARS	99.3	100	0	99.4	100	0	0	100	100	99.6	100	99.6	99.5
TRUCKS	5	0	0	5	0	0	0	0	0	3	0	3	8
% TRUCKS	0.7	0	0	0.6	0	0	0	0	0	0.4	0	0.4	0.5

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_2_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2



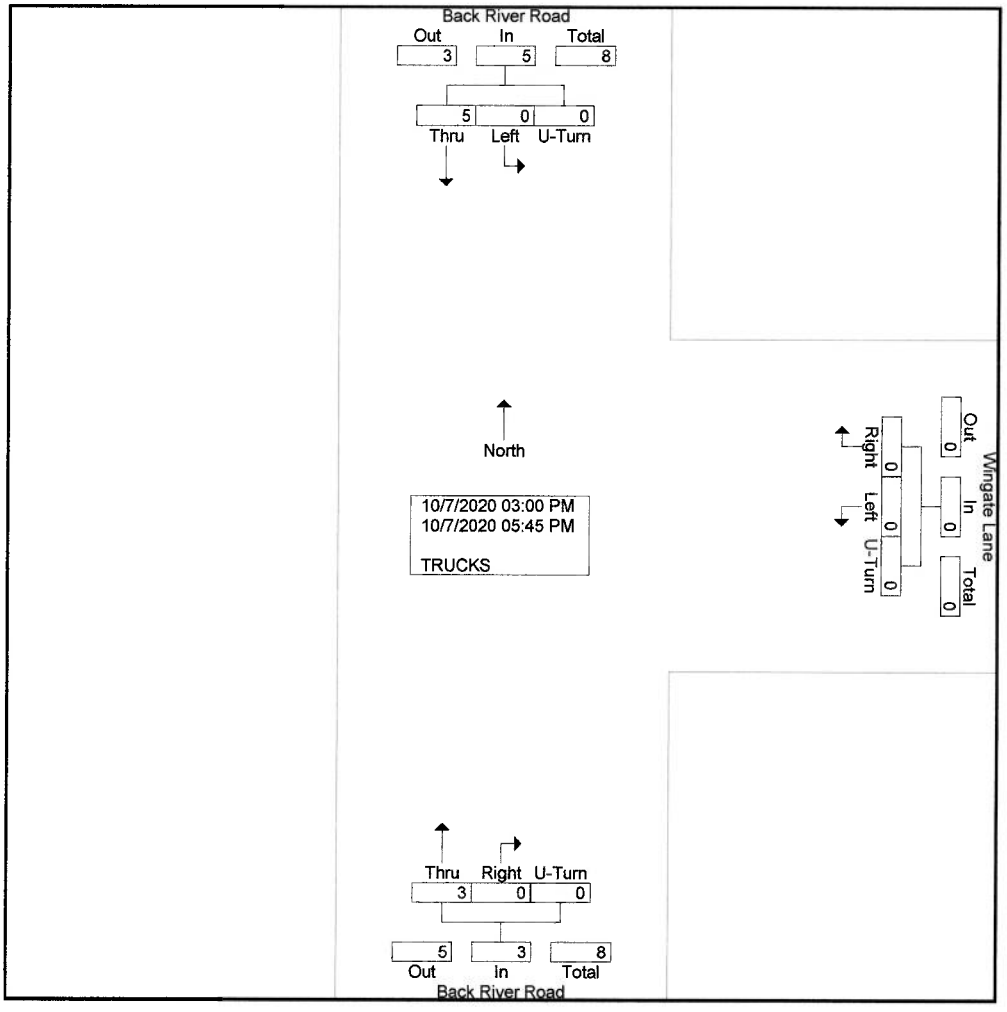
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_2_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- TRUCKS

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
03:15 PM	2	0	0	2	0	0	0	0	0	1	0	1	3
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	3	0	0	3	0	0	0	0	0	2	0	2	5
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	2	0	0	2	0	0	0	0	0	1	0	1	3
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	2	0	0	0	0	0	1	0	1	3
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	5	0	0	5	0	0	0	0	0	3	0	3	8
Apprch %	100	0	0		0	0	0		0	100	0		
Total %	62.5	0	0	62.5	0	0	0	0	0	37.5	0	37.5	



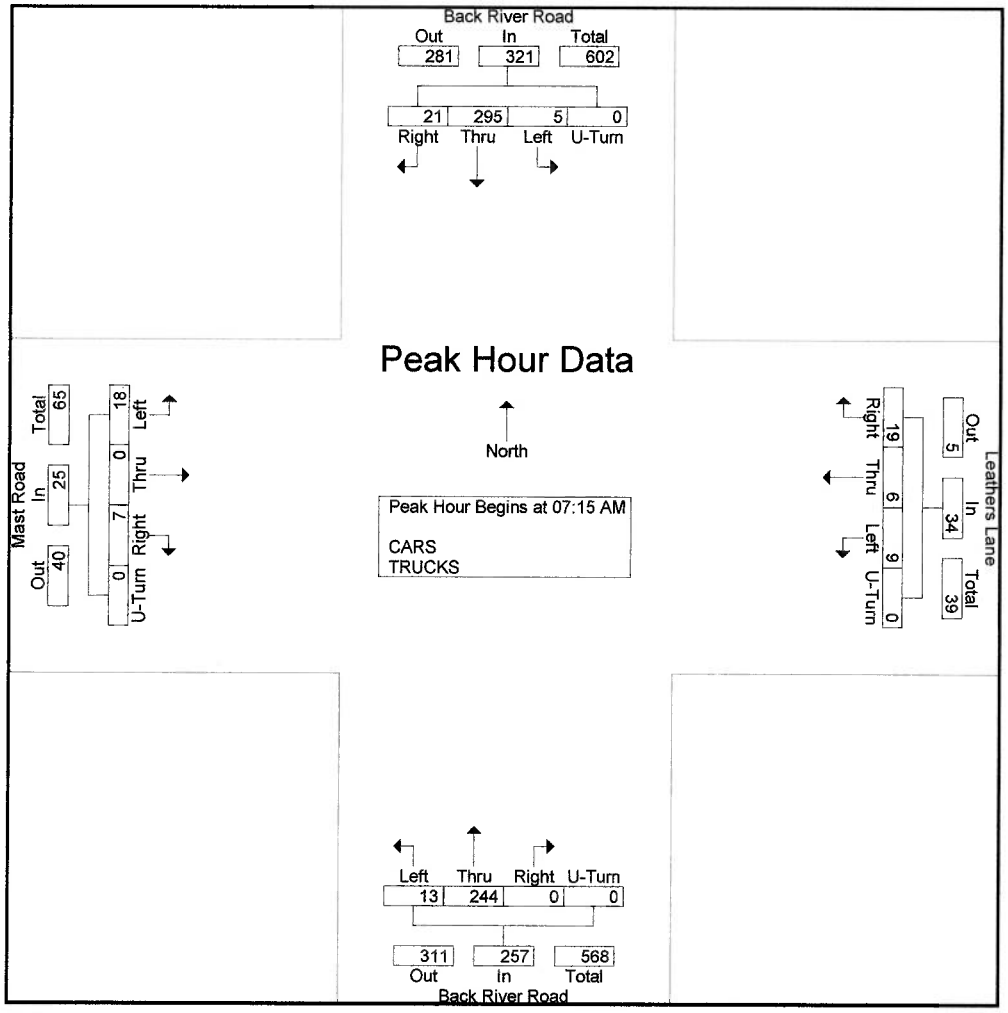
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

WED

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_~~Tues~~_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	53	**2**	0	55	5	**3**	1	0	9	0	45	3	0	48	2	0	**5**	0	**7**	119
07:30 AM	6	82	0	0	88	3	0	2	0	5	0	51	**4**	0	55	**3**	0	4	0	7	155
07:45 AM	7	**99**	1	0	**107**	**6**	2	**4**	0	**12**	0	72	2	0	74	2	0	4	0	6	**199**
08:00 AM	**8**	61	2	0	71	5	1	2	0	8	0	**76**	4	0	**80**	0	0	5	0	5	164
Total Volume	21	295	5	0	321	19	6	9	0	34	0	244	13	0	257	7	0	18	0	25	637
% App. Total	6.5	91.9	1.6	0		55.9	17.6	26.5	0		0	94.9	5.1	0		28	0	72	0		
PHF	.656	.745	.625	.000	.750	.792	.500	.563	.000	.708	.000	.803	.813	.000	.803	.583	.000	.900	.000	.893	.800

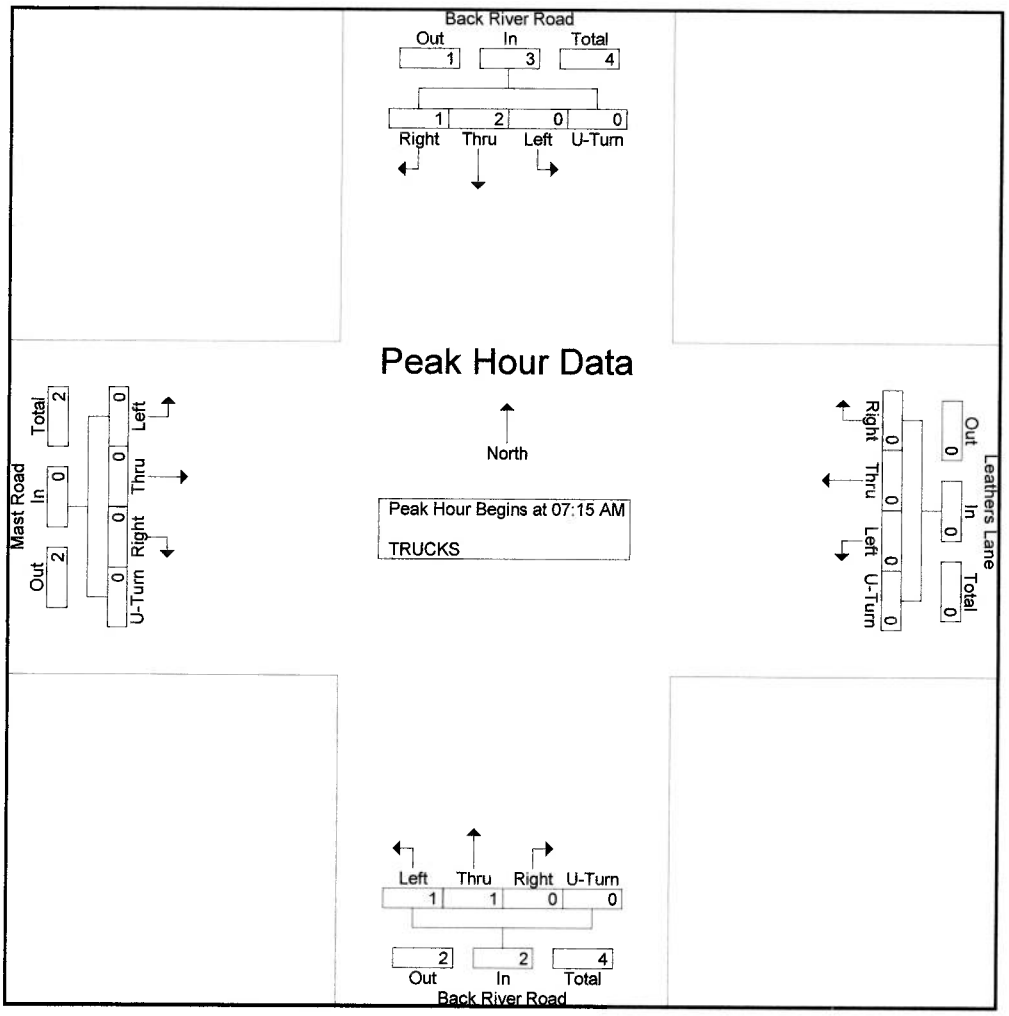


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 08:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	**1**	0	0	**1**	0	0	0	0	0	0	**1**	0	0	**1**	0	0	0	0	0	**2**
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	1	0	0	0	0	0	1
07:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:00 AM	**1**	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total Volume	1	2	0	0	3	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	5
% App. Total	33.3	66.7	0	0		0	0	0	0		0	50	50	0		0	0	0	0		
PHF	.250	.500	.000	.000	.750	.000	.000	.000	.000	.000	.000	.250	.250	.000	.500	.000	.000	.000	.000	.000	.625



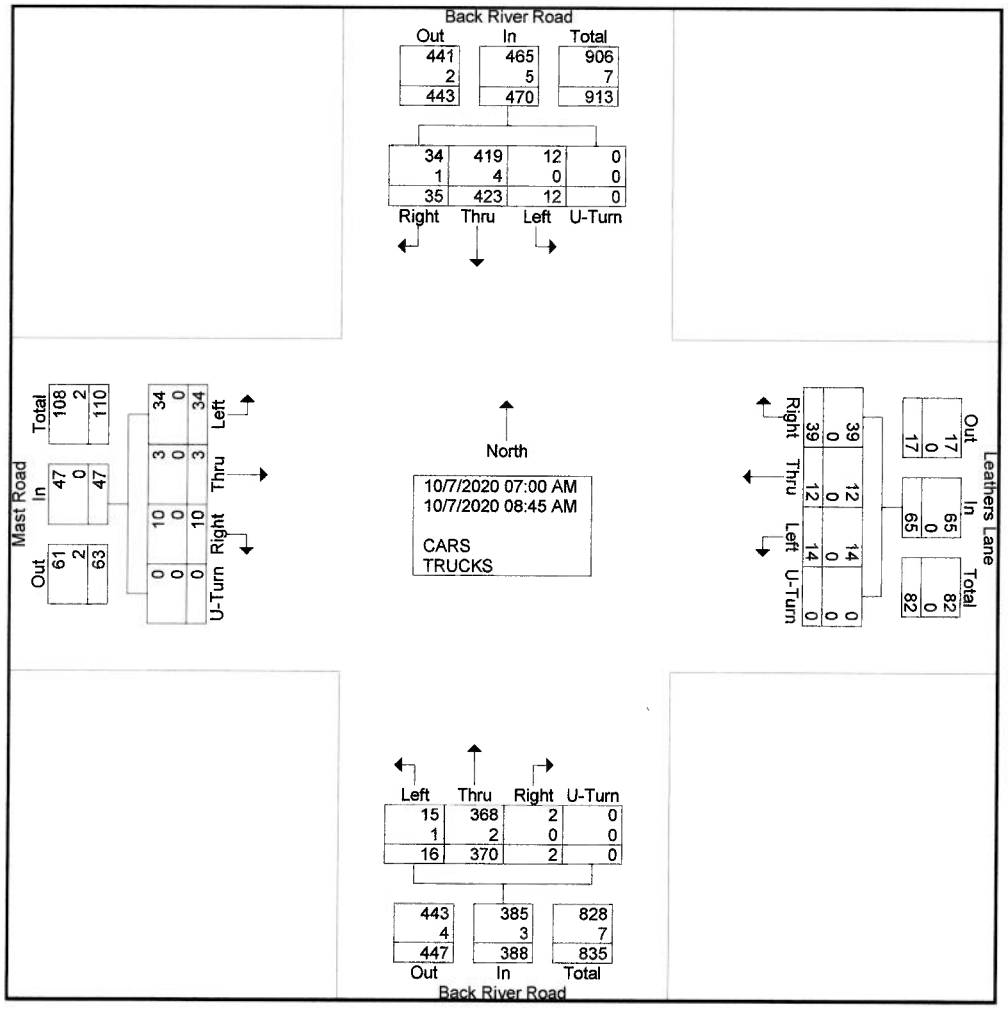
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- CARS - TRUCKS

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	1	30	1	0	32	6	0	5	0	11	1	31	1	0	33	1	0	2	0	3	79
07:15 AM	0	53	2	0	55	5	3	1	0	9	0	45	3	0	48	2	0	5	0	7	119
07:30 AM	6	82	0	0	88	3	0	2	0	5	0	51	4	0	55	3	0	4	0	7	155
07:45 AM	7	99	1	0	107	6	2	4	0	12	0	72	2	0	74	2	0	4	0	6	199
Total	14	264	4	0	282	20	5	12	0	37	1	199	10	0	210	8	0	15	0	23	552
08:00 AM	8	61	2	0	71	5	1	2	0	8	0	76	4	0	80	0	0	5	0	5	164
08:15 AM	5	30	4	0	39	3	2	0	0	5	0	41	0	0	41	2	0	3	0	5	90
08:30 AM	4	38	1	0	43	4	2	0	0	6	0	24	1	0	25	0	2	6	0	8	82
08:45 AM	4	30	1	0	35	7	2	0	0	9	1	30	1	0	32	0	1	5	0	6	82
Total	21	159	8	0	188	19	7	2	0	28	1	171	6	0	178	2	3	19	0	24	418
Grand Total	35	423	12	0	470	39	12	14	0	65	2	370	16	0	388	10	3	34	0	47	970
Apprch %	7.4	90	2.6	0		60	18.5	21.5	0		0.5	95.4	4.1	0		21.3	6.4	72.3	0		
Total %	3.6	43.6	1.2	0	48.5	4	1.2	1.4	0	6.7	0.2	38.1	1.6	0	40	1	0.3	3.5	0	4.8	
CARS	34	419	12	0	465	39	12	14	0	65	2	368	15	0	385	10	3	34	0	47	962
% CARS	97.1	99.1	100	0	98.9	100	100	100	0	100	100	99.5	93.8	0	99.2	100	100	100	0	100	99.2
TRUCKS	1	4	0	0	5	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	8
% TRUCKS	2.9	0.9	0	0	1.1	0	0	0	0	0	0	0.5	6.2	0	0.8	0	0	0	0	0	0.8



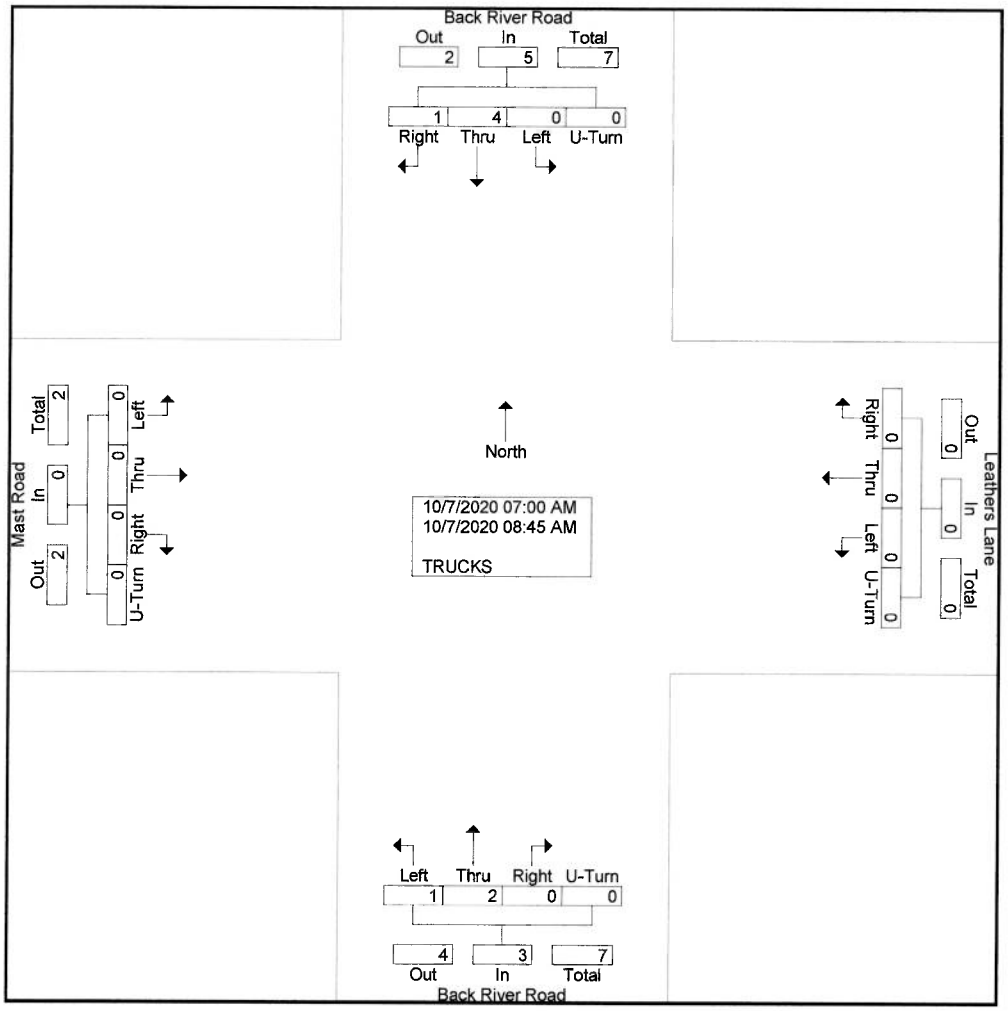
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- TRUCKS

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
07:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	2	0	0	2	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	4
08:00 AM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30 AM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
08:45 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total	1	2	0	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
Grand Total	1	4	0	0	5	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	8
Apprch %	20	80	0	0		0	0	0	0		0	66.7	33.3	0		0	0	0	0		
Total %	12.5	50	0	0	62.5	0	0	0	0	0	0	25	12.5	0	37.5	0	0	0	0	0	

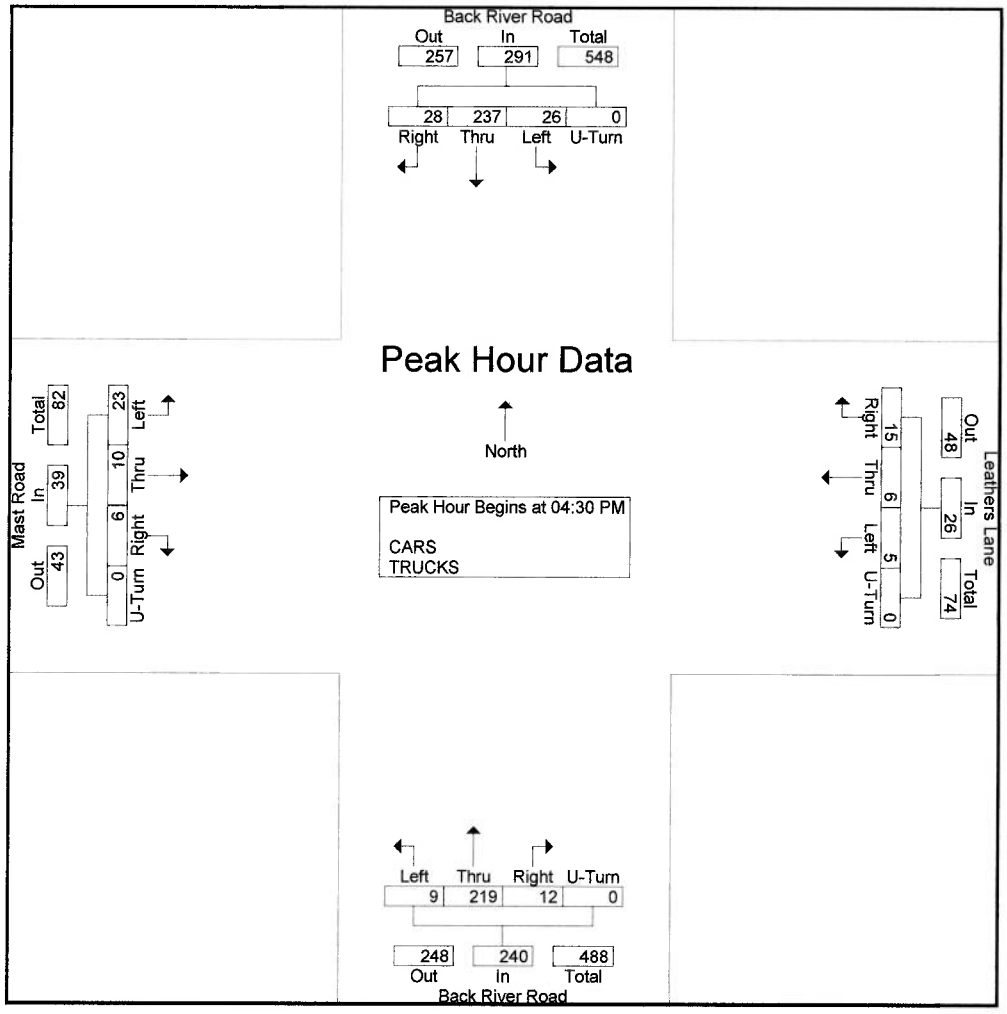


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_~~Tues~~ WED _AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 3

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	**9**	47	**15**	0	71	2	1	**2**	0	5	0	57	**3**	0	60	1	2	**8**	0	**11**	147
04:45 PM	6	**81**	1	0	**88**	3	**2**	1	0	6	1	44	2	0	47	**4**	**3**	4	0	11	152
05:00 PM	8	46	6	0	60	**7**	1	2	0	**10**	**6**	50	3	0	59	1	2	3	0	6	135
05:15 PM	5	63	4	0	72	3	2	0	0	5	5	**68**	1	0	**74**	0	3	8	0	11	**162**
Total Volume	28	237	26	0	291	15	6	5	0	26	12	219	9	0	240	6	10	23	0	39	596
% App. Total	9.6	81.4	8.9	0		57.7	23.1	19.2	0		5	91.2	3.8	0		15.4	25.6	59	0		
PHF	.778	.731	.433	.000	.827	.536	.750	.625	.000	.650	.500	.805	.750	.000	.811	.375	.833	.719	.000	.886	.920

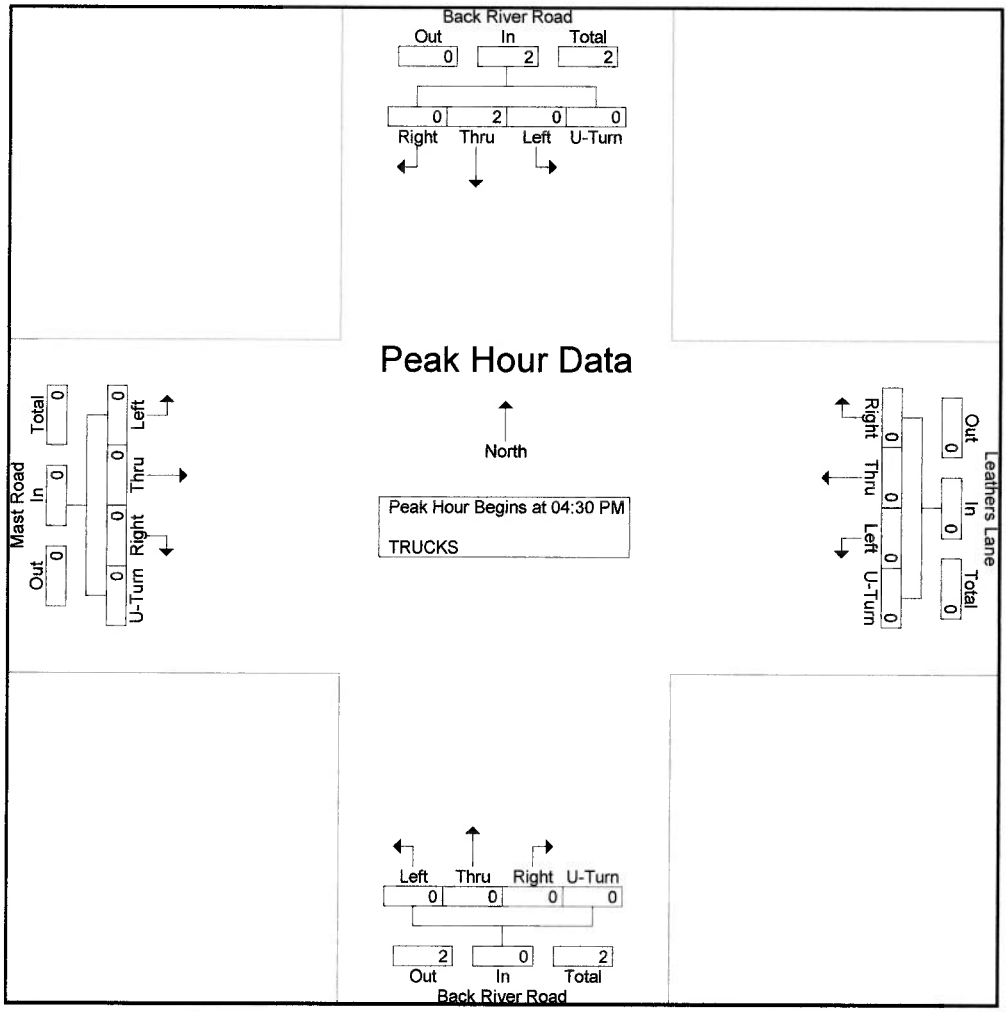


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	**2**	0	0	**2**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
% App. Total	0	100	0	0		0	0	0	0		0	0	0	0		0	0	0	0		
PHF	.000	.250	.000	.000	.250	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.250



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

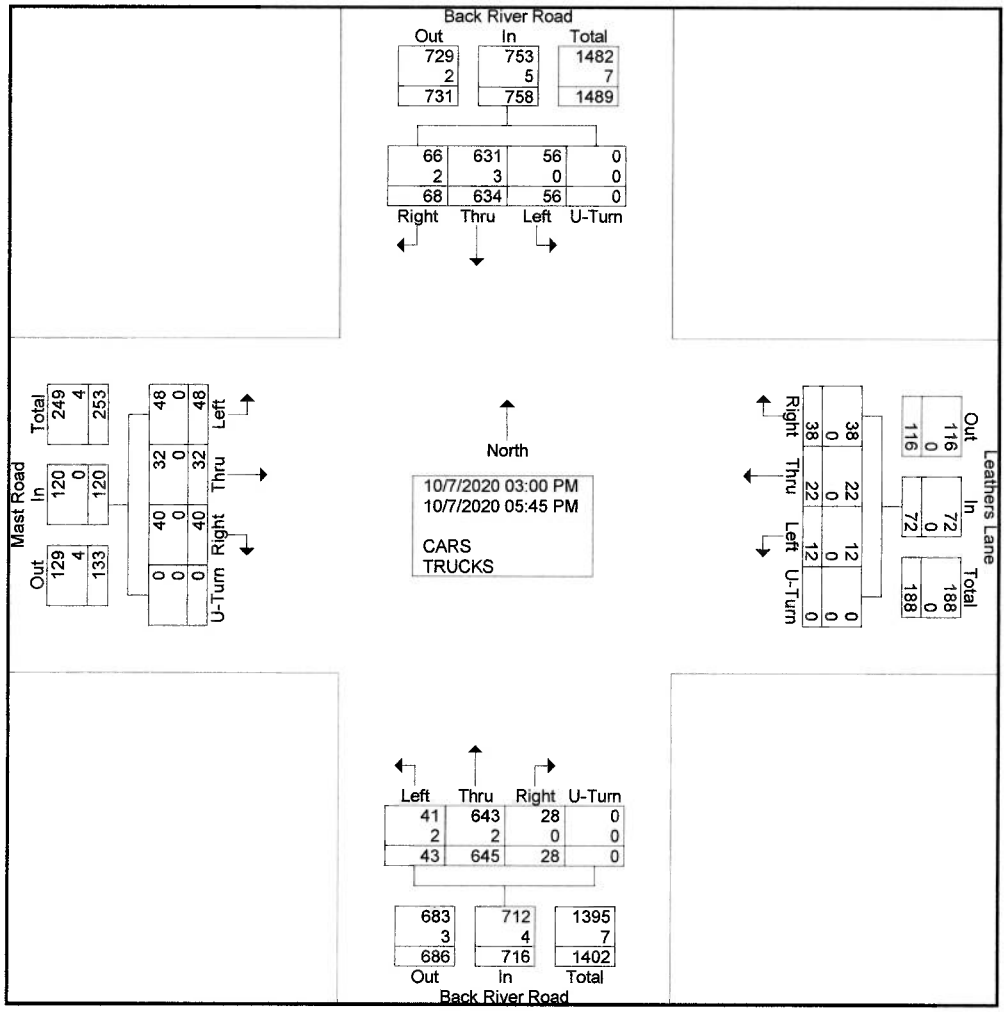
Groups Printed- CARS - TRUCKS

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
03:00 PM	5	69	2	0	76	1	1	1	0	3	3	61	6	0	70	4	1	1	0	6	155
03:15 PM	4	59	5	0	68	4	1	0	0	5	4	74	4	0	82	2	2	2	0	6	161
03:30 PM	2	42	1	0	45	2	1	0	0	3	0	74	10	0	84	6	3	3	0	12	144
03:45 PM	7	43	4	0	54	4	1	0	0	5	1	48	1	0	50	3	6	0	0	9	118
Total	18	213	12	0	243	11	4	1	0	16	8	257	21	0	286	15	12	6	0	33	578
04:00 PM	2	46	5	0	53	4	4	1	0	9	2	48	5	0	55	4	1	4	0	9	126
04:15 PM	5	48	3	0	56	4	3	3	0	10	3	38	2	0	43	3	2	5	0	10	119
04:30 PM	9	47	15	0	71	2	1	2	0	5	0	57	3	0	60	1	2	8	0	11	147
04:45 PM	6	81	1	0	88	3	2	1	0	6	1	44	2	0	47	4	3	4	0	11	152
Total	22	222	24	0	268	13	10	7	0	30	6	187	12	0	205	12	8	21	0	41	544
05:00 PM	8	46	6	0	60	7	1	2	0	10	6	50	3	0	59	1	2	3	0	6	135
05:15 PM	5	63	4	0	72	3	2	0	0	5	5	68	1	0	74	0	3	8	0	11	162
05:30 PM	7	46	8	0	61	2	2	1	0	5	2	43	5	0	50	5	1	5	0	11	127
05:45 PM	8	44	2	0	54	2	3	1	0	6	1	40	1	0	42	7	6	5	0	18	120
Total	28	199	20	0	247	14	8	4	0	26	14	201	10	0	225	13	12	21	0	46	544
Grand Total	68	634	56	0	758	38	22	12	0	72	28	645	43	0	716	40	32	48	0	120	1666
Apprch %	9	83.6	7.4	0		52.8	30.6	16.7	0		3.9	90.1	6	0		33.3	26.7	40	0		
Total %	4.1	38.1	3.4	0	45.5	2.3	1.3	0.7	0	4.3	1.7	38.7	2.6	0	43	2.4	1.9	2.9	0	7.2	
CARS	66	631	56	0	753	38	22	12	0	72	28	643	41	0	712	40	32	48	0	120	1657
% CARS	97.1	99.5	100	0	99.3	100	100	100	0	100	100	99.7	95.3	0	99.4	100	100	100	0	100	99.5
TRUCKS	2	3	0	0	5	0	0	0	0	0	0	2	2	0	4	0	0	0	0	0	9
% TRUCKS	2.9	0.5	0	0	0.7	0	0	0	0	0	0	0.3	4.7	0	0.6	0	0	0	0	0	0.5

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2



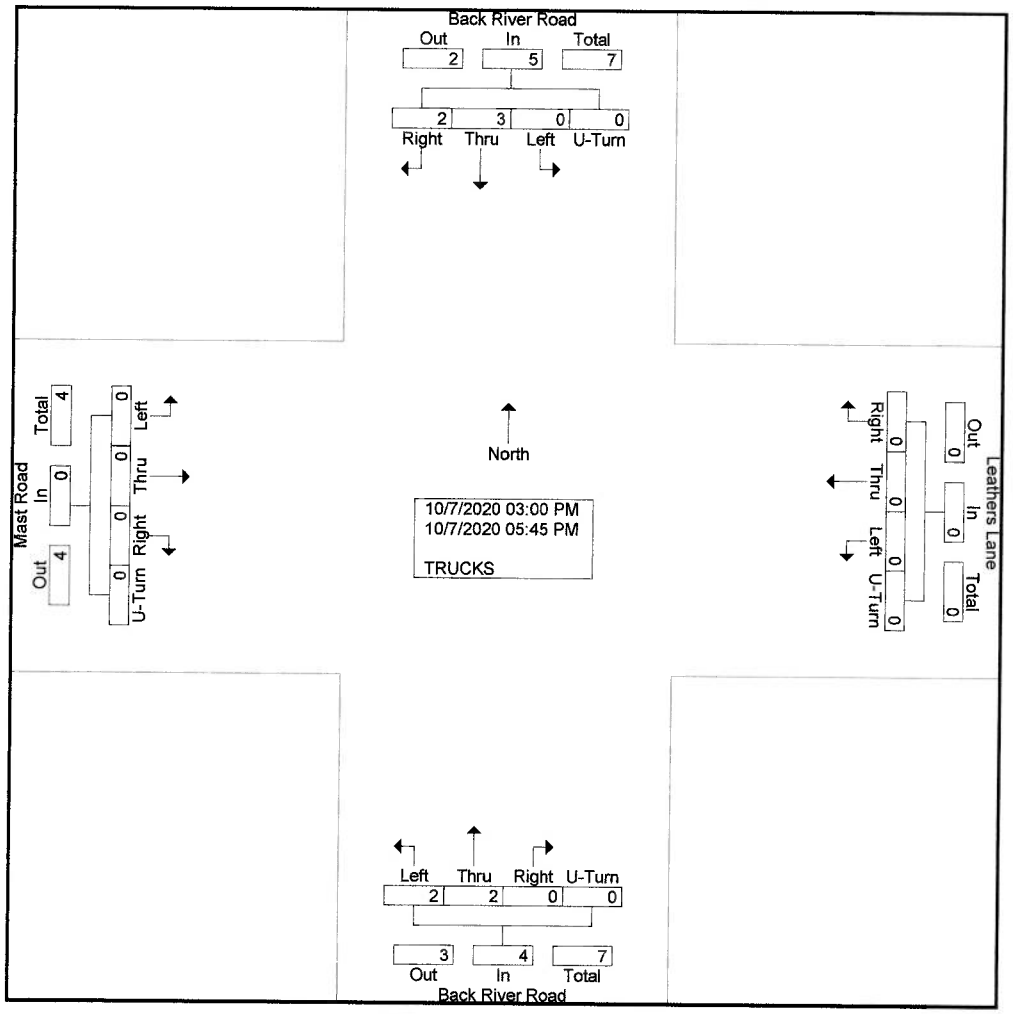
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Tues_AM_&_PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- TRUCKS

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
03:15 PM	2	1	0	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
03:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
Total	2	1	0	0	3	0	0	0	0	0	0	2	1	0	3	0	0	0	0	0	6
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	0	0	2	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	3
05:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	2	3	0	0	5	0	0	0	0	0	0	2	2	0	4	0	0	0	0	0	9
Apprch %	40	60	0	0		0	0	0	0		0	50	50	0		0	0	0	0		
Total %	22.2	33.3	0	0	55.6	0	0	0	0	0	0	22.2	22.2	0	44.4	0	0	0	0	0	

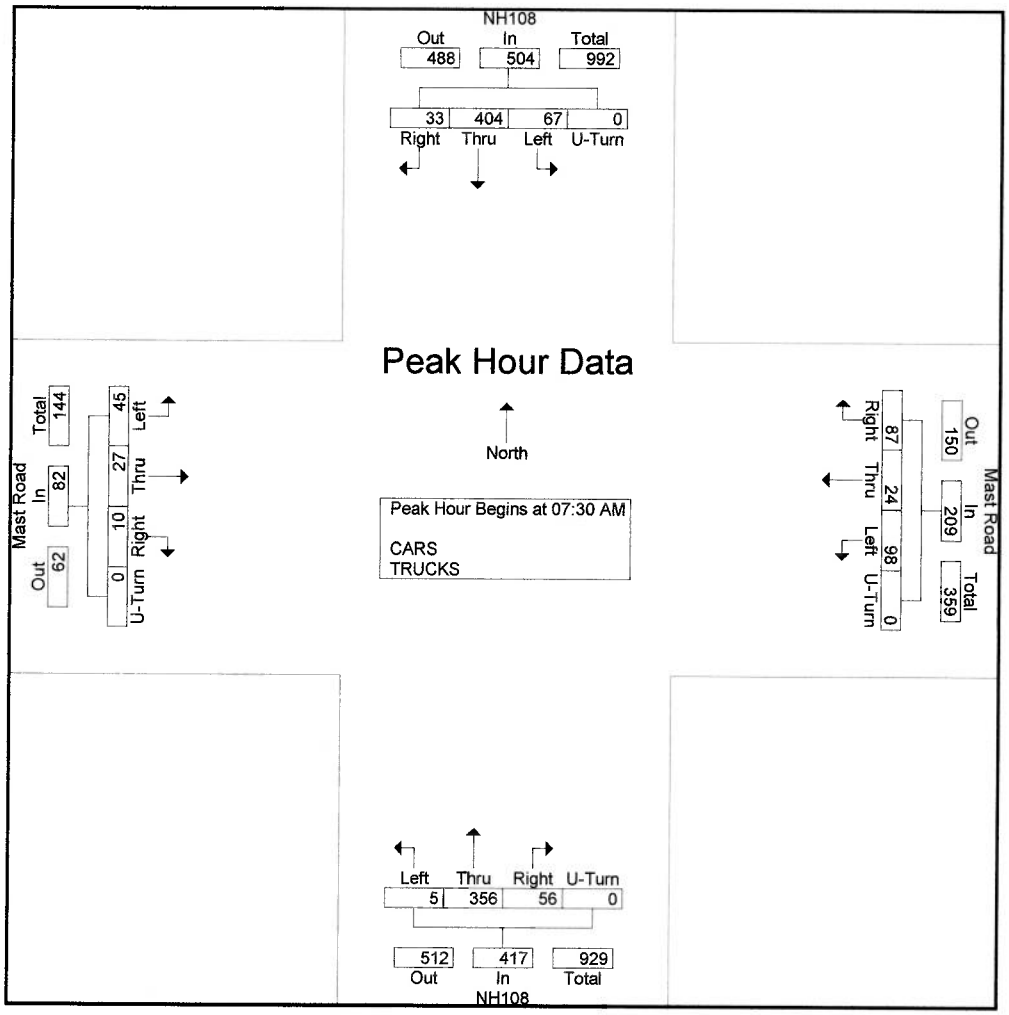


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT 4 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	6	100	14	0	120	**27**	4	22	0	53	20	**100**	1	0	**121**	**3**	8	12	0	23	317
07:45 AM	**12**	**122**	17	0	**151**	27	**9**	23	0	59	**26**	92	**2**	0	120	3	**13**	**14**	0	**30**	**360**
08:00 AM	8	95	**20**	0	123	20	6	**35**	0	**61**	6	80	1	0	87	2	5	7	0	14	285
08:15 AM	7	87	16	0	110	13	5	18	0	36	4	84	1	0	89	2	1	12	0	15	250
Total Volume	33	404	67	0	504	87	24	98	0	209	56	356	5	0	417	10	27	45	0	82	1212
% App. Total	6.5	80.2	13.3	0		41.6	11.5	46.9	0		13.4	85.4	1.2	0		12.2	32.9	54.9	0		
PHF	.688	.828	.838	.000	.834	.806	.667	.700	.000	.857	.538	.890	.625	.000	.862	.833	.519	.804	.000	.683	.842

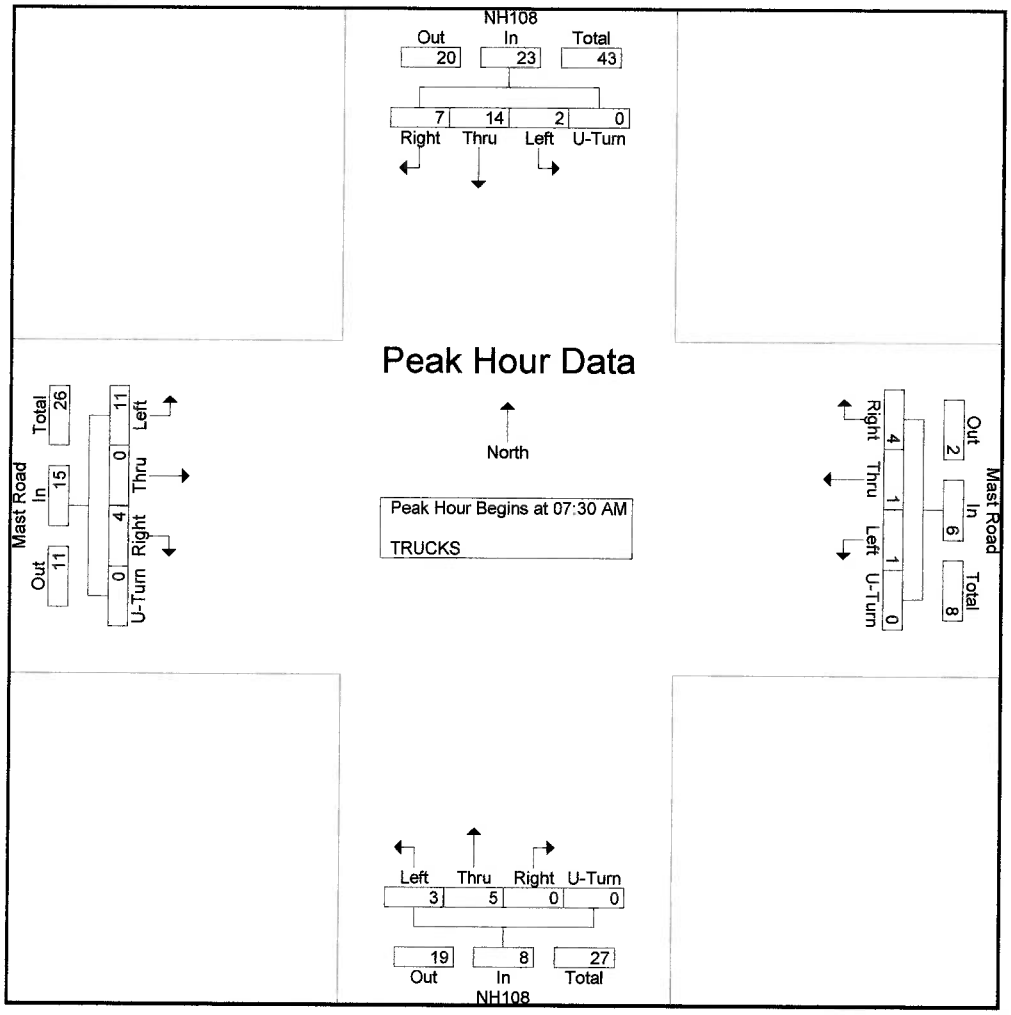


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT 4 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	0	2	**1**	0	3	1	0	**1**	0	2	0	1	0	0	1	1	0	2	0	3	9
07:45 AM	**4**	1	0	0	5	1	0	0	0	1	0	1	**2**	0	**3**	**2**	0	**5**	0	**7**	**16**
08:00 AM	3	4	1	0	**8**	0	0	0	0	0	0	1	0	0	1	1	0	1	0	2	11
08:15 AM	0	**7**	0	0	7	**2**	**1**	0	0	**3**	0	**2**	1	0	3	0	0	3	0	3	16
Total Volume	7	14	2	0	23	4	1	1	0	6	0	5	3	0	8	4	0	11	0	15	52
% App. Total	30.4	60.9	8.7	0		66.7	16.7	16.7	0		0	62.5	37.5	0		26.7	0	73.3	0		
PHF	.438	.500	.500	.000	.719	.500	.250	.250	.000	.500	.000	.625	.375	.000	.667	.500	.000	.550	.000	.536	.813



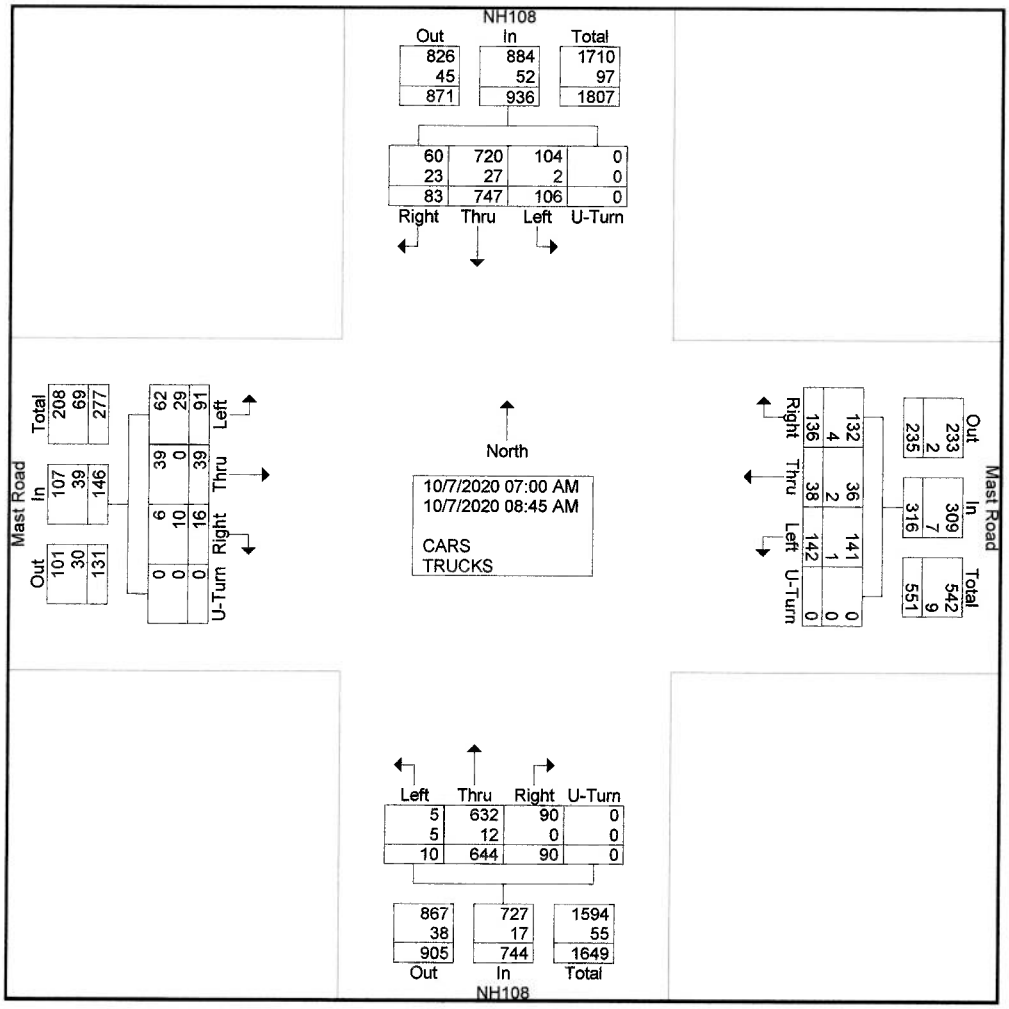
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT 4 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- CARS - TRUCKS

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	9	79	9	0	97	13	4	8	0	25	9	56	1	0	66	1	1	18	0	20	208
07:15 AM	7	78	10	0	95	13	5	14	0	32	16	75	2	0	93	2	7	14	0	23	243
07:30 AM	6	100	14	0	120	27	4	22	0	53	20	100	1	0	121	3	8	12	0	23	317
07:45 AM	12	122	17	0	151	27	9	23	0	59	26	92	2	0	120	3	13	14	0	30	360
Total	34	379	50	0	463	80	22	67	0	169	71	323	6	0	400	9	29	58	0	96	1128
08:00 AM	8	95	20	0	123	20	6	35	0	61	6	80	1	0	87	2	5	7	0	14	285
08:15 AM	7	87	16	0	110	13	5	18	0	36	4	84	1	0	89	2	1	12	0	15	250
08:30 AM	15	92	9	0	116	13	4	13	0	30	7	87	0	0	94	1	3	5	0	9	249
08:45 AM	19	94	11	0	124	10	1	9	0	20	2	70	2	0	74	2	1	9	0	12	230
Total	49	368	56	0	473	56	16	75	0	147	19	321	4	0	344	7	10	33	0	50	1014
Grand Total	83	747	106	0	936	136	38	142	0	316	90	644	10	0	744	16	39	91	0	146	2142
Apprch %	8.9	79.8	11.3	0		43	12	44.9	0		12.1	86.6	1.3	0		11	26.7	62.3	0		
Total %	3.9	34.9	4.9	0	43.7	6.3	1.8	6.6	0	14.8	4.2	30.1	0.5	0	34.7	0.7	1.8	4.2	0	6.8	
CARS	60	720	104	0	884	132	36	141	0	309	90	632	5	0	727	6	39	62	0	107	2027
% CARS	72.3	96.4	98.1	0	94.4	97.1	94.7	99.3	0	97.8	100	98.1	50	0	97.7	37.5	100	68.1	0	73.3	94.6
TRUCKS	23	27	2	0	52	4	2	1	0	7	0	12	5	0	17	10	0	29	0	39	115
% TRUCKS	27.7	3.6	1.9	0	5.6	2.9	5.3	0.7	0	2.2	0	1.9	50	0	2.3	62.5	0	31.9	0	26.7	5.4



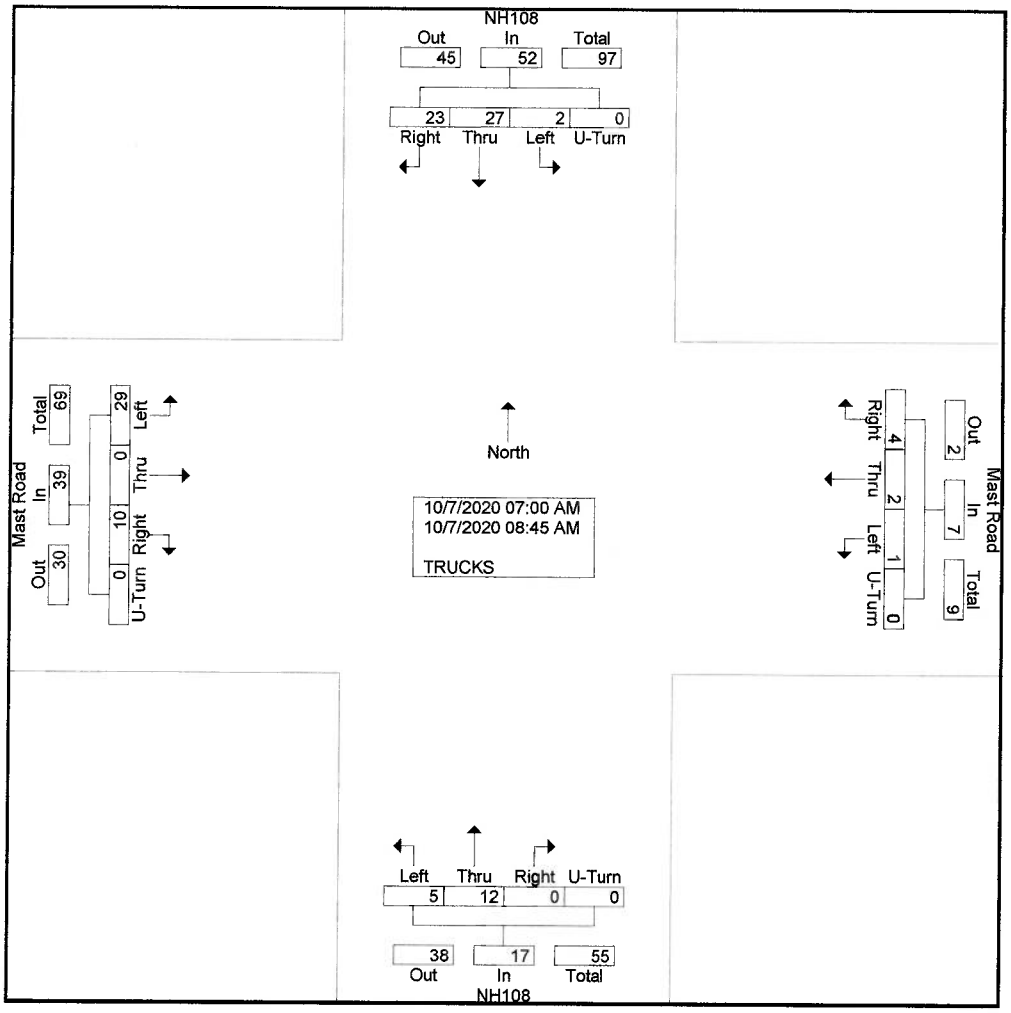
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT 4 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- TRUCKS

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	1	1	0	0	2	0	0	0	0	0	0	2	0	0	2	1	0	10	0	11	15
07:15 AM	1	6	0	0	7	0	0	0	0	0	0	0	1	0	1	2	0	4	0	6	14
07:30 AM	0	2	1	0	3	1	0	1	0	2	0	1	0	0	1	1	0	2	0	3	9
07:45 AM	4	1	0	0	5	1	0	0	0	1	0	1	2	0	3	2	0	5	0	7	16
Total	6	10	1	0	17	2	0	1	0	3	0	4	3	0	7	6	0	21	0	27	54
08:00 AM	3	4	1	0	8	0	0	0	0	0	0	1	0	0	1	1	0	1	0	2	11
08:15 AM	0	7	0	0	7	2	1	0	0	3	0	2	1	0	3	0	0	3	0	3	16
08:30 AM	8	6	0	0	14	0	1	0	0	1	0	2	0	0	2	1	0	2	0	3	20
08:45 AM	6	0	0	0	6	0	0	0	0	0	0	3	1	0	4	2	0	2	0	4	14
Total	17	17	1	0	35	2	2	0	0	4	0	8	2	0	10	4	0	8	0	12	61
Grand Total	23	27	2	0	52	4	2	1	0	7	0	12	5	0	17	10	0	29	0	39	115
Apprch %	44.2	51.9	3.8	0		57.1	28.6	14.3	0		0	70.6	29.4	0		25.6	0	74.4	0		
Total %	20	23.5	1.7	0	45.2	3.5	1.7	0.9	0	6.1	0	10.4	4.3	0	14.8	8.7	0	25.2	0	33.9	

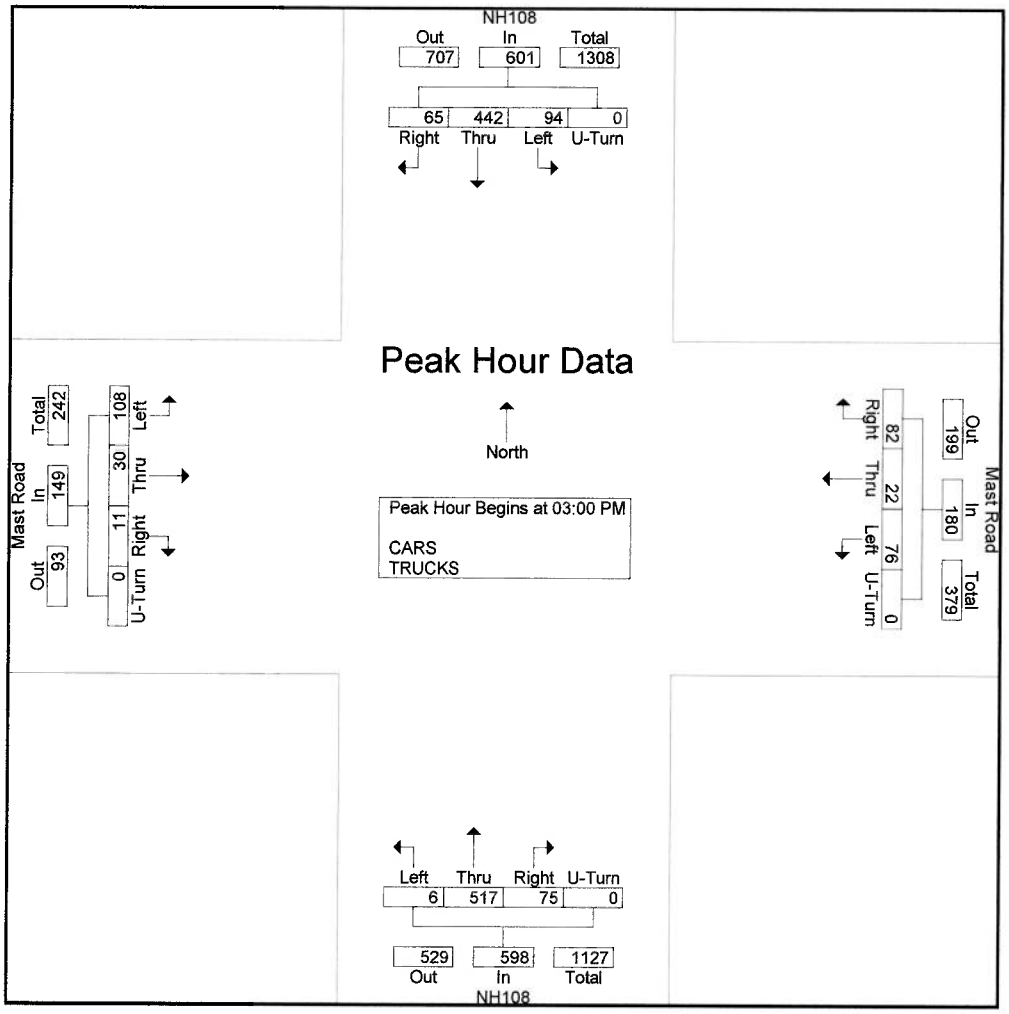


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT 4 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 3

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	9	107	16	0	132	10	5	13	0	28	**23**	115	0	0	138	3	7	37	0	47	345
03:15 PM	**22**	102	19	0	143	22	7	23	0	52	19	130	**3**	0	152	1	5	10	0	16	363
03:30 PM	17	108	**31**	0	156	**36**	**8**	**26**	0	**70**	13	126	2	0	141	**4**	**14**	**39**	0	**57**	**424**
03:45 PM	17	**125**	28	0	**170**	14	2	14	0	30	20	**146**	1	0	**167**	3	4	22	0	29	396
Total Volume	65	442	94	0	601	82	22	76	0	180	75	517	6	0	598	11	30	108	0	149	1528
% App. Total	10.8	73.5	15.6	0		45.6	12.2	42.2	0		12.5	86.5	1	0		7.4	20.1	72.5	0		
PHF	.739	.884	.758	.000	.884	.569	.688	.731	.000	.643	.815	.885	.500	.000	.895	.688	.536	.692	.000	.654	.901

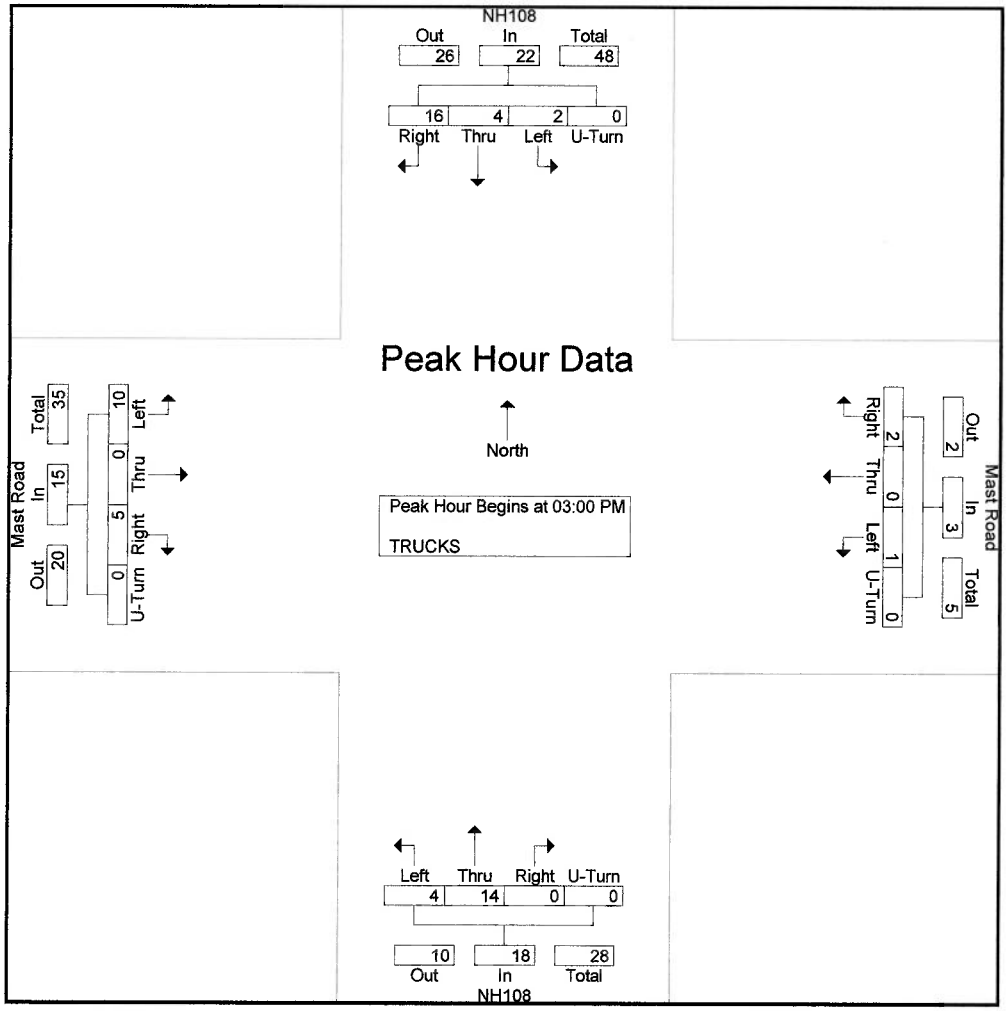


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT 4 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 03:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	4	1	0	0	5	0	0	**1**	0	**1**	0	**4**	0	0	4	1	0	**4**	0	**5**	15
03:15 PM	4	0	**1**	0	5	**1**	0	0	0	1	0	4	**3**	0	**7**	1	0	4	0	5	**18**
03:30 PM	1	**2**	1	0	4	0	0	0	0	0	0	4	1	0	5	**2**	0	2	0	4	13
03:45 PM	**7**	1	0	0	**8**	1	0	0	0	1	0	2	0	0	2	1	0	0	0	1	12
Total Volume	16	4	2	0	22	2	0	1	0	3	0	14	4	0	18	5	0	10	0	15	58
% App. Total	72.7	18.2	9.1	0		66.7	0	33.3	0		0	77.8	22.2	0		33.3	0	66.7	0		
PHF	.571	.500	.500	.000	.688	.500	.000	.250	.000	.750	.000	.875	.333	.000	.643	.625	.000	.625	.000	.750	.806



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT 4 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

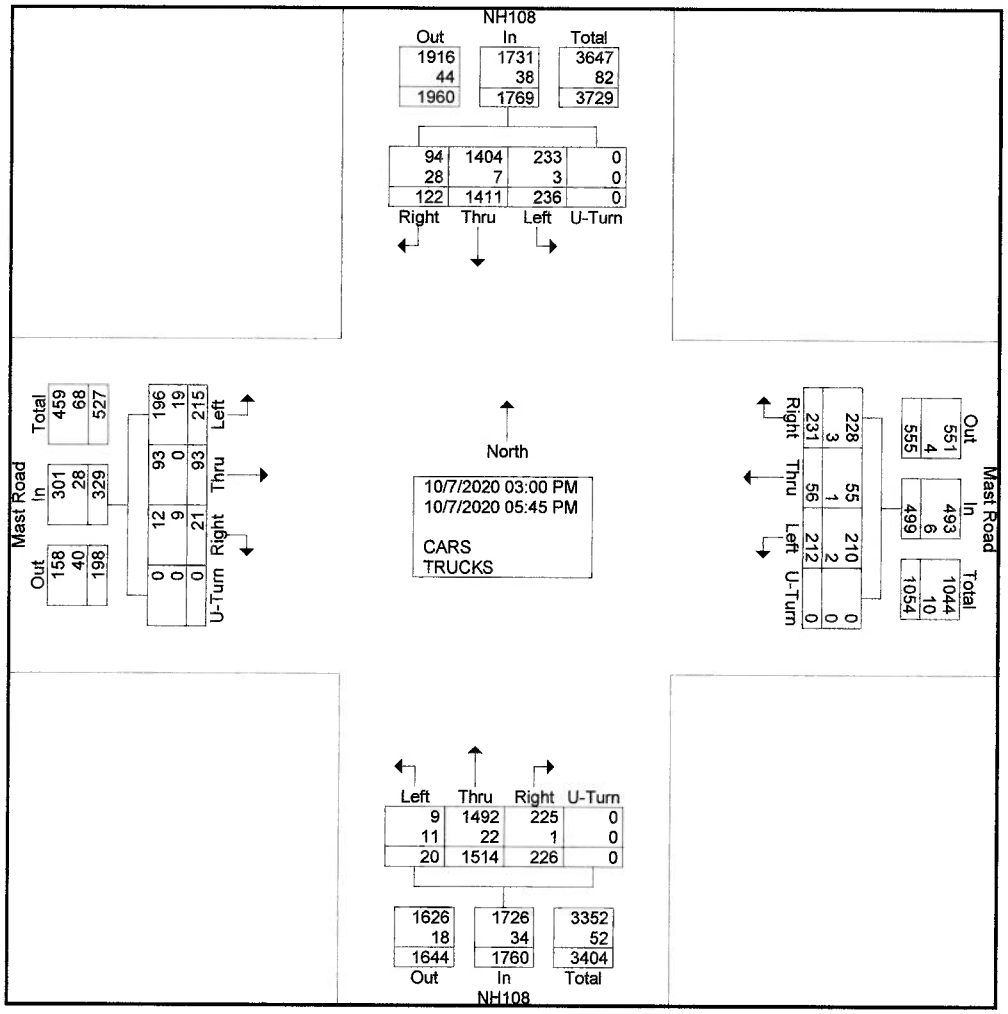
Groups Printed- CARS - TRUCKS

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
03:00 PM	9	107	16	0	132	10	5	13	0	28	23	115	0	0	138	3	7	37	0	47	345
03:15 PM	22	102	19	0	143	22	7	23	0	52	19	130	3	0	152	1	5	10	0	16	363
03:30 PM	17	108	31	0	156	36	8	26	0	70	13	126	2	0	141	4	14	39	0	57	424
03:45 PM	17	125	28	0	170	14	2	14	0	30	20	146	1	0	167	3	4	22	0	29	396
Total	65	442	94	0	601	82	22	76	0	180	75	517	6	0	598	11	30	108	0	149	1528
04:00 PM	8	100	20	0	128	19	1	15	0	35	13	116	0	0	129	1	5	17	0	23	315
04:15 PM	7	127	16	0	150	14	4	15	0	33	22	119	3	0	144	3	11	12	0	26	353
04:30 PM	10	131	19	0	160	31	4	20	0	55	18	136	2	0	156	3	10	12	0	25	396
04:45 PM	10	143	21	0	174	15	5	21	0	41	18	115	2	0	135	0	9	20	0	29	379
Total	35	501	76	0	612	79	14	71	0	164	71	486	7	0	564	7	35	61	0	103	1443
05:00 PM	7	137	16	0	160	21	2	18	0	41	17	134	2	0	153	1	9	10	0	20	374
05:15 PM	5	118	21	0	144	21	10	18	0	49	18	139	2	0	159	1	7	14	0	22	374
05:30 PM	5	105	14	0	124	15	5	21	0	41	19	108	2	0	129	0	3	15	0	18	312
05:45 PM	5	108	15	0	128	13	3	8	0	24	26	130	1	0	157	1	9	7	0	17	326
Total	22	468	66	0	556	70	20	65	0	155	80	511	7	0	598	3	28	46	0	77	1386
Grand Total	122	1411	236	0	1769	231	56	212	0	499	226	1514	20	0	1760	21	93	215	0	329	4357
Apprch %	6.9	79.8	13.3	0		46.3	11.2	42.5	0		12.8	86	1.1	0		6.4	28.3	65.3	0		
Total %	2.8	32.4	5.4	0	40.6	5.3	1.3	4.9	0	11.5	5.2	34.7	0.5	0	40.4	0.5	2.1	4.9	0	7.6	
CARS	94	1404	233	0	1731	228	55	210	0	493	225	1492	9	0	1726	12	93	196	0	301	4251
% CARS	77	99.5	98.7	0	97.9	98.7	98.2	99.1	0	98.8	99.6	98.5	45	0	98.1	57.1	100	91.2	0	91.5	97.6
TRUCKS	28	7	3	0	38	3	1	2	0	6	1	22	11	0	34	9	0	19	0	28	106
% TRUCKS	23	0.5	1.3	0	2.1	1.3	1.8	0.9	0	1.2	0.4	1.5	55	0	1.9	42.9	0	8.8	0	8.5	2.4

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT 4 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 2



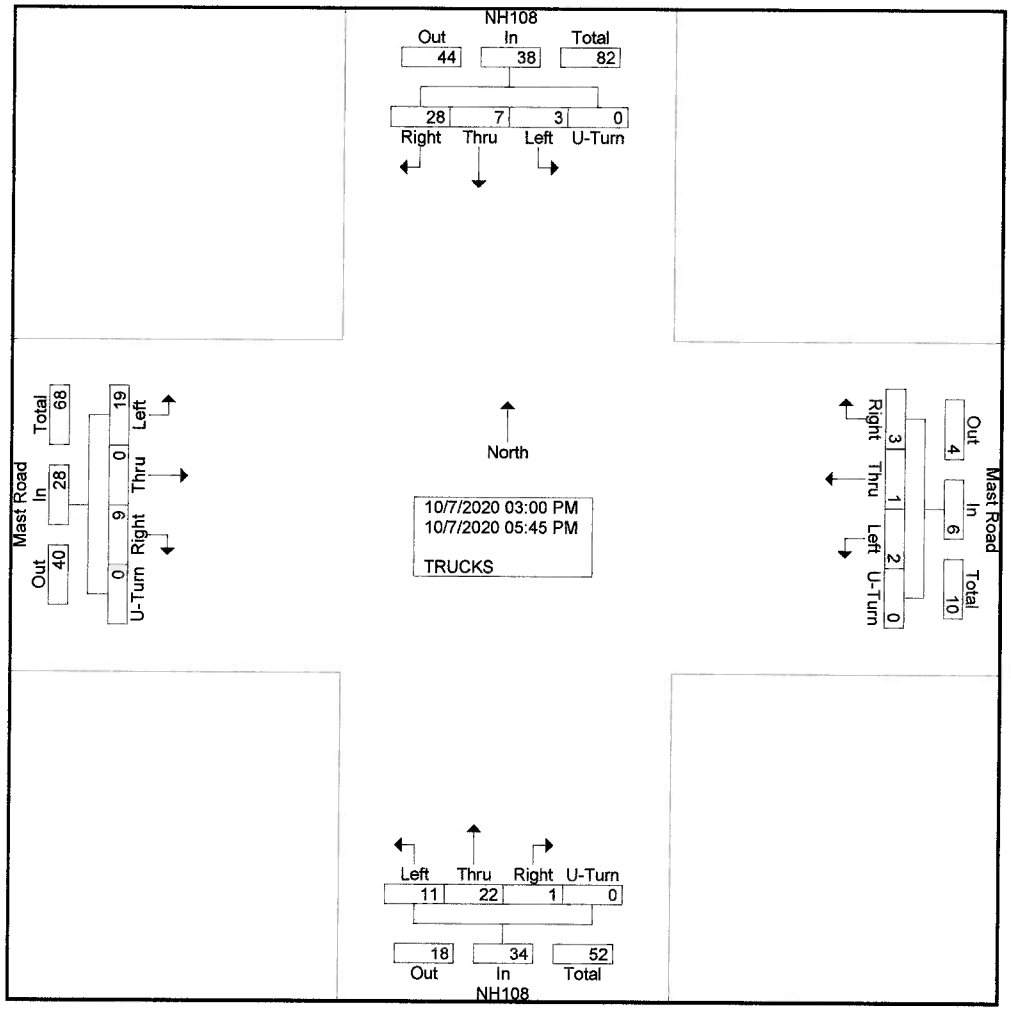
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT 4 Wed AM & PM
Site Code : 2037A
Start Date : 10/7/2020
Page No : 1

Groups Printed- TRUCKS

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
03:00 PM	4	1	0	0	5	0	0	1	0	1	0	4	0	0	4	1	0	4	0	5	15
03:15 PM	4	0	1	0	5	1	0	0	0	1	0	4	3	0	7	1	0	4	0	5	18
03:30 PM	1	2	1	0	4	0	0	0	0	0	0	4	1	0	5	2	0	2	0	4	13
03:45 PM	7	1	0	0	8	1	0	0	0	1	0	2	0	0	2	1	0	0	0	1	12
Total	16	4	2	0	22	2	0	1	0	3	0	14	4	0	18	5	0	10	0	15	58
04:00 PM	3	0	0	0	3	1	0	1	0	2	0	3	0	0	3	1	0	1	0	2	10
04:15 PM	1	0	1	0	2	0	0	0	0	0	0	1	2	0	3	1	0	1	0	2	7
04:30 PM	1	0	0	0	1	0	0	0	0	0	0	0	1	0	1	1	0	4	0	5	7
04:45 PM	2	1	0	0	3	0	1	0	0	1	0	1	2	0	3	0	0	0	0	0	7
Total	7	1	1	0	9	1	1	1	0	3	0	5	5	0	10	3	0	6	0	9	31
05:00 PM	2	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
05:15 PM	2	1	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	4
05:30 PM	1	1	0	0	2	0	0	0	0	0	1	3	1	0	5	0	0	2	0	2	9
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	2
Total	5	2	0	0	7	0	0	0	0	0	1	3	2	0	6	1	0	3	0	4	17
Grand Total	28	7	3	0	38	3	1	2	0	6	1	22	11	0	34	9	0	19	0	28	106
Apprch %	73.7	18.4	7.9	0		50	16.7	33.3	0		2.9	64.7	32.4	0		32.1	0	67.9	0		
Total %	26.4	6.6	2.8	0	35.8	2.8	0.9	1.9	0	5.7	0.9	20.8	10.4	0	32.1	8.5	0	17.9	0	26.4	

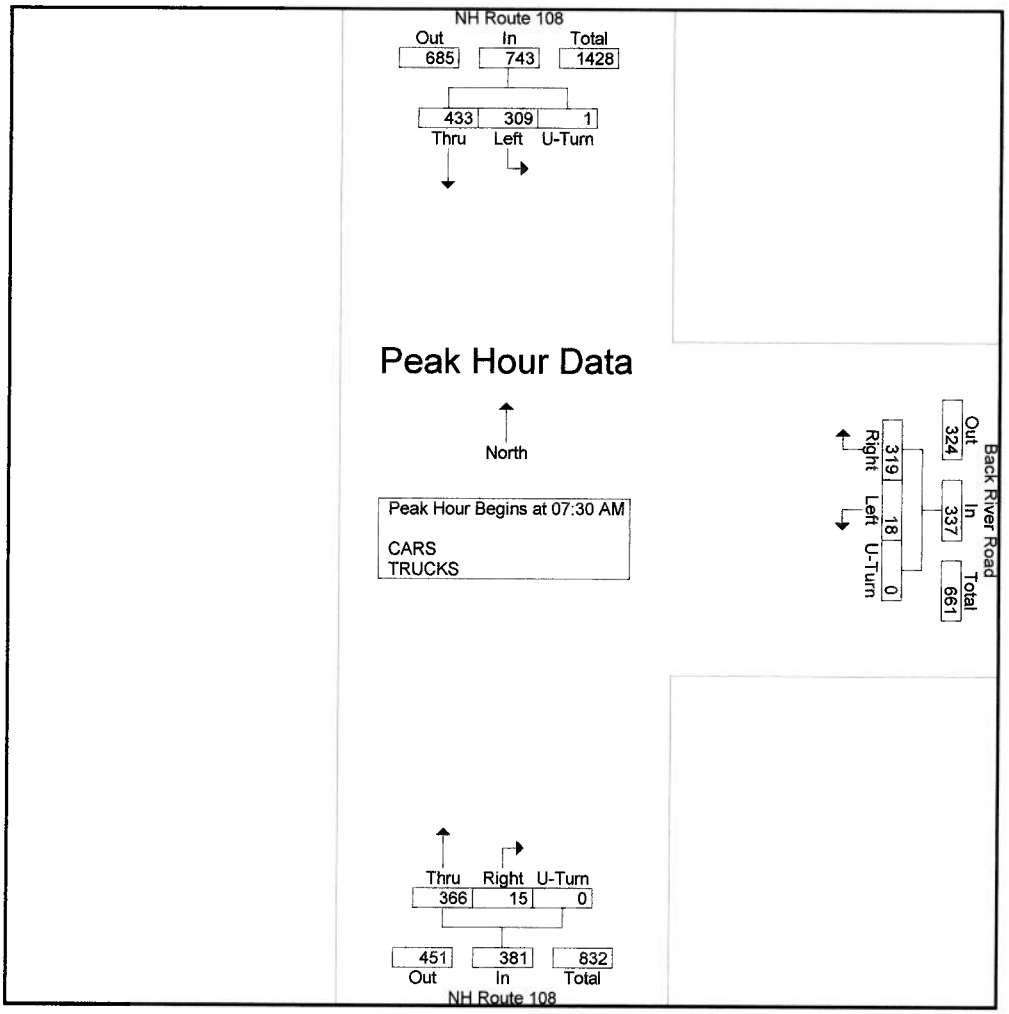


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	NH Route 108 From North				Back River Road From East				NH Route 108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	**125**	99	0	224	68	**8**	0	76	3	90	0	93	393
07:45 AM	124	**109**	0	**233**	**95**	2	0	**97**	1	79	0	80	**410**
08:00 AM	100	61	**1**	162	91	4	0	95	**7**	98	0	**105**	362
08:15 AM	84	40	0	124	65	4	0	69	4	**99**	0	103	296
Total Volume	433	309	1	743	319	18	0	337	15	366	0	381	1461
% App. Total	58.3	41.6	0.1		94.7	5.3	0		3.9	96.1	0		
PHF	.866	.709	.250	.797	.839	.563	.000	.869	.536	.924	.000	.907	.891

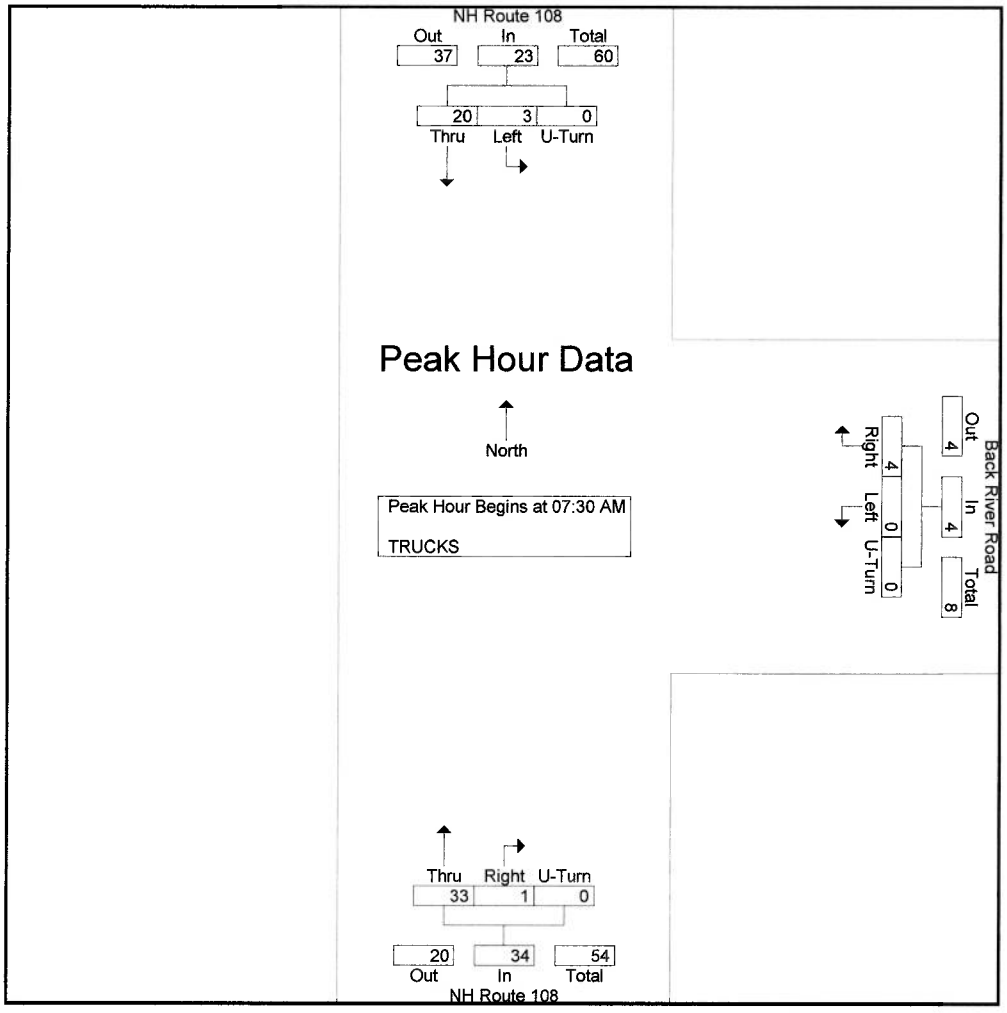


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	NH Route 108 From North				Back River Road From East				NH Route 108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	**8**	1	0	**9**	**2**	0	0	**2**	**1**	8	0	**9**	**20**
07:45 AM	5	**2**	0	7	1	0	0	1	0	**9**	0	9	17
08:00 AM	5	0	0	5	1	0	0	1	0	8	0	8	14
08:15 AM	2	0	0	2	0	0	0	0	0	8	0	8	10
Total Volume	20	3	0	23	4	0	0	4	1	33	0	34	61
% App. Total	87	13	0		100	0	0		2.9	97.1	0		
PHF	.625	.375	.000	.639	.500	.000	.000	.500	.250	.917	.000	.944	.763



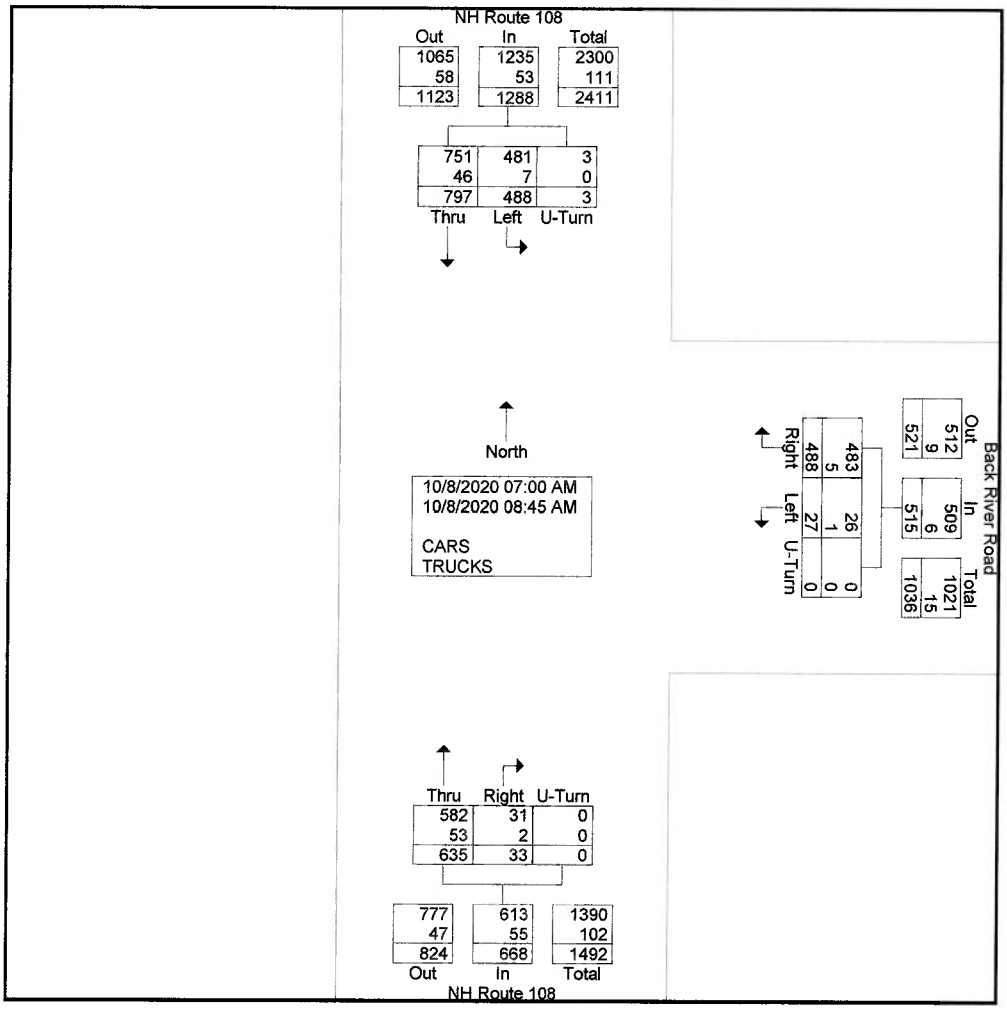
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- CARS - TRUCKS

	NH Route 108 From North				Back River Road From East				NH Route 108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	90	31	0	121	36	4	0	40	5	57	0	62	223
07:15 AM	84	59	2	145	65	1	0	66	7	65	0	72	283
07:30 AM	125	99	0	224	68	8	0	76	3	90	0	93	393
07:45 AM	124	109	0	233	95	2	0	97	1	79	0	80	410
Total	423	298	2	723	264	15	0	279	16	291	0	307	1309
08:00 AM	100	61	1	162	91	4	0	95	7	98	0	105	362
08:15 AM	84	40	0	124	65	4	0	69	4	99	0	103	296
08:30 AM	82	40	0	122	35	2	0	37	3	72	0	75	234
08:45 AM	108	49	0	157	33	2	0	35	3	75	0	78	270
Total	374	190	1	565	224	12	0	236	17	344	0	361	1162
Grand Total	797	488	3	1288	488	27	0	515	33	635	0	668	2471
Apprch %	61.9	37.9	0.2		94.8	5.2	0		4.9	95.1	0		
Total %	32.3	19.7	0.1	52.1	19.7	1.1	0	20.8	1.3	25.7	0	27	
CARS	751	481	3	1235	483	26	0	509	31	582	0	613	2357
% CARS	94.2	98.6	100	95.9	99	96.3	0	98.8	93.9	91.7	0	91.8	95.4
TRUCKS	46	7	0	53	5	1	0	6	2	53	0	55	114
% TRUCKS	5.8	1.4	0	4.1	1	3.7	0	1.2	6.1	8.3	0	8.2	4.6



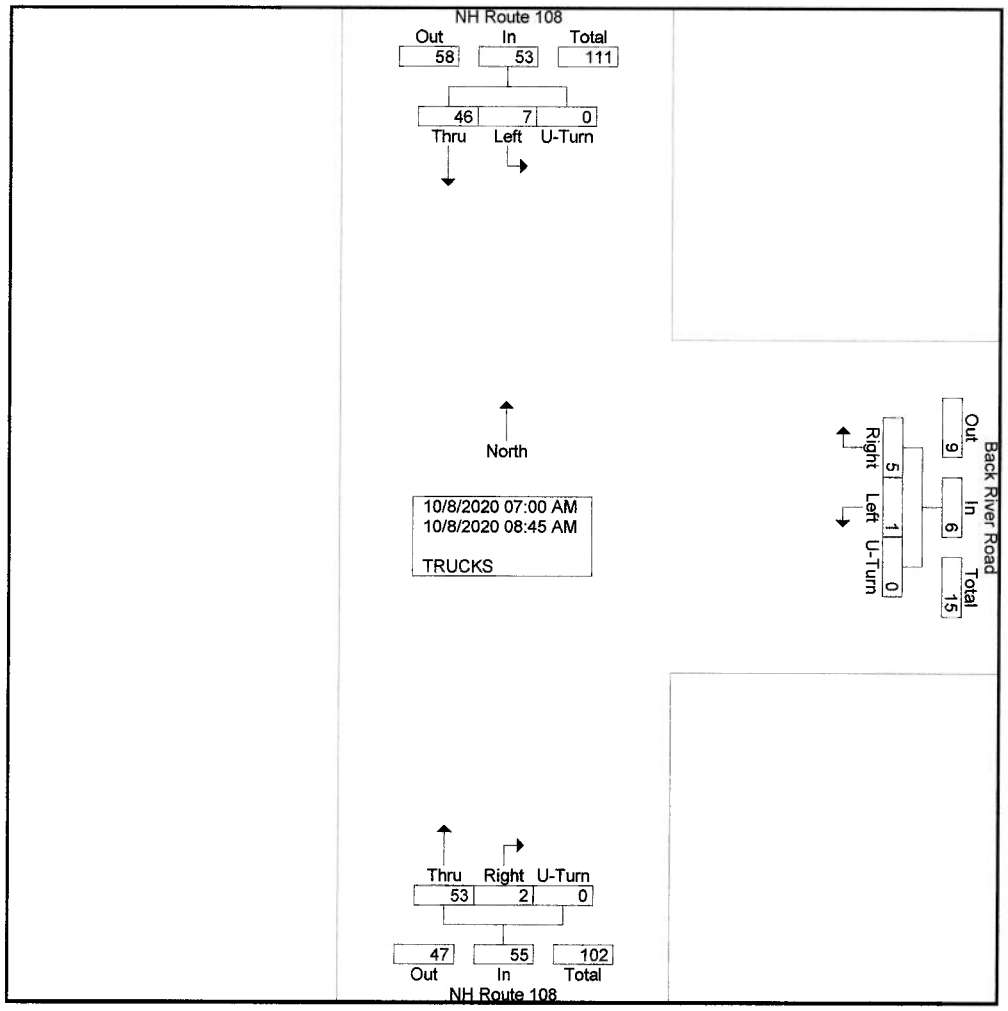
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- TRUCKS

	NH Route 108 From North				Back River Road From East				NH Route 108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	4	0	0	4	1	0	0	1	1	4	0	5	10
07:15 AM	6	2	0	8	0	0	0	0	0	7	0	7	15
07:30 AM	8	1	0	9	2	0	0	2	1	8	0	9	20
07:45 AM	5	2	0	7	1	0	0	1	0	9	0	9	17
Total	23	5	0	28	4	0	0	4	2	28	0	30	62
08:00 AM	5	0	0	5	1	0	0	1	0	8	0	8	14
08:15 AM	2	0	0	2	0	0	0	0	0	8	0	8	10
08:30 AM	7	1	0	8	0	1	0	1	0	6	0	6	15
08:45 AM	9	1	0	10	0	0	0	0	0	3	0	3	13
Total	23	2	0	25	1	1	0	2	0	25	0	25	52
Grand Total	46	7	0	53	5	1	0	6	2	53	0	55	114
Apprch %	86.8	13.2	0		83.3	16.7	0		3.6	96.4	0		
Total %	40.4	6.1	0	46.5	4.4	0.9	0	5.3	1.8	46.5	0	48.2	

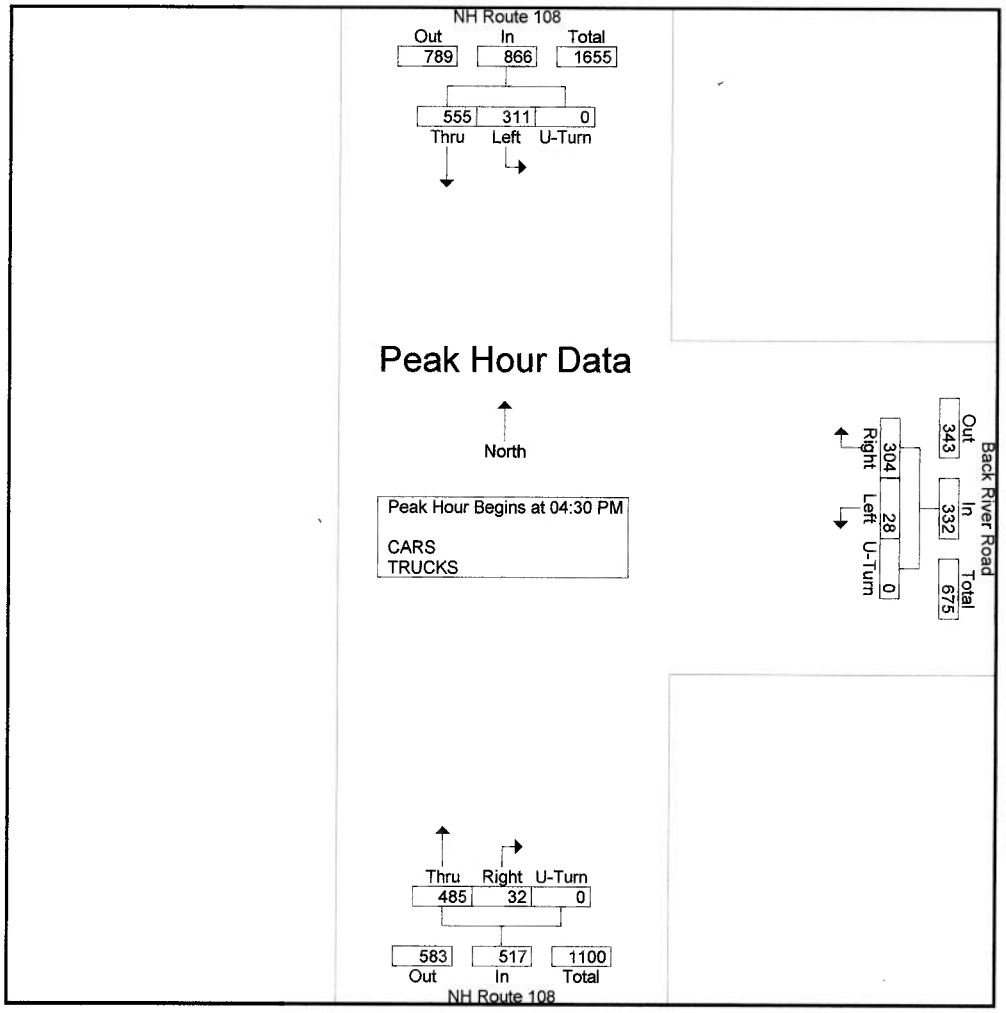


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 3

	NH Route 108 From North				Back River Road From East				NH Route 108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	137	67	0	204	63	4	0	67	6	123	0	129	400
04:45 PM	**155**	**86**	0	**241**	67	6	0	73	7	**127**	0	134	**448**
05:00 PM	129	77	0	206	81	6	0	87	**12**	124	0	**136**	429
05:15 PM	134	81	0	215	**93**	**12**	0	**105**	7	111	0	118	438
Total Volume	555	311	0	866	304	28	0	332	32	485	0	517	1715
% App. Total	64.1	35.9	0		91.6	8.4	0		6.2	93.8	0		
PHF	.895	.904	.000	.898	.817	.583	.000	.790	.667	.955	.000	.950	.957

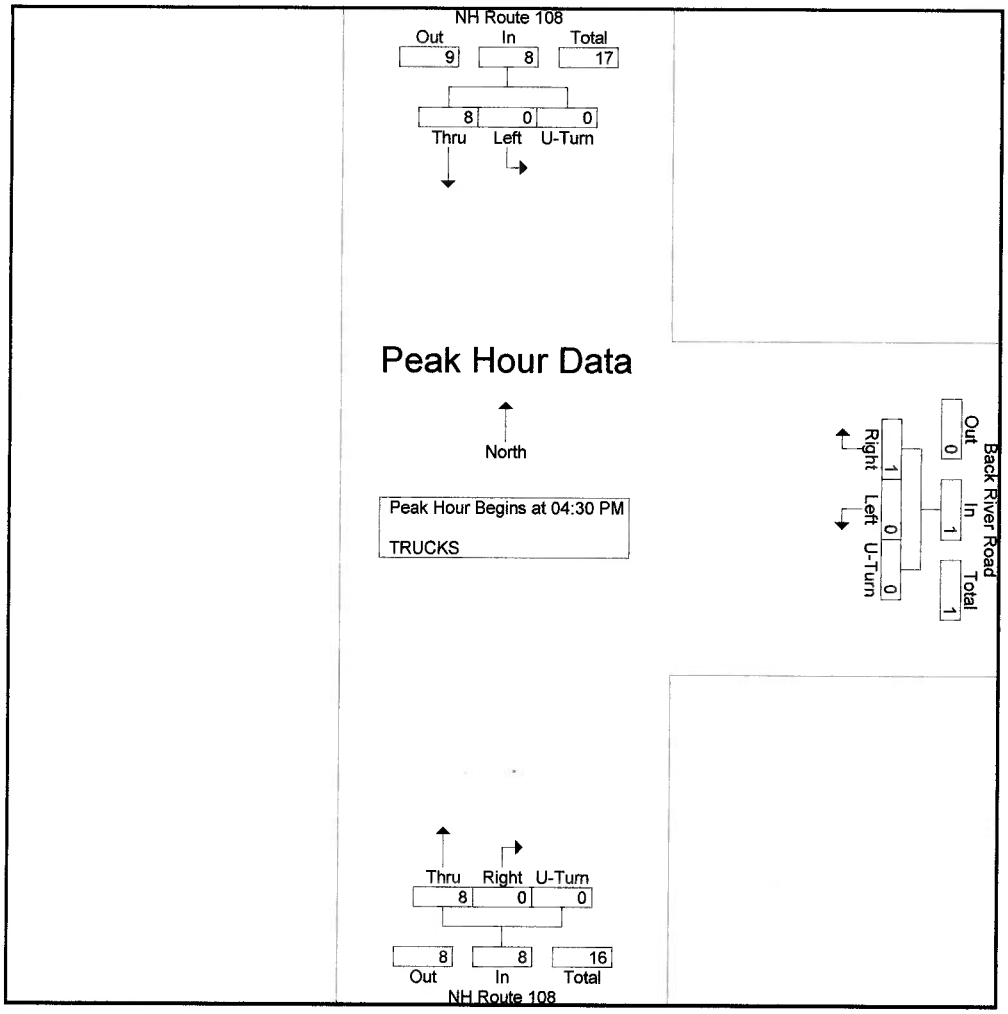


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	NH Route 108 From North				Back River Road From East				NH Route 108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	1	0	0	1	0	0	0	0	0	**4**	0	**4**	5
04:45 PM	2	0	0	2	0	0	0	0	0	2	0	2	4
05:00 PM	**4**	0	0	**4**	**1**	0	0	**1**	0	1	0	1	**6**
05:15 PM	1	0	0	1	0	0	0	0	0	1	0	1	2
Total Volume	8	0	0	8	1	0	0	1	0	8	0	8	17
% App. Total	100	0	0		100	0	0		0	100	0		
PHF	.500	.000	.000	.500	.250	.000	.000	.250	.000	.500	.000	.500	.708



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

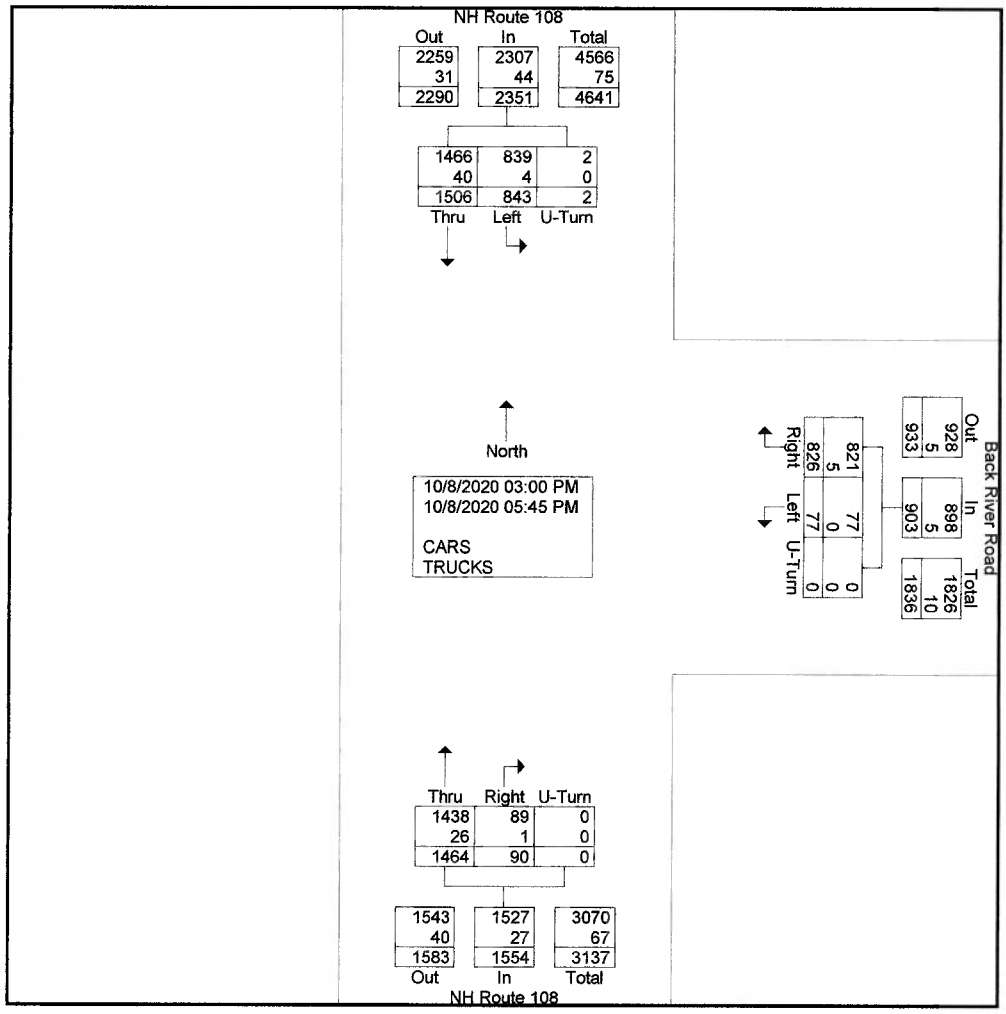
Groups Printed- CARS - TRUCKS

	NH Route 108 From North				Back River Road From East				NH Route 108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	97	99	1	197	51	3	0	54	7	114	0	121	372
03:15 PM	127	59	0	186	78	7	0	85	5	101	0	106	377
03:30 PM	147	75	0	222	85	3	0	88	12	138	0	150	460
03:45 PM	116	54	0	170	67	10	0	77	7	162	0	169	416
Total	487	287	1	775	281	23	0	304	31	515	0	546	1625
04:00 PM	120	65	1	186	60	6	0	66	9	109	0	118	370
04:15 PM	143	60	0	203	60	10	0	70	7	105	0	112	385
04:30 PM	137	67	0	204	63	4	0	67	6	123	0	129	400
04:45 PM	155	86	0	241	67	6	0	73	7	127	0	134	448
Total	555	278	1	834	250	26	0	276	29	464	0	493	1603
05:00 PM	129	77	0	206	81	6	0	87	12	124	0	136	429
05:15 PM	134	81	0	215	93	12	0	105	7	111	0	118	438
05:30 PM	105	60	0	165	55	4	0	59	5	134	0	139	363
05:45 PM	96	60	0	156	66	6	0	72	6	116	0	122	350
Total	464	278	0	742	295	28	0	323	30	485	0	515	1580
Grand Total	1506	843	2	2351	826	77	0	903	90	1464	0	1554	4808
Apprch %	64.1	35.9	0.1		91.5	8.5	0		5.8	94.2	0		
Total %	31.3	17.5	0	48.9	17.2	1.6	0	18.8	1.9	30.4	0	32.3	
CARS	1466	839	2	2307	821	77	0	898	89	1438	0	1527	4732
% CARS	97.3	99.5	100	98.1	99.4	100	0	99.4	98.9	98.2	0	98.3	98.4
TRUCKS	40	4	0	44	5	0	0	5	1	26	0	27	76
% TRUCKS	2.7	0.5	0	1.9	0.6	0	0	0.6	1.1	1.8	0	1.7	1.6

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2



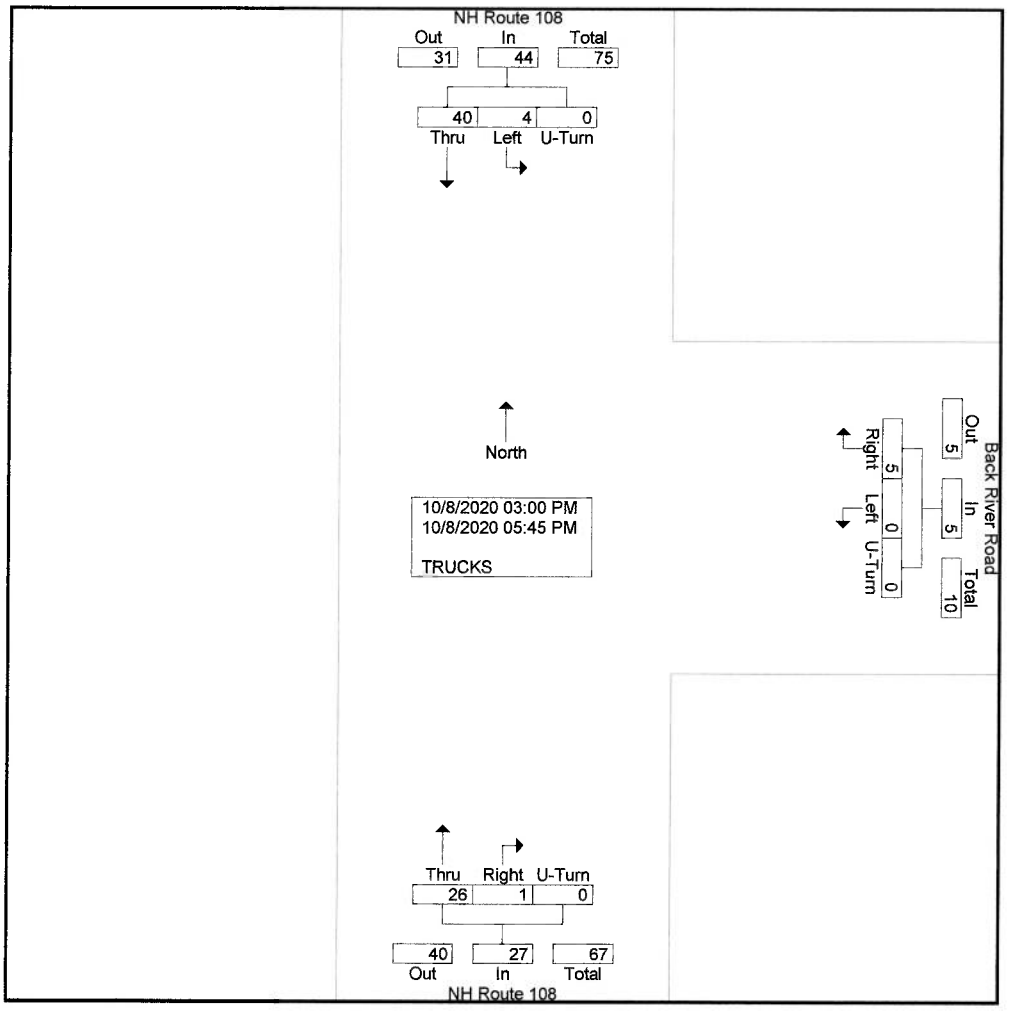
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Back_River_INT 1 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- TRUCKS

	NH Route 108 From North				Back River Road From East				NH Route 108 From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	6	0	0	6	2	0	0	2	1	3	0	4	12
03:15 PM	5	1	0	6	0	0	0	0	0	2	0	2	8
03:30 PM	9	1	0	10	1	0	0	1	0	2	0	2	13
03:45 PM	1	0	0	1	1	0	0	1	0	7	0	7	9
Total	21	2	0	23	4	0	0	4	1	14	0	15	42
04:00 PM	3	1	0	4	0	0	0	0	0	2	0	2	6
04:15 PM	6	1	0	7	0	0	0	0	0	0	0	0	7
04:30 PM	1	0	0	1	0	0	0	0	0	4	0	4	5
04:45 PM	2	0	0	2	0	0	0	0	0	2	0	2	4
Total	12	2	0	14	0	0	0	0	0	8	0	8	22
05:00 PM	4	0	0	4	1	0	0	1	0	1	0	1	6
05:15 PM	1	0	0	1	0	0	0	0	0	1	0	1	2
05:30 PM	2	0	0	2	0	0	0	0	0	0	0	0	2
05:45 PM	0	0	0	0	0	0	0	0	0	2	0	2	2
Total	7	0	0	7	1	0	0	1	0	4	0	4	12
Grand Total	40	4	0	44	5	0	0	5	1	26	0	27	76
Apprch %	90.9	9.1	0		100	0	0		3.7	96.3	0		
Total %	52.6	5.3	0	57.9	6.6	0	0	6.6	1.3	34.2	0	35.5	

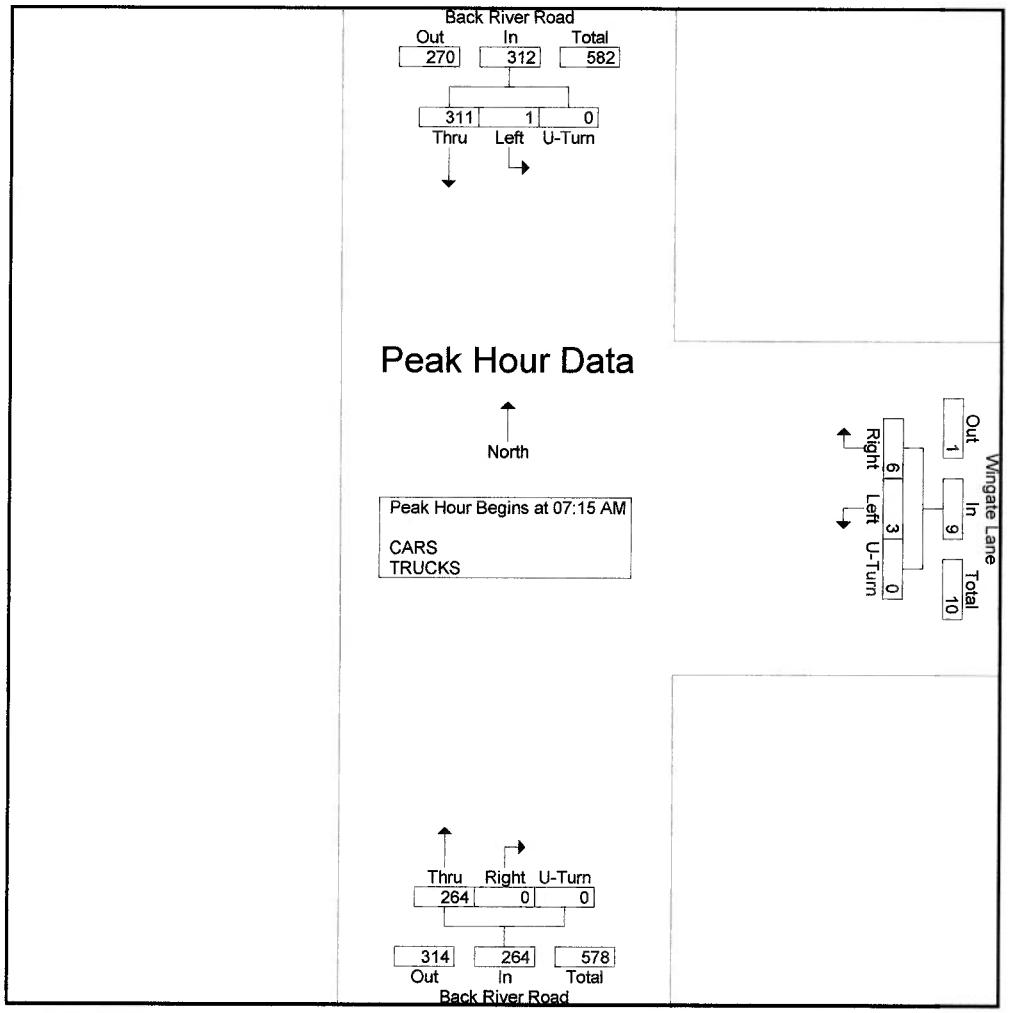


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2050A
Town/State: Dover, NH

File Name : 2037A_INT_2_~~Wed~~ Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	57	**1**	0	58	**2**	0	0	2	0	49	0	49	109
07:30 AM	91	0	0	91	2	**2**	0	**4**	0	62	0	62	157
07:45 AM	**100**	0	0	**100**	2	0	0	2	0	**79**	0	**79**	**181**
08:00 AM	63	0	0	63	0	1	0	1	0	74	0	74	138
Total Volume	311	1	0	312	6	3	0	9	0	264	0	264	585
% App. Total	99.7	0.3	0		66.7	33.3	0		0	100	0		
PHF	.778	.250	.000	.780	.750	.375	.000	.563	.000	.835	.000	.835	.808

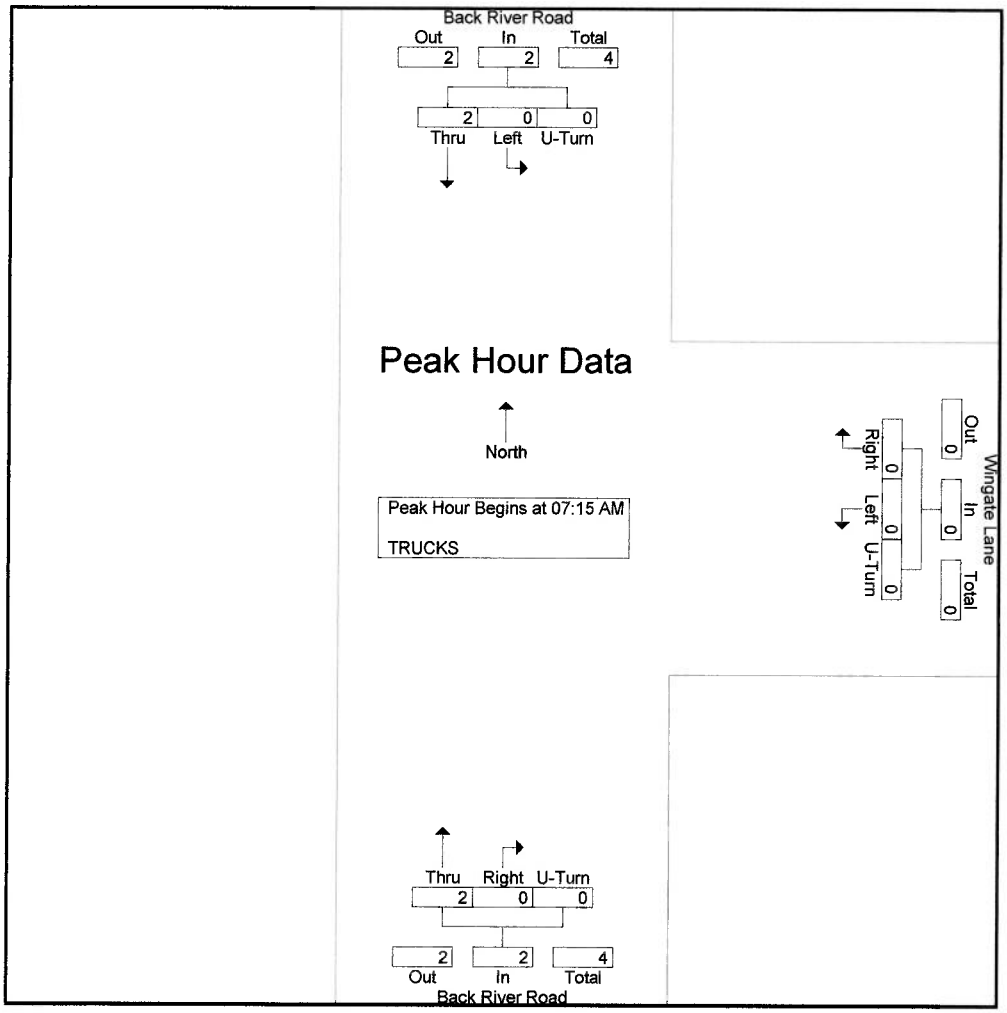


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2050A
Town/State: Dover, NH

File Name : 2037A_INT_2_Thu_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:15 AM to 08:00 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:15 AM													
07:15 AM	**1**	0	0	**1**	0	0	0	0	0	**1**	0	**1**	**2**
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total Volume	2	0	0	2	0	0	0	0	0	2	0	2	4
% App. Total	100	0	0		0	0	0		0	100	0		
PHF	.500	.000	.000	.500	.000	.000	.000	.000	.000	.500	.000	.500	.500



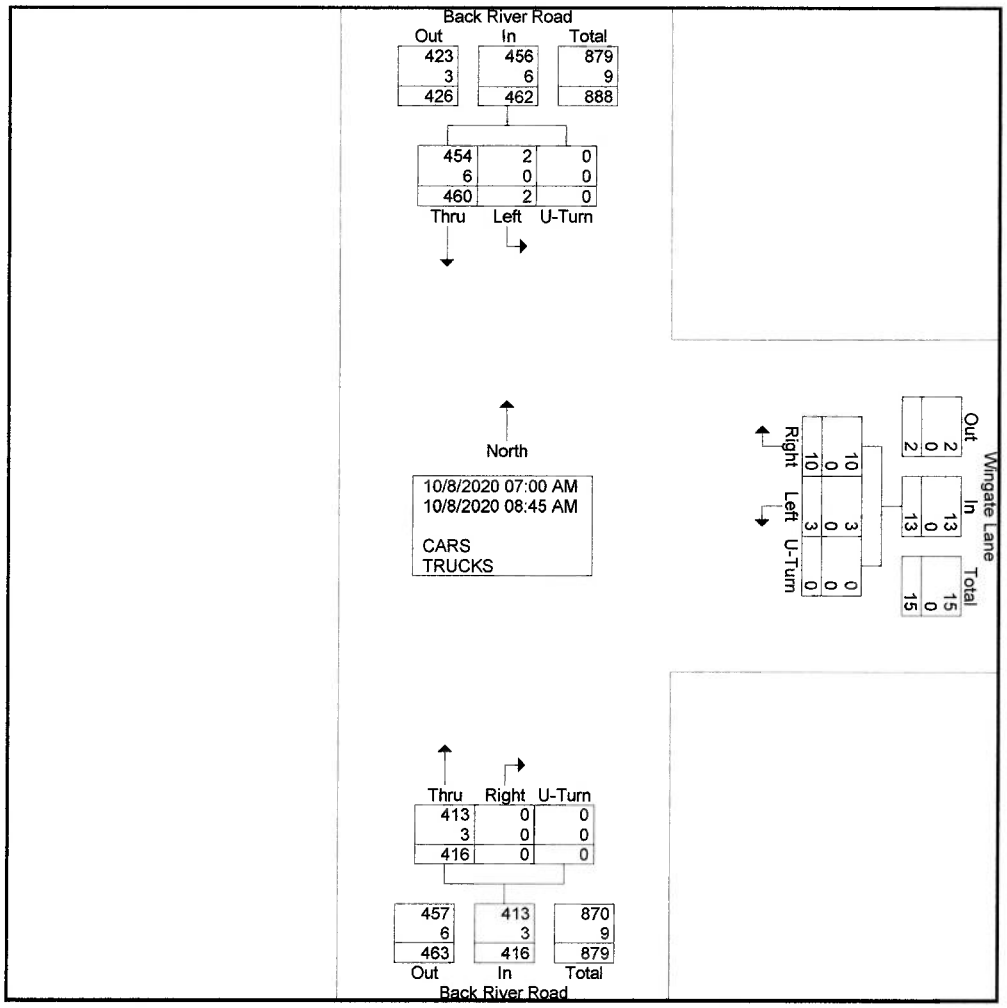
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2050A
Town/State: Dover, NH

File Name : 2037A_INT_2_~~Wed~~Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- CARS - TRUCKS

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	29	0	0	29	1	0	0	1	0	38	0	38	68
07:15 AM	57	1	0	58	2	0	0	2	0	49	0	49	109
07:30 AM	91	0	0	91	2	2	0	4	0	62	0	62	157
07:45 AM	100	0	0	100	2	0	0	2	0	79	0	79	181
Total	277	1	0	278	7	2	0	9	0	228	0	228	515
08:00 AM	63	0	0	63	0	1	0	1	0	74	0	74	138
08:15 AM	34	1	0	35	0	0	0	0	0	55	0	55	90
08:30 AM	38	0	0	38	3	0	0	3	0	29	0	29	70
08:45 AM	48	0	0	48	0	0	0	0	0	30	0	30	78
Total	183	1	0	184	3	1	0	4	0	188	0	188	376
Grand Total	460	2	0	462	10	3	0	13	0	416	0	416	891
Apprch %	99.6	0.4	0		76.9	23.1	0		0	100	0		
Total %	51.6	0.2	0	51.9	1.1	0.3	0	1.5	0	46.7	0	46.7	
CARS	454	2	0	456	10	3	0	13	0	413	0	413	882
% CARS	98.7	100	0	98.7	100	100	0	100	0	99.3	0	99.3	99
TRUCKS	6	0	0	6	0	0	0	0	0	3	0	3	9
% TRUCKS	1.3	0	0	1.3	0	0	0	0	0	0.7	0	0.7	1



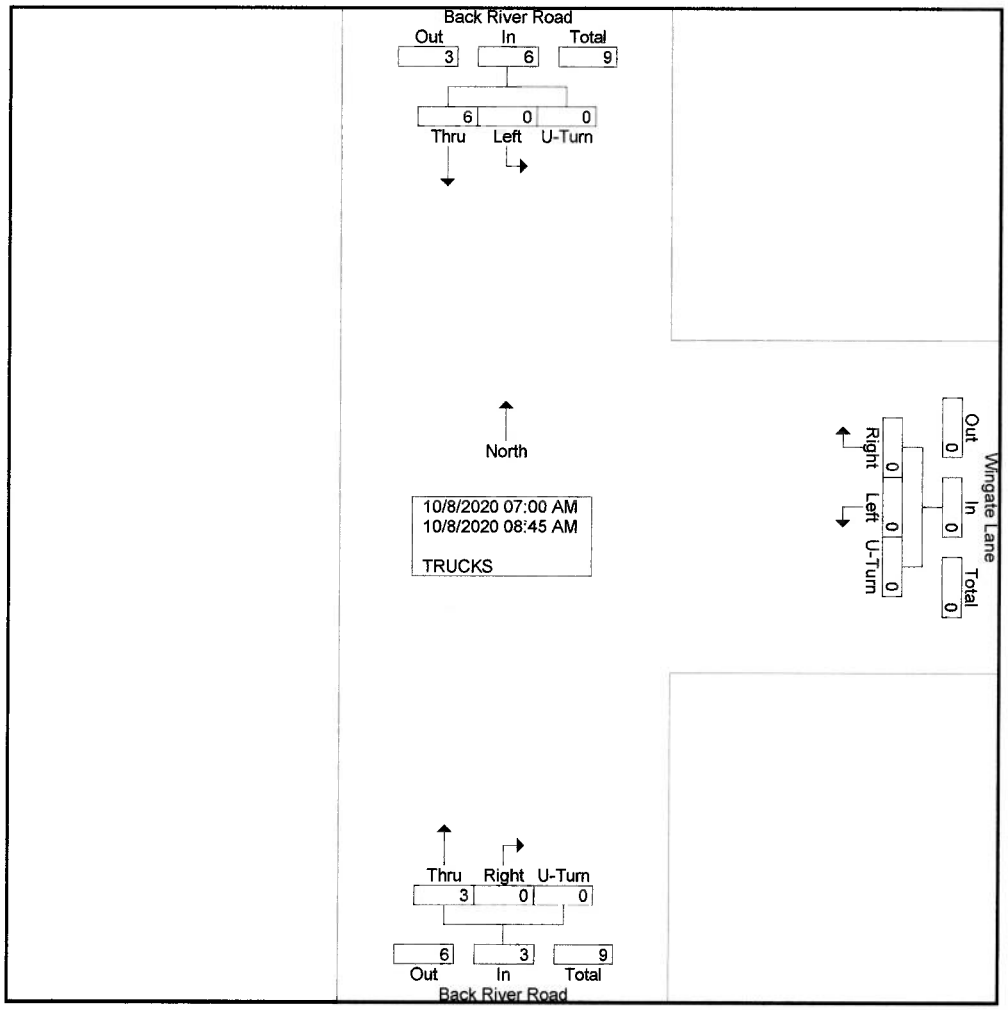
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2050A
Town/State: Dover, NH

File Name : 2037A_INT_2_~~Wed~~ Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- TRUCKS

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
07:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15 AM	1	0	0	1	0	0	0	0	0	1	0	1	2
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
Total	2	0	0	2	0	0	0	0	0	1	0	1	3
08:00 AM	0	0	0	0	0	0	0	0	0	1	0	1	1
08:15 AM	1	0	0	1	0	0	0	0	0	0	0	0	1
08:30 AM	1	0	0	1	0	0	0	0	0	1	0	1	2
08:45 AM	2	0	0	2	0	0	0	0	0	0	0	0	2
Total	4	0	0	4	0	0	0	0	0	2	0	2	6
Grand Total	6	0	0	6	0	0	0	0	0	3	0	3	9
Apprch %	100	0	0		0	0	0		0	100	0		
Total %	66.7	0	0	66.7	0	0	0	0	0	33.3	0	33.3	



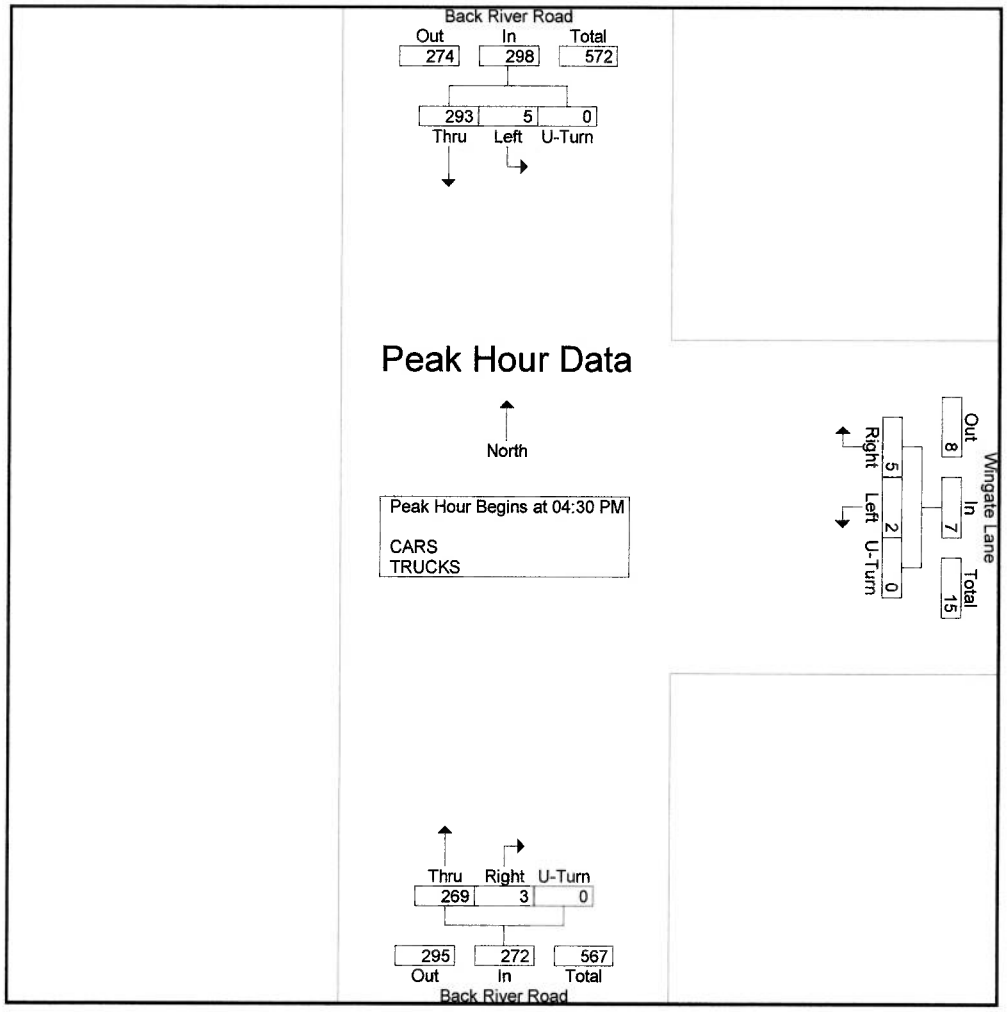
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Thurs

Weather: Clear
Collected By: MV
Job Number: 2050A
Town/State: Dover, NH

File Name : 2037A_INT_2_~~Wed~~_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 3

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	72	1	0	73	1	0	0	1	0	51	0	51	125
04:45 PM	**78**	1	0	**79**	0	0	0	0	0	64	0	64	143
05:00 PM	75	1	0	76	**3**	0	0	**3**	**2**	71	0	73	152
05:15 PM	68	**2**	0	70	1	**2**	0	3	1	**83**	0	**84**	**157**
Total Volume	293	5	0	298	5	2	0	7	3	269	0	272	577
% App. Total	98.3	1.7	0		71.4	28.6	0		1.1	98.9	0		
PHF	.939	.625	.000	.943	.417	.250	.000	.583	.375	.810	.000	.810	.919



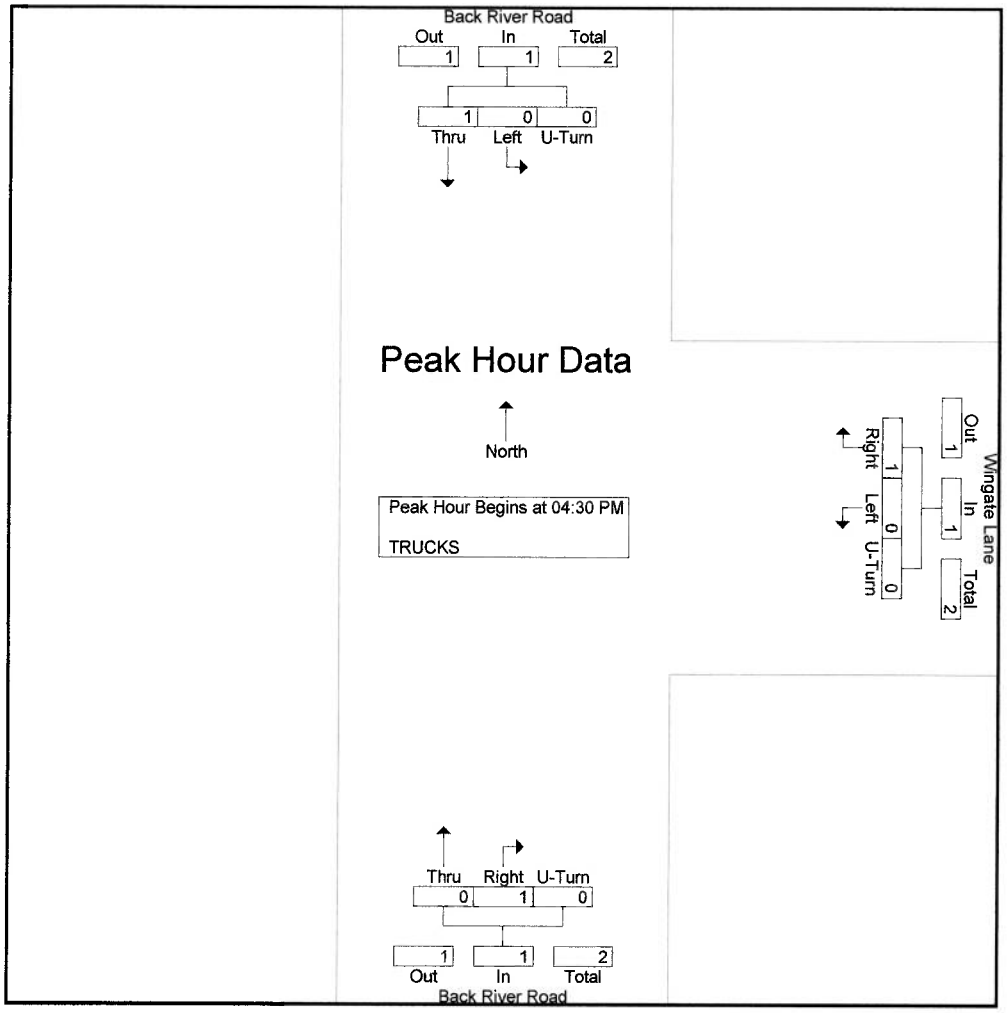
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2050A
Town/State: Dover, NH

Thurs

File Name : 2037A_INT_2_~~Wed~~_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:30 PM													
04:30 PM	**1**	0	0	**1**	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	**1**	0	0	**1**	**1**	0	0	**1**	**2**
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	1	0	0	1	1	0	0	1	1	0	0	1	3
% App. Total	100	0	0		100	0	0		100	0	0		
PHF	.250	.000	.000	.250	.250	.000	.000	.250	.250	.000	.000	.250	.375



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Thurs

Weather: Clear
Collected By: MV
Job Number: 2050A
Town/State: Dover, NH

File Name : 2037A_INT_2_~~Wed~~_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- CARS - TRUCKS

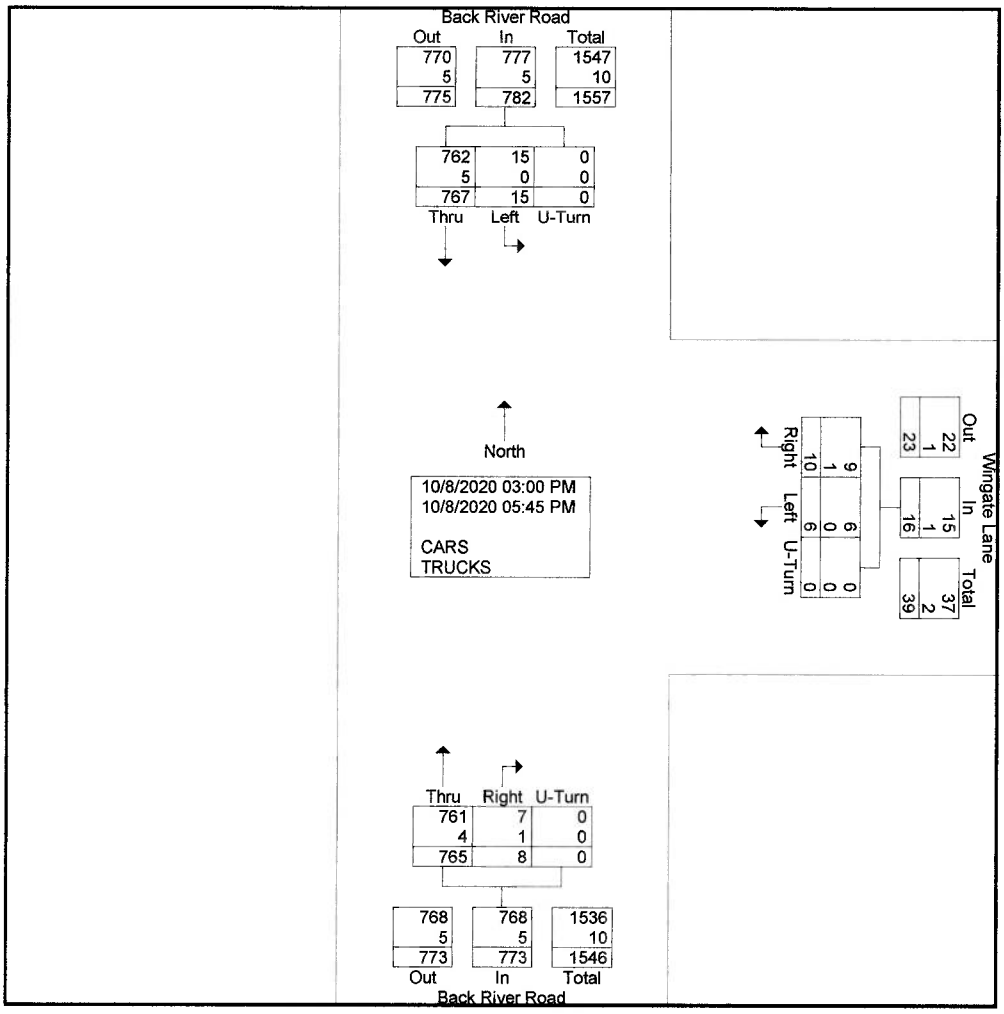
	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	96	5	0	101	0	0	0	0	0	50	0	50	151
03:15 PM	55	0	0	55	2	0	0	2	2	83	0	85	142
03:30 PM	69	2	0	71	0	2	0	2	0	86	0	86	159
03:45 PM	52	0	0	52	0	0	0	0	0	59	0	59	111
Total	272	7	0	279	2	2	0	4	2	278	0	280	563
04:00 PM	50	1	0	51	1	0	0	1	0	59	0	59	111
04:15 PM	51	0	0	51	0	2	0	2	3	60	0	63	116
04:30 PM	72	1	0	73	1	0	0	1	0	51	0	51	125
04:45 PM	78	1	0	79	0	0	0	0	0	64	0	64	143
Total	251	3	0	254	2	2	0	4	3	234	0	237	495
05:00 PM	75	1	0	76	3	0	0	3	2	71	0	73	152
05:15 PM	68	2	0	70	1	2	0	3	1	83	0	84	157
05:30 PM	55	2	0	57	1	0	0	1	0	51	0	51	109
05:45 PM	46	0	0	46	1	0	0	1	0	48	0	48	95
Total	244	5	0	249	6	2	0	8	3	253	0	256	513
Grand Total	767	15	0	782	10	6	0	16	8	765	0	773	1571
Apprch %	98.1	1.9	0		62.5	37.5	0		1	99	0		
Total %	48.8	1	0	49.8	0.6	0.4	0	1	0.5	48.7	0	49.2	
CARS	762	15	0	777	9	6	0	15	7	761	0	768	1560
% CARS	99.3	100	0	99.4	90	100	0	93.8	87.5	99.5	0	99.4	99.3
TRUCKS	5	0	0	5	1	0	0	1	1	4	0	5	11
% TRUCKS	0.7	0	0	0.6	10	0	0	6.2	12.5	0.5	0	0.6	0.7

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Thurs

Weather: Clear
Collected By: MV
Job Number: 2050A
Town/State: Dover, NH

File Name : 2037A_INT_2_Wed_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

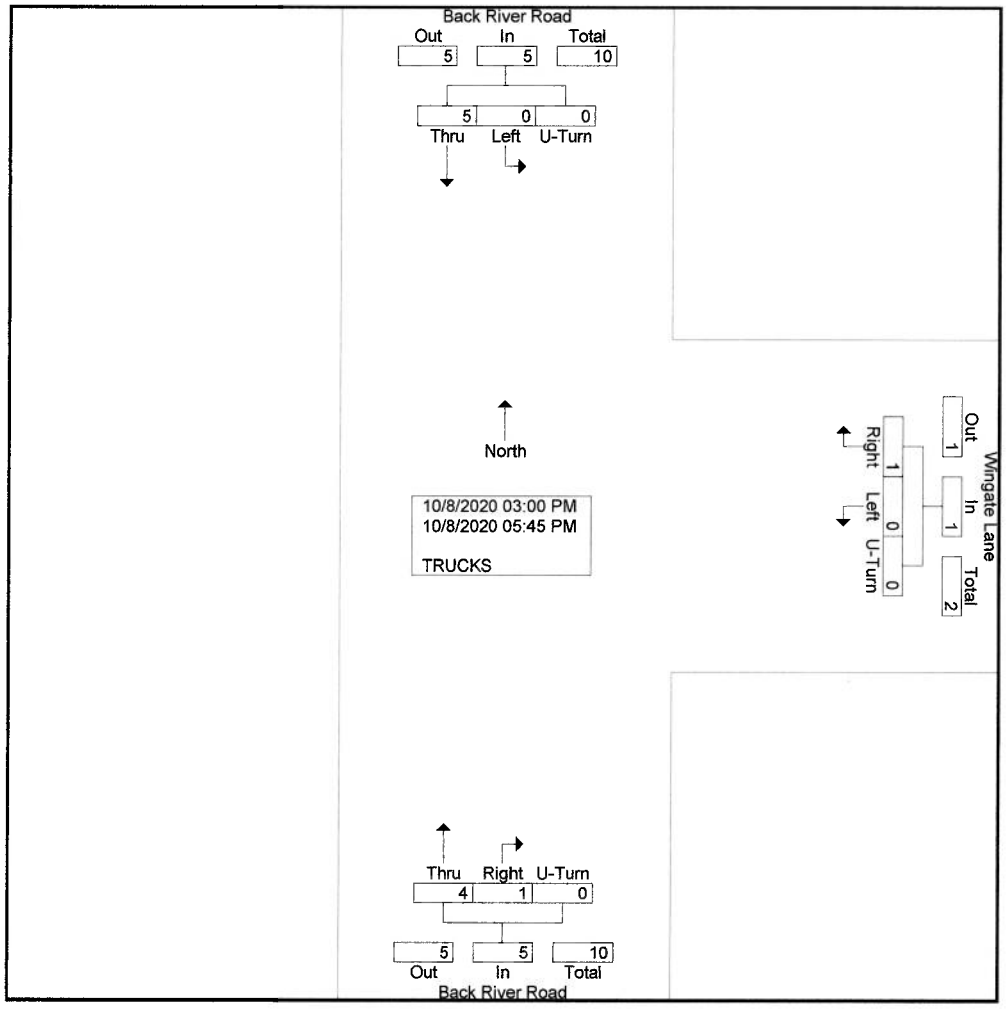
Thurs

Weather: Clear
Collected By: MV
Job Number: 2050A
Town/State: Dover, NH

File Name : 2037A_INT_2_~~Wed~~_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- TRUCKS

	Back River Road From North				Wingate Lane From East				Back River Road From South				
Start Time	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
03:00 PM	0	0	0	0	0	0	0	0	0	2	0	2	2
03:15 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
03:30 PM	1	0	0	1	0	0	0	0	0	1	0	1	2
03:45 PM	0	0	0	0	0	0	0	0	0	1	0	1	1
Total	2	0	0	2	0	0	0	0	0	4	0	4	6
04:00 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
04:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
04:30 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	0	0	2	0	0	0	0	0	0	0	0	2
05:00 PM	0	0	0	0	1	0	0	1	1	0	0	1	2
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	1	0	0	1	0	0	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	1	1	0	0	1	1	0	0	1	3
Grand Total	5	0	0	5	1	0	0	1	1	4	0	5	11
Apprch %	100	0	0		100	0	0		20	80	0		
Total %	45.5	0	0	45.5	9.1	0	0	9.1	9.1	36.4	0	45.5	

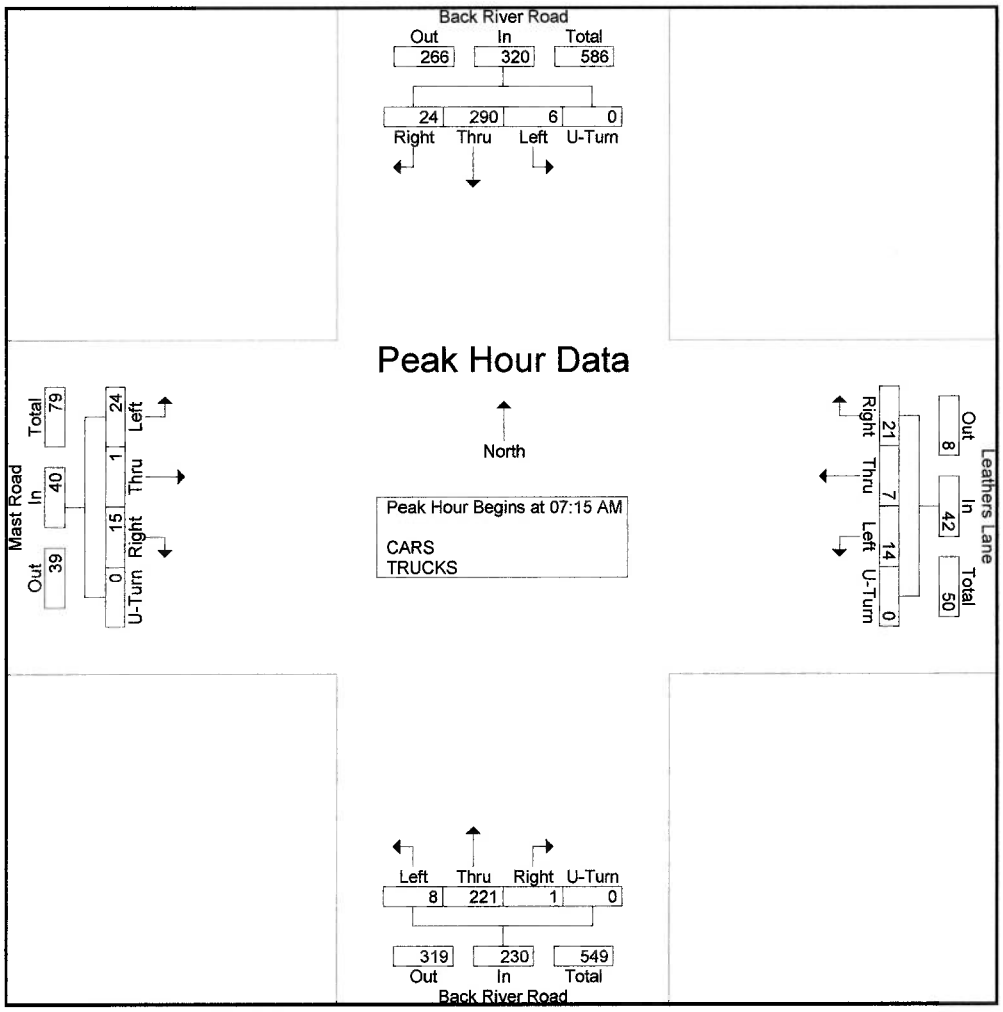


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	3	54	2	0	59	**6**	**3**	1	0	10	0	40	2	0	42	5	0	4	0	9	120
07:30 AM	6	86	0	0	92	4	2	**8**	0	**14**	0	49	**3**	0	52	2	**1**	8	0	11	169
07:45 AM	**9**	**91**	1	0	**101**	6	1	3	0	10	0	64	2	0	66	**7**	0	**9**	0	**16**	**193**
08:00 AM	6	59	**3**	0	68	5	1	2	0	8	**1**	**68**	1	0	**70**	1	0	3	0	4	150
Total Volume	24	290	6	0	320	21	7	14	0	42	1	221	8	0	230	15	1	24	0	40	632
% App. Total	7.5	90.6	1.9	0		50	16.7	33.3	0		0.4	96.1	3.5	0		37.5	2.5	60	0		
PHF	.667	.797	.500	.000	.792	.875	.583	.438	.000	.750	.250	.813	.667	.000	.821	.536	.250	.667	.000	.625	.819

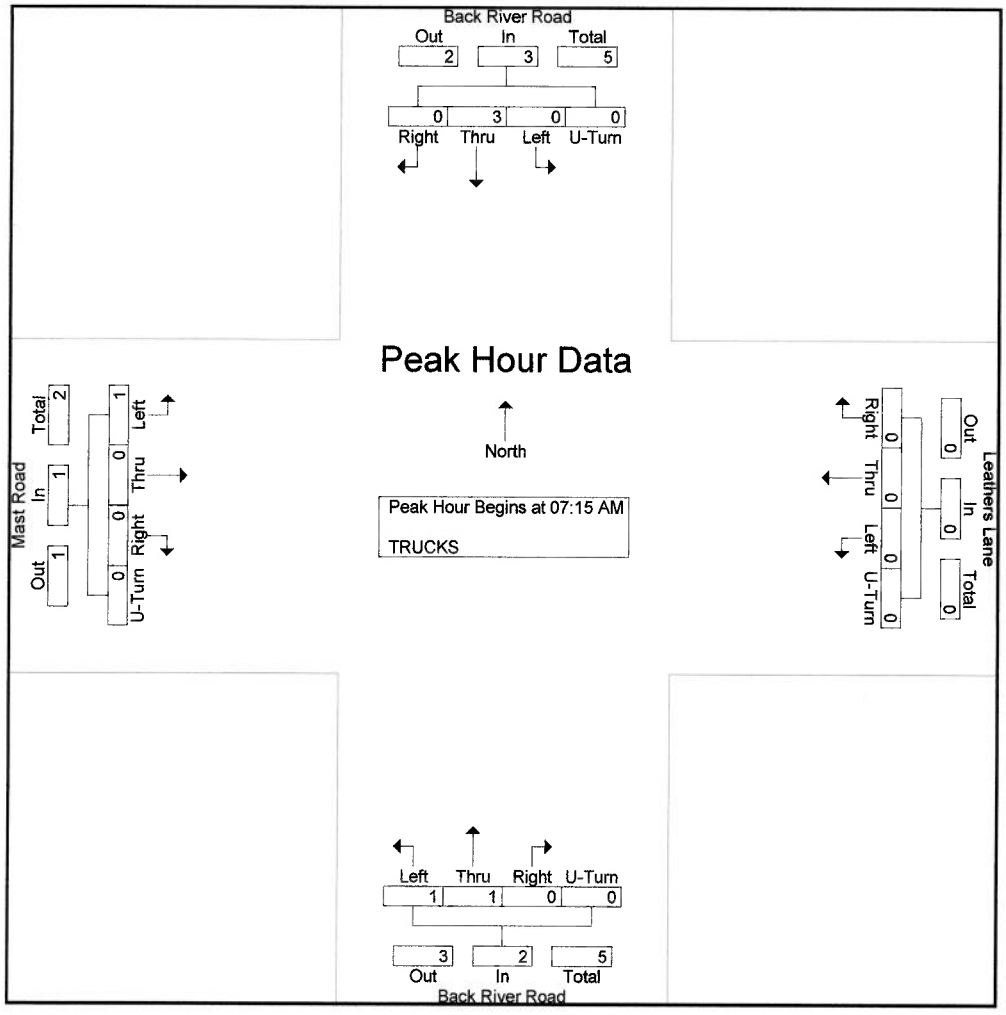


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	0	**2**	0	0	**2**	0	0	0	0	0	0	**1**	0	0	**1**	0	0	0	0	0	**3**
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	1	0	0	0	0	0	1
07:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**	0	**1**	1
Total Volume	0	3	0	0	3	0	0	0	0	0	0	1	1	0	2	0	0	1	0	1	6
% App. Total	0	100	0	0		0	0	0	0		0	50	50	0		0	0	100	0		
PHF	.000	.375	.000	.000	.375	.000	.000	.000	.000	.000	.000	.250	.250	.000	.500	.000	.000	.250	.000	.250	.500



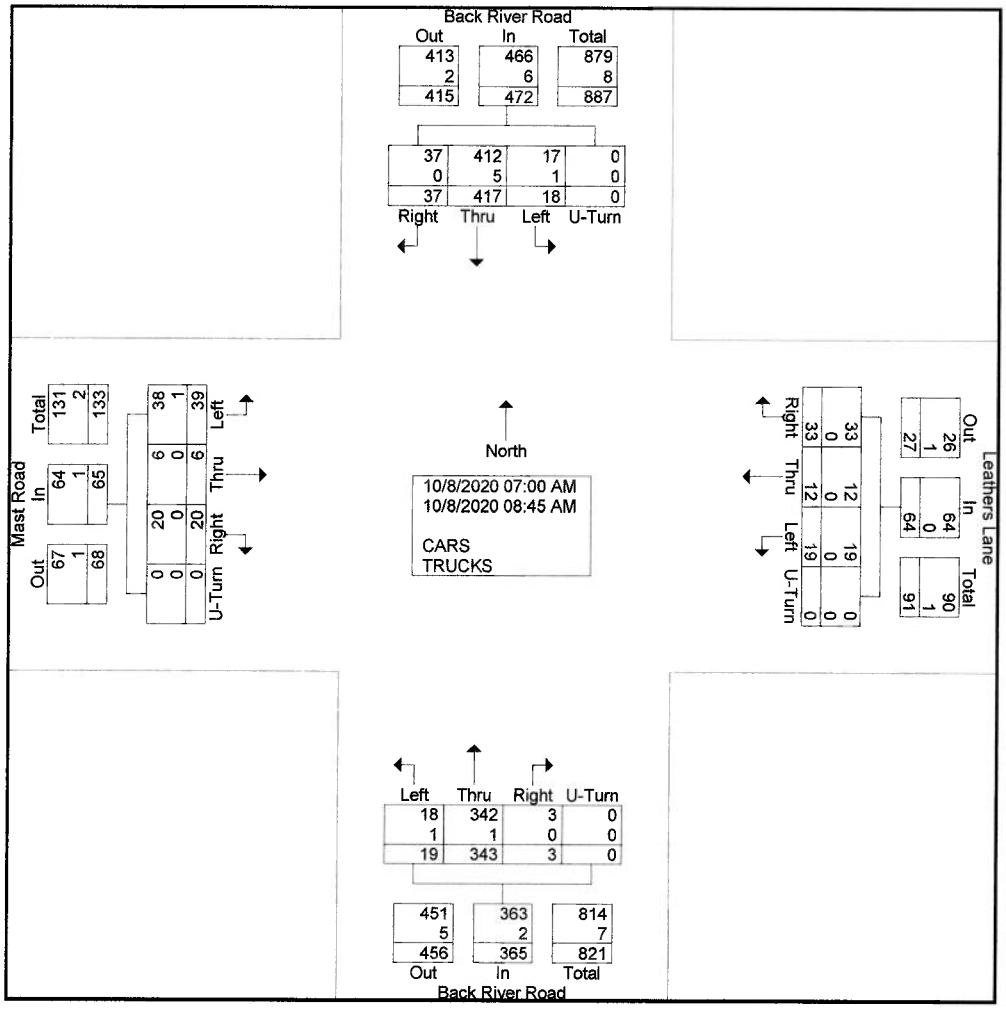
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- CARS - TRUCKS

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	1	26	1	0	28	3	0	3	0	6	0	29	3	0	32	0	2	5	0	7	73
07:15 AM	3	54	2	0	59	6	3	1	0	10	0	40	2	0	42	5	0	4	0	9	120
07:30 AM	6	86	0	0	92	4	2	8	0	14	0	49	3	0	52	2	1	8	0	11	169
07:45 AM	9	91	1	0	101	6	1	3	0	10	0	64	2	0	66	7	0	9	0	16	193
Total	19	257	4	0	280	19	6	15	0	40	0	182	10	0	192	14	3	26	0	43	555
08:00 AM	6	59	3	0	68	5	1	2	0	8	1	68	1	0	70	1	0	3	0	4	150
08:15 AM	5	27	4	0	36	4	3	2	0	9	0	47	3	0	50	3	1	4	0	8	103
08:30 AM	6	35	2	0	43	3	1	0	0	4	2	22	1	0	25	2	1	3	0	6	78
08:45 AM	1	39	5	0	45	2	1	0	0	3	0	24	4	0	28	0	1	3	0	4	80
Total	18	160	14	0	192	14	6	4	0	24	3	161	9	0	173	6	3	13	0	22	411
Grand Total	37	417	18	0	472	33	12	19	0	64	3	343	19	0	365	20	6	39	0	65	966
Apprch %	7.8	88.3	3.8	0		51.6	18.8	29.7	0		0.8	94	5.2	0		30.8	9.2	60	0		
Total %	3.8	43.2	1.9	0	48.9	3.4	1.2	2	0	6.6	0.3	35.5	2	0	37.8	2.1	0.6	4	0	6.7	
CARS	37	412	17	0	466	33	12	19	0	64	3	342	18	0	363	20	6	38	0	64	957
% CARS	100	98.8	94.4	0	98.7	100	100	100	0	100	100	99.7	94.7	0	99.5	100	100	97.4	0	98.5	99.1
TRUCKS	0	5	1	0	6	0	0	0	0	0	0	1	1	0	2	0	0	1	0	1	9
% TRUCKS	0	1.2	5.6	0	1.3	0	0	0	0	0	0	0.3	5.3	0	0.5	0	0	2.6	0	1.5	0.9



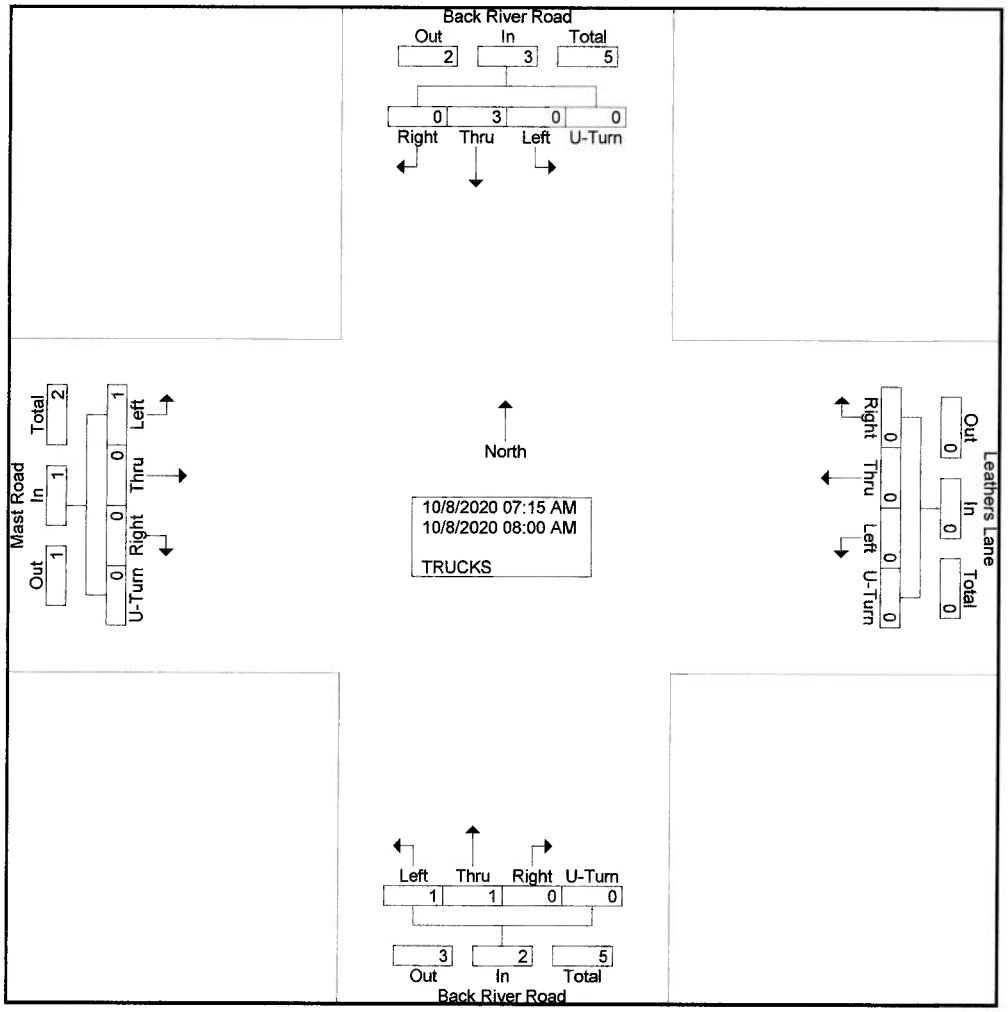
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- TRUCKS

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:15 AM	0	2	0	0	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	3
07:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	1
07:45 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	3	0	0	3	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	5
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Grand Total	0	3	0	0	3	0	0	0	0	0	0	1	1	0	2	0	0	1	0	1	6
Apprch %	0	100	0	0		0	0	0	0		0	50	50	0		0	0	100	0		
Total %	0	50	0	0	50	0	0	0	0	0	0	16.7	16.7	0	33.3	0	0	16.7	0	16.7	

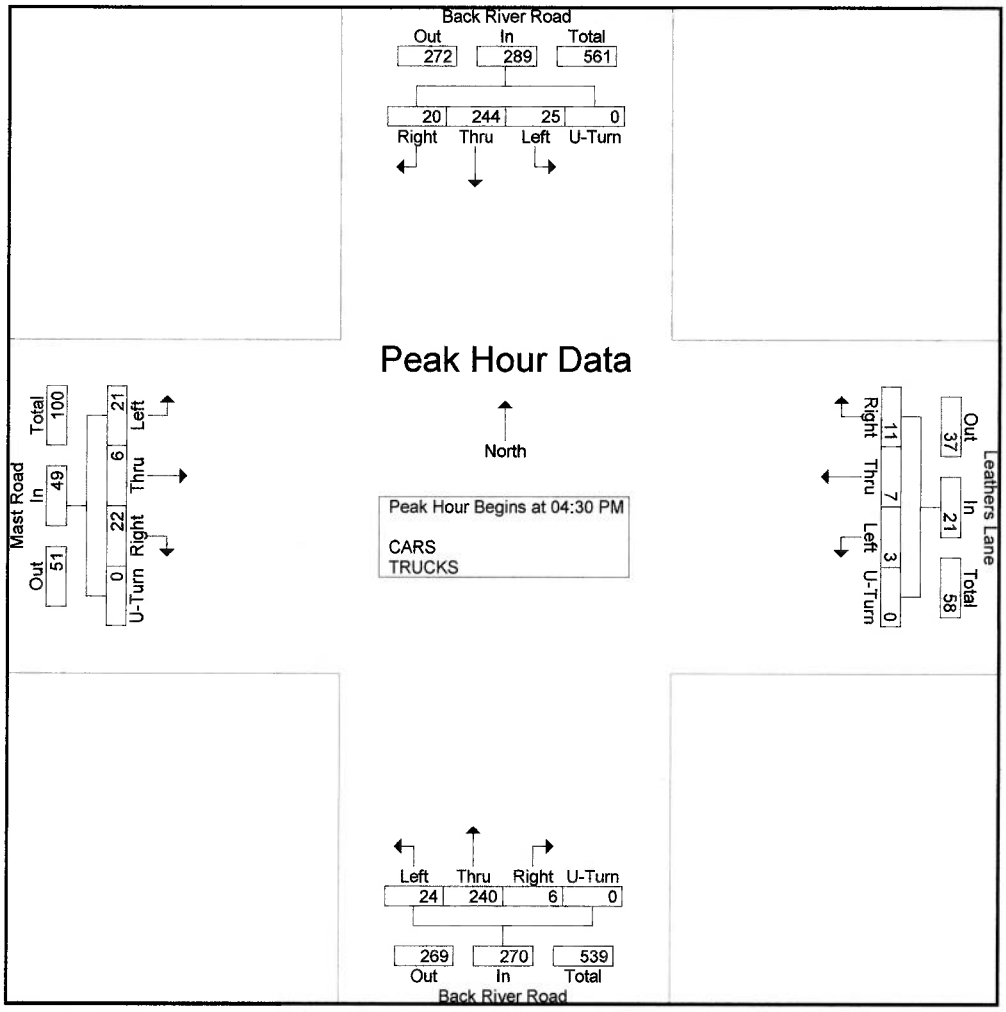


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 3

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	4	60	7	0	71	3	**4**	0	0	**7**	**3**	43	6	0	52	5	1	5	0	11	141
04:45 PM	2	**73**	1	0	**76**	**4**	0	**1**	0	5	0	57	8	0	65	5	0	4	0	9	155
05:00 PM	**8**	55	8	0	71	2	1	1	0	4	2	68	**9**	0	**79**	**9**	2	2	0	13	**167**
05:15 PM	6	56	**9**	0	71	2	2	1	0	5	1	**72**	1	0	74	3	**3**	**10**	0	**16**	166
Total Volume	20	244	25	0	289	11	7	3	0	21	6	240	24	0	270	22	6	21	0	49	629
% App. Total	6.9	84.4	8.7	0		52.4	33.3	14.3	0		2.2	88.9	8.9	0		44.9	12.2	42.9	0		
PHF	.625	.836	.694	.000	.951	.688	.438	.750	.000	.750	.500	.833	.667	.000	.854	.611	.500	.525	.000	.766	.942

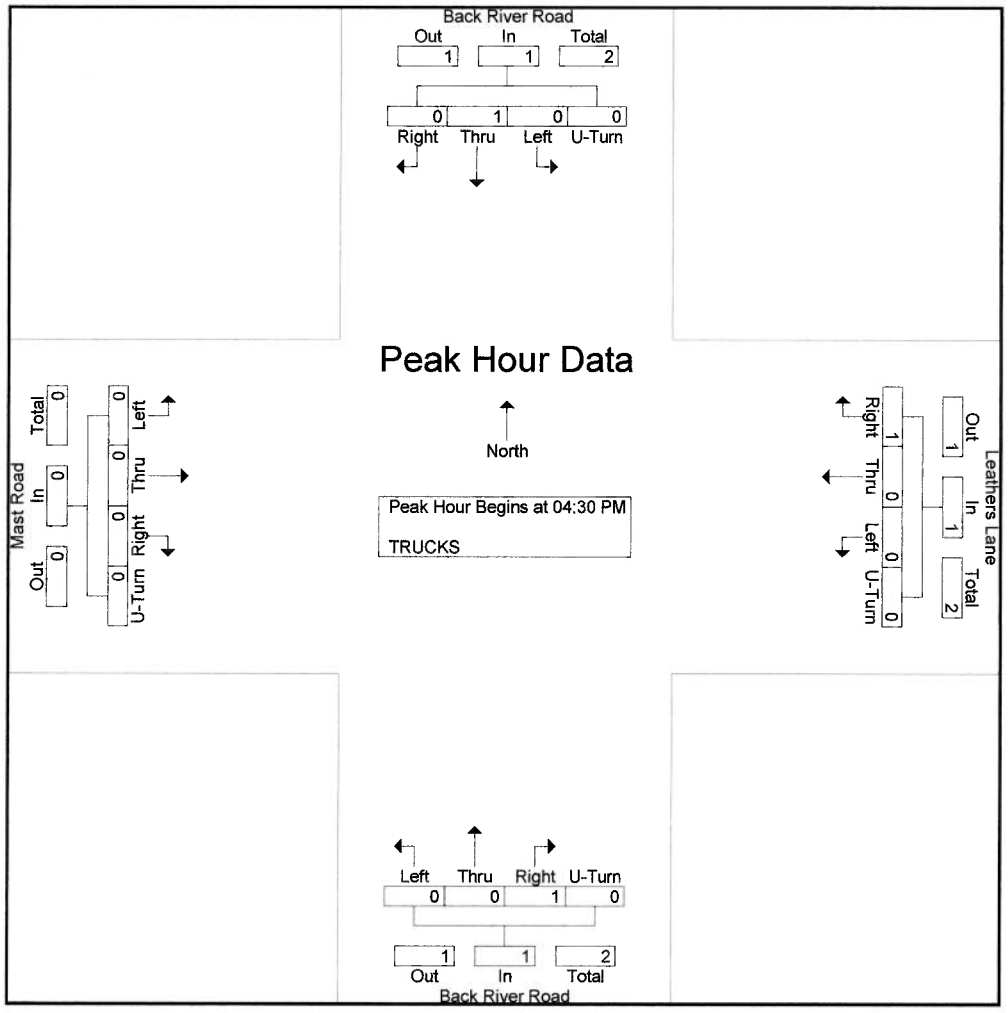


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 04:30 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:30 PM																					
04:30 PM	0	**1**	0	0	**1**	0	0	0	0	0	**1**	0	0	0	**1**	0	0	0	0	0	**2**
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00 PM	0	0	0	0	0	**1**	0	0	0	**1**	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	1	0	0	1	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	3
% App. Total	0	100	0	0		100	0	0	0		100	0	0	0		0	0	0	0		
PHF	.000	.250	.000	.000	.250	.250	.000	.000	.000	.250	.250	.000	.000	.000	.250	.000	.000	.000	.000	.000	.375



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

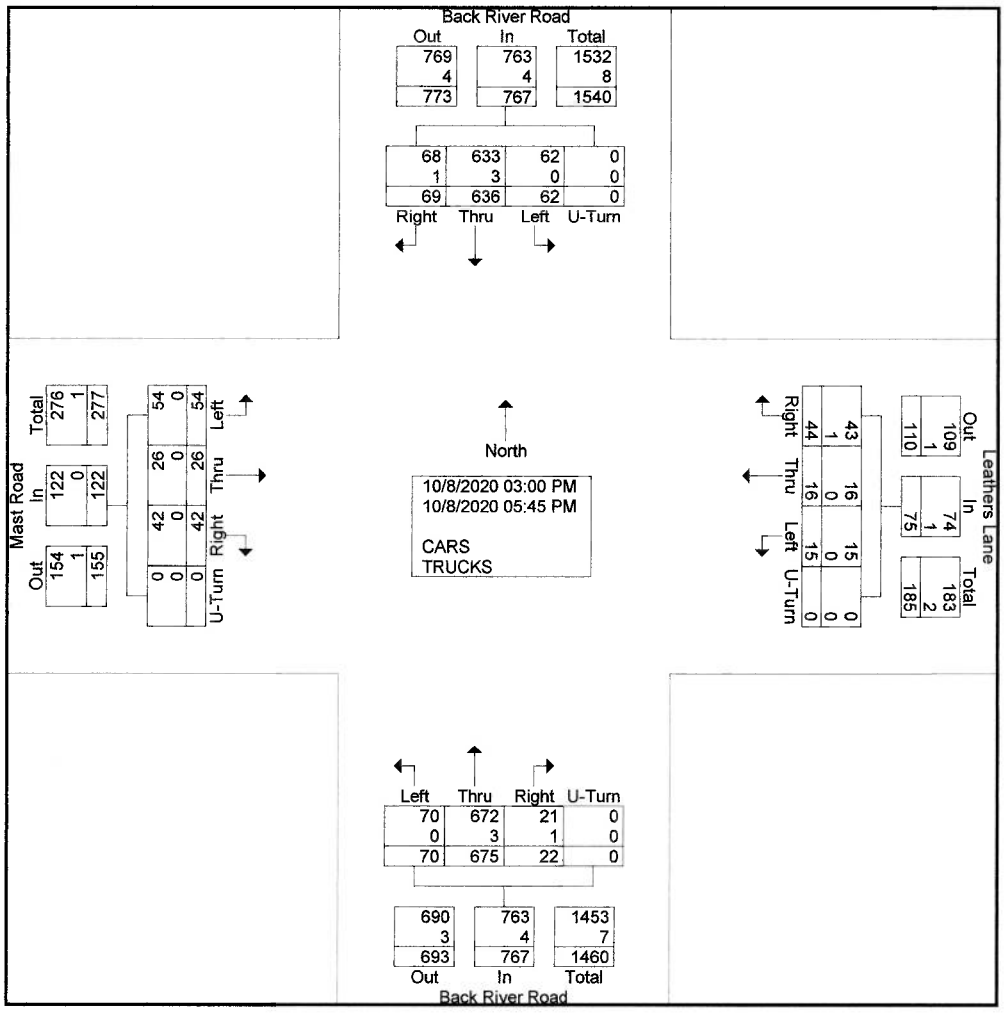
Groups Printed- CARS - TRUCKS

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
03:00 PM	9	82	6	0	97	3	2	0	0	5	4	44	3	0	51	4	0	2	0	6	159
03:15 PM	5	47	3	0	55	1	2	4	0	7	2	80	8	0	90	3	3	4	0	10	162
03:30 PM	3	61	3	0	67	6	1	2	0	9	3	76	9	0	88	1	2	5	0	8	172
03:45 PM	10	40	5	0	55	3	0	2	0	5	1	51	6	0	58	3	3	3	0	9	127
Total	27	230	17	0	274	13	5	8	0	26	10	251	26	0	287	11	8	14	0	33	620
04:00 PM	5	32	4	0	41	5	4	1	0	10	1	53	10	0	64	4	2	2	0	8	123
04:15 PM	9	46	7	0	62	3	0	0	0	3	1	50	3	0	54	2	3	10	0	15	134
04:30 PM	4	60	7	0	71	3	4	0	0	7	3	43	6	0	52	5	1	5	0	11	141
04:45 PM	2	73	1	0	76	4	0	1	0	5	0	57	8	0	65	5	0	4	0	9	155
Total	20	211	19	0	250	15	8	2	0	25	5	203	27	0	235	16	6	21	0	43	553
05:00 PM	8	55	8	0	71	2	1	1	0	4	2	68	9	0	79	9	2	2	0	13	167
05:15 PM	6	56	9	0	71	2	2	1	0	5	1	72	1	0	74	3	3	10	0	16	166
05:30 PM	6	46	5	0	57	9	0	1	0	10	3	36	6	0	45	2	4	6	0	12	124
05:45 PM	2	38	4	0	44	3	0	2	0	5	1	45	1	0	47	1	3	1	0	5	101
Total	22	195	26	0	243	16	3	5	0	24	7	221	17	0	245	15	12	19	0	46	558
Grand Total	69	636	62	0	767	44	16	15	0	75	22	675	70	0	767	42	26	54	0	122	1731
Apprch %	9	82.9	8.1	0		58.7	21.3	20	0		2.9	88	9.1	0		34.4	21.3	44.3	0		
Total %	4	36.7	3.6	0	44.3	2.5	0.9	0.9	0	4.3	1.3	39	4	0	44.3	2.4	1.5	3.1	0	7	
CARS	68	633	62	0	763	43	16	15	0	74	21	672	70	0	763	42	26	54	0	122	1722
% CARS	98.6	99.5	100	0	99.5	97.7	100	100	0	98.7	95.5	99.6	100	0	99.5	100	100	100	0	100	99.5
TRUCKS	1	3	0	0	4	1	0	0	0	1	1	3	0	0	4	0	0	0	0	0	9
% TRUCKS	1.4	0.5	0	0	0.5	2.3	0	0	0	1.3	4.5	0.4	0	0	0.5	0	0	0	0	0	0.5

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2



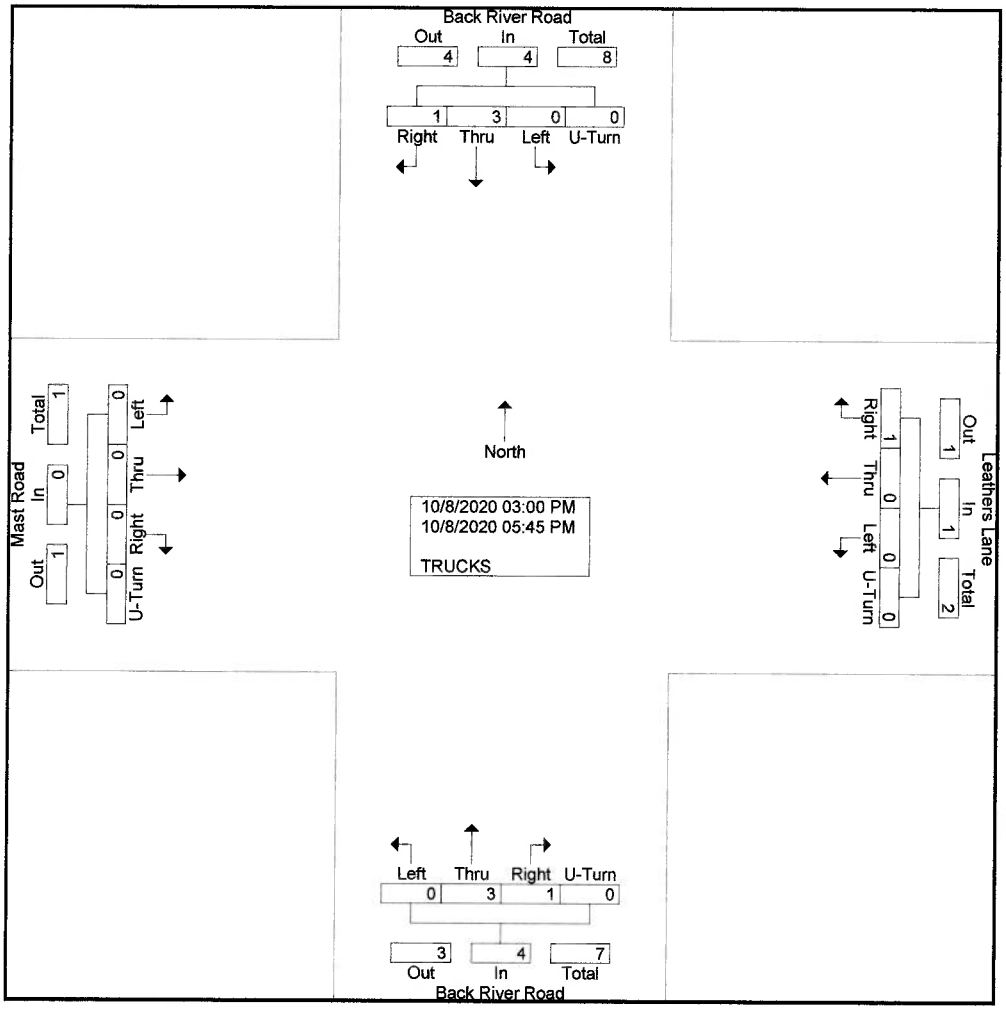
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_INT_3_Thurs_AM_&_PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- TRUCKS

	Back River Road From North					Leathers Lane From East					Back River Road From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
03:00 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
03:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:30 PM	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
03:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	0	0	0	0	4
04:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:15 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
04:30 PM	0	1	0	0	1	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	2
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	2	0	0	2	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	3
05:00 PM	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
05:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2
Grand Total	1	3	0	0	4	1	0	0	0	1	1	3	0	0	4	0	0	0	0	0	9
Apprch %	25	75	0	0		100	0	0	0		25	75	0	0		0	0	0	0		
Total %	11.1	33.3	0	0	44.4	11.1	0	0	0	11.1	11.1	33.3	0	0	44.4	0	0	0	0	0	

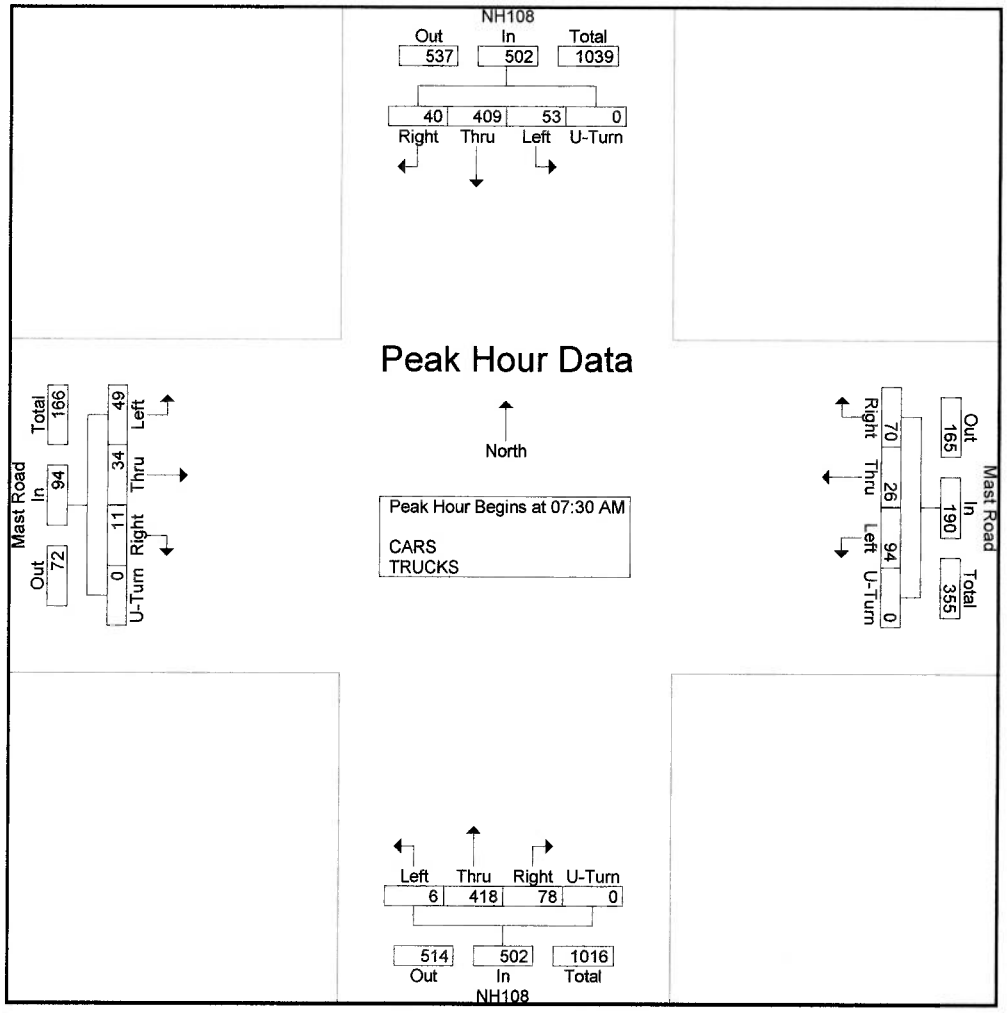


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Mast_INT 4 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	**13**	97	14	0	124	19	5	21	0	45	24	**127**	2	0	**153**	1	11	**16**	0	28	350
07:45 AM	9	**124**	13	0	**146**	**21**	**8**	**32**	0	**61**	**26**	109	**3**	0	138	4	**14**	12	0	**30**	**375**
08:00 AM	10	101	**15**	0	126	17	6	29	0	52	20	98	0	0	118	1	6	9	0	16	312
08:15 AM	8	87	11	0	106	13	7	12	0	32	8	84	1	0	93	**5**	3	12	0	20	251
Total Volume	40	409	53	0	502	70	26	94	0	190	78	418	6	0	502	11	34	49	0	94	1288
% App. Total	8	81.5	10.6	0		36.8	13.7	49.5	0		15.5	83.3	1.2	0		11.7	36.2	52.1	0		
PHF	.769	.825	.883	.000	.860	.833	.813	.734	.000	.779	.750	.823	.500	.000	.820	.550	.607	.766	.000	.783	.859

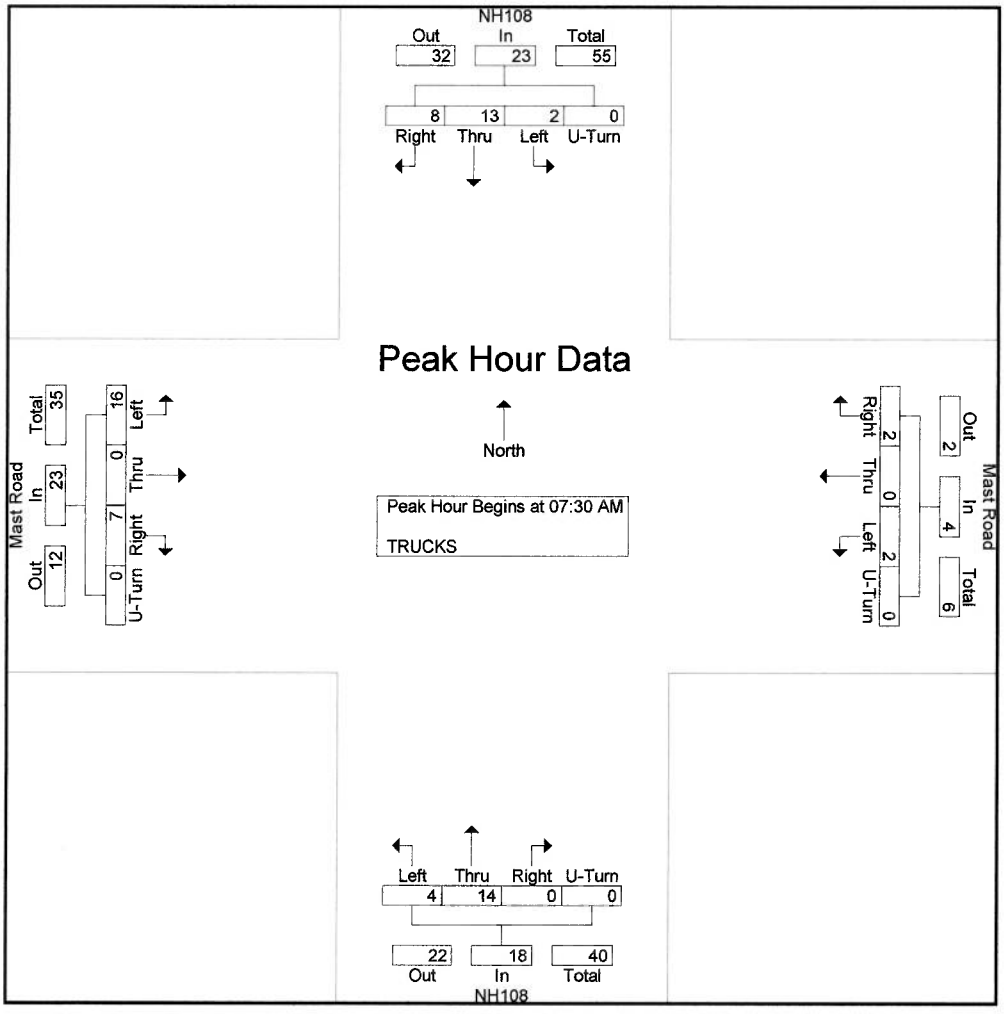


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Mast_INT 4 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	**6**	3	**1**	0	**10**	**1**	0	**1**	0	**2**	0	3	1	0	4	0	0	**8**	0	**8**	**24**
07:45 AM	0	3	1	0	4	1	0	1	0	2	0	**4**	**2**	0	**6**	**4**	0	4	0	8	20
08:00 AM	2	3	0	0	5	0	0	0	0	0	0	4	0	0	4	1	0	2	0	3	12
08:15 AM	0	**4**	0	0	4	0	0	0	0	0	0	3	1	0	4	2	0	2	0	4	12
Total Volume	8	13	2	0	23	2	0	2	0	4	0	14	4	0	18	7	0	16	0	23	68
% App. Total	34.8	56.5	8.7	0		50	0	50	0		0	77.8	22.2	0		30.4	0	69.6	0		
PHF	.333	.813	.500	.000	.575	.500	.000	.500	.000	.500	.000	.875	.500	.000	.750	.438	.000	.500	.000	.719	.708



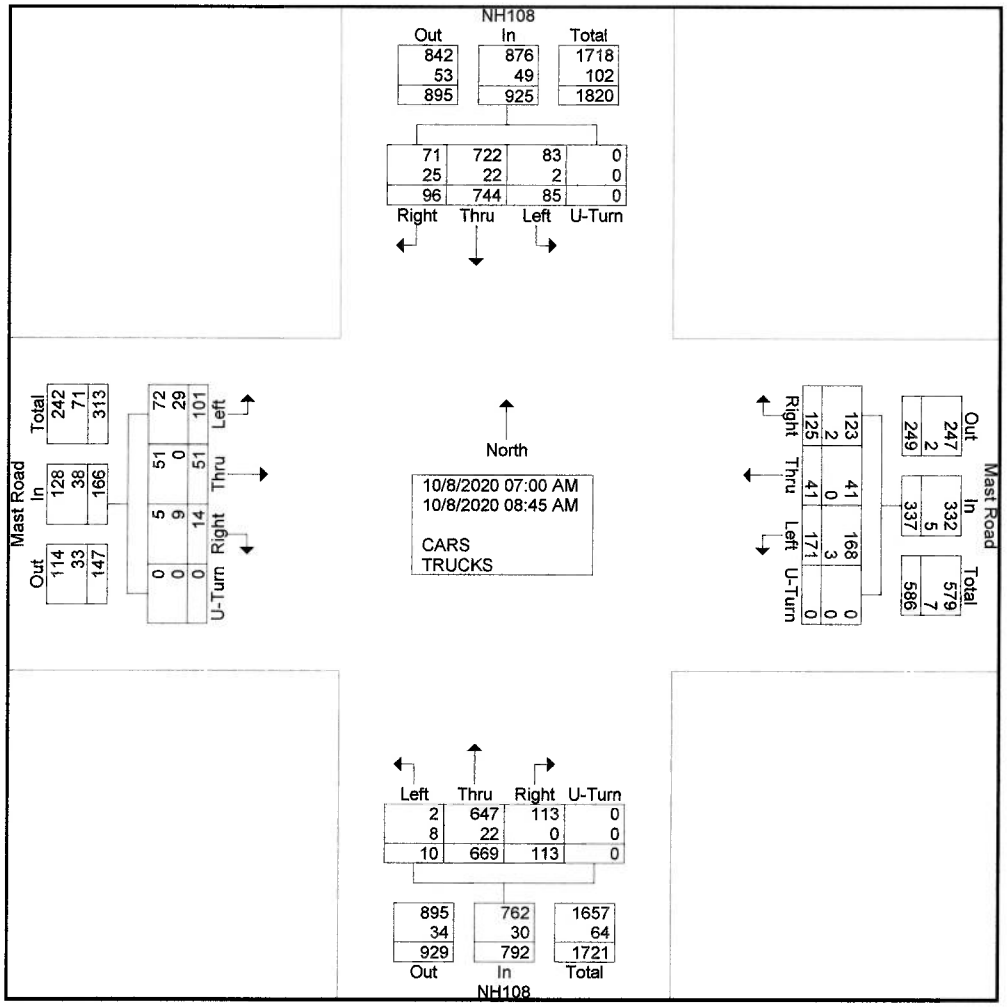
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Mast_INT 4 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- CARS - TRUCKS

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	12	82	11	0	105	12	3	18	0	33	10	51	1	0	62	0	5	15	0	20	220
07:15 AM	12	74	11	0	97	12	3	17	0	32	9	69	0	0	78	2	5	13	0	20	227
07:30 AM	13	97	14	0	124	19	5	21	0	45	24	127	2	0	153	1	11	16	0	28	350
07:45 AM	9	124	13	0	146	21	8	32	0	61	26	109	3	0	138	4	14	12	0	30	375
Total	46	377	49	0	472	64	19	88	0	171	69	356	6	0	431	7	35	56	0	98	1172
08:00 AM	10	101	15	0	126	17	6	29	0	52	20	98	0	0	118	1	6	9	0	16	312
08:15 AM	8	87	11	0	106	13	7	12	0	32	8	84	1	0	93	5	3	12	0	20	251
08:30 AM	14	93	4	0	111	18	5	10	0	33	7	65	3	0	75	0	6	13	0	19	238
08:45 AM	18	86	6	0	110	13	4	32	0	49	9	66	0	0	75	1	1	11	0	13	247
Total	50	367	36	0	453	61	22	83	0	166	44	313	4	0	361	7	16	45	0	68	1048
Grand Total	96	744	85	0	925	125	41	171	0	337	113	669	10	0	792	14	51	101	0	166	2220
Apprch %	10.4	80.4	9.2	0		37.1	12.2	50.7	0		14.3	84.5	1.3	0		8.4	30.7	60.8	0		
Total %	4.3	33.5	3.8	0	41.7	5.6	1.8	7.7	0	15.2	5.1	30.1	0.5	0	35.7	0.6	2.3	4.5	0	7.5	
CARS	71	722	83	0	876	123	41	168	0	332	113	647	2	0	762	5	51	72	0	128	2098
% CARS	74	97	97.6	0	94.7	98.4	100	98.2	0	98.5	100	96.7	20	0	96.2	35.7	100	71.3	0	77.1	94.5
TRUCKS	25	22	2	0	49	2	0	3	0	5	0	22	8	0	30	9	0	29	0	38	122
% TRUCKS	26	3	2.4	0	5.3	1.6	0	1.8	0	1.5	0	3.3	80	0	3.8	64.3	0	28.7	0	22.9	5.5



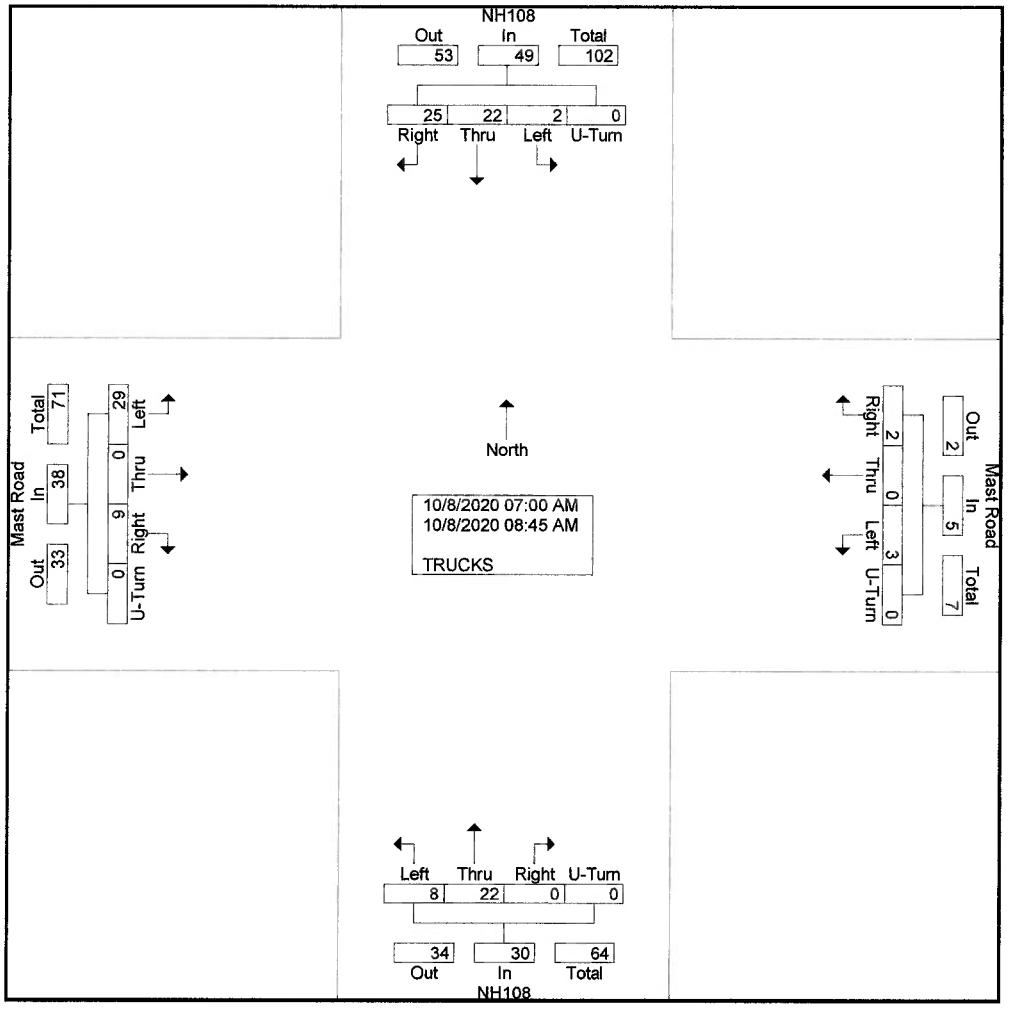
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Mast_INT 4 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- TRUCKS

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
07:00 AM	2	1	0	0	3	0	0	0	0	0	0	2	1	0	3	0	0	3	0	3	9
07:15 AM	2	3	0	0	5	0	0	0	0	0	0	1	0	0	1	2	0	5	0	7	13
07:30 AM	6	3	1	0	10	1	0	1	0	2	0	3	1	0	4	0	0	8	0	8	24
07:45 AM	0	3	1	0	4	1	0	1	0	2	0	4	2	0	6	4	0	4	0	8	20
Total	10	10	2	0	22	2	0	2	0	4	0	10	4	0	14	6	0	20	0	26	66
08:00 AM	2	3	0	0	5	0	0	0	0	0	0	4	0	0	4	1	0	2	0	3	12
08:15 AM	0	4	0	0	4	0	0	0	0	0	0	3	1	0	4	2	0	2	0	4	12
08:30 AM	3	5	0	0	8	0	0	0	0	0	0	3	3	0	6	0	0	3	0	3	17
08:45 AM	10	0	0	0	10	0	0	1	0	1	0	2	0	0	2	0	0	2	0	2	15
Total	15	12	0	0	27	0	0	1	0	1	0	12	4	0	16	3	0	9	0	12	56
Grand Total	25	22	2	0	49	2	0	3	0	5	0	22	8	0	30	9	0	29	0	38	122
Apprch %	51	44.9	4.1	0		40	0	60	0		0	73.3	26.7	0		23.7	0	76.3	0		
Total %	20.5	18	1.6	0	40.2	1.6	0	2.5	0	4.1	0	18	6.6	0	24.6	7.4	0	23.8	0	31.1	

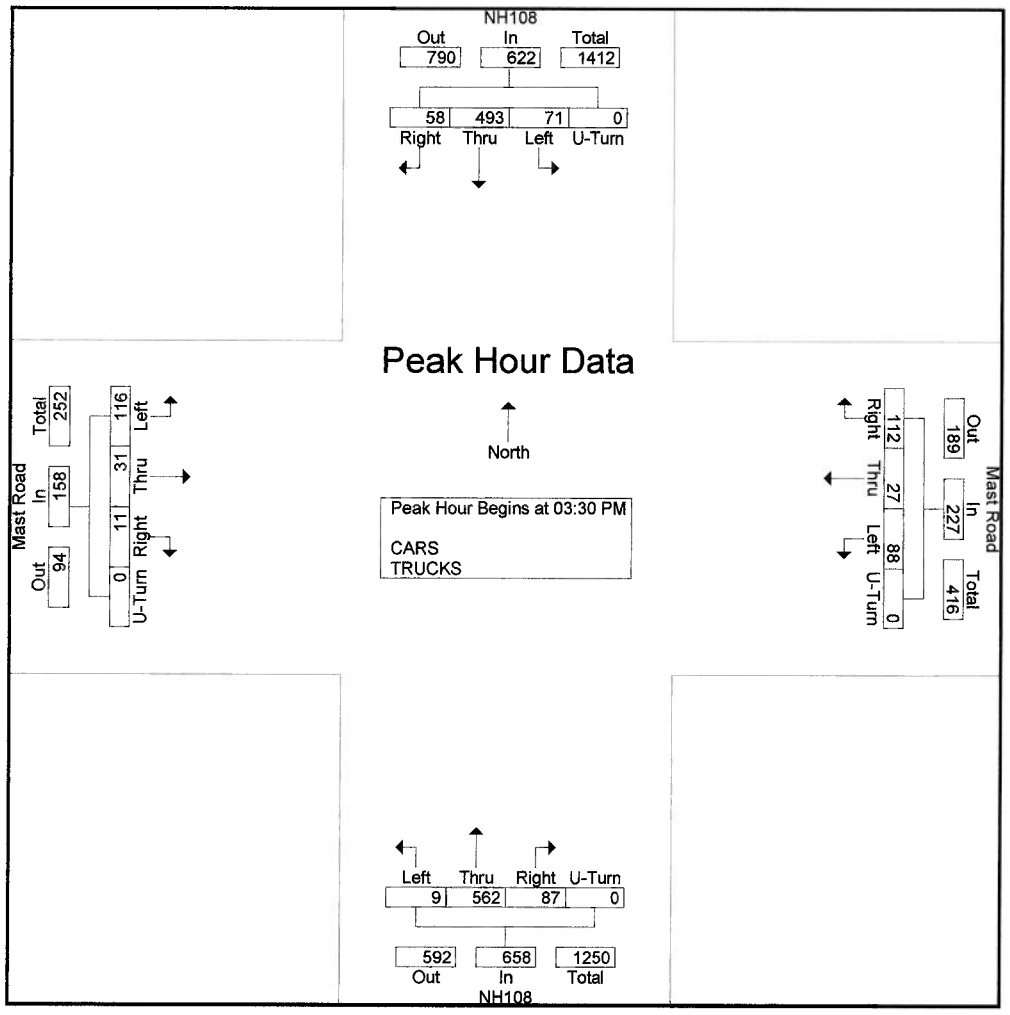


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Mast_INT 4 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 3

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	**18**	124	**22**	0	**164**	**41**	**10**	**24**	0	**75**	12	134	**3**	0	149	0	9	**57**	0	**66**	**454**
03:45 PM	16	109	16	0	141	27	5	18	0	50	**28**	**160**	2	0	**190**	**4**	6	24	0	34	415
04:00 PM	12	125	16	0	153	19	2	24	0	45	21	122	2	0	145	3	**10**	22	0	35	378
04:15 PM	12	**135**	17	0	164	25	10	22	0	57	26	146	2	0	174	4	6	13	0	23	418
Total Volume	58	493	71	0	622	112	27	88	0	227	87	562	9	0	658	11	31	116	0	158	1665
% App. Total	9.3	79.3	11.4	0		49.3	11.9	38.8	0		13.2	85.4	1.4	0		7	19.6	73.4	0		
PHF	.806	.913	.807	.000	.948	.683	.675	.917	.000	.757	.777	.878	.750	.000	.866	.688	.775	.509	.000	.598	.917

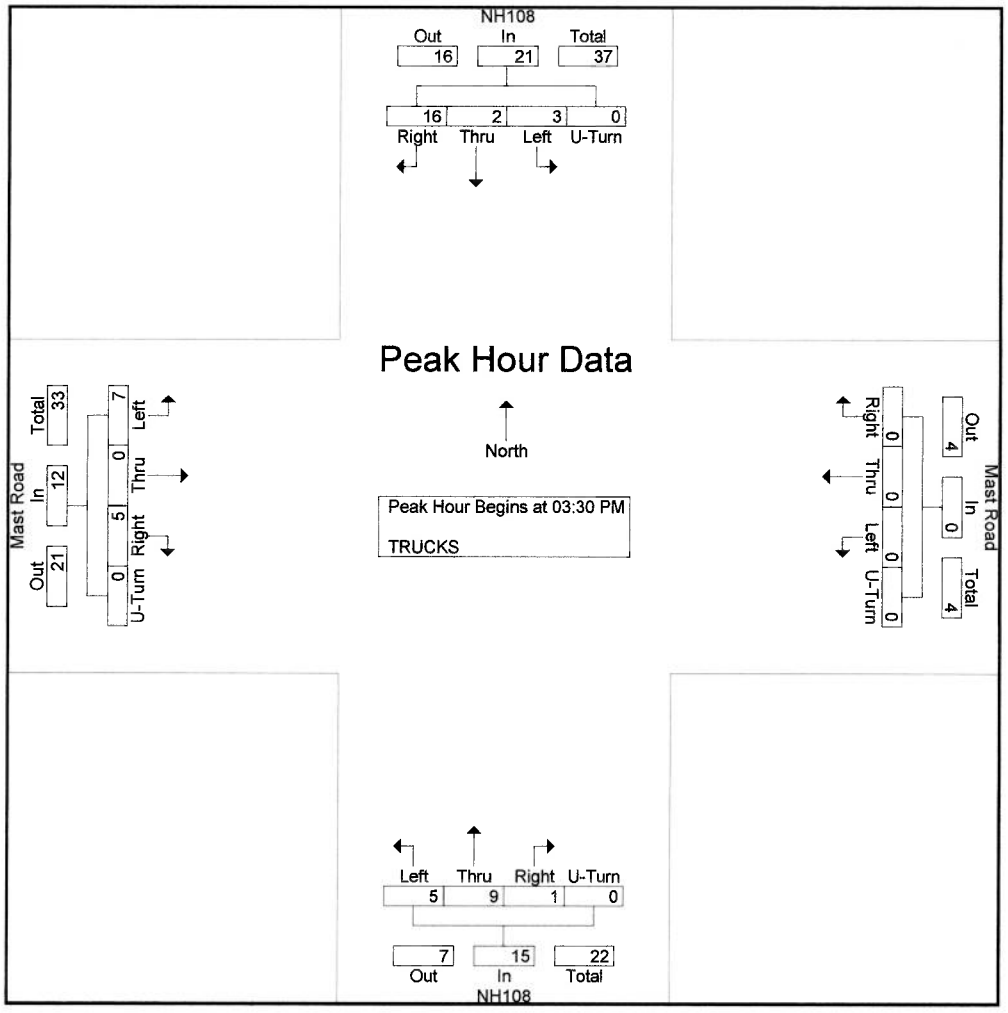


Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Mast_INT 4 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	**8**	**1**	0	0	**9**	0	0	0	0	0	0	0	**2**	0	2	0	0	3	0	3	14
03:45 PM	2	0	1	0	3	0	0	0	0	0	0	**7**	1	0	**8**	2	0	**4**	0	**6**	**17**
04:00 PM	2	0	0	0	2	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	4
04:15 PM	4	1	**2**	0	7	0	0	0	0	0	**1**	1	1	0	3	**3**	0	0	0	3	13
Total Volume	16	2	3	0	21	0	0	0	0	0	1	9	5	0	15	5	0	7	0	12	48
% App. Total	76.2	9.5	14.3	0		0	0	0	0		6.7	60	33.3	0		41.7	0	58.3	0		
PHF	.500	.500	.375	.000	.583	.000	.000	.000	.000	.000	.250	.321	.625	.000	.469	.417	.000	.438	.000	.500	.706



Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Mast_INT 4 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

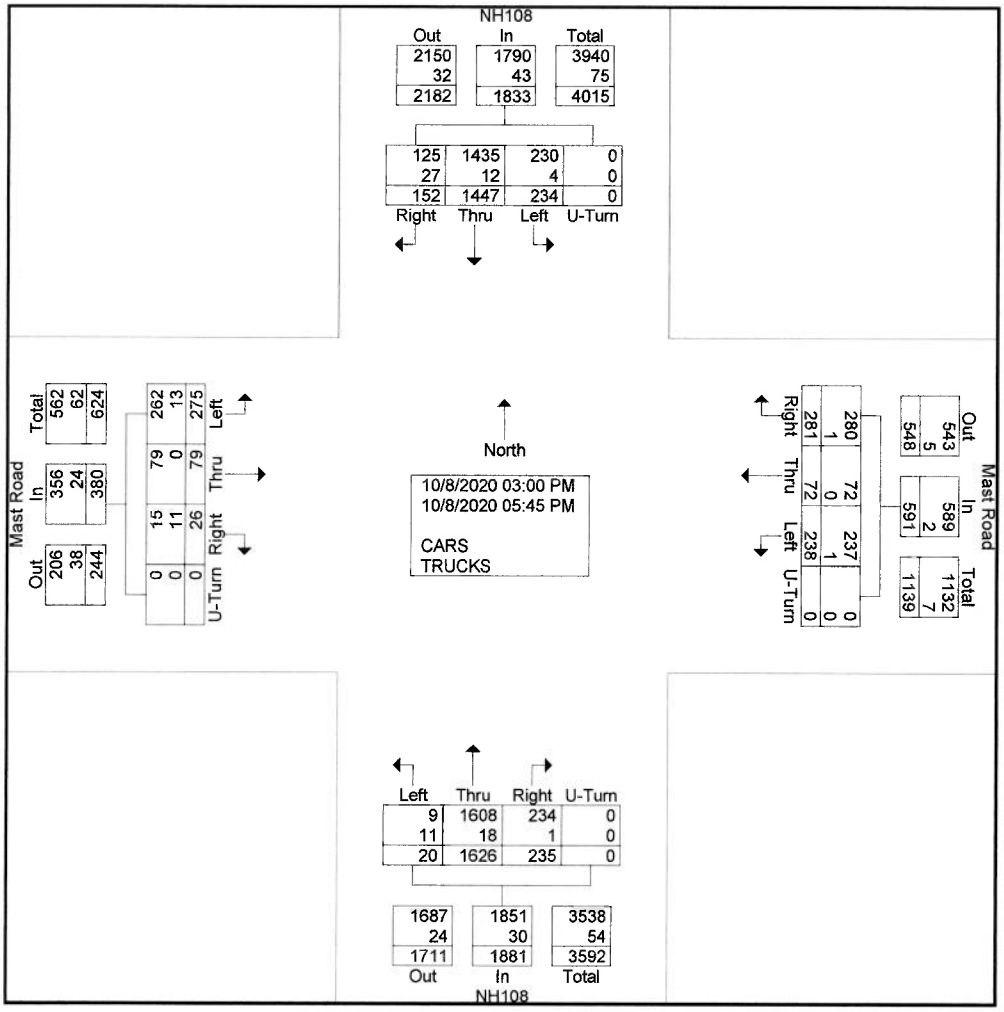
Groups Printed- CARS - TRUCKS

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
03:00 PM	31	102	12	0	145	11	5	15	0	31	20	106	2	0	128	6	8	43	0	57	361
03:15 PM	20	99	23	0	142	27	11	29	0	67	16	102	3	0	121	3	4	33	0	40	370
03:30 PM	18	124	22	0	164	41	10	24	0	75	12	134	3	0	149	0	9	57	0	66	454
03:45 PM	16	109	16	0	141	27	5	18	0	50	28	160	2	0	190	4	6	24	0	34	415
Total	85	434	73	0	592	106	31	86	0	223	76	502	10	0	588	13	27	157	0	197	1600
04:00 PM	12	125	16	0	153	19	2	24	0	45	21	122	2	0	145	3	10	22	0	35	378
04:15 PM	12	135	17	0	164	25	10	22	0	57	26	146	2	0	174	4	6	13	0	23	418
04:30 PM	6	138	30	0	174	28	5	30	0	63	23	141	0	0	164	0	6	8	0	14	415
04:45 PM	9	126	21	0	156	21	8	21	0	50	18	143	2	0	163	2	10	20	0	32	401
Total	39	524	84	0	647	93	25	97	0	215	88	552	6	0	646	9	32	63	0	104	1612
05:00 PM	10	144	22	0	176	20	5	16	0	41	20	124	1	0	145	1	7	20	0	28	390
05:15 PM	6	144	14	0	164	25	4	18	0	47	17	131	2	0	150	2	5	15	0	22	383
05:30 PM	8	110	22	0	140	21	4	15	0	40	14	152	1	0	167	1	3	8	0	12	359
05:45 PM	4	91	19	0	114	16	3	6	0	25	20	165	0	0	185	0	5	12	0	17	341
Total	28	489	77	0	594	82	16	55	0	153	71	572	4	0	647	4	20	55	0	79	1473
Grand Total	152	1447	234	0	1833	281	72	238	0	591	235	1626	20	0	1881	26	79	275	0	380	4685
Apprch %	8.3	78.9	12.8	0		47.5	12.2	40.3	0		12.5	86.4	1.1	0		6.8	20.8	72.4	0		
Total %	3.2	30.9	5	0	39.1	6	1.5	5.1	0	12.6	5	34.7	0.4	0	40.1	0.6	1.7	5.9	0	8.1	
CARS	125	1435	230	0	1790	280	72	237	0	589	234	1608	9	0	1851	15	79	262	0	356	4586
% CARS	82.2	99.2	98.3	0	97.7	99.6	100	99.6	0	99.7	99.6	98.9	45	0	98.4	57.7	100	95.3	0	93.7	97.9
TRUCKS	27	12	4	0	43	1	0	1	0	2	1	18	11	0	30	11	0	13	0	24	99
% TRUCKS	17.8	0.8	1.7	0	2.3	0.4	0	0.4	0	0.3	0.4	1.1	55	0	1.6	42.3	0	4.7	0	6.3	2.1

Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Mast_INT 4 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 2



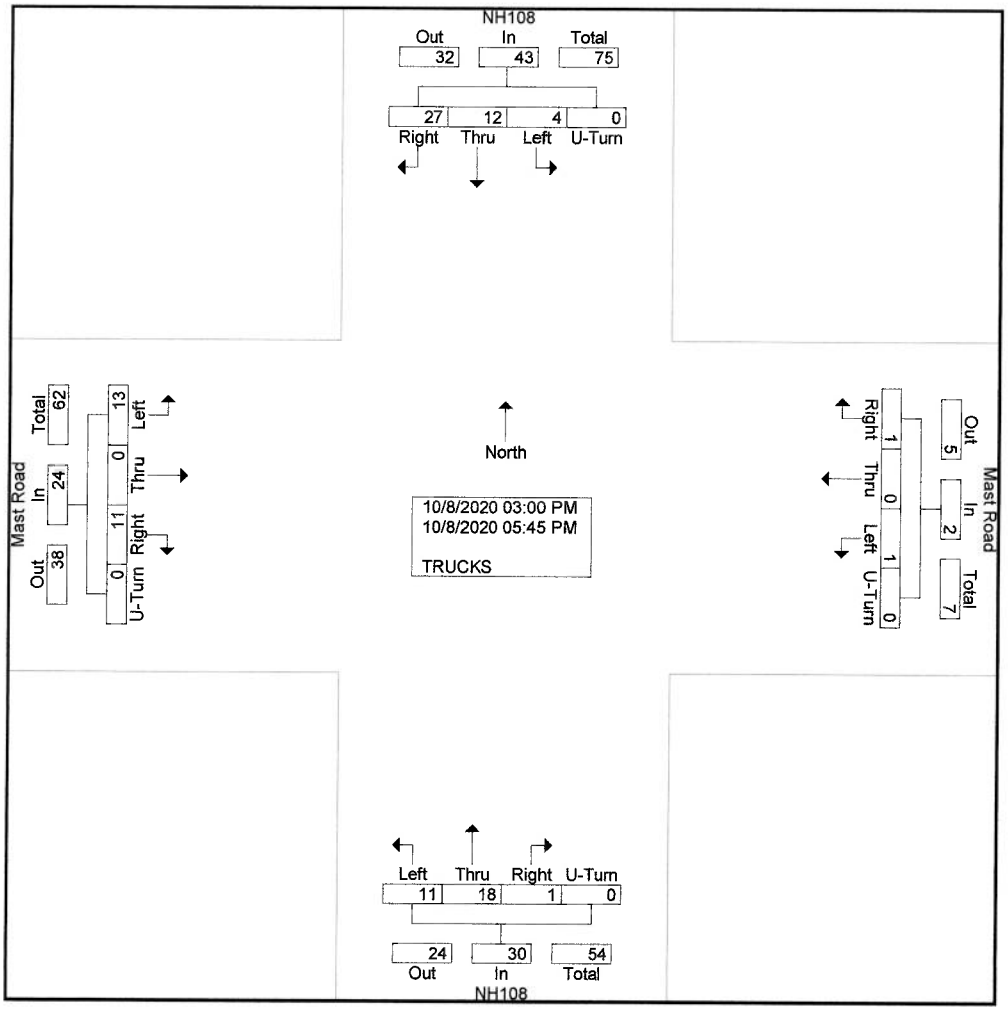
Stephen G. Pernaw & Company, Inc.
P.O. Box 1721
Concord, New Hampshire 03302

Weather: Clear
Collected By: MV
Job Number: 2037A
Town/State: Dover, NH

File Name : 2037A_NH108_Mast_INT 4 Thurs AM & PM
Site Code : 2037A
Start Date : 10/8/2020
Page No : 1

Groups Printed- TRUCKS

	NH108 From North					Mast Road From East					NH108 From South					Mast Road From West					
Start Time	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
03:00 PM	4	3	0	0	7	0	0	1	0	1	0	2	1	0	3	2	0	3	0	5	16
03:15 PM	2	3	0	0	5	0	0	0	0	0	0	1	2	0	3	1	0	1	0	2	10
03:30 PM	8	1	0	0	9	0	0	0	0	0	0	0	2	0	2	0	0	3	0	3	14
03:45 PM	2	0	1	0	3	0	0	0	0	0	0	7	1	0	8	2	0	4	0	6	17
Total	16	7	1	0	24	0	0	1	0	1	0	10	6	0	16	5	0	11	0	16	57
04:00 PM	2	0	0	0	2	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	4
04:15 PM	4	1	2	0	7	0	0	0	0	0	1	1	1	0	3	3	0	0	0	3	13
04:30 PM	1	0	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	1	0	1	4
04:45 PM	0	0	0	0	0	0	0	0	0	0	0	1	2	0	3	1	0	0	0	1	4
Total	7	1	2	0	10	0	0	0	0	0	1	5	4	0	10	4	0	1	0	5	25
05:00 PM	3	2	1	0	6	0	0	0	0	0	0	1	1	0	2	0	0	0	0	0	8
05:15 PM	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	3
05:30 PM	1	1	0	0	2	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	4
05:45 PM	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
Total	4	4	1	0	9	1	0	0	0	1	0	3	1	0	4	2	0	1	0	3	17
Grand Total	27	12	4	0	43	1	0	1	0	2	1	18	11	0	30	11	0	13	0	24	99
Apprch %	62.8	27.9	9.3	0		50	0	50	0		3.3	60	36.7	0		45.8	0	54.2	0		
Total %	27.3	12.1	4	0	43.4	1	0	1	0	2	1	18.2	11.1	0	30.3	11.1	0	13.1	0	24.2	



Appendix D Adjustment Factors

Seasonal Adjustment Factors
NHDOT Group 4 (Urban Highways)

Stephen G. Pernaw & Company, Inc.

Year 2019 Monthly Data - Urban

		Adjustment to	
Month	ADT	Average	Peak
Jan	11,431	1.12	1.23
Feb	11,848	1.08	1.18
Mar	12,141	1.06	1.15
Apr	12,860	1.00	1.09
May	13,551	0.95	1.03
Jun	13,785	0.93	1.02
Jul	13,942	0.92	1.01
Aug	14,016	0.92	1.00
Sep	13,379	0.96	1.05
Oct	13,339	0.96	1.05
Nov	12,265	1.05	1.14
Dec	11,496	1.12	1.22

Year 2018 Monthly Data - Urban

		Adjustment to	
Month	ADT	Average	Peak
Jan	11,282	1.13	1.24
Feb	11,848	1.08	1.18
Mar	11,828	1.08	1.18
Apr	12,491	1.02	1.12
May	13,587	0.94	1.03
Jun	13,911	0.92	1.00
Jul	13,765	0.93	1.01
Aug	13,945	0.92	1.00
Sep	13,168	0.97	1.06
Oct	13,367	0.96	1.04
Nov	12,215	1.05	1.14
Dec	11,963	1.07	1.17

Year 2017 Monthly Data - Urban

		Adjustment to	
Month	ADT	Average	Peak
Jan	12254	1.21	1.33
Feb	13494	1.10	1.21
Mar	14335	1.03	1.14
Apr	15004	0.99	1.09
May	15547	0.95	1.05
Jun	16310	0.91	1.00
Jul	15523	0.95	1.05
Aug	15974	0.93	1.02
Sep	15546	0.95	1.05
Oct	15104	0.98	1.08
Nov	14544	1.02	1.12
Dec	14151	1.05	1.15

Average Peak-Month Factor	**1.06**

Stephen G. Pernaw & Company, Inc.

STEPHEN G. PERNAW & COMPANY, INC.
PROJECT: Proposed Affordable Housing, Dover, New Hampshire
NUMBER: 2037A
COUNT STATION: 82125077

HISTORICAL GROWTH CALCULATIONS

LOCATION : NH108 (North of Back River Road) - Dover, NH
CASE : AADT

ARITHMETIC PROJECTIONS

YEAR	AADT
2015	15790
2016	14901
2017	15199
2018	15503

Regression Output:

Constant	128877.2
Std Err of Y Est	461.27557
R Squared	0.0359051
No. of Observations	4
Degrees of Freedom	2
X Coefficient	-56.3
Std Err of Coef.	206.28871

PROJECTIONS

2020	15151
2021	15095
2022	15039
2023	14982
2024	14926
2025	14870
2026	14813
2027	14757
2028	14701
2029	14645
2030	14588

RATE = -56 VPD/YEAR

GEOMETRIC PROJECTIONS

YEAR	AADT	Ln AADT
2015	15790	9.66713
2016	14901	9.60918
2017	15199	9.62898
2018	15503	9.64879

Regression Output:

Constant	16.74235
Std Err of Y Est	0.030113
R Squared	0.0330833
No. of Observations	4
Degrees of Freedom	2
X Coefficient	-0.0035229
Std Err of Coef.	0.013467

PROJECTIONS

2020	15157
2021	15103
2022	15050
2023	14997
2024	14945
2025	14892
2026	14840
2027	14787
2028	14735
2029	14684
2030	14632

CONCLUSION: USE 1% PER YEAR

RATE = -0.4 % / YEAR

New Hampshire DOT Department of Transportation

MS2

Transportation Data Management System

List View | All DIRs

Record 2375 of 5744 Goto Record go

Location ID	82125077	MPO ID	
Type	SPOT	HPMS ID	
On NHS	No	On HPMS	No
LRS ID	S0000108__	LRS Loc Pt.	
SF Group	04	Route Type	
AF Group	04	Route	NH 108
GF Group	E	Active	Yes
Class Dist Grp	Default	Category	3
Seas Clss Grp	Default		
WIM Group	Default		
QC Group	Default		
Fnct'l Class	Minor Arterial	Milepost	
Located On	Central Ave		
Loc On Alias	NH 108 (DURHAM RD) NORTH OF BACK RIVER RD (SB-NB) (81125202-81125203)		

More Detail

STATION DATA

Directions: 2-WAY | NB | SB

AADT

Year	AADT	DHV-30	K %	D %	PA	BC	Src
2019	18,047	1,983	11	61	16,532 (92%)	1,515 (8%)	
2018	15,503[3]		10	53	14,293 (92%)	1,210 (8%)	Grown from 2017
2017	15,199[3]		10	53	14,105 (93%)	1,094 (7%)	Grown from 2016
2016	14,901	1,418	10	53	13,589 (91%)	1,312 (9%)	
2015	15,790[3]						Grown from 2014

|<< < > >>| 1-5 of 16

Travel Demand Model

	Model Year	Model AADT	AM PHV	AM PPV	MD PHV	MD PPV	PM PHV	PM PPV	NT PHV	NT PPV

VOLUME COUNT

	Date	Int	Total
	Mon 9/16/2019	60	20,100
	Sun 9/15/2019	60	14,093
	Sat 9/14/2019	60	16,867
	Fri 9/13/2019	60	21,659
	Thu 9/12/2019	60	21,238
	Wed 9/11/2019	60	20,673
	Thu 8/25/2016	60	17,051
	Wed 8/24/2016	60	16,380

VOLUME TREND

Year	Annual Growth
2019	16%
2018	2%
2017	2%
2016	-6%
2015	3%
2014	2%
2013	-6%
2012	5%

CALCULATION SHEET

Stephen G. Pernaw & Company, Inc.

Project:	Residential - Dover	Job Number:	2037A
Calculated By:	SP	Date:	10/29/2020
Checked By:	CA	Date:	10/29/2020
Sheet No:	1	Of:	1
Subject:	COVID-19 Adjustment Factor		

Given:

A. Intersection turning movement counts conducted at Back River Road/Mast Road/Leathers Lane intersection in 2019 & 2020.

1. 11/21/19 AM peak hour = 833 vehicles entering the intersection (pre-Covid).
2. 11/21/19 PM peak hour = 654 vehicles entering the intersection (pre-Covid).
3. 10/7/20 AM peak hour = 637 vehicles entering the intersection (with Covid).
4. 10/7/20 PM peak hour = 596 vehicles entering the intersection (with Covid).

B. Annual background growth rate = 1.0% per year.

C. Peak-month seasonal adjustment factors for NHDOT Group 4 areas:

1. November to peak month = (1.14 + 1.14 + 1.12) / 3 = 1.13 (three-year average)
2. October to peak month = (1.05 + 1.04 + 1.08) / 3 = 1.06 (three-year average)

Calculate 2020 peak-month entering volumes from the 2019 pre-Covid data and the 2020 date with Covid

November 2019 AM peak hour entering volume = 833 X 1.01 (historical) X 1.13 (seasonal) = 951 vehicles in 2020 (w/o Covid)

November 2019 PM peak hour entering volume = 654 X 1.01 (historical) X 1.13 (seasonal) = 746 vehicles in 2020 (w/o Covid)

October 2020 AM peak hour entering volume = 637 X 1.00 (historical) X 1.06 (seasonal) = 675 vehicles in 2020 (w/ Covid)

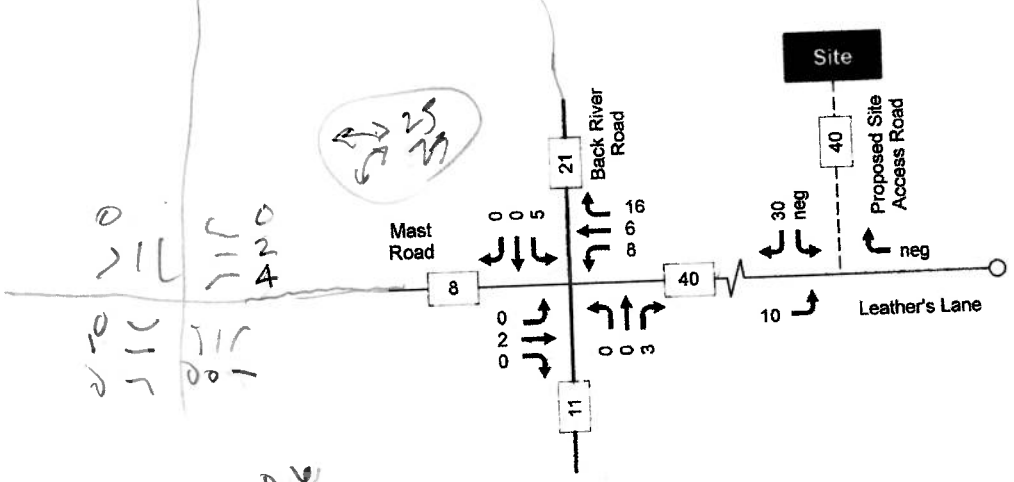
October 2020 PM peak hour entering volume = 596 X 1.00 (historical) X 1.06 (seasonal) = 632 vehicles in 2020 (w/ Covid)

Calculate Covid Factors

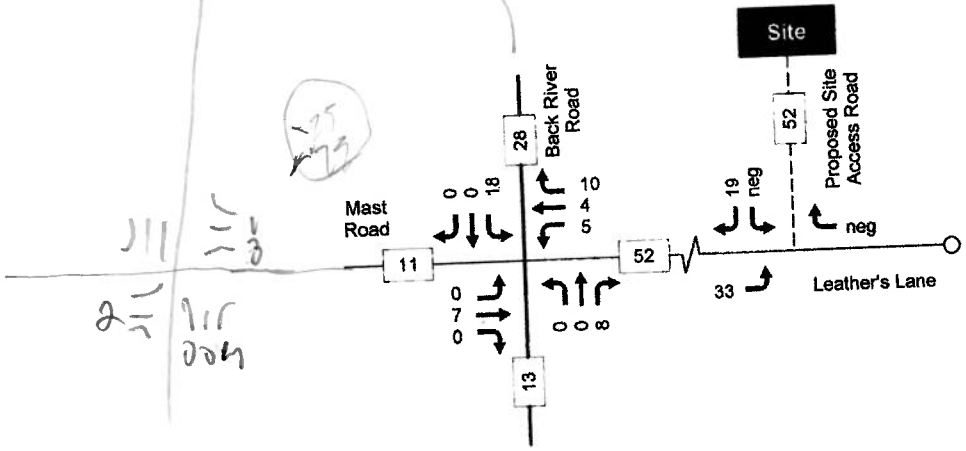
AM peak hour Covid factor = 951 / 675 = 1.41

PM peak hour Covid factor = 746 / 632 = 1.18

Appendix E **Other Development Traffic Volumes**



AM Peak Hour



PM Peak Hour

SOURCE: S.G. PERNAW & CO., INC. TRAFFIC EVALUATION - PROPOSED RESIDENTIAL DEVELOPMENT, DOVER, NH DATED JANUARY 2, 2020

NORTH

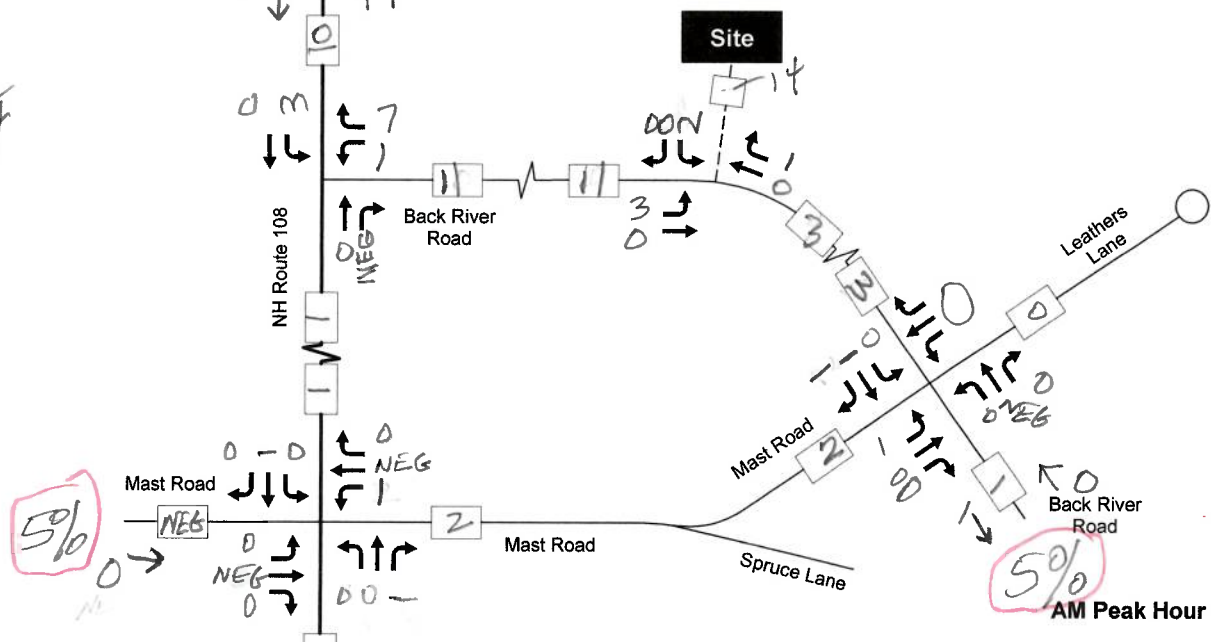
1980A

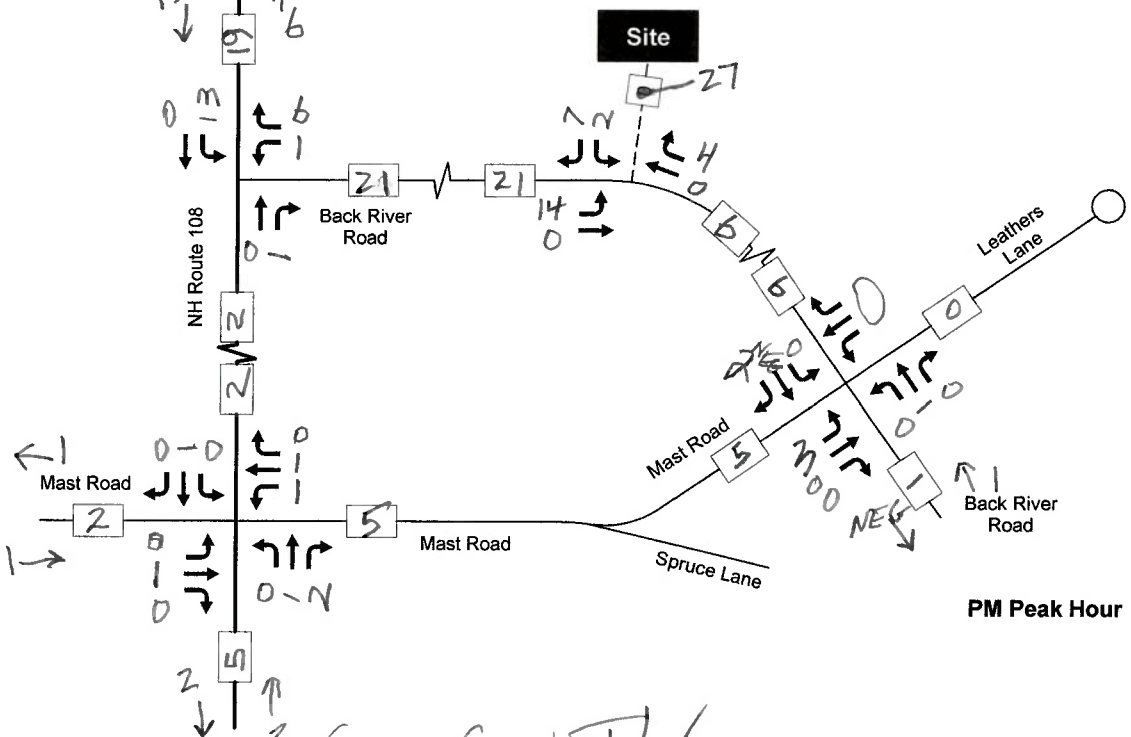
Appendix

Site Generated Traffic Volumes

Traffic Evaluation, Proposed Residential Development, Dover, New Hampshire

Appendix E **Site Generated Traffic Volumes / Trip Distribution**





SITE GEN T/VOL

2037A

NORTH

Trip Generation Summary

Alternative: Alternative 1
Phase:
Project: 2037A

Open Date: 10/15/2020
Analysis Date: 10/15/2020

ITE	Land Use		Weekday Average Daily Trips *	Enter	Exit	Total	Weekday AM Peak Hour of Adjacent Street Traffic *	Enter	Exit	Total	Weekday PM Peak Hour of Adjacent Street Traffic *	Enter	Exit	Total
210	SFHOUSE 2 TRIP EQUATION METHOD			116	116	232		4	10	14		18	9	27
	66	Residents												
210	SFHOUSE 1 TRIP RATE METHOD			88	87	175		4	10	14		12	6	18
	66	Residents												
Unadjusted Volume				204	203	407		8	20	28		30	15	45
Internal Capture Trips				0	0	0		0	0	0		0	0	0
Pass-By Trips				0	0	0		0	0	0		0	0	0
Volume Added to Adjacent Streets				204	203	407		8	20	28		30	15	45

Total Weekday Average Daily Trips Internal Capture = 0 Percent
Total Weekday AM Peak Hour of Adjacent Street Traffic Internal Capture = 0 Percent
Total Weekday PM Peak Hour of Adjacent Street Traffic Internal Capture = 0 Percent

* - Custom rate used for selected time period.

Source: Institute of Transportation Engineers, Trip Generation Manual 10th Edition
TRIP GENERATION 10, TRAFFICWARE, LLC

Stephen G. Pernaw & Company, Inc.

Location: Dover, New Hampshire
Job Number: 2037A

TRIP DISTRIBUTION ANALYSIS - Method A

Work Destination Report - Where Workers are Employed Who Live in the Selection Area - by County Subdivisions

Total All Jobs

Jobs Counts by County Subdivisions Where Workers are Employed - All Jobs	Count	Gateway % A	Gateway % B	Gateway % C	Gateway % D		Gateway Allocation A	Gateway Allocation B	Gateway Allocation C	Gateway Allocation D	
Dover city (Strafford, NH)	3,755	0.85	0.05	0.05	0.05	1.00	3192	188	188	188	3756
Portsmouth city (Rockingham, NH)	3,102	0.90	0.10			1.00	2792	310	0	0	3102
Rochester city (Strafford, NH)	812	1.00				1.00	812	0	0	0	812
Durham town (Strafford, NH)	722			1.00		1.00	0	0	722	0	722
Somersworth city (Strafford, NH)	660	1.00				1.00	660	0	0	0	660
Newington town (Rockingham, NH)	462	0.90	0.10			1.00	416	46	0	0	462
Exeter town (Rockingham, NH)	449	0.30		0.70		1.00	135	0	314	0	449
Manchester city (Hillsborough, NH)	423			0.50	0.50	1.00	0	0	212	212	424
Concord city (Merrimack, NH)	399			0.80	0.20	1.00	0	0	319	80	399
Nashua city (Hillsborough, NH)	363			0.80	0.20	1.00	0	0	290	73	363
	11147						8007	544	2045	553	11149
							71.8%	4.9%	18.3%	5.0%	100%

KEY
A = T/F North on NH108
B = T/F South on Back River Road
C = T/F South on NH108
D = T/F West on Mast Road

72	5	18	5	100
72	28			

Stephen G. Pernaw & Company, Inc.

Project Location: Dover, NH
Project Number: 2037A

TRIP DISTRIBUTION ANALYSIS - Method B

TMC Patterns at Back River Road/Wingate Lane Intersection

	Wednesday, October 7, 2020						Thursday, October 8, 2020					
AM (2-hrs)												
To/From North =	6	+	11	=	17	85%	2	+	10	=	12	80%
To/From South =	3	+	0	=	3	15%	3	+	0	=	3	20%
					20	100%					15	100%
PM (3-hrs)												
To/From North =	16	+	14	=	30	79%	15	+	10	=	25	64%
To/From South =	0	+	8	=	8	21%	6	+	8	=	14	36%
					38	100%					39	100%
Combined (5-hr, AM & PM)												
To/From North =	17	+	30	=	47	81%	12	+	25	=	37	69%
To/From South =	3	+	8	=	11	19%	3	+	14	=	17	31%
					58	100%					54	100%
	USE	**=**	**81%**	**-**	**19%**		**USE**	**=**	**69%**	**-**	**31%**	
			N		**S**				**N**		**S**	

Combine Both Days

To/From North =	47	+	37	=	84	**75%**
To/From South =	11	+	17	=	28	**25%**
					112	**100%**

Appendix F Capacity and Level of Service Calculations – Unsignalized

Intersection	
Int Delay, s/veh	0.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	8	438	1	3	471
Future Vol, veh/h	2	8	438	1	3	471
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	81	81	72	72
Heavy Vehicles, %	0	0	0	0	0	1
Mvmt Flow	2	9	541	1	4	654

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1204	542	0	0	542	0
Stage 1	542	-	-	-	-	-
Stage 2	662	-	-	-	-	-
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	205	544	-	-	1037	-
Stage 1	587	-	-	-	-	-
Stage 2	517	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	204	544	-	-	1037	-
Mov Cap-2 Maneuver	204	-	-	-	-	-
Stage 1	587	-	-	-	-	-
Stage 2	514	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.1	0	0.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	408	1037	-
HCM Lane V/C Ratio	-	-	0.027	0.004	-
HCM Control Delay (s)	-	-	14.1	8.5	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	8	482	1	3	520
Future Vol, veh/h	2	8	482	1	3	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	-	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	81	81	72	72
Heavy Vehicles, %	0	0	0	0	0	1
Mvmt Flow	2	9	595	1	4	722

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1326	596	0	0	596	0
Stage 1	596	-	-	-	-	-
Stage 2	730	-	-	-	-	-
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	173	507	-	-	990	-
Stage 1	554	-	-	-	-	-
Stage 2	481	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	172	507	-	-	990	-
Mov Cap-2 Maneuver	172	-	-	-	-	-
Stage 1	554	-	-	-	-	-
Stage 2	478	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.2	0	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	365	990	-
HCM Lane V/C Ratio	-	-	0.03	0.004	-
HCM Control Delay (s)	-	-	15.2	8.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	7	360	4	14	398
Future Vol, veh/h	2	7	360	4	14	398
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	83	83	78	78
Heavy Vehicles, %	0	0	0	0	0	1
Mvmt Flow	2	8	434	5	18	510

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	983	437	0	0	439	0
Stage 1	437	-	-	-	-	-
Stage 2	546	-	-	-	-	-
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	278	624	-	-	1132	-
Stage 1	655	-	-	-	-	-
Stage 2	584	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	272	624	-	-	1132	-
Mov Cap-2 Maneuver	272	-	-	-	-	-
Stage 1	655	-	-	-	-	-
Stage 2	571	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.6	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	485	1132	-
HCM Lane V/C Ratio	-	-	0.021	0.016	-
HCM Control Delay (s)	-	-	12.6	8.2	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0	-

Intersection	
Int Delay, s/veh	0.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	7	397	4	14	438
Future Vol, veh/h	2	7	397	4	14	438
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	90	90	83	83	78	78
Heavy Vehicles, %	0	0	0	0	0	1
Mvmt Flow	2	8	478	5	18	562

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1079	481	0	0	483	0
Stage 1	481	-	-	-	-	-
Stage 2	598	-	-	-	-	-
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	244	589	-	-	1090	-
Stage 1	626	-	-	-	-	-
Stage 2	553	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	238	589	-	-	1090	-
Mov Cap-2 Maneuver	238	-	-	-	-	-
Stage 1	626	-	-	-	-	-
Stage 2	540	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.3	0	0.3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	444	1090	-
HCM Lane V/C Ratio	-	-	0.023	0.016	-
HCM Control Delay (s)	-	-	13.3	8.4	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1	-

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	18	0	7	9	6	19	13	244	0	5	295	21
Future Vol, veh/h	18	0	7	9	6	19	13	244	0	5	295	21
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	71	71	71	80	80	80	75	75	75
Heavy Vehicles, %	0	0	0	0	0	0	8	1	0	0	1	5
Mvmt Flow	20	0	8	13	8	27	16	305	0	7	393	28

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	776	758	407	762	772	305	421	0	0	305	0	0
Stage 1	421	421	-	337	337	-	-	-	-	-	-	-
Stage 2	355	337	-	425	435	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.18	-	-	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	2.272	-	-	2.2	-	-
Pot Cap-1 Maneuver	317	339	648	324	333	740	1107	-	-	1267	-	-
Stage 1	614	592	-	681	645	-	-	-	-	-	-	-
Stage 2	666	645	-	611	584	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	294	331	648	314	325	740	1107	-	-	1267	-	-
Mov Cap-2 Maneuver	294	331	-	314	325	-	-	-	-	-	-	-
Stage 1	604	588	-	669	634	-	-	-	-	-	-	-
Stage 2	623	634	-	599	580	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	16.3	13.6	0.4	0.1
HCM LOS	C	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1107	-	-	347	467	1267	-	-
HCM Lane V/C Ratio	0.015	-	-	0.081	0.103	0.005	-	-
HCM Control Delay (s)	8.3	0	-	16.3	13.6	7.9	0	-
HCM Lane LOS	A	A	-	C	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.3	0	-	-

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	27	2	11	21	14	43	20	372	3	12	450	32
Future Vol, veh/h	27	2	11	21	14	43	20	372	3	12	450	32
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	71	71	71	80	80	80	75	75	75
Heavy Vehicles, %	0	0	0	0	0	0	8	1	0	0	1	5
Mvmt Flow	30	2	12	30	20	61	25	465	4	16	600	43

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1212	1173	622	1178	1192	467	643	0	0	469	0	0
Stage 1	654	654	-	517	517	-	-	-	-	-	-	-
Stage 2	558	519	-	661	675	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.18	-	-	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	2.272	-	-	2.2	-	-
Pot Cap-1 Maneuver	160	194	490	169	189	600	914	-	-	1103	-	-
Stage 1	459	466	-	545	537	-	-	-	-	-	-	-
Stage 2	518	536	-	455	456	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	126	183	490	156	178	600	914	-	-	1103	-	-
Mov Cap-2 Maneuver	126	183	-	156	178	-	-	-	-	-	-	-
Stage 1	442	455	-	525	517	-	-	-	-	-	-	-
Stage 2	431	516	-	431	446	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	35.5	26.7	0.5	0.2
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	914	-	-	162	274	1103	-	-
HCM Lane V/C Ratio	0.027	-	-	0.277	0.401	0.015	-	-
HCM Control Delay (s)	9	0	-	35.5	26.7	8.3	0	-
HCM Lane LOS	A	A	-	E	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	1.8	0	-	-

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	28	2	11	21	14	43	20	372	3	12	451	33
Future Vol, veh/h	28	2	11	21	14	43	20	372	3	12	451	33
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	71	71	71	80	80	80	75	75	75
Heavy Vehicles, %	0	0	0	0	0	0	8	1	0	0	1	5
Mvmt Flow	31	2	12	30	20	61	25	465	4	16	601	44

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1213	1174	623	1179	1194	467	645	0	0	469	0	0
Stage 1	655	655	-	517	517	-	-	-	-	-	-	-
Stage 2	558	519	-	662	677	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.18	-	-	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	2.272	-	-	2.2	-	-
Pot Cap-1 Maneuver	160	193	490	169	188	600	912	-	-	1103	-	-
Stage 1	458	466	-	545	537	-	-	-	-	-	-	-
Stage 2	518	536	-	454	455	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	126	182	490	156	177	600	912	-	-	1103	-	-
Mov Cap-2 Maneuver	126	182	-	156	177	-	-	-	-	-	-	-
Stage 1	441	455	-	525	517	-	-	-	-	-	-	-
Stage 2	431	516	-	430	445	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	36.4	26.8	0.5	0.2
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	912	-	-	160	273	1103	-	-
HCM Lane V/C Ratio	0.027	-	-	0.288	0.402	0.015	-	-
HCM Control Delay (s)	9.1	0	-	36.4	26.8	8.3	0	-
HCM Lane LOS	A	A	-	E	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	1.9	0	-	-

Intersection												
Int Delay, s/veh	4.6											

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	30	2	12	21	14	43	22	411	3	12	497	35
Future Vol, veh/h	30	2	12	21	14	43	22	411	3	12	497	35
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	71	71	71	80	80	80	75	75	75
Heavy Vehicles, %	0	0	0	0	0	0	8	1	0	0	1	5
Mvmt Flow	34	2	13	30	20	61	28	514	4	16	663	47

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1332	1293	687	1298	1314	516	710	0	0	518	0	0
Stage 1	719	719	-	572	572	-	-	-	-	-	-	-
Stage 2	613	574	-	726	742	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.18	-	-	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	2.272	-	-	2.2	-	-
Pot Cap-1 Maneuver	133	164	450	140	160	563	862	-	-	1058	-	-
Stage 1	423	436	-	509	508	-	-	-	-	-	-	-
Stage 2	483	506	-	419	425	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	101	153	450	127	149	563	862	-	-	1058	-	-
Mov Cap-2 Maneuver	101	153	-	127	149	-	-	-	-	-	-	-
Stage 1	404	425	-	486	485	-	-	-	-	-	-	-
Stage 2	394	483	-	394	414	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	48.3	33.7	0.5	0.2
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	862	-	-	131	232	1058	-	-
HCM Lane V/C Ratio	0.032	-	-	0.377	0.474	0.015	-	-
HCM Control Delay (s)	9.3	0	-	48.3	33.7	8.5	0	-
HCM Lane LOS	A	A	-	E	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.6	2.3	0	-	-

Intersection												
Int Delay, s/veh	4.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	31	2	12	21	14	43	22	411	3	12	498	36
Future Vol, veh/h	31	2	12	21	14	43	22	411	3	12	498	36
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	89	89	89	71	71	71	80	80	80	75	75	75
Heavy Vehicles, %	0	0	0	0	0	0	8	1	0	0	1	5
Mvmt Flow	35	2	13	30	20	61	28	514	4	16	664	48

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1333	1294	688	1300	1316	516	712	0	0	518	0	0
Stage 1	720	720	-	572	572	-	-	-	-	-	-	-
Stage 2	613	574	-	728	744	-	-	-	-	-	-	-
Critical Hdwy	7.1	6.5	6.2	7.1	6.5	6.2	4.18	-	-	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	2.272	-	-	2.2	-	-
Pot Cap-1 Maneuver	132	164	450	140	159	563	861	-	-	1058	-	-
Stage 1	422	435	-	509	508	-	-	-	-	-	-	-
Stage 2	483	506	-	418	424	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	100	153	450	127	148	563	861	-	-	1058	-	-
Mov Cap-2 Maneuver	100	153	-	127	148	-	-	-	-	-	-	-
Stage 1	403	424	-	486	485	-	-	-	-	-	-	-
Stage 2	394	483	-	393	413	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	49.8	33.7	0.5	0.2
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	861	-	-	129	232	1058	-	-
HCM Lane V/C Ratio	0.032	-	-	0.392	0.474	0.015	-	-
HCM Control Delay (s)	9.3	0	-	49.8	33.7	8.5	0	-
HCM Lane LOS	A	A	-	E	D	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.7	2.3	0	-	-

Intersection												
Int Delay, s/veh	2.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	21	6	22	3	7	11	24	240	6	25	244	20
Future Vol, veh/h	21	6	22	3	7	11	24	240	6	25	244	20
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	75	75	75	85	85	85	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	27	8	29	4	9	15	28	282	7	26	257	21

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	674	665	268	680	672	286	278	0	0	289	0	0
Stage 1	320	320	-	342	342	-	-	-	-	-	-	-
Stage 2	354	345	-	338	330	-	-	-	-	-	-	-
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	371	383	776	368	380	758	1296	-	-	1284	-	-
Stage 1	696	656	-	677	642	-	-	-	-	-	-	-
Stage 2	667	640	-	681	649	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	343	364	776	336	361	758	1296	-	-	1284	-	-
Mov Cap-2 Maneuver	343	364	-	336	361	-	-	-	-	-	-	-
Stage 1	678	640	-	659	625	-	-	-	-	-	-	-
Stage 2	628	623	-	632	633	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14	12.8	0.7	0.7
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1296	-	-	462	490	1284	-	-
HCM Lane V/C Ratio	0.022	-	-	0.138	0.057	0.02	-	-
HCM Control Delay (s)	7.8	0	-	14	12.8	7.9	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.5	0.2	0.1	-	-

Intersection												
Int Delay, s/veh	3.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	27	14	28	9	12	23	31	306	15	48	311	26
Future Vol, veh/h	27	14	28	9	12	23	31	306	15	48	311	26
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	75	75	75	85	85	85	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	35	18	36	12	16	31	36	360	18	51	327	27

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	908	893	341	911	897	369	354	0	0	378	0	0
Stage 1	443	443	-	441	441	-	-	-	-	-	-	-
Stage 2	465	450	-	470	456	-	-	-	-	-	-	-
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	258	283	706	257	281	681	1216	-	-	1192	-	-
Stage 1	598	579	-	599	580	-	-	-	-	-	-	-
Stage 2	581	575	-	578	572	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	219	258	706	215	256	681	1216	-	-	1192	-	-
Mov Cap-2 Maneuver	219	258	-	215	256	-	-	-	-	-	-	-
Stage 1	575	548	-	576	558	-	-	-	-	-	-	-
Stage 2	518	553	-	502	542	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	20.7	17	0.7	1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1216	-	-	318	359	1192	-	-
HCM Lane V/C Ratio	0.03	-	-	0.282	0.163	0.042	-	-
HCM Control Delay (s)	8.1	0	-	20.7	17	8.2	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.1	0.6	0.1	-	-

Intersection												
Int Delay, s/veh	3.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	30	14	28	9	12	23	31	307	15	48	311	28
Future Vol, veh/h	30	14	28	9	12	23	31	307	15	48	311	28
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	75	75	75	85	85	85	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	39	18	36	12	16	31	36	361	18	51	327	29

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	910	895	342	913	900	370	356	0	0	379	0	0
Stage 1	444	444	-	442	442	-	-	-	-	-	-	-
Stage 2	466	451	-	471	458	-	-	-	-	-	-	-
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	258	282	705	256	280	680	1214	-	-	1191	-	-
Stage 1	597	579	-	598	580	-	-	-	-	-	-	-
Stage 2	581	574	-	577	570	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	219	257	705	214	255	680	1214	-	-	1191	-	-
Mov Cap-2 Maneuver	219	257	-	214	255	-	-	-	-	-	-	-
Stage 1	574	548	-	575	558	-	-	-	-	-	-	-
Stage 2	518	552	-	501	539	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	21.5	17	0.7	1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1214	-	-	311	358	1191	-	-
HCM Lane V/C Ratio	0.03	-	-	0.301	0.164	0.042	-	-
HCM Control Delay (s)	8.1	0	-	21.5	17	8.2	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.2	0.6	0.1	-	-

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	30	14	31	9	12	23	34	338	15	48	344	29
Future Vol, veh/h	30	14	31	9	12	23	34	338	15	48	344	29
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	75	75	75	85	85	85	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	39	18	40	12	16	31	40	398	18	51	362	31

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	991	976	378	996	982	407	393	0	0	416	0	0
Stage 1	480	480	-	487	487	-	-	-	-	-	-	-
Stage 2	511	496	-	509	495	-	-	-	-	-	-	-
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	227	253	673	225	251	648	1177	-	-	1154	-	-
Stage 1	571	558	-	566	554	-	-	-	-	-	-	-
Stage 2	549	549	-	550	549	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	189	228	673	184	226	648	1177	-	-	1154	-	-
Mov Cap-2 Maneuver	189	228	-	184	226	-	-	-	-	-	-	-
Stage 1	546	526	-	541	530	-	-	-	-	-	-	-
Stage 2	485	525	-	471	518	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	24.4	18.8	0.7	0.9
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1177	-	-	282	320	1154	-	-
HCM Lane V/C Ratio	0.034	-	-	0.345	0.183	0.044	-	-
HCM Control Delay (s)	8.2	0	-	24.4	18.8	8.3	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.5	0.7	0.1	-	-

Intersection												
Int Delay, s/veh	4.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	33	14	31	9	12	23	34	339	15	48	344	31
Future Vol, veh/h	33	14	31	9	12	23	34	339	15	48	344	31
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	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	77	77	77	75	75	75	85	85	85	95	95	95
Heavy Vehicles, %	0	0	0	0	0	0	0	0	0	0	1	0
Mvmt Flow	43	18	40	12	16	31	40	399	18	51	362	33

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	993	978	379	998	985	408	395	0	0	417	0	0
Stage 1	481	481	-	488	488	-	-	-	-	-	-	-
Stage 2	512	497	-	510	497	-	-	-	-	-	-	-
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	226	252	672	224	250	648	1175	-	-	1153	-	-
Stage 1	570	557	-	565	553	-	-	-	-	-	-	-
Stage 2	548	548	-	550	548	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	188	227	672	183	226	648	1175	-	-	1153	-	-
Mov Cap-2 Maneuver	188	227	-	183	226	-	-	-	-	-	-	-
Stage 1	545	525	-	540	529	-	-	-	-	-	-	-
Stage 2	484	524	-	471	517	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	25.5	18.8	0.7	0.9
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1175	-	-	275	319	1153	-	-
HCM Lane V/C Ratio	0.034	-	-	0.368	0.184	0.044	-	-
HCM Control Delay (s)	8.2	0	-	25.5	18.8	8.3	0	-
HCM Lane LOS	A	A	-	D	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	1.6	0.7	0.1	-	-

Appendix G **Capacity and Level of Service Calculations - Signalized**

HCM Signalized Intersection Capacity Analysis
1: NH108 & Back River Road

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	329	25	330	448	21	331
Future Volume (vph)	329	25	330	448	21	331
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1792	1495	1787	1810	1805	1599
Flt Permitted	1.00	1.00	0.55	1.00	0.95	1.00
Satd. Flow (perm)	1792	1495	1037	1810	1805	1599
Peak-hour factor, PHF	0.94	0.94	0.80	0.80	0.89	0.89
Adj. Flow (vph)	350	27	412	560	24	372
RTOR Reduction (vph)	0	5	0	0	0	336
Lane Group Flow (vph)	350	22	413	560	24	36
Heavy Vehicles (%)	6%	8%	1%	5%	0%	1%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	40.1	52.2	40.1	40.1	6.1	6.1
Effective Green, g (s)	40.1	52.2	40.1	40.1	6.1	6.1
Actuated g/C Ratio	0.64	0.83	0.64	0.64	0.10	0.10
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1146	1244	663	1157	175	155
v/s Ratio Prot	0.20	0.02		0.31	0.01	c0.02
v/s Ratio Perm			c0.40			
v/c Ratio	0.31	0.02	0.62	0.48	0.14	0.23
Uniform Delay, d1	5.1	0.9	6.8	5.9	25.9	26.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	1.8	0.3	0.4	0.8
Delay (s)	5.2	0.9	8.6	6.2	26.3	26.9
Level of Service	A	A	A	A	C	C
Approach Delay (s)	4.9			7.2	26.9	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	11.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	62.7	Sum of lost time (s)	14.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

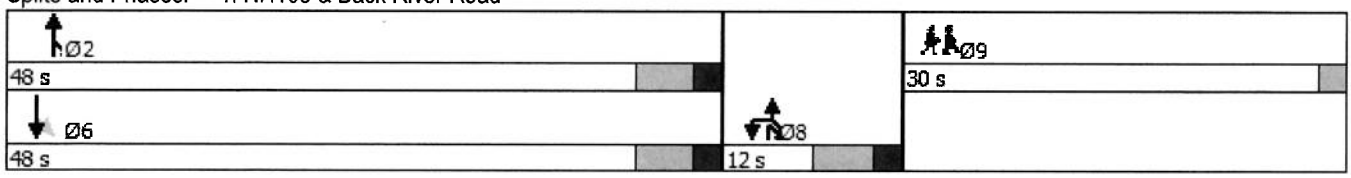
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations							
Traffic Volume (vph)	329	25	330	448	21	331	
Future Volume (vph)	329	25	330	448	21	331	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	48.0		48.0	48.0	12.0	12.0	30.0
Total Split (%)	53.3%		53.3%	53.3%	13.3%	13.3%	33%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	40.1	57.4	40.1	40.1	6.1	6.1	
Actuated g/C Ratio	0.66	0.94	0.66	0.66	0.10	0.10	
v/c Ratio	0.30	0.02	0.61	0.47	0.13	0.75	
Control Delay	6.5	1.2	13.2	8.2	30.8	15.6	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	6.5	1.2	13.2	8.2	30.8	15.6	
LOS	A	A	B	A	C	B	
Approach Delay	6.2			10.3	16.5		
Approach LOS	A			B	B		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 61.2
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 10.8
Intersection LOS: B
Intersection Capacity Utilization 53.9%
ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	350	27	413	560	24	372
v/c Ratio	0.30	0.02	0.61	0.47	0.13	0.75
Control Delay	6.5	1.2	13.2	8.2	30.8	15.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.5	1.2	13.2	8.2	30.8	15.6
Queue Length 50th (ft)	36	0	57	68	8	0
Queue Length 95th (ft)	146	7	211	216	33	#114
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1251	1368	724	1264	180	494
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	0.28	0.02	0.57	0.44	0.13	0.75

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: NH108 & Back River Road

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Volume (vph)	502	39	507	683	34	519
Future Volume (vph)	502	39	507	683	34	519
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1792	1495	1787	1810	1805	1599
Flt Permitted	1.00	1.00	0.43	1.00	0.95	1.00
Satd. Flow (perm)	1792	1495	812	1810	1805	1599
Peak-hour factor, PHF	0.94	0.94	0.80	0.80	0.89	0.89
Adj. Flow (vph)	534	41	634	854	38	583
RTOR Reduction (vph)	0	7	0	0	0	537
Lane Group Flow (vph)	534	34	634	854	38	46
Heavy Vehicles (%)	6%	8%	1%	5%	0%	1%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	43.5	54.6	43.5	43.5	5.1	5.1
Effective Green, g (s)	43.5	54.6	43.5	43.5	5.1	5.1
Actuated g/C Ratio	0.67	0.84	0.67	0.67	0.08	0.08
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1195	1251	541	1207	141	125
v/s Ratio Prot	0.30	0.02		0.47	0.02	c0.03
v/s Ratio Perm			c0.78			
v/c Ratio	0.45	0.03	1.17	0.71	0.27	0.36
Uniform Delay, d1	5.1	0.9	10.9	6.8	28.3	28.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.0	95.7	1.9	1.0	1.8
Delay (s)	5.4	0.9	106.5	8.8	29.3	30.3
Level of Service	A	A	F	A	C	C
Approach Delay (s)	5.1			50.4	30.3	
Approach LOS	A			D	C	

Intersection Summary			
HCM 2000 Control Delay	36.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

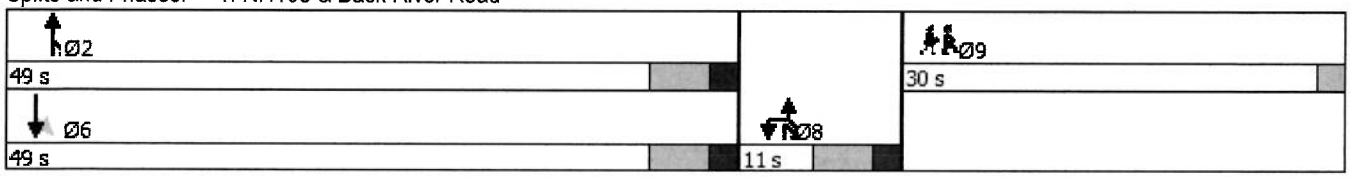
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations	↑	↱	↰	↑	↰	↱	
Traffic Volume (vph)	502	39	507	683	34	519	
Future Volume (vph)	502	39	507	683	34	519	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	49.0		49.0	49.0	11.0	11.0	30.0
Total Split (%)	54.4%		54.4%	54.4%	12.2%	12.2%	33%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	43.5	59.7	43.5	43.5	5.1	5.1	
Actuated g/C Ratio	0.68	0.94	0.68	0.68	0.08	0.08	
v/c Ratio	0.44	0.03	1.14	0.69	0.27	0.88	
Control Delay	7.3	1.0	100.4	12.2	34.9	20.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	7.3	1.0	100.4	12.2	34.9	20.3	
LOS	A	A	F	B	C	C	
Approach Delay	6.8			49.8	21.2		
Approach LOS	A			D	C		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 63.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.14
Intersection Signal Delay: 34.0 — Intersection LOS: C
Intersection Capacity Utilization 72.8% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	534	41	634	854	38	583
v/c Ratio	0.44	0.03	1.14	0.69	0.27	0.88
Control Delay	7.3	1.0	100.4	12.2	34.9	20.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.3	1.0	100.4	12.2	34.9	20.3
Queue Length 50th (ft)	58	0	~267	124	13	0
Queue Length 95th (ft)	239	8	#522	399	47	#155
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1225	1405	555	1237	143	663
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	0.44	0.03	1.14	0.69	0.27	0.88

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.

HCM Signalized Intersection Capacity Analysis
1: NH108 & Back River Road

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	502	39	510	683	35	526
Future Volume (vph)	502	39	510	683	35	526
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1792	1495	1787	1810	1805	1599
Flt Permitted	1.00	1.00	0.43	1.00	0.95	1.00
Satd. Flow (perm)	1792	1495	812	1810	1805	1599
Peak-hour factor, PHF	0.94	0.94	0.80	0.80	0.89	0.89
Adj. Flow (vph)	534	41	638	854	39	591
RTOR Reduction (vph)	0	7	0	0	0	538
Lane Group Flow (vph)	534	34	638	854	39	53
Heavy Vehicles (%)	6%	8%	1%	5%	0%	1%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	43.5	54.6	43.5	43.5	5.1	5.1
Effective Green, g (s)	43.5	54.6	43.5	43.5	5.1	5.1
Actuated g/C Ratio	0.67	0.84	0.67	0.67	0.08	0.08
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1195	1251	541	1207	141	125
v/s Ratio Prot	0.30	0.02		0.47	0.02	c0.03
v/s Ratio Perm			c0.79			
v/c Ratio	0.45	0.03	1.18	0.71	0.28	0.42
Uniform Delay, d1	5.1	0.9	10.9	6.8	28.3	28.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.0	98.6	1.9	1.1	2.3
Delay (s)	5.4	0.9	109.4	8.8	29.4	30.9
Level of Service	A	A	F	A	C	C
Approach Delay (s)	5.1			51.8	30.8	
Approach LOS	A			D	C	

Intersection Summary			
HCM 2000 Control Delay	37.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

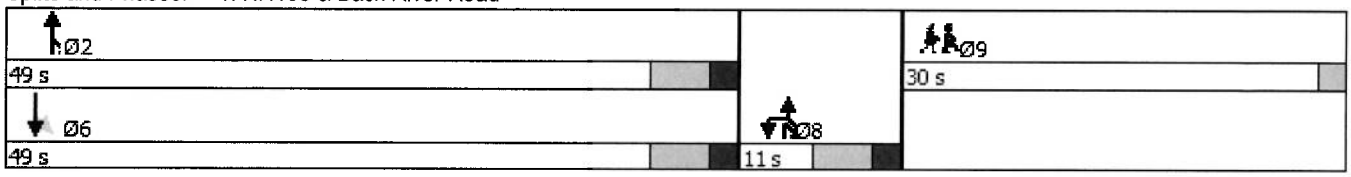
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations	↑	↱	↰	↑	↰	↱	
Traffic Volume (vph)	502	39	510	683	35	526	
Future Volume (vph)	502	39	510	683	35	526	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	49.0		49.0	49.0	11.0	11.0	30.0
Total Split (%)	54.4%		54.4%	54.4%	12.2%	12.2%	33%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	43.5	59.7	43.5	43.5	5.1	5.1	
Actuated g/C Ratio	0.68	0.94	0.68	0.68	0.08	0.08	
v/c Ratio	0.44	0.03	1.15	0.69	0.27	0.89	
Control Delay	7.3	1.0	103.2	12.2	35.0	21.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	7.3	1.0	103.2	12.2	35.0	21.7	
LOS	A	A	F	B	D	C	
Approach Delay	6.8			51.1	22.5		
Approach LOS	A			D	C		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 63.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 35.0
Intersection LOS: C
Intersection Capacity Utilization 73.0%
ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	534	41	638	854	39	591
v/c Ratio	0.44	0.03	1.15	0.69	0.27	0.89
Control Delay	7.3	1.0	103.2	12.2	35.0	21.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.3	1.0	103.2	12.2	35.0	21.7
Queue Length 50th (ft)	58	0	~270	124	14	2
Queue Length 95th (ft)	239	8	#527	399	48	#163
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1225	1405	555	1237	143	664
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	0.44	0.03	1.15	0.69	0.27	0.89

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.

HCM Signalized Intersection Capacity Analysis
1: NH108 & Back River Road

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	555	43	560	755	37	572
Future Volume (vph)	555	43	560	755	37	572
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1792	1495	1787	1810	1805	1599
Flt Permitted	1.00	1.00	0.41	1.00	0.95	1.00
Satd. Flow (perm)	1792	1495	780	1810	1805	1599
Peak-hour factor, PHF	0.94	0.94	0.80	0.80	0.89	0.89
Adj. Flow (vph)	590	46	700	944	42	643
RTOR Reduction (vph)	0	4	0	0	0	477
Lane Group Flow (vph)	590	42	700	944	42	166
Heavy Vehicles (%)	6%	8%	1%	5%	0%	1%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	100.3	114.3	100.3	100.3	8.0	8.0
Effective Green, g (s)	100.3	114.3	100.3	100.3	8.0	8.0
Actuated g/C Ratio	0.80	0.91	0.80	0.80	0.06	0.06
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1435	1364	624	1450	115	102
v/s Ratio Prot	0.33	0.03		0.52	0.02	c0.10
v/s Ratio Perm			c0.90			
v/c Ratio	0.41	0.03	1.12	0.65	0.37	1.62
Uniform Delay, d1	3.7	0.5	12.5	5.2	56.2	58.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	74.4	1.1	2.0	320.7
Delay (s)	3.9	0.5	86.8	6.2	58.1	379.3
Level of Service	A	A	F	A	E	F
Approach Delay (s)	3.6			40.6	359.6	
Approach LOS	A			D	F	

Intersection Summary			
HCM 2000 Control Delay	106.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	125.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

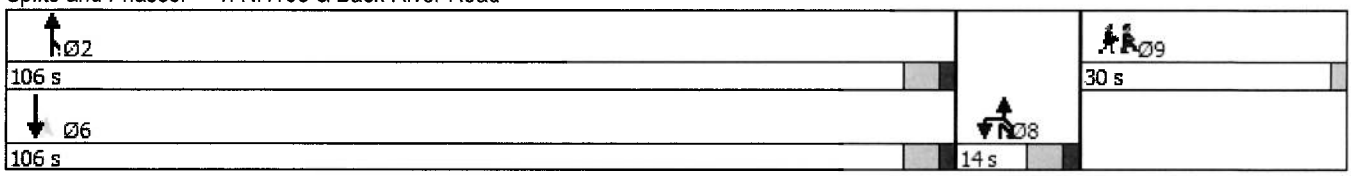
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations							
Traffic Volume (vph)	555	43	560	755	37	572	
Future Volume (vph)	555	43	560	755	37	572	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	106.0		106.0	106.0	14.0	14.0	30.0
Total Split (%)	70.7%		70.7%	70.7%	9.3%	9.3%	20%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	100.3	119.3	100.3	100.3	8.0	8.0	
Actuated g/C Ratio	0.81	0.97	0.81	0.81	0.06	0.06	
v/c Ratio	0.41	0.03	1.11	0.64	0.36	1.11	
Control Delay	4.9	0.5	84.0	8.2	66.3	82.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	4.9	0.5	84.0	8.2	66.3	82.3	
LOS	A	A	F	A	E	F	
Approach Delay	4.6			40.5	81.3		
Approach LOS	A			D	F		

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 123.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.11
Intersection Signal Delay: 42.2 — Intersection LOS: D
Intersection Capacity Utilization 78.6% — ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	590	46	700	944	42	643
v/c Ratio	0.41	0.03	1.11	0.64	0.36	1.11
Control Delay	4.9	0.5	84.0	8.2	66.3	82.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.9	0.5	84.0	8.2	66.3	82.3
Queue Length 50th (ft)	86	0	~604	192	32	~172
Queue Length 95th (ft)	265	6	#847	457	77	#430
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1454	1445	633	1469	117	580
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	0.41	0.03	1.11	0.64	0.36	1.11

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.

HCM Signalized Intersection Capacity Analysis
1: NH108 & Back River Road

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	555	43	563	755	38	579
Future Volume (vph)	555	43	563	755	38	579
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1792	1495	1787	1810	1805	1599
Flt Permitted	1.00	1.00	0.41	1.00	0.95	1.00
Satd. Flow (perm)	1792	1495	780	1810	1805	1599
Peak-hour factor, PHF	0.94	0.94	0.80	0.80	0.89	0.89
Adj. Flow (vph)	590	46	704	944	43	651
RTOR Reduction (vph)	0	4	0	0	0	477
Lane Group Flow (vph)	590	42	704	944	43	174
Heavy Vehicles (%)	6%	8%	1%	5%	0%	1%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	100.3	114.3	100.3	100.3	8.0	8.0
Effective Green, g (s)	100.3	114.3	100.3	100.3	8.0	8.0
Actuated g/C Ratio	0.80	0.91	0.80	0.80	0.06	0.06
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1435	1364	624	1450	115	102
v/s Ratio Prot	0.33	0.03		0.52	0.02	c0.11
v/s Ratio Perm			c0.90			
v/c Ratio	0.41	0.03	1.13	0.65	0.37	1.70
Uniform Delay, d1	3.7	0.5	12.5	5.2	56.2	58.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	76.8	1.1	2.0	354.0
Delay (s)	3.9	0.5	89.2	6.2	58.2	412.6
Level of Service	A	A	F	A	E	F
Approach Delay (s)	3.6			41.7	390.6	
Approach LOS	A			D	F	

Intersection Summary			
HCM 2000 Control Delay	114.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	125.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

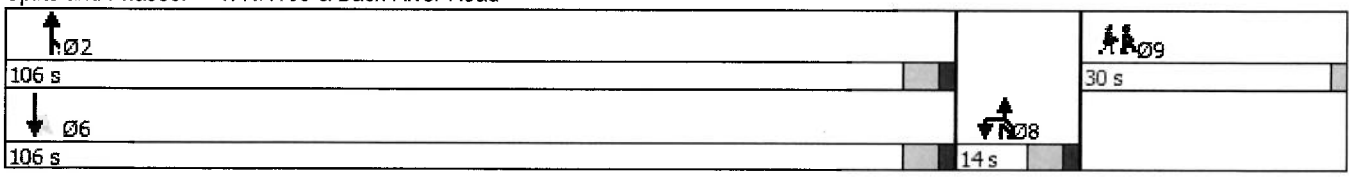
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations	↑	↱	↰	↑	↰	↱	
Traffic Volume (vph)	555	43	563	755	38	579	
Future Volume (vph)	555	43	563	755	38	579	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	106.0		106.0	106.0	14.0	14.0	30.0
Total Split (%)	70.7%		70.7%	70.7%	9.3%	9.3%	20%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	100.3	119.3	100.3	100.3	8.0	8.0	
Actuated g/C Ratio	0.81	0.97	0.81	0.81	0.06	0.06	
v/c Ratio	0.41	0.03	1.11	0.64	0.37	1.12	
Control Delay	4.9	0.5	86.3	8.2	66.6	87.5	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	4.9	0.5	86.3	8.2	66.6	87.5	
LOS	A	A	F	A	E	F	
Approach Delay	4.6			41.6	86.2		
Approach LOS	A			D	F		

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 123.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.12
Intersection Signal Delay: 44.1 — Intersection LOS: D
Intersection Capacity Utilization 78.7% — ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	590	46	704	944	43	651
v/c Ratio	0.41	0.03	1.11	0.64	0.37	1.12
Control Delay	4.9	0.5	86.3	8.2	66.6	87.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.9	0.5	86.3	8.2	66.6	87.5
Queue Length 50th (ft)	86	0	~610	192	32	~185
Queue Length 95th (ft)	265	6	#855	457	79	#445
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1454	1445	633	1469	117	580
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	0.41	0.03	1.11	0.64	0.37	1.12

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	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	485	32	311	555	28	304
Future Volume (vph)	485	32	311	555	28	304
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1881	1615	1787	1863	1805	1615
Flt Permitted	1.00	1.00	0.44	1.00	0.95	1.00
Satd. Flow (perm)	1881	1615	831	1863	1805	1615
Peak-hour factor, PHF	0.95	0.95	0.90	0.90	0.79	0.79
Adj. Flow (vph)	511	34	346	617	35	385
RTOR Reduction (vph)	0	6	0	0	0	349
Lane Group Flow (vph)	511	28	346	617	35	36
Heavy Vehicles (%)	1%	0%	1%	2%	0%	0%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	42.5	54.6	42.5	42.5	6.1	6.1
Effective Green, g (s)	42.5	54.6	42.5	42.5	6.1	6.1
Actuated g/C Ratio	0.65	0.84	0.65	0.65	0.09	0.09
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1226	1352	541	1214	168	151
v/s Ratio Prot	0.27	0.02		0.33	0.02	c0.02
v/s Ratio Perm			c0.42			
v/c Ratio	0.42	0.02	0.64	0.51	0.21	0.24
Uniform Delay, d1	5.4	0.9	6.8	5.9	27.3	27.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	2.5	0.3	0.6	0.8
Delay (s)	5.7	0.9	9.3	6.2	27.9	28.2
Level of Service	A	A	A	A	C	C
Approach Delay (s)	5.4			7.3	28.2	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

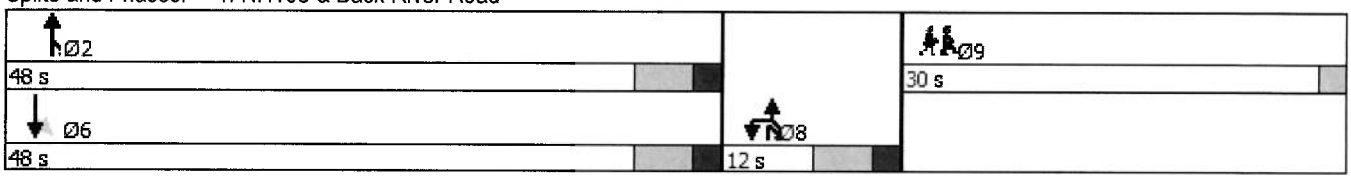
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations							
Traffic Volume (vph)	485	32	311	555	28	304	
Future Volume (vph)	485	32	311	555	28	304	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	48.0		48.0	48.0	12.0	12.0	30.0
Total Split (%)	53.3%		53.3%	53.3%	13.3%	13.3%	33%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	42.6	59.8	42.6	42.6	6.1	6.1	
Actuated g/C Ratio	0.67	0.94	0.67	0.67	0.10	0.10	
v/c Ratio	0.41	0.02	0.62	0.50	0.20	0.77	
Control Delay	7.3	1.1	15.3	8.4	32.1	16.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	7.3	1.1	15.3	8.4	32.1	16.0	
LOS	A	A	B	A	C	B	
Approach Delay	6.9			10.9	17.3		
Approach LOS	A			B	B		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 63.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 11.2 — Intersection LOS: B
Intersection Capacity Utilization 61.1% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	511	34	346	617	35	385
v/c Ratio	0.41	0.02	0.62	0.50	0.20	0.77
Control Delay	7.3	1.1	15.3	8.4	32.1	16.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.3	1.1	15.3	8.4	32.1	16.0
Queue Length 50th (ft)	59	0	50	77	12	0
Queue Length 95th (ft)	226	7	#283	296	38	45
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1256	1518	555	1244	171	502
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	0.41	0.02	0.62	0.50	0.20	0.77

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: NH108 & Back River Road

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Volume (vph)	619	43	413	708	37	397
Future Volume (vph)	619	43	413	708	37	397
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1881	1615	1787	1863	1805	1615
Flt Permitted	1.00	1.00	0.36	1.00	0.95	1.00
Satd. Flow (perm)	1881	1615	671	1863	1805	1615
Peak-hour factor, PHF	0.95	0.95	0.90	0.90	0.79	0.79
Adj. Flow (vph)	652	45	459	787	47	503
RTOR Reduction (vph)	0	7	0	0	0	464
Lane Group Flow (vph)	652	38	459	787	47	39
Heavy Vehicles (%)	1%	0%	1%	2%	0%	0%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	43.5	54.6	43.5	43.5	5.1	5.1
Effective Green, g (s)	43.5	54.6	43.5	43.5	5.1	5.1
Actuated g/C Ratio	0.67	0.84	0.67	0.67	0.08	0.08
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1254	1352	447	1242	141	126
v/s Ratio Prot	0.35	0.02		0.42	c0.03	0.02
v/s Ratio Perm			c0.68			
v/c Ratio	0.52	0.03	1.03	0.63	0.33	0.31
Uniform Delay, d1	5.5	0.9	10.9	6.3	28.4	28.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.0	49.6	1.1	1.4	1.4
Delay (s)	5.9	0.9	60.4	7.3	29.8	29.8
Level of Service	A	A	E	A	C	C
Approach Delay (s)	5.6			26.9	29.8	
Approach LOS	A			C	C	

Intersection Summary			
HCM 2000 Control Delay	21.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

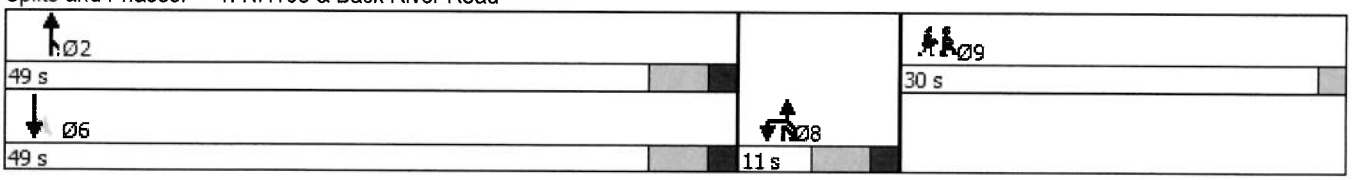
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations	↑	↱	↰	↑	↰	↱	
Traffic Volume (vph)	619	43	413	708	37	397	
Future Volume (vph)	619	43	413	708	37	397	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	49.0		49.0	49.0	11.0	11.0	30.0
Total Split (%)	54.4%		54.4%	54.4%	12.2%	12.2%	33%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	43.5	59.7	43.5	43.5	5.1	5.1	
Actuated g/C Ratio	0.68	0.94	0.68	0.68	0.08	0.08	
v/c Ratio	0.51	0.03	1.00	0.62	0.33	0.85	
Control Delay	8.0	1.0	59.2	9.9	36.5	19.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.0	1.0	59.2	9.9	36.5	19.4	
LOS	A	A	E	A	D	B	
Approach Delay	7.6			28.1	20.9		
Approach LOS	A			C	C		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 63.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 20.8
Intersection LOS: C
Intersection Capacity Utilization 73.8%
ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	652	45	459	787	47	503
v/c Ratio	0.51	0.03	1.00	0.62	0.33	0.85
Control Delay	8.0	1.0	59.2	9.9	36.5	19.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	1.0	59.2	9.9	36.5	19.4
Queue Length 50th (ft)	76	0	112	105	16	0
Queue Length 95th (ft)	308	8	#456	426	48	#63
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1286	1518	458	1273	143	591
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	0.51	0.03	1.00	0.62	0.33	0.85

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: NH108 & Back River Road

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	619	44	426	708	38	403
Future Volume (vph)	619	44	426	708	38	403
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1881	1615	1787	1863	1805	1615
Flt Permitted	1.00	1.00	0.36	1.00	0.95	1.00
Satd. Flow (perm)	1881	1615	671	1863	1805	1615
Peak-hour factor, PHF	0.95	0.95	0.90	0.90	0.79	0.79
Adj. Flow (vph)	652	46	473	787	48	510
RTOR Reduction (vph)	0	7	0	0	0	470
Lane Group Flow (vph)	652	39	473	787	48	40
Heavy Vehicles (%)	1%	0%	1%	2%	0%	0%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	43.5	54.6	43.5	43.5	5.1	5.1
Effective Green, g (s)	43.5	54.6	43.5	43.5	5.1	5.1
Actuated g/C Ratio	0.67	0.84	0.67	0.67	0.08	0.08
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1254	1352	447	1242	141	126
v/s Ratio Prot	0.35	0.02		0.42	c0.03	0.02
v/s Ratio Perm			c0.71			
v/c Ratio	0.52	0.03	1.06	0.63	0.34	0.32
Uniform Delay, d1	5.5	0.9	10.9	6.3	28.5	28.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.0	58.8	1.1	1.4	1.4
Delay (s)	5.9	0.9	69.6	7.3	29.9	29.9
Level of Service	A	A	E	A	C	C
Approach Delay (s)	5.6			30.7	29.9	
Approach LOS	A			C	C	

Intersection Summary			
HCM 2000 Control Delay	23.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

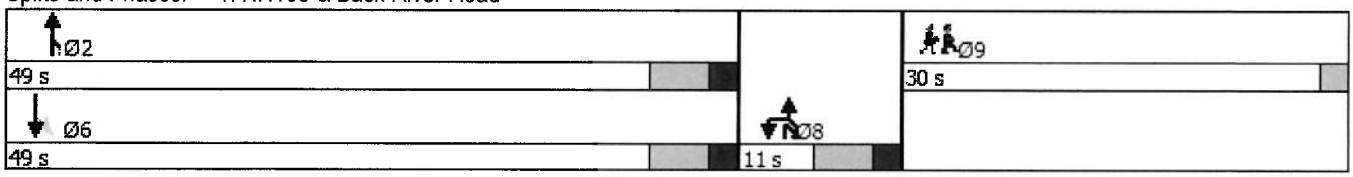
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations	↑	↱	↰	↑	↰	↱	
Traffic Volume (vph)	619	44	426	708	38	403	
Future Volume (vph)	619	44	426	708	38	403	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	49.0		49.0	49.0	11.0	11.0	30.0
Total Split (%)	54.4%		54.4%	54.4%	12.2%	12.2%	33%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	43.5	59.7	43.5	43.5	5.1	5.1	
Actuated g/C Ratio	0.68	0.94	0.68	0.68	0.08	0.08	
v/c Ratio	0.51	0.03	1.03	0.62	0.34	0.85	
Control Delay	8.0	1.0	67.4	9.9	36.7	19.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.0	1.0	67.4	9.9	36.7	19.4	
LOS	A	A	E	A	D	B	
Approach Delay	7.6			31.5	20.9		
Approach LOS	A			C	C		

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 63.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 22.5
Intersection LOS: C
Intersection Capacity Utilization 74.5%
ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	652	46	473	787	48	510
v/c Ratio	0.51	0.03	1.03	0.62	0.34	0.85
Control Delay	8.0	1.0	67.4	9.9	36.7	19.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	1.0	67.4	9.9	36.7	19.4
Queue Length 50th (ft)	76	0	123	105	17	0
Queue Length 95th (ft)	308	8	#472	426	49	#63
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1286	1518	458	1273	143	598
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	0.51	0.03	1.03	0.62	0.34	0.85

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
1: NH108 & Back River Road

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	684	47	455	782	41	438
Future Volume (vph)	684	47	455	782	41	438
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1881	1615	1787	1863	1805	1615
Flt Permitted	1.00	1.00	0.35	1.00	0.95	1.00
Satd. Flow (perm)	1881	1615	659	1863	1805	1615
Peak-hour factor, PHF	0.95	0.95	0.90	0.90	0.79	0.79
Adj. Flow (vph)	720	49	506	869	52	554
RTOR Reduction (vph)	0	4	0	0	0	419
Lane Group Flow (vph)	720	45	506	869	52	135
Heavy Vehicles (%)	1%	0%	1%	2%	0%	0%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	100.3	114.3	100.3	100.3	8.0	8.0
Effective Green, g (s)	100.3	114.3	100.3	100.3	8.0	8.0
Actuated g/C Ratio	0.80	0.91	0.80	0.80	0.06	0.06
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1506	1474	527	1492	115	103
v/s Ratio Prot	0.38	0.03		0.47	0.03	c0.08
v/s Ratio Perm			c0.77			
v/c Ratio	0.48	0.03	0.96	0.58	0.45	1.31
Uniform Delay, d1	4.0	0.5	10.7	4.6	56.5	58.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	29.3	0.6	2.8	191.8
Delay (s)	4.3	0.5	40.0	5.2	59.3	250.4
Level of Service	A	A	D	A	E	F
Approach Delay (s)	4.0			18.0	234.0	
Approach LOS	A			B	F	

Intersection Summary			
HCM 2000 Control Delay	61.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	125.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	79.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

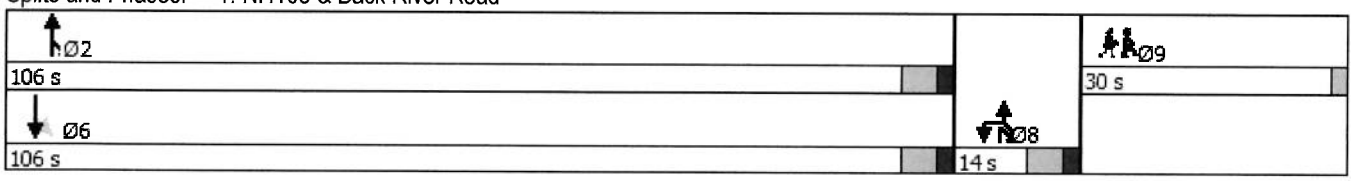
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations							
Traffic Volume (vph)	684	47	455	782	41	438	
Future Volume (vph)	684	47	455	782	41	438	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	106.0		106.0	106.0	14.0	14.0	30.0
Total Split (%)	70.7%		70.7%	70.7%	9.3%	9.3%	20%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	100.3	119.3	100.3	100.3	8.0	8.0	
Actuated g/C Ratio	0.81	0.97	0.81	0.81	0.06	0.06	
v/c Ratio	0.47	0.03	0.95	0.57	0.44	1.06	
Control Delay	5.5	0.4	41.4	6.9	70.0	67.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	5.5	0.4	41.4	6.9	70.0	67.7	
LOS	A	A	D	A	E	E	
Approach Delay	5.2			19.6	67.9		
Approach LOS	A			B	E		

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 123.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.06
Intersection Signal Delay: 26.2
Intersection LOS: C
Intersection Capacity Utilization 79.5%
ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	720	49	506	869	52	554
v/c Ratio	0.47	0.03	0.95	0.57	0.44	1.06
Control Delay	5.5	0.4	41.4	6.9	70.0	67.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.5	0.4	41.4	6.9	70.0	67.7
Queue Length 50th (ft)	114	0	214	158	39	~122
Queue Length 95th (ft)	345	6	#722	485	81	#224
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1526	1560	534	1512	117	523
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	0.47	0.03	0.95	0.57	0.44	1.06

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.

HCM Signalized Intersection Capacity Analysis
1: NH108 & Back River Road

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Traffic Volume (vph)	684	48	468	782	42	444
Future Volume (vph)	684	48	468	782	42	444
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1881	1615	1787	1863	1805	1615
Flt Permitted	1.00	1.00	0.35	1.00	0.95	1.00
Satd. Flow (perm)	1881	1615	659	1863	1805	1615
Peak-hour factor, PHF	0.95	0.95	0.90	0.90	0.79	0.79
Adj. Flow (vph)	720	51	520	869	53	562
RTOR Reduction (vph)	0	4	0	0	0	419
Lane Group Flow (vph)	720	47	520	869	53	143
Heavy Vehicles (%)	1%	0%	1%	2%	0%	0%
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot
Protected Phases	2	2 8		6	8	8
Permitted Phases			6			
Actuated Green, G (s)	100.3	114.3	100.3	100.3	8.0	8.0
Effective Green, g (s)	100.3	114.3	100.3	100.3	8.0	8.0
Actuated g/C Ratio	0.80	0.91	0.80	0.80	0.06	0.06
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1506	1474	527	1492	115	103
v/s Ratio Prot	0.38	0.03		0.47	0.03	c0.09
v/s Ratio Perm			c0.79			
v/c Ratio	0.48	0.03	0.99	0.58	0.46	1.38
Uniform Delay, d1	4.0	0.5	11.8	4.6	56.5	58.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.0	35.4	0.6	2.9	222.1
Delay (s)	4.3	0.5	47.3	5.2	59.4	280.7
Level of Service	A	A	D	A	E	F
Approach Delay (s)	4.0			21.0	261.7	
Approach LOS	A			C	F	

Intersection Summary			
HCM 2000 Control Delay	69.6	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	125.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	80.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

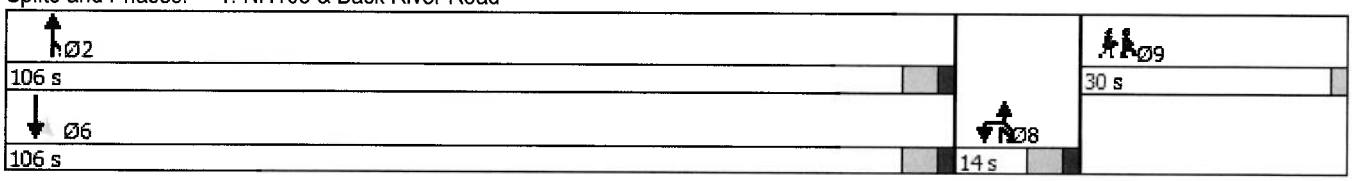
Timings
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR	Ø9
Lane Configurations	↑	↱	↰	↑	↰	↱	
Traffic Volume (vph)	684	48	468	782	42	444	
Future Volume (vph)	684	48	468	782	42	444	
Turn Type	NA	pt+ov	Perm	NA	Prot	Prot	
Protected Phases	2	2 8		6	8	8	9
Permitted Phases			6				
Detector Phase	2	2 8	6	6	8	8	
Switch Phase							
Minimum Initial (s)	4.0		4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	22.0		22.0	22.0	11.0	11.0	30.0
Total Split (s)	106.0		106.0	106.0	14.0	14.0	30.0
Total Split (%)	70.7%		70.7%	70.7%	9.3%	9.3%	20%
Yellow Time (s)	4.0		4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	2.0		2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0		6.0	6.0	6.0	6.0	
Lead/Lag							
Lead-Lag Optimize?							
Recall Mode	Min		Min	Min	None	None	None
Act Effct Green (s)	100.3	119.3	100.3	100.3	8.0	8.0	
Actuated g/C Ratio	0.81	0.97	0.81	0.81	0.06	0.06	
v/c Ratio	0.47	0.03	0.97	0.57	0.45	1.07	
Control Delay	5.5	0.4	47.1	6.9	70.4	72.9	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	5.5	0.4	47.1	6.9	70.4	72.9	
LOS	A	A	D	A	E	E	
Approach Delay	5.2			21.9	72.7		
Approach LOS	A			C	E		

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 123.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 28.5
Intersection LOS: C
Intersection Capacity Utilization 80.3%
ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 1: NH108 & Back River Road



Queues
1: NH108 & Back River Road

Lane Group	NBT	NBR	SBL	SBT	NWL	NWR
Lane Group Flow (vph)	720	51	520	869	53	562
v/c Ratio	0.47	0.03	0.97	0.57	0.45	1.07
Control Delay	5.5	0.4	47.1	6.9	70.4	72.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.5	0.4	47.1	6.9	70.4	72.9
Queue Length 50th (ft)	114	0	242	158	40	~135
Queue Length 95th (ft)	345	6	#750	485	82	#237
Internal Link Dist (ft)	888			556	693	
Turn Bay Length (ft)		150				180
Base Capacity (vph)	1526	1560	534	1512	117	523
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	0.47	0.03	0.97	0.57	0.45	1.07

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.

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	45	27	10	98	24	87	5	356	56	67	404	33
Future Volume (vph)	45	27	10	98	24	87	5	356	56	67	404	33
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1456	1643		1787	1600			1864	1615	1752	1800	
Flt Permitted	0.67	1.00		0.72	1.00			0.99	1.00	0.33	1.00	
Satd. Flow (perm)	1033	1643		1357	1600			1850	1615	607	1800	
Peak-hour factor, PHF	0.68	0.68	0.68	0.86	0.86	0.86	0.86	0.86	0.86	0.83	0.83	0.83
Adj. Flow (vph)	66	40	15	114	28	101	6	414	65	81	487	40
RTOR Reduction (vph)	0	12	0	0	86	0	0	0	41	0	3	0
Lane Group Flow (vph)	66	43	0	114	43	0	0	420	24	81	524	0
Heavy Vehicles (%)	24%	0%	40%	1%	4%	5%	60%	1%	0%	3%	3%	21%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	7.5	7.5		5.5	5.5			18.3	18.3	27.0	27.0	
Effective Green, g (s)	9.5	9.5		7.5	7.5			20.3	18.3	29.0	29.0	
Actuated g/C Ratio	0.19	0.19		0.15	0.15			0.41	0.37	0.59	0.59	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	199	316		206	243			761	599	466	1058	
v/s Ratio Prot		0.03			0.03					0.02	c0.29	
v/s Ratio Perm	0.06			c0.08				0.23	0.01	0.09		
v/c Ratio	0.33	0.14		0.55	0.18			0.55	0.04	0.17	0.49	
Uniform Delay, d1	17.2	16.5		19.3	18.2			11.0	9.9	5.2	5.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.0	0.2		3.2	0.4			0.9	0.0	0.2	0.4	
Delay (s)	18.1	16.7		22.5	18.6			11.9	9.9	5.4	6.3	
Level of Service	B	B		C	B			B	A	A	A	
Approach Delay (s)		17.5			20.4			11.6			6.2	
Approach LOS		B			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	49.3	Sum of lost time (s)	14.0
Intersection Capacity Utilization	64.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

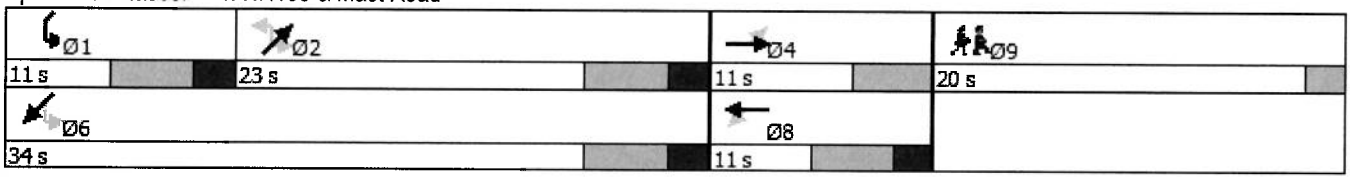
Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	45	27	98	24	5	356	56	67	404	
Future Volume (vph)	45	27	98	24	5	356	56	67	404	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	11.0	11.0	11.0	11.0	23.0	23.0	23.0	11.0	34.0	20.0
Total Split (%)	16.9%	16.9%	16.9%	16.9%	35.4%	35.4%	35.4%	16.9%	52.3%	31%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	9.6	9.6	7.5	7.5		20.4	18.3	26.5	26.5	
Actuated g/C Ratio	0.21	0.21	0.16	0.16		0.45	0.40	0.58	0.58	
v/c Ratio	0.30	0.15	0.51	0.37		0.51	0.09	0.15	0.50	
Control Delay	24.8	17.3	33.8	12.5		16.8	0.2	7.1	9.6	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	24.8	17.3	33.8	12.5		16.8	0.2	7.1	9.6	
LOS	C	B	C	B		B	A	A	A	
Approach Delay		21.4		22.5		14.6			9.2	
Approach LOS		C		C		B			A	

Intersection Summary

Cycle Length: 65
Actuated Cycle Length: 45.6
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.51
Intersection Signal Delay: 14.3
Intersection LOS: B
Intersection Capacity Utilization 64.4%
ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road



Queues
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	66	55	114	129	420	65	81	527
v/c Ratio	0.30	0.15	0.51	0.37	0.51	0.09	0.15	0.50
Control Delay	24.8	17.3	33.8	12.5	16.8	0.2	7.1	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.8	17.3	33.8	12.5	16.8	0.2	7.1	9.6
Queue Length 50th (ft)	14	8	26	6	75	0	5	46
Queue Length 95th (ft)	46	32	#123	53	#279	0	38	232
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	218	358	222	347	892	806	540	1270
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	0.30	0.15	0.51	0.37	0.47	0.08	0.15	0.41

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	69	42	15	153	39	133	8	543	86	102	616	50
Future Volume (vph)	69	42	15	153	39	133	8	543	86	102	616	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1456	1652		1787	1603			1865	1615	1752	1800	
Flt Permitted	0.52	1.00		0.69	1.00			0.99	1.00	0.15	1.00	
Satd. Flow (perm)	796	1652		1301	1603			1841	1615	284	1800	
Peak-hour factor, PHF	0.68	0.68	0.68	0.86	0.86	0.86	0.86	0.86	0.86	0.83	0.83	0.83
Adj. Flow (vph)	101	62	22	178	45	155	9	631	100	123	742	60
RTOR Reduction (vph)	0	18	0	0	134	0	0	0	62	0	3	0
Lane Group Flow (vph)	101	66	0	178	66	0	0	640	38	123	799	0
Heavy Vehicles (%)	24%	0%	40%	1%	4%	5%	60%	1%	0%	3%	3%	21%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	7.2	7.2		5.2	5.2			20.0	20.0	30.0	30.0	
Effective Green, g (s)	9.2	9.2		7.2	7.2			22.0	20.0	32.0	32.0	
Actuated g/C Ratio	0.18	0.18		0.14	0.14			0.42	0.38	0.61	0.61	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	140	290		179	220			774	617	342	1101	
v/s Ratio Prot		0.04			0.04					0.04	c0.44	
v/s Ratio Perm	0.13			c0.14				c0.35	0.02	0.18		
v/c Ratio	0.72	0.23		0.99	0.30			0.83	0.06	0.36	0.73	
Uniform Delay, d1	20.3	18.5		22.5	20.3			13.5	10.2	7.4	7.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	16.7	0.4		65.3	0.8			7.2	0.0	0.6	2.4	
Delay (s)	37.0	18.9		87.8	21.1			20.7	10.3	8.0	9.5	
Level of Service	D	B		F	C			C	B	A	A	
Approach Delay (s)		28.8			52.5			19.3			9.3	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	21.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	52.3	Sum of lost time (s)	14.0
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

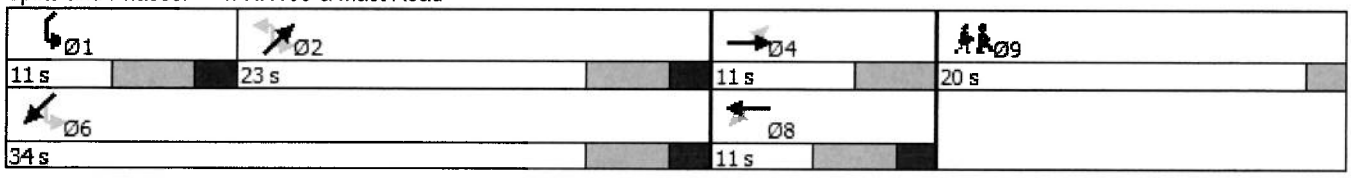
Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	69	42	153	39	8	543	86	102	616	
Future Volume (vph)	69	42	153	39	8	543	86	102	616	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	11.0	11.0	11.0	11.0	23.0	23.0	23.0	11.0	34.0	20.0
Total Split (%)	16.9%	16.9%	16.9%	16.9%	35.4%	35.4%	35.4%	16.9%	52.3%	31%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	9.3	9.3	7.2	7.2		22.0	20.0	30.9	30.9	
Actuated g/C Ratio	0.19	0.19	0.14	0.14		0.44	0.40	0.62	0.62	
v/c Ratio	0.68	0.26	0.95	0.55		0.78	0.13	0.32	0.71	
Control Delay	50.0	18.4	83.3	15.0		25.9	0.7	8.4	14.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	50.0	18.4	83.3	15.0		25.9	0.7	8.4	14.9	
LOS	D	B	F	B		C	A	A	B	
Approach Delay		35.7		47.1		22.5			14.0	
Approach LOS		D		D		C			B	

Intersection Summary

Cycle Length: 65
Actuated Cycle Length: 49.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 24.3 — Intersection LOS: C
Intersection Capacity Utilization 91.9% — ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road



Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	101	84	178	200	640	100	123	802
v/c Ratio	0.68	0.26	0.95	0.55	0.78	0.13	0.32	0.71
Control Delay	50.0	18.4	83.3	15.0	25.9	0.7	8.4	14.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.0	18.4	83.3	15.0	25.9	0.7	8.4	14.9
Queue Length 50th (ft)	24	13	46	10	137	0	8	89
Queue Length 95th (ft)	#87	43	#199	#81	#493	1	54	#489
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	148	325	188	364	816	759	389	1123
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	0.68	0.26	0.95	0.55	0.78	0.13	0.32	0.71

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	69	42	15	154	39	133	8	543	87	102	617	50
Future Volume (vph)	69	42	15	154	39	133	8	543	87	102	617	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1456	1652		1787	1603			1865	1615	1752	1800	
Flt Permitted	0.52	1.00		0.69	1.00			0.99	1.00	0.15	1.00	
Satd. Flow (perm)	796	1652		1301	1603			1841	1615	284	1800	
Peak-hour factor, PHF	0.68	0.68	0.68	0.86	0.86	0.86	0.86	0.86	0.86	0.83	0.83	0.83
Adj. Flow (vph)	101	62	22	179	45	155	9	631	101	123	743	60
RTOR Reduction (vph)	0	18	0	0	134	0	0	0	62	0	3	0
Lane Group Flow (vph)	101	66	0	179	66	0	0	640	39	123	800	0
Heavy Vehicles (%)	24%	0%	40%	1%	4%	5%	60%	1%	0%	3%	3%	21%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	7.2	7.2		5.2	5.2			20.0	20.0	30.0	30.0	
Effective Green, g (s)	9.2	9.2		7.2	7.2			22.0	20.0	32.0	32.0	
Actuated g/C Ratio	0.18	0.18		0.14	0.14			0.42	0.38	0.61	0.61	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	140	290		179	220			774	617	342	1101	
v/s Ratio Prot		0.04			0.04					0.04	c0.44	
v/s Ratio Perm	0.13			c0.14				c0.35	0.02	0.18		
v/c Ratio	0.72	0.23		1.00	0.30			0.83	0.06	0.36	0.73	
Uniform Delay, d1	20.3	18.5		22.5	20.3			13.5	10.2	7.4	7.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	16.7	0.4		67.3	0.8			7.2	0.0	0.6	2.4	
Delay (s)	37.0	18.9		89.8	21.1			20.7	10.3	8.0	9.5	
Level of Service	D	B		F	C			C	B	A	A	
Approach Delay (s)		28.8			53.5			19.3			9.3	
Approach LOS		C			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	21.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	52.3	Sum of lost time (s)	14.0
Intersection Capacity Utilization	91.9%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	69	42	154	39	8	543	87	102	617	
Future Volume (vph)	69	42	154	39	8	543	87	102	617	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	11.0	11.0	11.0	11.0	23.0	23.0	23.0	11.0	34.0	20.0
Total Split (%)	16.9%	16.9%	16.9%	16.9%	35.4%	35.4%	35.4%	16.9%	52.3%	31%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	9.2	9.2	7.2	7.2		22.0	20.0	30.9	30.9	
Actuated g/C Ratio	0.19	0.19	0.14	0.14		0.44	0.40	0.62	0.62	
v/c Ratio	0.68	0.26	0.95	0.55		0.78	0.13	0.32	0.72	
Control Delay	50.0	18.4	84.5	15.0		25.8	0.7	8.4	14.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	50.0	18.4	84.5	15.0		25.8	0.7	8.4	14.9	
LOS	D	B	F	B		C	A	A	B	
Approach Delay		35.7		47.8		22.4			14.1	
Approach LOS		D		D		C			B	

Intersection Summary

Cycle Length: 65
Actuated Cycle Length: 49.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 24.4 — Intersection LOS: C
Intersection Capacity Utilization 91.9% — ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road

Queues
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	101	84	179	200	640	101	123	803
v/c Ratio	0.68	0.26	0.95	0.55	0.78	0.13	0.32	0.72
Control Delay	50.0	18.4	84.5	15.0	25.8	0.7	8.4	14.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.0	18.4	84.5	15.0	25.8	0.7	8.4	14.9
Queue Length 50th (ft)	24	13	46	10	137	0	8	89
Queue Length 95th (ft)	#87	43	#200	#81	#493	2	54	#490
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	148	325	188	364	816	759	389	1123
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	0.68	0.26	0.95	0.55	0.78	0.13	0.32	0.72

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	76	46	17	169	43	147	9	600	95	113	681	55
Future Volume (vph)	76	46	17	169	43	147	9	600	95	113	681	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1456	1646		1787	1603			1864	1615	1752	1801	
Flt Permitted	0.44	1.00		0.63	1.00			0.99	1.00	0.16	1.00	
Satd. Flow (perm)	676	1646		1194	1603			1841	1615	289	1801	
Peak-hour factor, PHF	0.68	0.68	0.68	0.86	0.86	0.86	0.86	0.86	0.86	0.83	0.83	0.83
Adj. Flow (vph)	112	68	25	197	50	171	10	698	110	136	820	66
RTOR Reduction (vph)	0	14	0	0	132	0	0	0	59	0	3	0
Lane Group Flow (vph)	112	79	0	197	89	0	0	708	51	136	883	0
Heavy Vehicles (%)	24%	0%	40%	1%	4%	5%	60%	1%	0%	3%	3%	21%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	14.2	14.2		12.2	12.2			35.5	35.5	46.6	46.6	
Effective Green, g (s)	16.2	16.2		14.2	14.2			37.5	35.5	48.6	48.6	
Actuated g/C Ratio	0.21	0.21		0.19	0.19			0.49	0.47	0.64	0.64	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	143	349		222	298			906	752	320	1148	
v/s Ratio Prot		0.05			0.06					0.04	c0.49	
v/s Ratio Perm	0.17			c0.17				0.38	0.03	0.23		
v/c Ratio	0.78	0.23		0.89	0.30			0.78	0.07	0.42	0.77	
Uniform Delay, d1	28.3	24.8		30.2	26.7			16.0	11.2	10.5	9.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	23.8	0.3		31.7	0.6			4.4	0.0	0.9	3.2	
Delay (s)	52.2	25.1		62.0	27.3			20.4	11.3	11.4	13.0	
Level of Service	D	C		E	C			C	B	B	B	
Approach Delay (s)		39.9			43.6			19.2			12.8	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	76.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

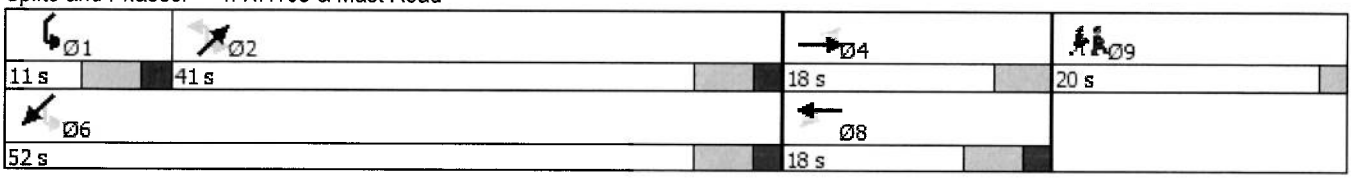
Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	76	46	169	43	9	600	95	113	681	
Future Volume (vph)	76	46	169	43	9	600	95	113	681	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	18.0	18.0	18.0	18.0	41.0	41.0	41.0	11.0	52.0	20.0
Total Split (%)	20.0%	20.0%	20.0%	20.0%	45.6%	45.6%	45.6%	12.2%	57.8%	22%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	16.2	16.2	14.2	14.2		37.5	35.5	48.6	48.6	
Actuated g/C Ratio	0.22	0.22	0.19	0.19		0.50	0.48	0.65	0.65	
v/c Ratio	0.77	0.25	0.87	0.51		0.77	0.13	0.41	0.75	
Control Delay	64.1	24.3	67.8	14.3		24.2	2.7	10.6	16.7	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	64.1	24.3	67.8	14.3		24.2	2.7	10.6	16.7	
LOS	E	C	E	B		C	A	B	B	
Approach Delay		46.1		39.5		21.3			15.9	
Approach LOS		D		D		C			B	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 74.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 24.2
Intersection LOS: C
Intersection Capacity Utilization 100.1%
ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road



Queues
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	112	93	197	221	708	110	136	886
v/c Ratio	0.77	0.25	0.87	0.51	0.77	0.13	0.41	0.75
Control Delay	64.1	24.3	67.8	14.3	24.2	2.7	10.6	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.1	24.3	67.8	14.3	24.2	2.7	10.6	16.7
Queue Length 50th (ft)	45	26	82	21	216	0	16	192
Queue Length 95th (ft)	#114	60	#251	92	#590	20	65	#646
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	146	372	226	436	924	837	328	1176
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	0.25	0.87	0.51	0.77	0.13	0.41	0.75

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	76	46	17	170	43	147	9	600	96	113	682	55
Future Volume (vph)	76	46	17	170	43	147	9	600	96	113	682	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1456	1646		1787	1603			1864	1615	1752	1801	
Flt Permitted	0.44	1.00		0.63	1.00			0.99	1.00	0.16	1.00	
Satd. Flow (perm)	676	1646		1194	1603			1840	1615	289	1801	
Peak-hour factor, PHF	0.68	0.68	0.68	0.86	0.86	0.86	0.86	0.86	0.86	0.83	0.83	0.83
Adj. Flow (vph)	112	68	25	198	50	171	10	698	112	136	822	66
RTOR Reduction (vph)	0	14	0	0	132	0	0	0	60	0	3	0
Lane Group Flow (vph)	112	79	0	198	89	0	0	708	52	136	885	0
Heavy Vehicles (%)	24%	0%	40%	1%	4%	5%	60%	1%	0%	3%	3%	21%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	14.2	14.2		12.2	12.2			35.5	35.5	46.6	46.6	
Effective Green, g (s)	16.2	16.2		14.2	14.2			37.5	35.5	48.6	48.6	
Actuated g/C Ratio	0.21	0.21		0.19	0.19			0.49	0.47	0.64	0.64	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	143	349		222	298			905	752	320	1148	
v/s Ratio Prot		0.05			0.06					0.04	c0.49	
v/s Ratio Perm	0.17			c0.17				0.38	0.03	0.23		
v/c Ratio	0.78	0.23		0.89	0.30			0.78	0.07	0.42	0.77	
Uniform Delay, d1	28.3	24.8		30.3	26.7			16.0	11.2	10.5	9.8	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	23.8	0.3		32.9	0.6			4.5	0.0	0.9	3.3	
Delay (s)	52.2	25.1		63.1	27.3			20.4	11.3	11.4	13.1	
Level of Service	D	C		E	C			C	B	B	B	
Approach Delay (s)		39.9			44.2			19.2			12.9	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	76.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	100.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

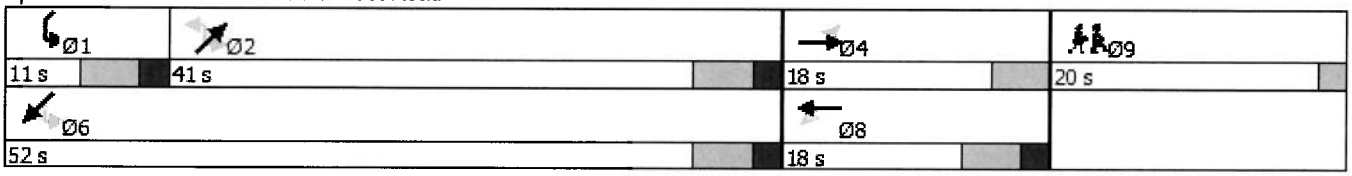
Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	76	46	170	43	9	600	96	113	682	
Future Volume (vph)	76	46	170	43	9	600	96	113	682	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	18.0	18.0	18.0	18.0	41.0	41.0	41.0	11.0	52.0	20.0
Total Split (%)	20.0%	20.0%	20.0%	20.0%	45.6%	45.6%	45.6%	12.2%	57.8%	22%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	16.2	16.2	14.2	14.2		37.5	35.5	48.6	48.6	
Actuated g/C Ratio	0.22	0.22	0.19	0.19		0.50	0.48	0.65	0.65	
v/c Ratio	0.77	0.25	0.88	0.51		0.77	0.13	0.41	0.76	
Control Delay	64.1	24.3	68.5	14.3		24.2	2.8	10.6	16.8	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	64.1	24.3	68.5	14.3		24.2	2.8	10.6	16.8	
LOS	E	C	E	B		C	A	B	B	
Approach Delay		46.1		39.9		21.3			15.9	
Approach LOS		D		D		C			B	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 74.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 24.3 — Intersection LOS: C
Intersection Capacity Utilization 100.2% — ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road



Queues
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	112	93	198	221	708	112	136	888
v/c Ratio	0.77	0.25	0.88	0.51	0.77	0.13	0.41	0.76
Control Delay	64.1	24.3	68.5	14.3	24.2	2.8	10.6	16.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	64.1	24.3	68.5	14.3	24.2	2.8	10.6	16.8
Queue Length 50th (ft)	45	26	82	21	216	0	16	193
Queue Length 95th (ft)	#114	60	#253	92	#590	21	65	#647
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	146	372	226	436	924	837	328	1176
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	0.25	0.88	0.51	0.77	0.13	0.41	0.76

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	116	31	11	88	27	112	9	562	87	71	493	58
Future Volume (vph)	116	31	11	88	27	112	9	562	87	71	493	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1656	1637		1787	1645			1826	1615	1770	1806	
Flt Permitted	0.58	1.00		0.71	1.00			0.99	1.00	0.15	1.00	
Satd. Flow (perm)	1008	1637		1338	1645			1808	1615	288	1806	
Peak-hour factor, PHF	0.60	0.60	0.60	0.76	0.76	0.76	0.87	0.87	0.87	0.95	0.95	0.95
Adj. Flow (vph)	193	52	18	116	36	147	10	646	100	75	519	61
RTOR Reduction (vph)	0	15	0	0	126	0	0	0	61	0	5	0
Lane Group Flow (vph)	193	55	0	116	57	0	0	656	39	75	575	0
Heavy Vehicles (%)	9%	0%	45%	1%	0%	2%	67%	3%	0%	2%	1%	25%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	7.4	7.4		5.4	5.4			19.9	19.9	28.7	28.7	
Effective Green, g (s)	9.4	9.4		7.4	7.4			21.9	19.9	30.7	30.7	
Actuated g/C Ratio	0.18	0.18		0.15	0.15			0.43	0.39	0.60	0.60	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	185	301		194	238			776	630	312	1087	
v/s Ratio Prot		0.03			0.03					0.02	c0.32	
v/s Ratio Perm	c0.19			0.09				c0.36	0.02	0.12		
v/c Ratio	1.04	0.18		0.60	0.24			0.85	0.06	0.24	0.53	
Uniform Delay, d1	20.8	17.6		20.4	19.3			13.0	9.7	7.2	5.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	78.0	0.3		4.9	0.5			8.4	0.0	0.4	0.5	
Delay (s)	98.8	17.9		25.3	19.8			21.4	9.8	7.6	6.4	
Level of Service	F	B		C	B			C	A	A	A	
Approach Delay (s)		77.3			22.0			19.9			6.5	
Approach LOS		E			C			B			A	

Intersection Summary			
HCM 2000 Control Delay	23.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	51.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	83.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

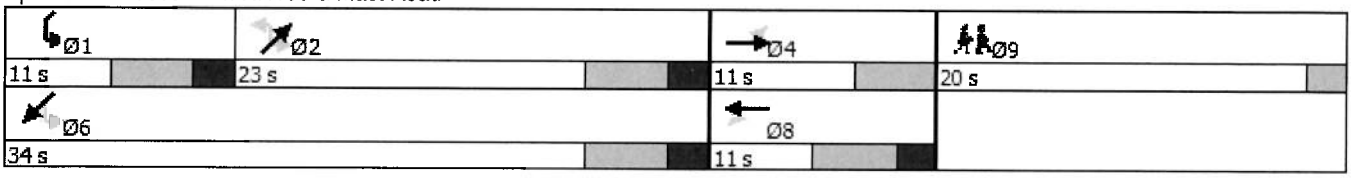
Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	116	31	88	27	9	562	87	71	493	
Future Volume (vph)	116	31	88	27	9	562	87	71	493	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	11.0	11.0	11.0	11.0	23.0	23.0	23.0	11.0	34.0	20.0
Total Split (%)	16.9%	16.9%	16.9%	16.9%	35.4%	35.4%	35.4%	16.9%	52.3%	31%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	9.5	9.5	7.4	7.4		22.0	19.9	28.1	28.1	
Actuated g/C Ratio	0.20	0.20	0.16	0.16		0.47	0.42	0.60	0.60	
v/c Ratio	0.96	0.20	0.56	0.48		0.78	0.13	0.19	0.54	
Control Delay	82.3	17.9	36.5	12.8		25.0	0.6	7.4	9.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	82.3	17.9	36.5	12.8		25.0	0.6	7.4	9.9	
LOS	F	B	D	B		C	A	A	A	
Approach Delay		65.1		22.0		21.8			9.6	
Approach LOS		E		C		C			A	

Intersection Summary

Cycle Length: 65
Actuated Cycle Length: 47.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 23.6
Intersection LOS: C
Intersection Capacity Utilization 83.8%
ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road



Queues
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	193	70	116	183	656	100	75	580
v/c Ratio	0.96	0.20	0.56	0.48	0.78	0.13	0.19	0.54
Control Delay	82.3	17.9	36.5	12.8	25.0	0.6	7.4	9.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	82.3	17.9	36.5	12.8	25.0	0.6	7.4	9.9
Queue Length 50th (ft)	50	11	28	8	143	0	5	52
Queue Length 95th (ft)	#132	33	#104	47	#521	2	39	301
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	202	343	209	381	844	789	403	1255
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	0.96	0.20	0.56	0.48	0.78	0.13	0.19	0.46

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	148	42	14	115	35	143	11	717	116	91	629	74
Future Volume (vph)	148	42	14	115	35	143	11	717	116	91	629	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1656	1646		1787	1645			1826	1615	1770	1806	
Flt Permitted	0.46	1.00		0.68	1.00			0.99	1.00	0.16	1.00	
Satd. Flow (perm)	803	1646		1275	1645			1800	1615	299	1806	
Peak-hour factor, PHF	0.60	0.60	0.60	0.76	0.76	0.76	0.87	0.87	0.87	0.95	0.95	0.95
Adj. Flow (vph)	247	70	23	151	46	188	13	824	133	96	662	78
RTOR Reduction (vph)	0	17	0	0	160	0	0	0	83	0	5	0
Lane Group Flow (vph)	247	76	0	151	74	0	0	837	50	96	735	0
Heavy Vehicles (%)	9%	0%	45%	1%	0%	2%	67%	3%	0%	2%	1%	25%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	7.4	7.4		5.4	5.4			18.9	18.9	27.6	27.6	
Effective Green, g (s)	9.4	9.4		7.4	7.4			20.9	18.9	29.6	29.6	
Actuated g/C Ratio	0.19	0.19		0.15	0.15			0.42	0.38	0.59	0.59	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	151	310		189	244			755	612	316	1073	
v/s Ratio Prot		0.05			0.04					0.03	c0.41	
v/s Ratio Perm	c0.31			0.12				c0.47	0.03	0.15		
v/c Ratio	1.64	0.25		0.80	0.30			1.11	0.08	0.30	0.69	
Uniform Delay, d1	20.2	17.2		20.5	18.9			14.4	9.9	9.0	6.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	314.0	0.4		20.5	0.7			66.7	0.1	0.5	1.8	
Delay (s)	334.2	17.6		41.0	19.6			81.2	10.0	9.5	8.7	
Level of Service	F	B		D	B			F	A	A	A	
Approach Delay (s)		247.6			28.0			71.4			8.8	
Approach LOS		F			C			E			A	

Intersection Summary

HCM 2000 Control Delay	67.8	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	49.8	Sum of lost time (s)	14.0
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

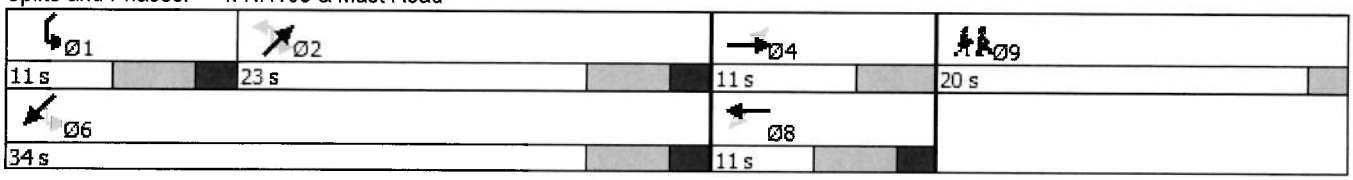
Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	148	42	115	35	11	717	116	91	629	
Future Volume (vph)	148	42	115	35	11	717	116	91	629	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	11.0	11.0	11.0	11.0	23.0	23.0	23.0	11.0	34.0	20.0
Total Split (%)	16.9%	16.9%	16.9%	16.9%	35.4%	35.4%	35.4%	16.9%	52.3%	31%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	9.5	9.5	7.4	7.4		21.1	18.9	27.0	27.0	
Actuated g/C Ratio	0.21	0.21	0.16	0.16		0.46	0.41	0.59	0.59	
v/c Ratio	1.49	0.26	0.74	0.55		1.02	0.17	0.23	0.69	
Control Delay	275.1	18.7	49.5	13.9		57.4	2.3	7.7	14.2	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	275.1	18.7	49.5	13.9		57.4	2.3	7.7	14.2	
LOS	F	B	D	B		E	A	A	B	
Approach Delay		205.0		27.8		49.9			13.5	
Approach LOS		F		C		D			B	

Intersection Summary

Cycle Length: 65
Actuated Cycle Length: 46
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.49
Intersection Signal Delay: 55.3
Intersection LOS: E
Intersection Capacity Utilization 104.5%
ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road



Queues
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	247	93	151	234	837	133	96	740
v/c Ratio	1.49	0.26	0.74	0.55	1.02	0.17	0.23	0.69
Control Delay	275.1	18.7	49.5	13.9	57.4	2.3	7.7	14.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	275.1	18.7	49.5	13.9	57.4	2.3	7.7	14.2
Queue Length 50th (ft)	~95	16	38	11	~261	0	6	77
Queue Length 95th (ft)	#185	41	#143	54	#692	16	48	#497
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	166	357	205	422	824	774	412	1248
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	1.49	0.26	0.74	0.55	1.02	0.17	0.23	0.59

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.

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	148	43	14	116	36	143	11	718	118	91	630	74
Future Volume (vph)	148	43	14	116	36	143	11	718	118	91	630	74
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1656	1651		1787	1646			1826	1615	1770	1806	
Flt Permitted	0.46	1.00		0.67	1.00			0.99	1.00	0.16	1.00	
Satd. Flow (perm)	799	1651		1264	1646			1800	1615	299	1806	
Peak-hour factor, PHF	0.60	0.60	0.60	0.76	0.76	0.76	0.87	0.87	0.87	0.95	0.95	0.95
Adj. Flow (vph)	247	72	23	153	47	188	13	825	136	96	663	78
RTOR Reduction (vph)	0	17	0	0	160	0	0	0	84	0	5	0
Lane Group Flow (vph)	247	78	0	153	75	0	0	838	52	96	736	0
Heavy Vehicles (%)	9%	0%	45%	1%	0%	2%	67%	3%	0%	2%	1%	25%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	7.4	7.4		5.4	5.4			18.9	18.9	27.6	27.6	
Effective Green, g (s)	9.4	9.4		7.4	7.4			20.9	18.9	29.6	29.6	
Actuated g/C Ratio	0.19	0.19		0.15	0.15			0.42	0.38	0.59	0.59	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	150	311		187	244			755	612	316	1073	
v/s Ratio Prot		0.05			0.05					0.03	c0.41	
v/s Ratio Perm	c0.31			0.12				c0.47	0.03	0.15		
v/c Ratio	1.65	0.25		0.82	0.31			1.11	0.08	0.30	0.69	
Uniform Delay, d1	20.2	17.2		20.5	18.9			14.4	9.9	9.0	6.9	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	318.9	0.4		23.4	0.7			67.2	0.1	0.5	1.8	
Delay (s)	339.1	17.6		44.0	19.6			81.6	10.0	9.5	8.8	
Level of Service	F	B		D	B			F	A	A	A	
Approach Delay (s)		249.8			29.2			71.6			8.8	
Approach LOS		F			C			E			A	

Intersection Summary

HCM 2000 Control Delay	68.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.17		
Actuated Cycle Length (s)	49.8	Sum of lost time (s)	14.0
Intersection Capacity Utilization	104.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

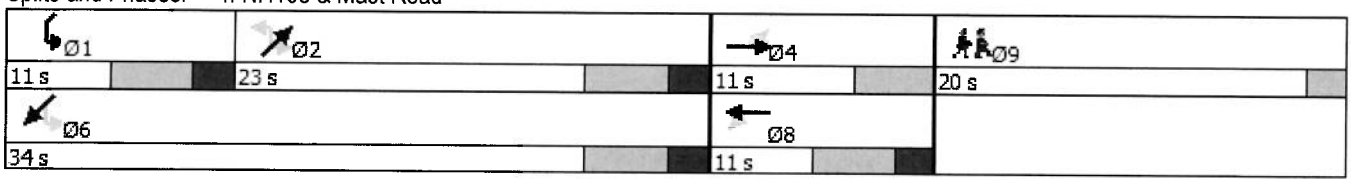
Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	148	43	116	36	11	718	118	91	630	
Future Volume (vph)	148	43	116	36	11	718	118	91	630	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	11.0	11.0	11.0	11.0	23.0	23.0	23.0	11.0	34.0	20.0
Total Split (%)	16.9%	16.9%	16.9%	16.9%	35.4%	35.4%	35.4%	16.9%	52.3%	31%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	9.5	9.5	7.4	7.4		21.0	18.9	27.0	27.0	
Actuated g/C Ratio	0.21	0.21	0.16	0.16		0.46	0.41	0.59	0.59	
v/c Ratio	1.50	0.27	0.75	0.56		1.02	0.18	0.23	0.70	
Control Delay	279.0	18.8	51.3	13.9		58.0	2.4	7.7	14.3	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	279.0	18.8	51.3	13.9		58.0	2.4	7.7	14.3	
LOS	F	B	D	B		E	A	A	B	
Approach Delay		206.7		28.7		50.2			13.5	
Approach LOS		F		C		D			B	

Intersection Summary

Cycle Length: 65
Actuated Cycle Length: 45.9
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.50
Intersection Signal Delay: 55.9
Intersection LOS: E
Intersection Capacity Utilization 104.5%
ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road



Queues
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	247	95	153	235	838	136	96	741
v/c Ratio	1.50	0.27	0.75	0.56	1.02	0.18	0.23	0.70
Control Delay	279.0	18.8	51.3	13.9	58.0	2.4	7.7	14.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	279.0	18.8	51.3	13.9	58.0	2.4	7.7	14.3
Queue Length 50th (ft)	~95	16	39	11	~261	0	6	77
Queue Length 95th (ft)	#185	42	#146	54	#693	18	48	#498
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	165	358	203	422	823	773	412	1249
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	1.50	0.27	0.75	0.56	1.02	0.18	0.23	0.59

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.

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	164	46	15	127	39	158	12	792	128	101	695	82
Future Volume (vph)	164	46	15	127	39	158	12	792	128	101	695	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1656	1648		1787	1645			1826	1615	1770	1806	
Flt Permitted	0.43	1.00		0.63	1.00			0.98	1.00	0.05	1.00	
Satd. Flow (perm)	755	1648		1187	1645			1798	1615	100	1806	
Peak-hour factor, PHF	0.60	0.60	0.60	0.76	0.76	0.76	0.87	0.87	0.87	0.95	0.95	0.95
Adj. Flow (vph)	273	77	25	167	51	208	14	910	147	106	732	86
RTOR Reduction (vph)	0	8	0	0	94	0	0	0	40	0	2	0
Lane Group Flow (vph)	273	94	0	167	165	0	0	924	107	106	816	0
Heavy Vehicles (%)	9%	0%	45%	1%	0%	2%	67%	3%	0%	2%	1%	25%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	41.2	41.2		39.2	39.2			68.3	68.3	79.3	79.3	
Effective Green, g (s)	43.2	43.2		41.2	41.2			70.3	68.3	81.3	81.3	
Actuated g/C Ratio	0.32	0.32		0.30	0.30			0.52	0.50	0.60	0.60	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	239	522		359	497			928	809	145	1078	
v/s Ratio Prot		0.06			0.10					0.04	c0.45	
v/s Ratio Perm	c0.36			0.14				c0.51	0.07	0.40		
v/c Ratio	1.14	0.18		0.47	0.33			1.00	0.13	0.73	0.76	
Uniform Delay, d1	46.5	33.7		38.6	36.8			32.8	18.1	32.5	20.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	102.0	0.2		1.0	0.4			28.3	0.1	17.2	3.1	
Delay (s)	148.5	33.9		39.5	37.2			61.1	18.2	49.7	23.3	
Level of Service	F	C		D	D			E	B	D	C	
Approach Delay (s)		117.3			38.1			55.2			26.3	
Approach LOS		F			D			E			C	

Intersection Summary

HCM 2000 Control Delay	51.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	136.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	114.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

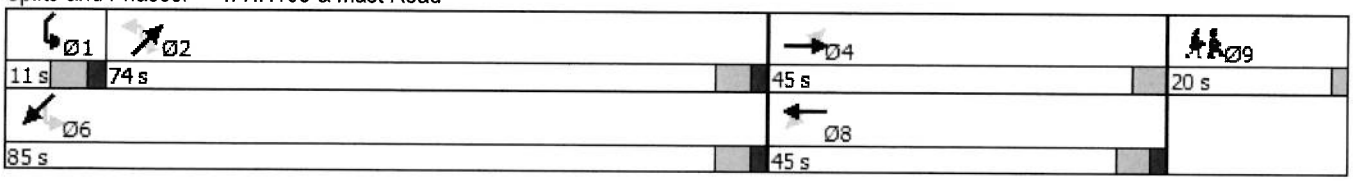
Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	164	46	127	39	12	792	128	101	695	
Future Volume (vph)	164	46	127	39	12	792	128	101	695	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	45.0	45.0	45.0	45.0	74.0	74.0	74.0	11.0	85.0	20.0
Total Split (%)	30.0%	30.0%	30.0%	30.0%	49.3%	49.3%	49.3%	7.3%	56.7%	13%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	43.2	43.2	41.2	41.2		70.3	68.3	81.3	81.3	
Actuated g/C Ratio	0.32	0.32	0.31	0.31		0.52	0.51	0.60	0.60	
v/c Ratio	1.13	0.19	0.46	0.43		0.98	0.17	0.72	0.75	
Control Delay	139.3	32.2	44.3	20.7		57.9	9.8	48.5	25.9	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	139.3	32.2	44.3	20.7		57.9	9.8	48.5	25.9	
LOS	F	C	D	C		E	A	D	C	
Approach Delay		110.1		30.0		51.3			28.5	
Approach LOS		F		C		D			C	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 134.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.13
Intersection Signal Delay: 48.4 — Intersection LOS: D
Intersection Capacity Utilization 114.8% — ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road



Queues
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	273	102	167	259	924	147	106	818
v/c Ratio	1.13	0.19	0.46	0.43	0.98	0.17	0.72	0.75
Control Delay	139.3	32.2	44.3	20.7	57.9	9.8	48.5	25.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	139.3	32.2	44.3	20.7	57.9	9.8	48.5	25.9
Queue Length 50th (ft)	~259	54	112	78	713	27	36	443
Queue Length 95th (ft)	#283	76	182	136	#1250	79	#165	895
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	242	536	363	597	939	858	147	1093
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	1.13	0.19	0.46	0.43	0.98	0.17	0.72	0.75

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.

HCM Signalized Intersection Capacity Analysis
4: NH108 & Mast Road

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	164	47	15	128	40	158	12	793	130	101	696	82
Future Volume (vph)	164	47	15	128	40	158	12	793	130	101	696	82
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	2.0		4.0	4.0			4.0	6.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	0.88			1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00			1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1656	1651		1787	1647			1826	1615	1770	1806	
Flt Permitted	0.43	1.00		0.63	1.00			0.98	1.00	0.05	1.00	
Satd. Flow (perm)	750	1651		1184	1647			1798	1615	100	1806	
Peak-hour factor, PHF	0.60	0.60	0.60	0.76	0.76	0.76	0.87	0.87	0.87	0.95	0.95	0.95
Adj. Flow (vph)	273	78	25	168	53	208	14	911	149	106	733	86
RTOR Reduction (vph)	0	8	0	0	91	0	0	0	40	0	2	0
Lane Group Flow (vph)	273	95	0	168	170	0	0	925	109	106	817	0
Heavy Vehicles (%)	9%	0%	45%	1%	0%	2%	67%	3%	0%	2%	1%	25%
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2		2	6		
Actuated Green, G (s)	41.2	41.2		39.2	39.2			68.3	68.3	79.3	79.3	
Effective Green, g (s)	43.2	43.2		41.2	41.2			70.3	68.3	81.3	81.3	
Actuated g/C Ratio	0.32	0.32		0.30	0.30			0.52	0.50	0.60	0.60	
Clearance Time (s)	4.0	4.0		6.0	6.0			6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	237	523		358	498			928	809	145	1078	
v/s Ratio Prot		0.06			0.10					0.04	c0.45	
v/s Ratio Perm	c0.36			0.14				c0.51	0.07	0.40		
v/c Ratio	1.15	0.18		0.47	0.34			1.00	0.13	0.73	0.76	
Uniform Delay, d1	46.5	33.7		38.6	37.0			32.8	18.2	32.6	20.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	105.6	0.2		1.0	0.4			28.5	0.1	17.2	3.1	
Delay (s)	152.1	33.9		39.6	37.4			61.4	18.2	49.8	23.3	
Level of Service	F	C		D	D			E	B	D	C	
Approach Delay (s)		119.7			38.2			55.4			26.3	
Approach LOS		F			D			E			C	

Intersection Summary

HCM 2000 Control Delay	51.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	136.2	Sum of lost time (s)	14.0
Intersection Capacity Utilization	114.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

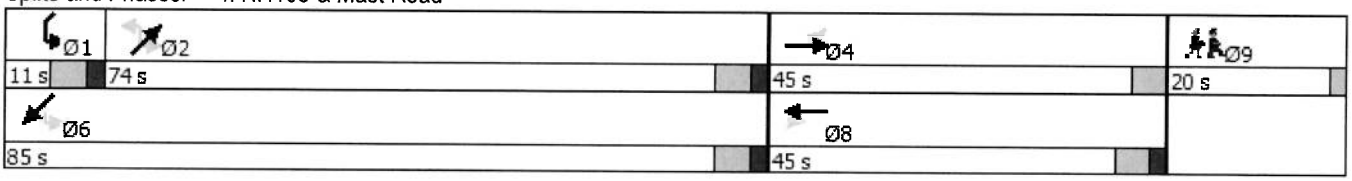
Timings
4: NH108 & Mast Road

Lane Group	EBL	EBT	WBL	WBT	NEL	NET	NER	SWL	SWT	Ø9
Lane Configurations										
Traffic Volume (vph)	164	47	128	40	12	793	130	101	696	
Future Volume (vph)	164	47	128	40	12	793	130	101	696	
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	pm+pt	NA	
Protected Phases		4		8		2		1	6	9
Permitted Phases	4		8		2		2	6		
Detector Phase	4	4	8	8	2	2	2	1	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1.0
Minimum Split (s)	11.0	11.0	11.0	11.0	22.0	22.0	22.0	11.0	22.0	20.0
Total Split (s)	45.0	45.0	45.0	45.0	74.0	74.0	74.0	11.0	85.0	20.0
Total Split (%)	30.0%	30.0%	30.0%	30.0%	49.3%	49.3%	49.3%	7.3%	56.7%	13%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	2.0
All-Red Time (s)	0.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-2.0	-2.0	-2.0	-2.0		-2.0	0.0	-2.0	-2.0	
Total Lost Time (s)	2.0	2.0	4.0	4.0		4.0	6.0	4.0	4.0	
Lead/Lag					Lag	Lag	Lag	Lead		
Lead-Lag Optimize?					Yes	Yes	Yes	Yes		
Recall Mode	None	None	None	None	Min	Min	Min	None	Min	None
Act Effct Green (s)	43.2	43.2	41.2	41.2		70.3	68.3	81.3	81.3	
Actuated g/C Ratio	0.32	0.32	0.31	0.31		0.52	0.51	0.60	0.60	
v/c Ratio	1.14	0.19	0.46	0.44		0.99	0.17	0.72	0.75	
Control Delay	141.2	32.2	44.5	21.7		58.1	9.9	48.5	26.0	
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	
Total Delay	141.2	32.2	44.5	21.7		58.1	9.9	48.5	26.0	
LOS	F	C	D	C		E	A	D	C	
Approach Delay		111.3		30.6		51.4			28.6	
Approach LOS		F		C		D			C	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 134.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.14
Intersection Signal Delay: 48.7
Intersection LOS: D
Intersection Capacity Utilization 114.9%
ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 4: NH108 & Mast Road



Lane Group	EBL	EBT	WBL	WBT	NET	NER	SWL	SWT
Lane Group Flow (vph)	273	103	168	261	925	149	106	819
v/c Ratio	1.14	0.19	0.46	0.44	0.99	0.17	0.72	0.75
Control Delay	141.2	32.2	44.5	21.7	58.1	9.9	48.5	26.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	141.2	32.2	44.5	21.7	58.1	9.9	48.5	26.0
Queue Length 50th (ft)	~261	55	113	83	715	28	36	444
Queue Length 95th (ft)	#285	76	184	142	#1252	81	#165	897
Internal Link Dist (ft)		613		780	1365			1468
Turn Bay Length (ft)	190		50			130	170	
Base Capacity (vph)	240	537	362	594	939	858	147	1093
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	1.14	0.19	0.46	0.44	0.99	0.17	0.72	0.75

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.

Appendix H **Auxiliary Turn Lane Warrants Analysis**

Stephen G. Pernaw & Company, Inc.

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

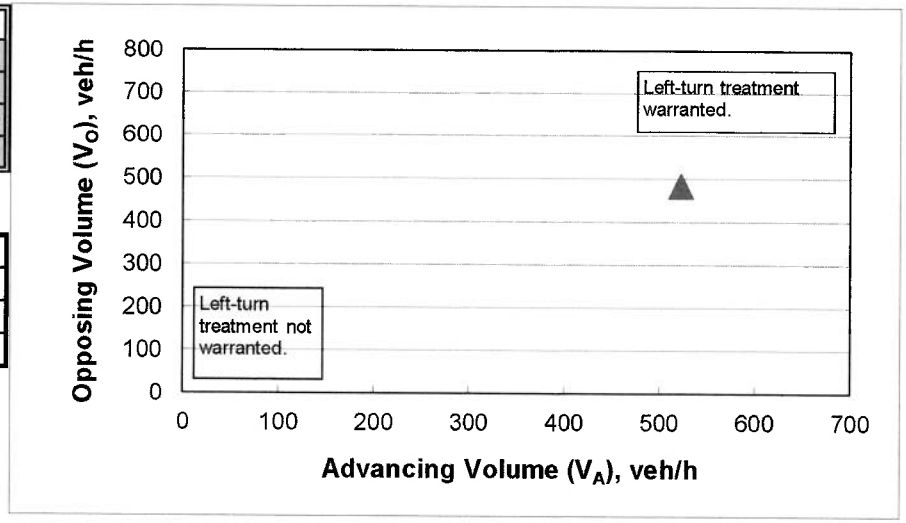
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	1%
Advancing volume (V_A), veh/h:	523
Opposing volume (V_O), veh/h:	483

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	1502
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Stephen G. Pernaw & Company, Inc.

Figure 2 - 5. Guideline for determining the need for a major-road left-turn bay at a two-way stop-controlled intersection.

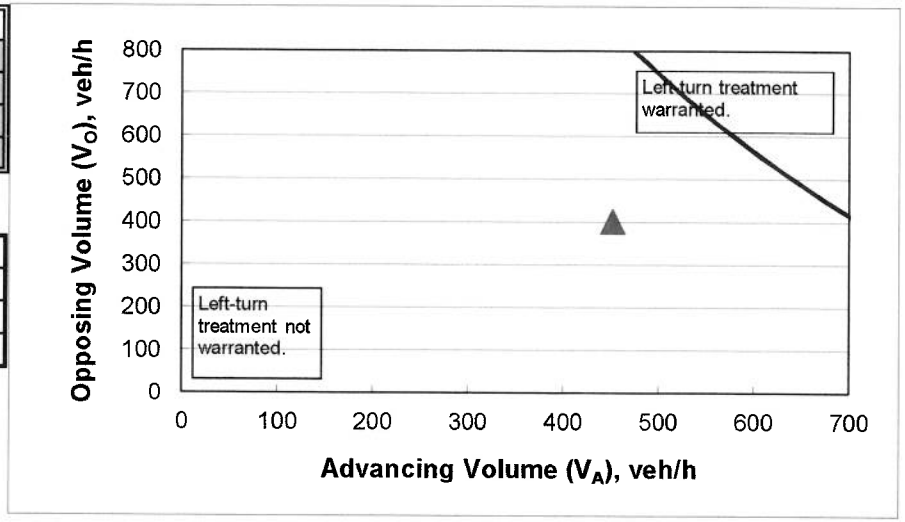
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	30
Percent of left-turns in advancing volume (V_A), %:	3%
Advancing volume (V_A), veh/h:	452
Opposing volume (V_O), veh/h:	401

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	711
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Stephen G. Pernaw & Company, Inc.

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

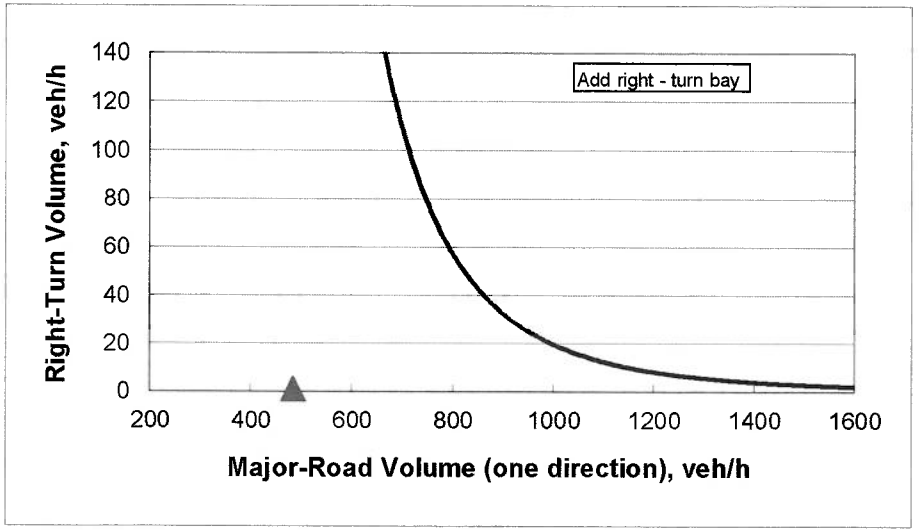
INPUT

2-lane roadway

Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	483
Right-turn volume, veh/h:	1

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	652
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Stephen G. Pernaw & Company, Inc.

Figure 2 - 6. Guideline for determining the need for a major-road right-turn bay at a two-way stop-controlled intersection.

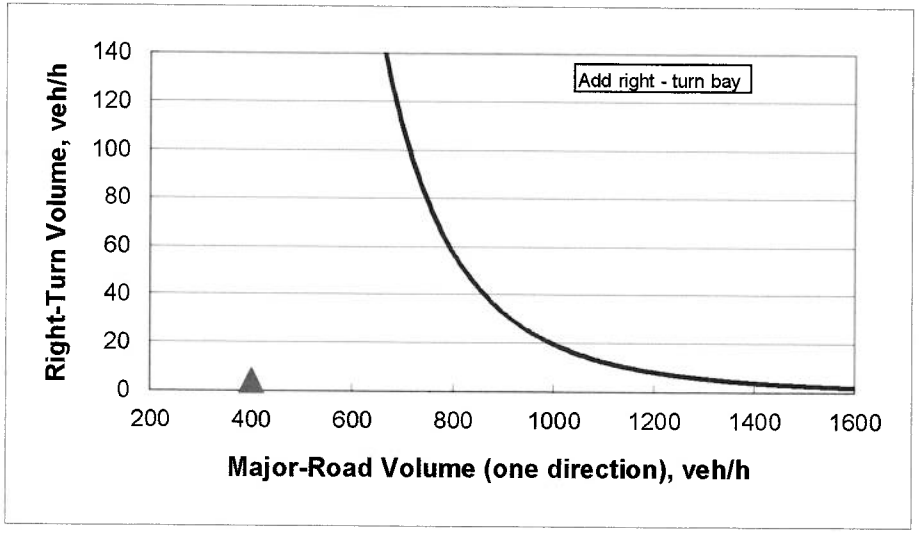
INPUT

2-lane roadway

Variable	Value
Major-road speed, mph:	30
Major-road volume (one direction), veh/h:	401
Right-turn volume, veh/h:	4

OUTPUT

Variable	Value
Limiting right-turn volume, veh/h:	1597
Guidance for determining the need for a major-road right-turn bay for a 2-lane roadway:	
Do NOT add right-turn bay.	



Stephen G. Pernaw & Company, Inc.

Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	1006
Percentage of right-turns on minor road, %:	80%
Minor-road volume (one direction), veh/h:	10

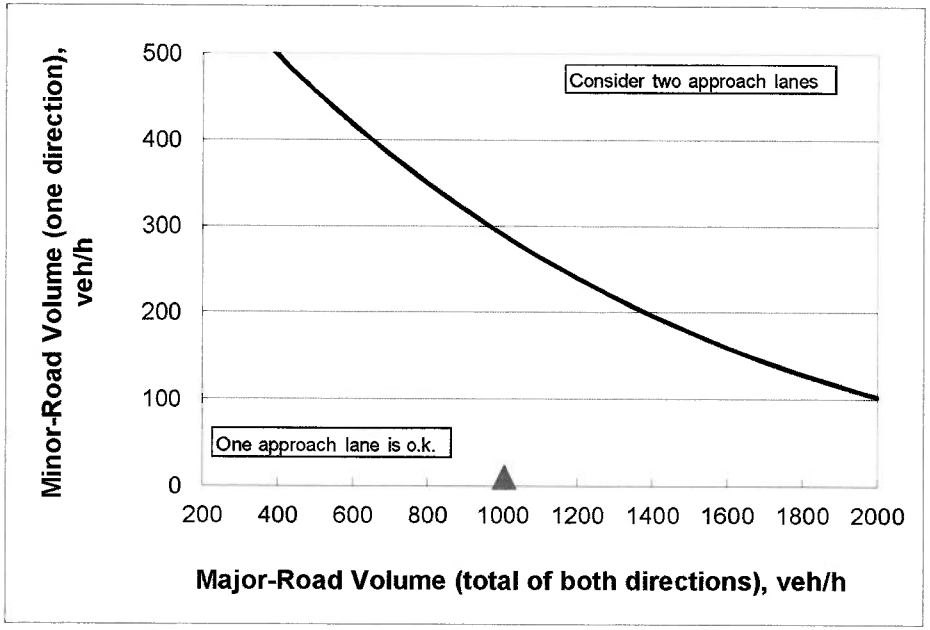
OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	289
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM



Stephen G. Pernaw & Company, Inc.

Figure 2 - 4. Guideline for determining minor-road approach geometry at two-way stop-controlled intersections.

INPUT

Variable	Value
Major-road volume (total of both directions), veh/h:	853
Percentage of right-turns on minor road, %:	78%
Minor-road volume (one direction), veh/h:	9

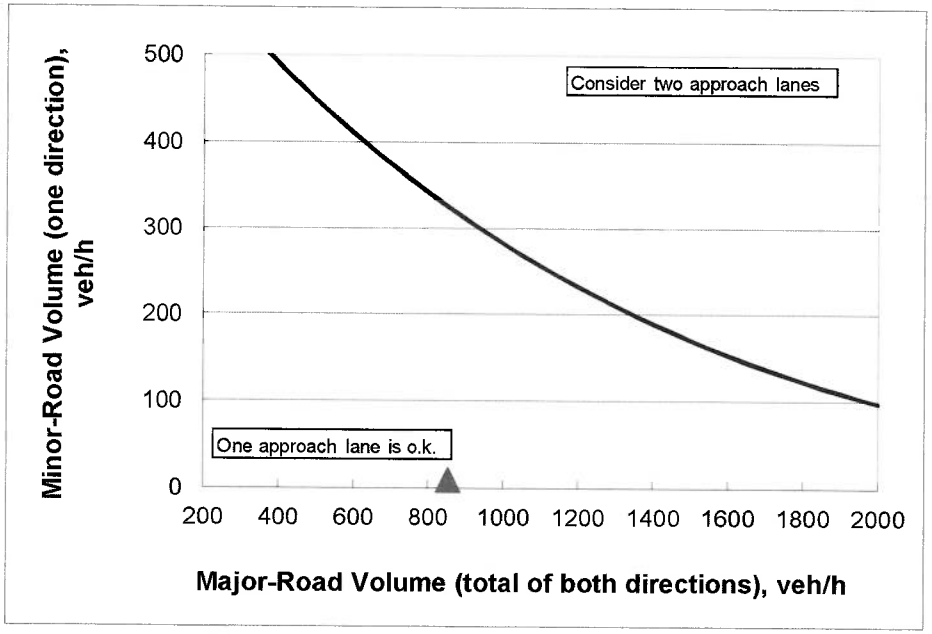
OUTPUT

Variable	Value
Limiting minor-road volume (one direction), veh/h:	325
Guidance for determining minor-road approach geometry:	
ONE approach lane is o.k.	

CALIBRATION CONSTANTS

Minor Road	Critical gap, s:	Follow-up gap, s:
Right-turn capacity, veh/h:	6.2	3.3
Left-turn and through capacity, veh/h:	6.5	4.0

* according to Table 17 - 5 of the HCM



Appendix I **Sight Distance Photographs**

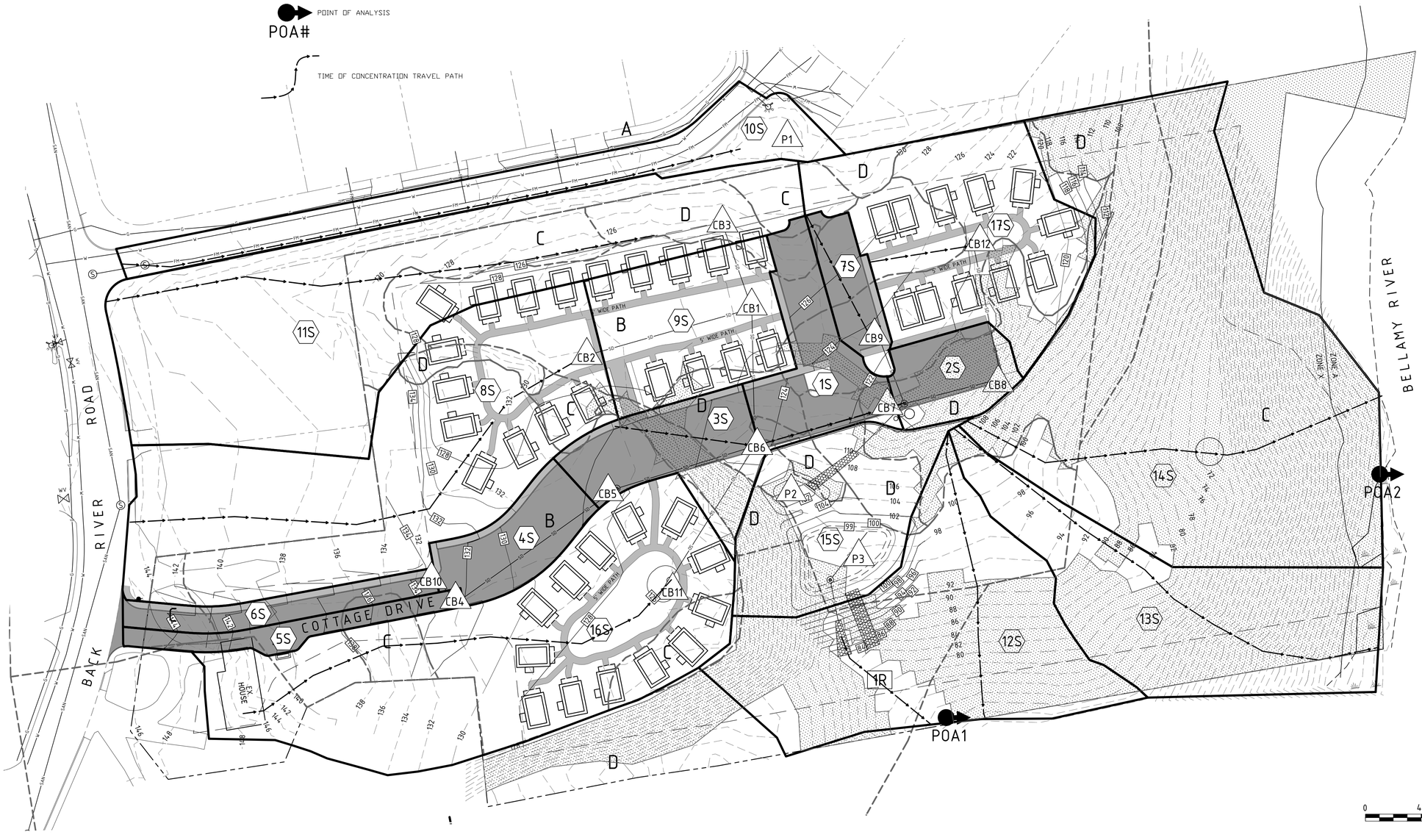
Looking Left

Looking Right

P:\20proj\20-011\Internal\Drawing Files\20011 Civil_1.dwg
2021-24-04 T18:24

LEGEND

- SUBCATCHMENT
- ## POND / CATCH BASIN
- ## REACH
- POINT OF ANALYSIS
- POA# TIME OF CONCENTRATION TRAVEL PATH



NO.	DATE	INT.
0.	PRELIMINARY SUBMISSION	11/25/20	MCS
1.	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20	1/4/21	MCS

REVISIONS

SEAL

DATE ISSUED: 11/25/20
SCALE: 1"=40'
DESIGNED BY: MJS
DRAWN BY: MCS
APPROVED BY: MJS
DWG FILE: 20011 Civil_1.dwg

GRADING & DRAINAGE PLAN
prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP 1, LOT 6
54 BACK RIVER ROAD, DOVER, NH

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad Sq., P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-5170 Fax: (603) 659-4627
E-mail: mjs@mjs-engineering.com

JOB: 20-011

POST

(P20-60)

P:\20proj\20-011\Internal\Drawing Files\20011 Civil_1.dwg
2021-23-04 T 18:23

LEGEND

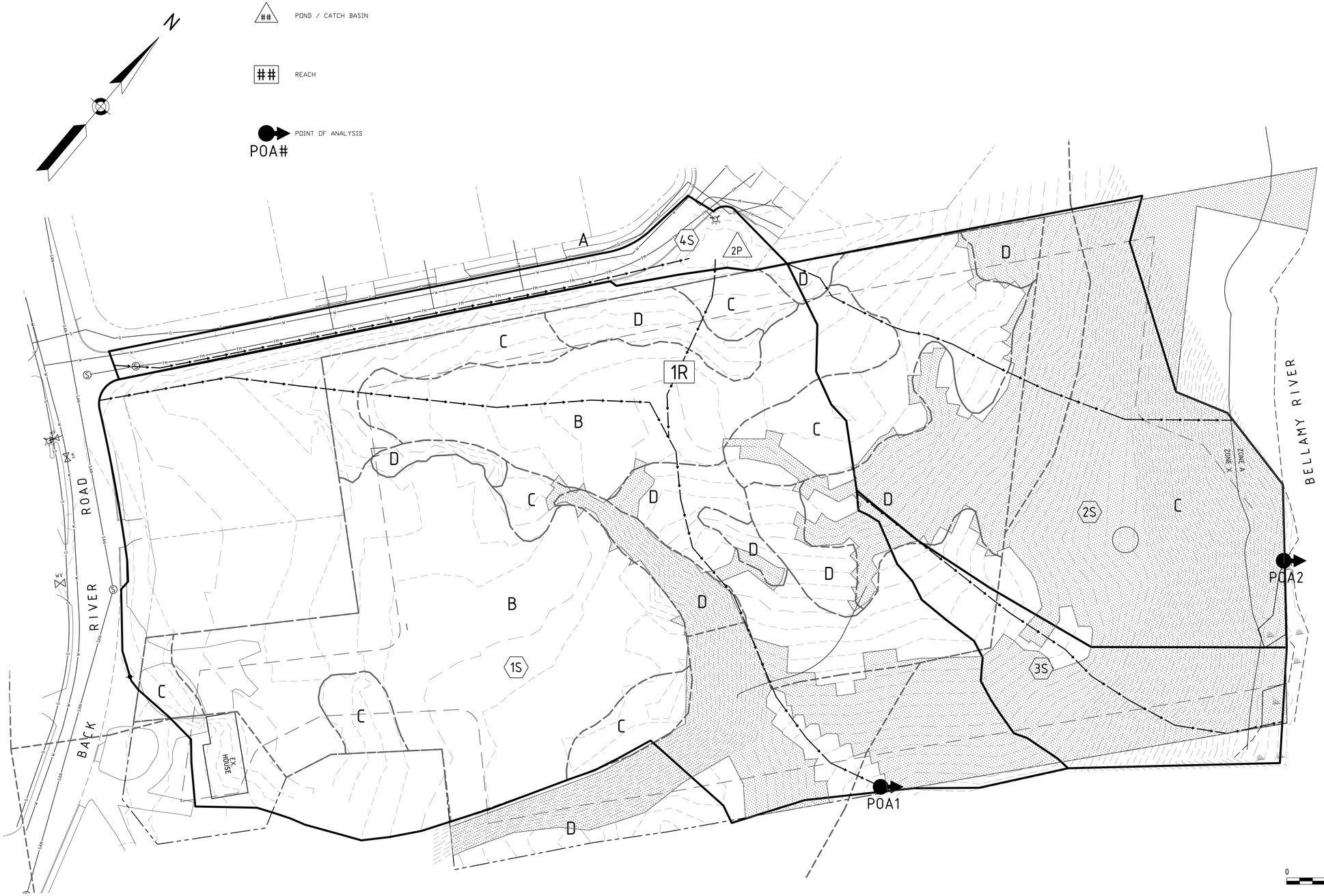
SUBCATCHMENT

POND / CATCH BASIN

REACH

POINT OF ANALYSIS

POA#


N
A
4S
2P
D
C
1R
B
D
C
D
C
D
D
D
D
D
D
2S
C
3S
1S
B
C
C
C
D
D
D
D
D
D

DRAINAGE REPORT

Prepared for:

54 BRR, LLC
54 Back River Road
Dover, NH 03820

Tax Map I, Lot 6

Prepared on:

September 17, 2020

Revised submission:

January 5, 2021

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL

5 Railroad Street • P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-4979
Email: mjs@mjs-engineering.com

Table of Contents

1. Project Background / Purpose 1
2. Methodology 1
3. Soils 1
4. Pre-Development Conditions 1
5. Post-Development Conditions 2
6. Comparison of Pre- and Post-Development Conditions 2
7. Erosion & Sediment Control 3
8. Conclusion 3

Appendix Number	Description
A	Drainage Plan
B	Pre-Development Drainage Analysis
C	Post-Development Drainage Analysis
D	Cornell Extreme Precipitation Table
E	Ksat Table for Soils

1. Project Background / Purpose

The proposal by 54 BRR, LLC is to develop the existing property into a workforce housing development. The style of the development will be small single family detached "Cottages" in clusters. Each cluster will have a central green space for community use. There is a main access road with parking situated along the road and in a small parking lot between two of the northerly clusters. The developed area encompasses approximately 4 acres of the subject parcel with the remaining 3.16 acres to remain as open space. The units are 384sf, with kitchen/living, bedroom and bath. There is a small front porch and attached storage shed.

2. Methodology

The watershed areas have been determined via inspection by our office and a topographical survey of the site. This analysis utilizes HydroCAD modeling software which models the runoff based on the SCS TR-20 method and the time of concentration based on the SCS TR-55 method. This analysis compares the runoff rates for the 1-inch, 2, 10, and 25-year USDA/SCS Type III 24-hour extreme storm events. The rainfall data used in the model is referenced from the Cornell extreme precipitation rainfall table found in Appendix D of this report.

3. Soils

The soils on site consist mostly of very rocky fine sandy loam and silt loam with Hydrologic Soil Groups determined to be A, C and D. The soils in this analysis have been identified in accordance with the NRCS Web Soil Survey.

Soil Types

Label	Description	HSG:
GlB	Gloucester fine sandy loam, 3-8% slopes	A
HgD	Hollis-Gloucester very rocky fine sandy loams, 15-25%	D
SfC	Suffield silt loam, 8-15%	C

4. Pre-Development Conditions

The subject parcel drains from the west by Back River Road down to Bellamy River in the east. The south west portion of the property had a more gradual slope (5-10%). The eastern portion of the has steep slope >25% which are part of the Dover Conservation District. The existing buildings are located near the road with the steeper sloped areas covered by trees.

The first point of analysis is the Bellamy River, a large portion of the forested area in the northeast drains directly into the river. The remainder of the water drains to the property located to the southeast property.

Midway through the property, travelling from the road to the river, there is a large 30-50% slope. Located at the toe of the slope is a drainage way. Th

5. Post-Development Conditions

The project proposes the construction of 44 single-family, one-bedroom cottages. The cottages are in four clusters of 10-13 units. Each cluster of homes will be built around a small green space. The clusters will be accessed by a single road with sidewalks. The end of the road has short parking area that is also used to emergency service access.

The natural drainage is maintained where possible. The overall site will drain from Back River Road to Bellamy River. The road drainage will be collected in a closed curb and drain system. Each cluster will drain to a catch basin that will be routed to that closed drainage system. An additional catch basin is installed near the north west property boundary to collect runoff coming from offsite. This catch basin is also tied into the closed drainage system.

The closed drainage system will outlet into a new basin that will be constructed at the bottom of a proposed retaining wall on the east side of the proposed road.

6. Comparison of Pre- and Post-Development Conditions

The following tables quantify the peak rate of discharge and discharge volume leaving the parcel at POA 1 as shown on the Pre- and Post-Development Drainage Plan. The analysis has been modeled using the extreme rainfall quantities.

Table 1: Peak Rate of Runoff at POA 1 Summary Table

Storm	Pre-Development (cfs)	Post-Development (cfs)	Difference
1-Inch	0.24	0.24	0.00
2-Year	3.15	2.52	-0.63
10-Year	7.22	4.46	-2.76
25-Year	11.43	11.23	-0.20

Table 2: Peak Rate of Runoff at POA 2 Summary Table

Storm	Pre-Development (cfs)	Post-Development (cfs)	Difference
1-Inch	0.00	0.00	0.00
2-Year	3.15	1.39	-1.76
10-Year	7.22	3.41	-3.81
25-Year	11.43	5.21	-6.22

As shown in Table 1 and 2, the peak runoff is decreased for all storm events, except for the 1" storm event, where the pre- and post- flows are equal.

7. Erosion & Sediment Control

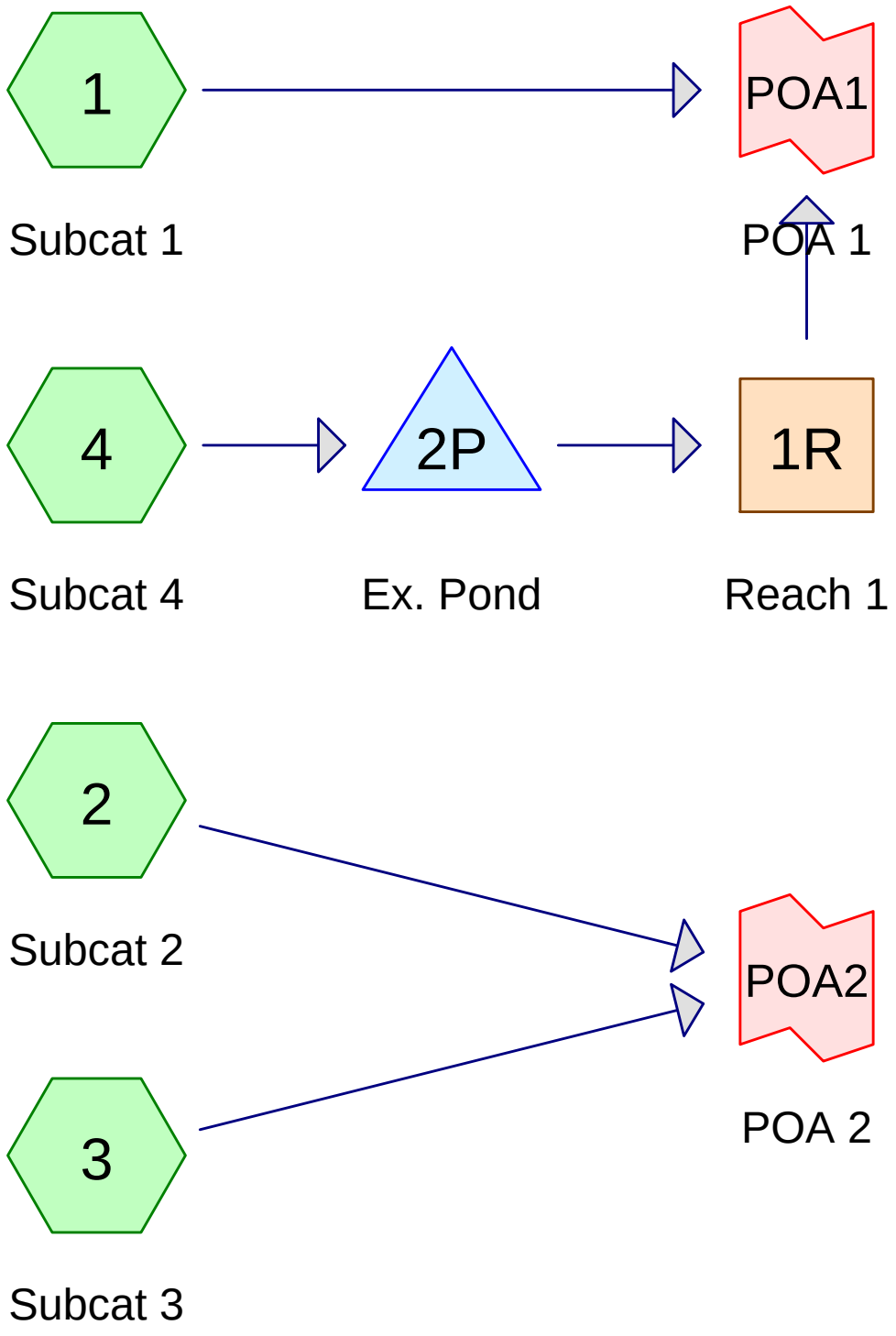
Temporary and permanent practices are used to prevent and minimize erosion and sedimentation on site. The installation of Silt Soxx™ at the perimeter of construction areas will provide sediment retention during the construction phase of the development. Erosion control matting is proposed on all spillways, steep slopes and swales to prevent erosion prior to the establishment of permanent vegetation. In addition, stone check dams will be used to help control erosion in the treatment swale.

8. Conclusion

The enclosed comparative hydrologic model provides sufficient evidence that the stormwater design will mitigate the typical increase in peak rate of stormwater discharge resulting from the proposed development of the site. Stormwater treatment practices will provide treatment of runoff from proposed paved surfaces. The use of erosion and sediment controls and proper construction practices will minimize the impact of this project to downstream surface waters.

APPENDIX A

APPENDIX B



Subcat Reach Pond Link

Routing Diagram for 20011_PreA
Prepared by MJS Engineering, PC, Printed 9/17/2020
HydroCAD® 10.00-25 s/n 08064 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
20,048	39	>75% Grass cover, Good, HSG A (1, 2, 4)
40,457	61	>75% Grass cover, Good, HSG B (1)
6,803	74	>75% Grass cover, Good, HSG C (1, 2, 3)
6,331	80	>75% Grass cover, Good, HSG D (1)
10,475	86	Fallow, bare soil, HSG B (1)
1,897	91	Fallow, bare soil, HSG C (1)
2,495	94	Fallow, bare soil, HSG D (1)
14,613	98	Paved parking, HSG A (1, 4)
4,206	98	Paved parking, HSG B (1)
386	98	Paved parking, HSG C (1)
3,403	98	Paved parking, HSG D (1)
27,669	30	Woods, Good, HSG A (1, 2)
31,330	55	Woods, Good, HSG B (1, 2)
107,322	70	Woods, Good, HSG C (1, 2, 3)
74,893	77	Woods, Good, HSG D (1, 2, 3, 4)
352,329	**67**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
62,330	HSG A	1, 2, 4
86,467	HSG B	1, 2
116,409	HSG C	1, 2, 3
87,122	HSG D	1, 2, 3, 4
0	Other	
352,329		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
20,048	40,457	6,803	6,331	0	73,639	>75% Grass cover, Good	
0	10,475	1,897	2,495	0	14,868	Fallow, bare soil	
14,613	4,206	386	3,403	0	22,609	Paved parking	
27,669	31,330	107,322	74,893	0	241,214	Woods, Good	
62,330	**86,467**	**116,409**	**87,122**	**0**	**352,329**	**TOTAL AREA**	

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=226,454 sf 5.24% Impervious Runoff Depth>0.07"
Flow Length=798' Tc=17.9 min CN=WQ Runoff=0.24 cfs 1,259 cf

Subcatchment 2: Subcat 2 Runoff Area=86,792 sf 0.00% Impervious Runoff Depth>0.01"
Flow Length=373' Tc=15.4 min CN=WQ Runoff=0.00 cfs 65 cf

Subcatchment 3: Subcat 3 Runoff Area=25,154 sf 0.00% Impervious Runoff Depth>0.01"
Flow Length=390' Tc=13.9 min CN=WQ Runoff=0.00 cfs 16 cf

Subcatchment 4: Subcat 4 Runoff Area=13,930 sf 77.17% Impervious Runoff Depth>0.58"
Flow Length=450' Tc=6.0 min CN=WQ Runoff=0.22 cfs 670 cf

Reach 1R: Reach 1 Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
n=0.030 L=473.0' S=0.1332 '/' Capacity=25.91 cfs Outflow=0.00 cfs 0 cf

Pond 2P: Ex. Pond Peak Elev=131.14' Storage=438 cf Inflow=0.22 cfs 670 cf
Discarded=0.01 cfs 276 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 276 cf

Link POA1: POA 1 Inflow=0.24 cfs 1,259 cf
Primary=0.24 cfs 1,259 cf

Link POA2: POA 2 Inflow=0.00 cfs 81 cf
Primary=0.00 cfs 81 cf

Total Runoff Area = 352,329 sf Runoff Volume = 2,010 cf Average Runoff Depth = 0.07"
93.58% Pervious = 329,720 sf 6.42% Impervious = 22,609 sf

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=226,454 sf 5.24% Impervious Runoff Depth>0.76"
Flow Length=798' Tc=17.9 min CN=WQ Runoff=3.15 cfs 14,347 cf

Subcatchment 2: Subcat 2 Runoff Area=86,792 sf 0.00% Impervious Runoff Depth>0.70"
Flow Length=373' Tc=15.4 min CN=WQ Runoff=1.22 cfs 5,080 cf

Subcatchment 3: Subcat 3 Runoff Area=25,154 sf 0.00% Impervious Runoff Depth>0.77"
Flow Length=390' Tc=13.9 min CN=WQ Runoff=0.40 cfs 1,618 cf

Subcatchment 4: Subcat 4 Runoff Area=13,930 sf 77.17% Impervious Runoff Depth>2.14"
Flow Length=450' Tc=6.0 min CN=WQ Runoff=0.75 cfs 2,490 cf

Reach 1R: Reach 1 Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0 cf
n=0.030 L=473.0' S=0.1332 '/' Capacity=25.91 cfs Outflow=0.00 cfs 0 cf

Pond 2P: Ex. Pond Peak Elev=132.92' Storage=1,915 cf Inflow=0.75 cfs 2,490 cf
Discarded=0.02 cfs 612 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 612 cf

Link POA1: POA 1 Inflow=3.15 cfs 14,347 cf
Primary=3.15 cfs 14,347 cf

Link POA2: POA 2 Inflow=1.62 cfs 6,698 cf
Primary=1.62 cfs 6,698 cf

Total Runoff Area = 352,329 sf Runoff Volume = 23,534 cf Average Runoff Depth = 0.80"
93.58% Pervious = 329,720 sf 6.42% Impervious = 22,609 sf

Time span=0.00-20.00 hrs, dt=0.01 hrs, 2001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=226,454 sf 5.24% Impervious Runoff Depth>2.39"
Flow Length=798' Tc=17.9 min CN=WQ Runoff=10.54 cfs 45,110 cf

Subcatchment 2: Subcat 2 Runoff Area=86,792 sf 0.00% Impervious Runoff Depth>2.46"
Flow Length=373' Tc=15.4 min CN=WQ Runoff=4.60 cfs 17,781 cf

Subcatchment 3: Subcat 3 Runoff Area=25,154 sf 0.00% Impervious Runoff Depth>2.71"
Flow Length=390' Tc=13.9 min CN=WQ Runoff=1.54 cfs 5,682 cf

Subcatchment 4: Subcat 4 Runoff Area=13,930 sf 77.17% Impervious Runoff Depth>4.35"
Flow Length=450' Tc=6.0 min CN=WQ Runoff=1.46 cfs 5,051 cf

Reach 1R: Reach 1 Avg. Flow Depth=0.09' Max Vel=3.32 fps Inflow=1.18 cfs 2,308 cf
n=0.030 L=473.0' S=0.1332 '/' Capacity=25.91 cfs Outflow=1.07 cfs 2,302 cf

Pond 2P: Ex. Pond Peak Elev=133.17' Storage=2,227 cf Inflow=1.46 cfs 5,051 cf
Discarded=0.02 cfs 726 cf Primary=1.18 cfs 2,308 cf Outflow=1.19 cfs 3,033 cf

Link POA1: POA 1 Inflow=11.43 cfs 47,413 cf
Primary=11.43 cfs 47,413 cf

Link POA2: POA 2 Inflow=6.12 cfs 23,463 cf
Primary=6.12 cfs 23,463 cf

Total Runoff Area = 352,329 sf Runoff Volume = 73,625 cf Average Runoff Depth = 2.51"
93.58% Pervious = 329,720 sf 6.42% Impervious = 22,609 sf

Summary for Subcatchment 1: Subcat 1

Runoff = 7.02 cfs @ 12.25 hrs, Volume= 30,345 cf, Depth> 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
443	77	Woods, Good, HSG D
0	77	Woods, Good, HSG D
3,130	70	Woods, Good, HSG C
5,424	70	Woods, Good, HSG C
7,524	70	Woods, Good, HSG C
25,773	55	Woods, Good, HSG B
5,471	77	Woods, Good, HSG D
0	77	Woods, Good, HSG D
3,571	77	Woods, Good, HSG D
4,332	77	Woods, Good, HSG D
1,530	77	Woods, Good, HSG D
15,918	77	Woods, Good, HSG D
1,595	70	Woods, Good, HSG C
131	74	>75% Grass cover, Good, HSG C
5	74	>75% Grass cover, Good, HSG C
200	74	>75% Grass cover, Good, HSG C
41	91	Fallow, bare soil, HSG C
1,434	77	Woods, Good, HSG D
160	80	>75% Grass cover, Good, HSG D
116	80	>75% Grass cover, Good, HSG D
4,449	77	Woods, Good, HSG D
18	80	>75% Grass cover, Good, HSG D
37	80	>75% Grass cover, Good, HSG D
6	80	>75% Grass cover, Good, HSG D
0	98	Paved parking, HSG C
340	98	Paved parking, HSG C
19	98	Paved parking, HSG C
1,303	74	>75% Grass cover, Good, HSG C
158	74	>75% Grass cover, Good, HSG C
28	98	Paved parking, HSG C
2,323	74	>75% Grass cover, Good, HSG C
629	91	Fallow, bare soil, HSG C
153	98	Paved parking, HSG B
1,160	98	Paved parking, HSG B
203	98	Paved parking, HSG B
91	98	Paved parking, HSG B
267	98	Paved parking, HSG B
0	94	Fallow, bare soil, HSG D
10,475	86	Fallow, bare soil, HSG B
3,828	61	>75% Grass cover, Good, HSG B
2,253	55	Woods, Good, HSG B
2,333	98	Paved parking, HSG B
36,499	61	>75% Grass cover, Good, HSG B
130	61	>75% Grass cover, Good, HSG B
1,227	91	Fallow, bare soil, HSG C
762	74	>75% Grass cover, Good, HSG C
40	70	Woods, Good, HSG C
144	70	Woods, Good, HSG C
1,725	74	>75% Grass cover, Good, HSG C
754	98	Paved parking, HSG A
3,109	98	Paved parking, HSG A
14,189	39	>75% Grass cover, Good, HSG A

0	80	>75% Grass cover, Good, HSG D
2,431	39	>75% Grass cover, Good, HSG A
19,935	30	Woods, Good, HSG A
0	98	Paved parking, HSG A
2	74	>75% Grass cover, Good, HSG C
9,982	70	Woods, Good, HSG C
991	98	Paved parking, HSG D
272	98	Paved parking, HSG D
2,029	98	Paved parking, HSG D
112	98	Paved parking, HSG D
2,495	94	Fallow, bare soil, HSG D
16,759	77	Woods, Good, HSG D
5,976	80	>75% Grass cover, Good, HSG D
17	80	>75% Grass cover, Good, HSG D
226,454		Weighted Average
214,595		94.76% Pervious Area
11,859		5.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.9	100	0.0900	0.14		**Sheet Flow, A-->B** Woods: Light underbrush n= 0.400 P2= 3.15"
5.5	370	0.0500	1.12		**Shallow Concentrated Flow, B-->C** Woodland Kv= 5.0 fps
0.5	328	0.1500	10.13	27.87	**Trap/Vee/Rect Channel Flow, C-->D** Bot.W=4.00' D=0.50' Z= 3.0 '/' Top.W=7.00' n= 0.030 Earth, grassed & winding
17.9	798	Total			

Summary for Subcatchment 2: Subcat 2

Runoff = 3.00 cfs @ 12.22 hrs, Volume= 11,703 cf, Depth> 1.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
862	77	Woods, Good, HSG D
14,837	70	Woods, Good, HSG C
2,392	77	Woods, Good, HSG D
3,304	55	Woods, Good, HSG B
12,238	77	Woods, Good, HSG D
1,672	77	Woods, Good, HSG D
7,733	30	Woods, Good, HSG A
250	39	>75% Grass cover, Good, HSG A
43,316	70	Woods, Good, HSG C
137	74	>75% Grass cover, Good, HSG C
52	74	>75% Grass cover, Good, HSG C
86,792		Weighted Average
86,792		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.3	150	0.1260	0.17		**Sheet Flow, A-->B** Woods: Light underbrush n= 0.400 P2= 3.15"
1.1	223	0.4600	3.39		**Shallow Concentrated Flow, B-->C** Woodland Kv= 5.0 fps
15.4	373	Total			

Summary for Subcatchment 3: Subcat 3

Runoff = 1.00 cfs @ 12.20 hrs, Volume= 3,743 cf, Depth> 1.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
618	77	Woods, Good, HSG D
3,201	77	Woods, Good, HSG D
4	74	>75% Grass cover, Good, HSG C
21,330	70	Woods, Good, HSG C
25,154		Weighted Average
25,154		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	150	0.1730	0.20		**Sheet Flow, A-->B** Woods: Light underbrush n= 0.400 P2= 3.15"
1.3	240	0.3540	2.97		**Shallow Concentrated Flow, B-->C** Woodland Kv= 5.0 fps
13.9	390	Total			

Summary for Subcatchment 4: Subcat 4

Runoff = 1.15 cfs @ 12.08 hrs, Volume= 3,896 cf, Depth> 3.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
1	77	Woods, Good, HSG D
3,178	39	>75% Grass cover, Good, HSG A
10,750	98	Paved parking, HSG A
13,930		Weighted Average
3,180		22.83% Pervious Area
10,750		77.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.80		**Sheet Flow, A-->B** Smooth surfaces n= 0.011 P2= 3.15"
0.4	100	0.0400	4.06		**Shallow Concentrated Flow, B-->C** Paved Kv= 20.3 fps
0.4	250	0.0600	11.11	8.73	**Pipe Channel, C-->D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.7	450	Total, Increased to minimum Tc = 6.0 min			

Summary for Reach 1R: Reach 1

Inflow Area = 13,930 sf, 77.17% Impervious, Inflow Depth > 1.03" for 10-yr (NRCC) event
Inflow = 0.43 cfs @ 12.31 hrs, Volume= 1,193 cf
Outflow = 0.40 cfs @ 12.36 hrs, Volume= 1,192 cf, Atten= 7%, Lag= 3.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.35 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 9.1 min

Peak Storage= 80 cf @ 12.36 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.50' Flow Area= 3.0 sf, Capacity= 25.91 cfs

3.00' x 0.50' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 6.0 '/' Top Width= 9.00'
Length= 473.0' Slope= 0.1332 '/'
Inlet Invert= 131.00', Outlet Invert= 68.00'

‡

Summary for Pond 2P: Ex. Pond

Inflow Area = 13,930 sf, 77.17% Impervious, Inflow Depth > 3.36" for 10-yr (NRCC) event
Inflow = 1.15 cfs @ 12.08 hrs, Volume= 3,896 cf
Outflow = 0.45 cfs @ 12.31 hrs, Volume= 1,883 cf, Atten= 61%, Lag= 13.3 min
Discarded = 0.02 cfs @ 12.31 hrs, Volume= 690 cf
Primary = 0.43 cfs @ 12.31 hrs, Volume= 1,193 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 133.09' @ 12.31 hrs Surf.Area= 1,226 sf Storage= 2,120 cf

Plug-Flow detention time= 197.9 min calculated for 1,882 cf (48% of inflow)
Center-of-Mass det. time= 86.5 min (809.7 - 723.1)

Volume	Invert	Avail.Storage	Storage Description
#1	130.00'	3,417 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
130.00	252	71.0	0	0	252
132.00	817	116.0	1,015	1,015	947
134.00	1,631	155.0	2,402	3,417	1,831

Device	Routing	Invert	Outlet Devices
#1	Primary	133.00'	**6.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	130.00'	**0.600 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 12.31 hrs HW=133.09' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.43 cfs @ 12.31 hrs HW=133.09' TW=131.05' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.43 cfs @ 0.80 fps)

Summary for Link POA1: POA 1

Inflow Area = 240,383 sf, 9.41% Impervious, Inflow Depth > 1.57" for 10-yr (NRCC) event
Inflow = 7.22 cfs @ 12.27 hrs, Volume= 31,537 cf
Primary = 7.22 cfs @ 12.27 hrs, Volume= 31,537 cf, Atten= 0%, Lag= 0.0 min

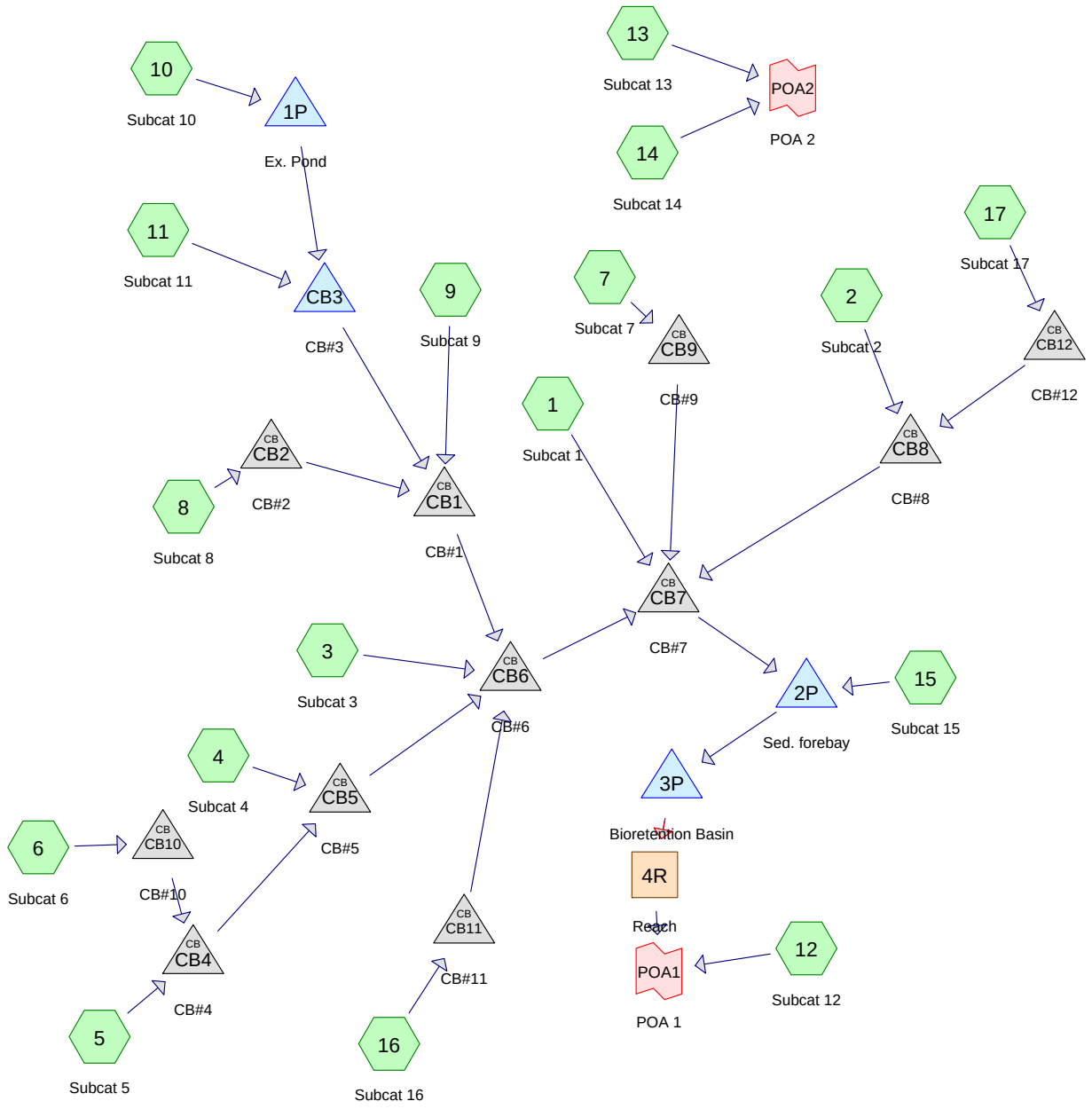
Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

Summary for Link POA2: POA 2

Inflow Area = 111,946 sf, 0.00% Impervious, Inflow Depth > 1.66" for 10-yr (NRCC) event
Inflow = 4.00 cfs @ 12.21 hrs, Volume= 15,447 cf
Primary = 4.00 cfs @ 12.21 hrs, Volume= 15,447 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-20.00 hrs, dt= 0.01 hrs

APPENDIX C



Routing Diagram for 20011_PostD
Prepared by MJS Engineering, PC, Printed 1/4/2021
HydroCAD® 10.00-25 s/n 08064 © 2019 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
0	0	>75% Grass cover, Good (12, 16)
20,480	39	>75% Grass cover, Good, HSG A (6, 8, 10, 11, 14, 17)
57,836	61	>75% Grass cover, Good, HSG B (1, 3, 4, 5, 6, 7, 8, 9, 11, 15, 16, 17)
18,164	74	>75% Grass cover, Good, HSG C (1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17)
37,603	80	>75% Grass cover, Good, HSG D (1, 2, 3, 5, 8, 9, 11, 12, 13, 14, 15, 16, 17)
845	0	Paved parking (5, 7, 11)
15,166	98	Paved parking, HSG A (5, 6, 8, 10, 11)
25,917	98	Paved parking, HSG B (1, 3, 4, 5, 6, 7, 8, 9, 11, 16, 17)
11,714	98	Paved parking, HSG C (1, 2, 3, 5, 6, 7, 8, 9, 11, 14, 16, 17)
13,307	98	Paved parking, HSG D (1, 2, 3, 5, 7, 8, 9, 11, 15, 16, 17)
27,530	30	Woods, Good, HSG A (8, 11, 14)
2,715	55	Woods, Good, HSG B (8, 11, 15, 17)
86,875	70	Woods, Good, HSG C (8, 11, 12, 13, 14, 15, 17)
36,252	77	Woods, Good, HSG D (2, 8, 10, 11, 12, 13, 14, 15, 17)
354,404	**71**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
63,177	HSG A	5, 6, 8, 10, 11, 14, 17
86,467	HSG B	1, 3, 4, 5, 6, 7, 8, 9, 11, 15, 16, 17
116,753	HSG C	1, 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17
87,162	HSG D	1, 2, 3, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
845	Other	5, 7, 11, 12, 16
354,404		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Sub Num
20,480	57,836	18,164	37,603	0	134,083	>75% Grass cover, Good	
15,166	25,917	11,714	13,307	845	66,949	Paved parking	
27,530	2,715	86,875	36,252	0	153,372	Woods, Good	
63,177	**86,467**	**116,753**	**87,162**	**845**	**354,404**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=8,496 sf 91.80% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=WQ Runoff=0.16 cfs 517 cf

Subcatchment 2: Subcat 2 Runoff Area=5,182 sf 64.64% Impervious Runoff Depth=0.54"
Tc=6.0 min CN=WQ Runoff=0.07 cfs 232 cf

Subcatchment 3: Subcat 3 Runoff Area=8,905 sf 70.76% Impervious Runoff Depth=0.58"
Tc=6.0 min CN=WQ Runoff=0.13 cfs 429 cf

Subcatchment 4: Subcat 4 Runoff Area=5,970 sf 95.13% Impervious Runoff Depth=0.75"
Tc=6.0 min CN=WQ Runoff=0.12 cfs 374 cf

Subcatchment 5: Subcat 5 Runoff Area=3,591 sf 79.74% Impervious Runoff Depth=0.63"
Tc=6.0 min CN=WQ Runoff=0.06 cfs 189 cf

Subcatchment 6: Subcat 6 Runoff Area=4,316 sf 86.15% Impervious Runoff Depth=0.68"
Tc=6.0 min CN=WQ Runoff=0.08 cfs 246 cf

Subcatchment 7: Subcat 7 Runoff Area=3,763 sf 72.05% Impervious Runoff Depth=0.57"
Tc=6.0 min CN=WQ Runoff=0.06 cfs 180 cf

Subcatchment 8: Subcat 8 Runoff Area=42,158 sf 15.86% Impervious Runoff Depth=0.13"
Flow Length=380' Tc=26.4 min CN=WQ Runoff=0.08 cfs 455 cf

Subcatchment 9: Subcat 9 Runoff Area=13,330 sf 20.65% Impervious Runoff Depth=0.17"
Tc=6.0 min CN=WQ Runoff=0.06 cfs 189 cf

Subcatchment 10: Subcat 10 Runoff Area=13,930 sf 77.17% Impervious Runoff Depth=0.61"
Flow Length=450' Tc=6.0 min CN=WQ Runoff=0.22 cfs 709 cf

Subcatchment 11: Subcat 11 Runoff Area=47,240 sf 5.14% Impervious Runoff Depth=0.05"
Flow Length=400' Slope=0.0600 '/' Tc=18.0 min CN=WQ Runoff=0.04 cfs 183 cf

Subcatchment 12: Subcat 12 Runoff Area=30,878 sf 0.00% Impervious Runoff Depth=0.04"
Flow Length=200' Tc=18.6 min CN=WQ Runoff=0.01 cfs 99 cf

Subcatchment 13: Subcat 13 Runoff Area=24,896 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=390' Tc=13.9 min CN=WQ Runoff=0.00 cfs 22 cf

Subcatchment 14: Subcat 14 Runoff Area=62,522 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=459' Tc=9.9 min CN=WQ Runoff=0.00 cfs 61 cf

Subcatchment 15: Subcat 15 Runoff Area=15,302 sf 0.00% Impervious Runoff Depth=0.08"
Tc=6.0 min CN=WQ Runoff=0.01 cfs 100 cf

Subcatchment 16: Subcat 16 Runoff Area=40,857 sf 16.35% Impervious Runoff Depth=0.15"
Flow Length=335' Tc=9.3 min CN=WQ Runoff=0.12 cfs 519 cf

Subcatchment 17: Subcat 17 Runoff Area=23,068 sf 19.02% Impervious Runoff Depth=0.17"
Flow Length=80' Slope=0.0200 '/' Tc=8.3 min CN=WQ Runoff=0.08 cfs 327 cf

Reach 4R: Reach Avg. Flow Depth=0.06' Max Vel=2.47 fps Inflow=0.24 cfs 2,998 cf
n=0.025 L=90.0' S=0.1333 '/' Capacity=510.47 cfs Outflow=0.24 cfs 2,998 cf

Pond 1P: Ex. Pond Peak Elev=131.14' Storage=438 cf Inflow=0.22 cfs 709 cf
Discarded=0.01 cfs 613 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 613 cf

Pond 2P: Sed. forebay Peak Elev=102.96' Storage=790 cf Inflow=0.96 cfs 3,757 cf
Outflow=0.93 cfs 3,070 cf

Pond 3P: Bioretention Basin Peak Elev=97.36' Storage=931 cf Inflow=0.93 cfs 3,070 cf
Primary=0.00 cfs 0 cf Secondary=0.24 cfs 2,998 cf Outflow=0.24 cfs 2,998 cf

Pond CB1: CB#1 Peak Elev=118.45' Inflow=0.10 cfs 644 cf
15.0" Round Culvert n=0.013 L=99.7' S=0.0110 '/' Outflow=0.10 cfs 644 cf

Pond CB10: CB#10 Peak Elev=127.03' Inflow=0.08 cfs 246 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0478 '/' Outflow=0.08 cfs 246 cf

Pond CB11: CB#11 Peak Elev=120.17' Inflow=0.12 cfs 519 cf
12.0" Round Culvert n=0.013 L=114.0' S=0.0202 '/' Outflow=0.12 cfs 519 cf

Pond CB12: CB#12 Peak Elev=116.85' Inflow=0.08 cfs 327 cf
12.0" Round Culvert n=0.013 L=100.5' S=0.0090 '/' Outflow=0.08 cfs 327 cf

Pond CB2: CB#2 Peak Elev=121.25' Inflow=0.08 cfs 455 cf
15.0" Round Culvert n=0.013 L=132.0' S=0.0152 '/' Outflow=0.08 cfs 455 cf

Pond CB3: CB#3 Peak Elev=124.23' Storage=65 cf Inflow=0.04 cfs 183 cf
Discarded=0.00 cfs 183 cf Primary=0.00 cfs 0 cf Outflow=0.00 cfs 183 cf

Pond CB4: CB#4 Peak Elev=125.78' Inflow=0.13 cfs 435 cf
12.0" Round Culvert n=0.013 L=139.9' S=0.0186 '/' Outflow=0.13 cfs 435 cf

Pond CB5: CB#5 Peak Elev=121.13' Inflow=0.25 cfs 809 cf
15.0" Round Culvert n=0.013 L=103.7' S=0.0309 '/' Outflow=0.25 cfs 809 cf

Pond CB6: CB#6 Peak Elev=117.34' Inflow=0.59 cfs 2,401 cf
18.0" Round Culvert n=0.013 L=111.7' S=0.0134 '/' Outflow=0.59 cfs 2,401 cf

Pond CB7: CB#7 Peak Elev=112.40' Inflow=0.96 cfs 3,657 cf
24.0" Round Culvert n=0.013 L=49.0' S=0.0408 '/' Outflow=0.96 cfs 3,657 cf

Pond CB8: CB#8 Peak Elev=115.89' Inflow=0.15 cfs 559 cf
12.0" Round Culvert n=0.013 L=71.7' S=0.0098 '/' Outflow=0.15 cfs 559 cf

Pond CB9: CB#9 Peak Elev=116.61' Inflow=0.06 cfs 180 cf
12.0" Round Culvert n=0.013 L=35.5' S=0.0141 '/' Outflow=0.06 cfs 180 cf

Link POA1: POA 1 Inflow=0.24 cfs 3,097 cf
Primary=0.24 cfs 3,097 cf

Link POA2: POA 2 Inflow=0.00 cfs 84 cf
Primary=0.00 cfs 84 cf

Total Runoff Area = 354,404 sf Runoff Volume = 4,831 cf Average Runoff Depth = 0.16"
81.35% Pervious = 288,300 sf 18.65% Impervious = 66,104 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=8,496 sf 91.80% Impervious Runoff Depth=2.77"
Tc=6.0 min CN=WQ Runoff=0.57 cfs 1,959 cf

Subcatchment 2: Subcat 2 Runoff Area=5,182 sf 64.64% Impervious Runoff Depth=2.35"
Tc=6.0 min CN=WQ Runoff=0.30 cfs 1,014 cf

Subcatchment 3: Subcat 3 Runoff Area=8,905 sf 70.76% Impervious Runoff Depth=2.40"
Tc=6.0 min CN=WQ Runoff=0.52 cfs 1,779 cf

Subcatchment 4: Subcat 4 Runoff Area=5,970 sf 95.13% Impervious Runoff Depth=2.80"
Tc=6.0 min CN=WQ Runoff=0.40 cfs 1,391 cf

Subcatchment 5: Subcat 5 Runoff Area=3,591 sf 79.74% Impervious Runoff Depth=2.46"
Tc=6.0 min CN=WQ Runoff=0.21 cfs 737 cf

Subcatchment 6: Subcat 6 Runoff Area=4,316 sf 86.15% Impervious Runoff Depth=2.60"
Tc=6.0 min CN=WQ Runoff=0.27 cfs 936 cf

Subcatchment 7: Subcat 7 Runoff Area=3,763 sf 72.05% Impervious Runoff Depth=2.32"
Tc=6.0 min CN=WQ Runoff=0.21 cfs 726 cf

Subcatchment 8: Subcat 8 Runoff Area=42,158 sf 15.86% Impervious Runoff Depth=0.78"
Flow Length=380' Tc=26.4 min CN=WQ Runoff=0.43 cfs 2,725 cf

Subcatchment 9: Subcat 9 Runoff Area=13,330 sf 20.65% Impervious Runoff Depth=1.02"
Tc=6.0 min CN=WQ Runoff=0.29 cfs 1,129 cf

Subcatchment 10: Subcat 10 Runoff Area=13,930 sf 77.17% Impervious Runoff Depth=2.25"
Flow Length=450' Tc=6.0 min CN=WQ Runoff=0.75 cfs 2,614 cf

Subcatchment 11: Subcat 11 Runoff Area=47,240 sf 5.14% Impervious Runoff Depth=0.44"
Flow Length=400' Slope=0.0600 '/' Tc=18.0 min CN=WQ Runoff=0.35 cfs 1,743 cf

Subcatchment 12: Subcat 12 Runoff Area=30,878 sf 0.00% Impervious Runoff Depth=1.08"
Flow Length=200' Tc=18.6 min CN=WQ Runoff=0.59 cfs 2,773 cf

Subcatchment 13: Subcat 13 Runoff Area=24,896 sf 0.00% Impervious Runoff Depth=0.85"
Flow Length=390' Tc=13.9 min CN=WQ Runoff=0.40 cfs 1,771 cf

Subcatchment 14: Subcat 14 Runoff Area=62,522 sf 0.00% Impervious Runoff Depth=0.76"
Flow Length=459' Tc=9.9 min CN=WQ Runoff=1.02 cfs 3,983 cf

Subcatchment 15: Subcat 15 Runoff Area=15,302 sf 0.00% Impervious Runoff Depth=1.33"
Tc=6.0 min CN=WQ Runoff=0.54 cfs 1,699 cf

Subcatchment 16: Subcat 16 Runoff Area=40,857 sf 16.35% Impervious Runoff Depth=1.12"
Flow Length=335' Tc=9.3 min CN=WQ Runoff=0.95 cfs 3,830 cf

Subcatchment 17: Subcat 17 Runoff Area=23,068 sf 19.02% Impervious Runoff Depth=1.30"
Flow Length=80' Slope=0.0200 '/' Tc=8.3 min CN=WQ Runoff=0.67 cfs 2,493 cf

Reach 4R: Reach Avg. Flow Depth=0.15' Max Vel=4.77 fps Inflow=2.04 cfs 20,790 cf
n=0.025 L=90.0' S=0.1333 '/' Capacity=510.47 cfs Outflow=2.04 cfs 20,790 cf

Pond 1P: Ex. Pond Peak Elev=132.92' Storage=1,915 cf Inflow=0.75 cfs 2,614 cf
Discarded=0.02 cfs 1,433 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 1,433 cf

Pond 2P: Sed. forebay Peak Elev=103.27' Storage=1,005 cf Inflow=4.98 cfs 21,548 cf
Outflow=4.94 cfs 20,861 cf

Pond 3P: Bioretention Basin Peak Elev=99.59' Storage=5,439 cf Inflow=4.94 cfs 20,861 cf
Primary=0.00 cfs 0 cf Secondary=2.04 cfs 20,790 cf Outflow=2.04 cfs 20,790 cf

Pond CB1: CB#1 Peak Elev=118.69' Inflow=0.68 cfs 4,983 cf
15.0" Round Culvert n=0.013 L=99.7' S=0.0110 '/' Outflow=0.68 cfs 4,983 cf

Pond CB10: CB#10 Peak Elev=127.15' Inflow=0.27 cfs 936 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0478 '/' Outflow=0.27 cfs 936 cf

Pond CB11: CB#11 Peak Elev=120.50' Inflow=0.95 cfs 3,830 cf
12.0" Round Culvert n=0.013 L=114.0' S=0.0202 '/' Outflow=0.95 cfs 3,830 cf

Pond CB12: CB#12 Peak Elev=117.13' Inflow=0.67 cfs 2,493 cf
12.0" Round Culvert n=0.013 L=100.5' S=0.0090 '/' Outflow=0.67 cfs 2,493 cf

Pond CB2: CB#2 Peak Elev=121.44' Inflow=0.43 cfs 2,725 cf
15.0" Round Culvert n=0.013 L=132.0' S=0.0152 '/' Outflow=0.43 cfs 2,725 cf

Pond CB3: CB#3 Peak Elev=125.62' Storage=516 cf Inflow=0.35 cfs 1,743 cf
Discarded=0.00 cfs 482 cf Primary=0.17 cfs 1,130 cf Outflow=0.17 cfs 1,612 cf

Pond CB4: CB#4 Peak Elev=125.95' Inflow=0.48 cfs 1,673 cf
12.0" Round Culvert n=0.013 L=139.9' S=0.0186 '/' Outflow=0.48 cfs 1,673 cf

Pond CB5: CB#5 Peak Elev=121.34' Inflow=0.88 cfs 3,064 cf
15.0" Round Culvert n=0.013 L=103.7' S=0.0309 '/' Outflow=0.88 cfs 3,064 cf

Pond CB6: CB#6 Peak Elev=117.77' Inflow=2.74 cfs 13,656 cf
18.0" Round Culvert n=0.013 L=111.7' S=0.0134 '/' Outflow=2.74 cfs 13,656 cf

Pond CB7: CB#7 Peak Elev=112.90' Inflow=4.45 cfs 19,849 cf
24.0" Round Culvert n=0.013 L=49.0' S=0.0408 '/' Outflow=4.45 cfs 19,849 cf

Pond CB8: CB#8 Peak Elev=116.21' Inflow=0.95 cfs 3,507 cf
12.0" Round Culvert n=0.013 L=71.7' S=0.0098 '/' Outflow=0.95 cfs 3,507 cf

Pond CB9: CB#9 Peak Elev=116.72' Inflow=0.21 cfs 726 cf
12.0" Round Culvert n=0.013 L=35.5' S=0.0141 '/' Outflow=0.21 cfs 726 cf

Link POA1: POA 1 Inflow=2.52 cfs 23,563 cf
Primary=2.52 cfs 23,563 cf

Link POA2: POA 2

Inflow=1.39 cfs 5,753 cf
Primary=1.39 cfs 5,753 cf

Total Runoff Area = 354,404 sf Runoff Volume = 33,301 cf Average Runoff Depth = 1.13"
81.35% Pervious = 288,300 sf 18.65% Impervious = 66,104 sf

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: Subcat 1 Runoff Area=8,496 sf 91.80% Impervious Runoff Depth=5.59"
Tc=6.0 min CN=WQ Runoff=1.12 cfs 3,956 cf

Subcatchment 2: Subcat 2 Runoff Area=5,182 sf 64.64% Impervious Runoff Depth=5.06"
Tc=6.0 min CN=WQ Runoff=0.64 cfs 2,184 cf

Subcatchment 3: Subcat 3 Runoff Area=8,905 sf 70.76% Impervious Runoff Depth=5.09"
Tc=6.0 min CN=WQ Runoff=1.09 cfs 3,775 cf

Subcatchment 4: Subcat 4 Runoff Area=5,970 sf 95.13% Impervious Runoff Depth=5.61"
Tc=6.0 min CN=WQ Runoff=0.79 cfs 2,790 cf

Subcatchment 5: Subcat 5 Runoff Area=3,591 sf 79.74% Impervious Runoff Depth=5.13"
Tc=6.0 min CN=WQ Runoff=0.44 cfs 1,536 cf

Subcatchment 6: Subcat 6 Runoff Area=4,316 sf 86.15% Impervious Runoff Depth=5.32"
Tc=6.0 min CN=WQ Runoff=0.54 cfs 1,914 cf

Subcatchment 7: Subcat 7 Runoff Area=3,763 sf 72.05% Impervious Runoff Depth=4.93"
Tc=6.0 min CN=WQ Runoff=0.44 cfs 1,547 cf

Subcatchment 8: Subcat 8 Runoff Area=42,158 sf 15.86% Impervious Runoff Depth=2.30"
Flow Length=380' Tc=26.4 min CN=WQ Runoff=1.42 cfs 8,090 cf

Subcatchment 9: Subcat 9 Runoff Area=13,330 sf 20.65% Impervious Runoff Depth=2.95"
Tc=6.0 min CN=WQ Runoff=0.98 cfs 3,278 cf

Subcatchment 10: Subcat 10 Runoff Area=13,930 sf 77.17% Impervious Runoff Depth=4.57"
Flow Length=450' Tc=6.0 min CN=WQ Runoff=1.46 cfs 5,309 cf

Subcatchment 11: Subcat 11 Runoff Area=47,240 sf 5.14% Impervious Runoff Depth=1.46"
Flow Length=400' Slope=0.0600 '/' Tc=18.0 min CN=WQ Runoff=1.15 cfs 5,753 cf

Subcatchment 12: Subcat 12 Runoff Area=30,878 sf 0.00% Impervious Runoff Depth=3.32"
Flow Length=200' Tc=18.6 min CN=WQ Runoff=1.92 cfs 8,553 cf

Subcatchment 13: Subcat 13 Runoff Area=24,896 sf 0.00% Impervious Runoff Depth=2.93"
Flow Length=390' Tc=13.9 min CN=WQ Runoff=1.52 cfs 6,071 cf

Subcatchment 14: Subcat 14 Runoff Area=62,522 sf 0.00% Impervious Runoff Depth=2.60"
Flow Length=459' Tc=9.9 min CN=WQ Runoff=3.80 cfs 13,554 cf

Subcatchment 15: Subcat 15 Runoff Area=15,302 sf 0.00% Impervious Runoff Depth=3.76"
Tc=6.0 min CN=WQ Runoff=1.54 cfs 4,789 cf

Subcatchment 16: Subcat 16 Runoff Area=40,857 sf 16.35% Impervious Runoff Depth=3.21"
Flow Length=335' Tc=9.3 min CN=WQ Runoff=2.98 cfs 10,918 cf

Subcatchment 17: Subcat 17 Runoff Area=23,068 sf 19.02% Impervious Runoff Depth=3.54"
Flow Length=80' Slope=0.0200 '/' Tc=8.3 min CN=WQ Runoff=1.94 cfs 6,809 cf

Reach 4R: Reach Avg. Flow Depth=0.31' Max Vel=7.59 fps Inflow=9.35 cfs 58,239 cf
n=0.025 L=90.0' S=0.1333 '/' Capacity=510.47 cfs Outflow=9.35 cfs 58,239 cf

Pond 1P: Ex. Pond Peak Elev=133.17' Storage=2,227 cf Inflow=1.46 cfs 5,309 cf
Discarded=0.02 cfs 1,606 cf Primary=1.18 cfs 2,334 cf Outflow=1.19 cfs 3,940 cf

Pond 2P: Sed. forebay Peak Elev=103.69' Storage=1,355 cf Inflow=13.64 cfs 58,999 cf
Outflow=13.47 cfs 58,312 cf

Pond 3P: Bioretention Basin Peak Elev=101.63' Storage=13,071 cf Inflow=13.47 cfs 58,312 cf
Primary=5.71 cfs 6,761 cf Secondary=3.65 cfs 51,478 cf Outflow=9.35 cfs 58,239 cf

Pond CB1: CB#1 Peak Elev=119.52' Inflow=3.70 cfs 18,781 cf
15.0" Round Culvert n=0.013 L=99.7' S=0.0110 '/' Outflow=3.70 cfs 18,781 cf

Pond CB10: CB#10 Peak Elev=127.27' Inflow=0.54 cfs 1,914 cf
12.0" Round Culvert n=0.013 L=23.0' S=0.0478 '/' Outflow=0.54 cfs 1,914 cf

Pond CB11: CB#11 Peak Elev=121.12' Inflow=2.98 cfs 10,918 cf
12.0" Round Culvert n=0.013 L=114.0' S=0.0202 '/' Outflow=2.98 cfs 10,918 cf

Pond CB12: CB#12 Peak Elev=117.54' Inflow=1.94 cfs 6,809 cf
12.0" Round Culvert n=0.013 L=100.5' S=0.0090 '/' Outflow=1.94 cfs 6,809 cf

Pond CB2: CB#2 Peak Elev=121.75' Inflow=1.42 cfs 8,090 cf
15.0" Round Culvert n=0.013 L=132.0' S=0.0152 '/' Outflow=1.42 cfs 8,090 cf

Pond CB3: CB#3 Peak Elev=126.70' Storage=931 cf Inflow=2.11 cfs 8,087 cf
Discarded=0.01 cfs 537 cf Primary=2.09 cfs 7,413 cf Outflow=2.10 cfs 7,950 cf

Pond CB4: CB#4 Peak Elev=126.11' Inflow=0.98 cfs 3,449 cf
12.0" Round Culvert n=0.013 L=139.9' S=0.0186 '/' Outflow=0.98 cfs 3,449 cf

Pond CB5: CB#5 Peak Elev=121.55' Inflow=1.76 cfs 6,240 cf
15.0" Round Culvert n=0.013 L=103.7' S=0.0309 '/' Outflow=1.76 cfs 6,240 cf

Pond CB6: CB#6 Peak Elev=118.80' Inflow=8.72 cfs 39,714 cf
18.0" Round Culvert n=0.013 L=111.7' S=0.0134 '/' Outflow=8.72 cfs 39,714 cf

Pond CB7: CB#7 Peak Elev=113.67' Inflow=12.36 cfs 54,209 cf
24.0" Round Culvert n=0.013 L=49.0' S=0.0408 '/' Outflow=12.36 cfs 54,209 cf

Pond CB8: CB#8 Peak Elev=116.64' Inflow=2.54 cfs 8,993 cf
12.0" Round Culvert n=0.013 L=71.7' S=0.0098 '/' Outflow=2.54 cfs 8,993 cf

Pond CB9: CB#9 Peak Elev=116.83' Inflow=0.44 cfs 1,547 cf
12.0" Round Culvert n=0.013 L=35.5' S=0.0141 '/' Outflow=0.44 cfs 1,547 cf

Link POA1: POA 1 Inflow=11.23 cfs 66,792 cf
Primary=11.23 cfs 66,792 cf

Link POA2: POA 2 Inflow=5.21 cfs 19,625 cf
Primary=5.21 cfs 19,625 cf

Total Runoff Area = 354,404 sf Runoff Volume = 90,826 cf Average Runoff Depth = 3.08"
81.35% Pervious = 288,300 sf 18.65% Impervious = 66,104 sf

Summary for Subcatchment 1: Subcat 1

Runoff = 0.87 cfs @ 12.08 hrs, Volume= 3,071 cf, Depth= 4.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
68	74	>75% Grass cover, Good, HSG C
131	98	Paved parking, HSG C
191	98	Paved parking, HSG C
67	74	>75% Grass cover, Good, HSG C
25	74	>75% Grass cover, Good, HSG C
2,244	98	Paved parking, HSG C
146	61	>75% Grass cover, Good, HSG B
1,054	98	Paved parking, HSG B
782	98	Paved parking, HSG D
138	80	>75% Grass cover, Good, HSG D
4	80	>75% Grass cover, Good, HSG D
550	98	Paved parking, HSG D
154	80	>75% Grass cover, Good, HSG D
7	98	Paved parking, HSG D
1,141	98	Paved parking, HSG D
1	80	>75% Grass cover, Good, HSG D
468	98	Paved parking, HSG D
1,230	98	Paved parking, HSG D
88	80	>75% Grass cover, Good, HSG D
6	80	>75% Grass cover, Good, HSG D
8,496		Weighted Average
697		8.20% Pervious Area
7,799		91.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 2: Subcat 2

Runoff = 0.49 cfs @ 12.08 hrs, Volume= 1,660 cf, Depth= 3.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
160	74	>75% Grass cover, Good, HSG C
948	98	Paved parking, HSG C
1,425	80	>75% Grass cover, Good, HSG D
247	77	Woods, Good, HSG D
2,401	98	Paved parking, HSG D
5,182		Weighted Average
1,832		35.36% Pervious Area
3,350		64.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 3: Subcat 3

Runoff = 0.83 cfs @ 12.08 hrs, Volume= 2,882 cf, Depth= 3.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
20	98	Paved parking, HSG D
297	80	>75% Grass cover, Good, HSG D
244	80	>75% Grass cover, Good, HSG D
2,140	98	Paved parking, HSG D
67	74	>75% Grass cover, Good, HSG C
51	98	Paved parking, HSG C
1,305	80	>75% Grass cover, Good, HSG D
88	80	>75% Grass cover, Good, HSG D
1,314	98	Paved parking, HSG D
2,776	98	Paved parking, HSG B
0	98	Paved parking, HSG B
475	61	>75% Grass cover, Good, HSG B
127	61	>75% Grass cover, Good, HSG B
8,905		Weighted Average
2,604		29.24% Pervious Area
6,301		70.76% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 4: Subcat 4

Runoff = 0.62 cfs @ 12.08 hrs, Volume= 2,171 cf, Depth= 4.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
5,680	98	Paved parking, HSG B
9	61	>75% Grass cover, Good, HSG B
26	61	>75% Grass cover, Good, HSG B
255	61	>75% Grass cover, Good, HSG B
5,970		Weighted Average
291		4.87% Pervious Area
5,680		95.13% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 5: Subcat 5

Runoff = 0.34 cfs @ 12.08 hrs, Volume= 1,179 cf, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

	Area (sf)	CN	Description
	461	98	Paved parking, HSG C
	283	74	>75% Grass cover, Good, HSG C
	373	98	Paved parking, HSG C
	426	61	>75% Grass cover, Good, HSG B
*	0	0	Paved parking
	1,319	98	Paved parking, HSG B
	245	98	Paved parking, HSG A
	19	80	>75% Grass cover, Good, HSG D
	464	98	Paved parking, HSG D
	3,591		Weighted Average
	728		20.26% Pervious Area
	2,864		79.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 6: Subcat 6

Runoff = 0.42 cfs @ 12.08 hrs, Volume= 1,478 cf, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
260	74	>75% Grass cover, Good, HSG C
600	98	Paved parking, HSG C
243	98	Paved parking, HSG C
280	61	>75% Grass cover, Good, HSG B
2,583	98	Paved parking, HSG B
58	39	>75% Grass cover, Good, HSG A
292	98	Paved parking, HSG A
4,316		Weighted Average
598		13.85% Pervious Area
3,718		86.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 7: Subcat 7

Runoff = 0.34 cfs @ 12.08 hrs, Volume= 1,178 cf, Depth= 3.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

	Area (sf)	CN	Description
	125	98	Paved parking, HSG C
	17	74	>75% Grass cover, Good, HSG C
	200	98	Paved parking, HSG C
	960	98	Paved parking, HSG C
	600	74	>75% Grass cover, Good, HSG C
	435	61	>75% Grass cover, Good, HSG B
*	0	0	Paved parking
	1,342	98	Paved parking, HSG B
	84	98	Paved parking, HSG D
	3,763		Weighted Average
	1,052		27.95% Pervious Area
	2,711		72.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 8: Subcat 8

Runoff = 0.94 cfs @ 12.38 hrs, Volume= 5,486 cf, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
14	98	Paved parking, HSG C
0	70	Woods, Good, HSG C
84	74	>75% Grass cover, Good, HSG C
4	98	Paved parking, HSG B
200	98	Paved parking, HSG B
202	98	Paved parking, HSG B
183	98	Paved parking, HSG B
103	98	Paved parking, HSG B
4,634	61	>75% Grass cover, Good, HSG B
309	98	Paved parking, HSG C
347	98	Paved parking, HSG C
1,186	74	>75% Grass cover, Good, HSG C
0	74	>75% Grass cover, Good, HSG C
267	98	Paved parking, HSG D
28	77	Woods, Good, HSG D
1,412	80	>75% Grass cover, Good, HSG D
19	98	Paved parking, HSG D
100	80	>75% Grass cover, Good, HSG D
847	74	>75% Grass cover, Good, HSG C
15,511	61	>75% Grass cover, Good, HSG B
1,843	55	Woods, Good, HSG B
384	98	Paved parking, HSG B
384	98	Paved parking, HSG B
75	98	Paved parking, HSG B
18	98	Paved parking, HSG B
384	98	Paved parking, HSG B
384	98	Paved parking, HSG B
275	98	Paved parking, HSG B
7	98	Paved parking, HSG B
3,538	39	>75% Grass cover, Good, HSG A
6,291	30	Woods, Good, HSG A
17	98	Paved parking, HSG A
3,109	98	Paved parking, HSG A
42,158		Weighted Average
35,474		84.14% Pervious Area
6,684		15.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.0	180	0.0500	0.12		**Sheet Flow, A-->B** Woods: Light underbrush n= 0.400 P2= 3.15"
0.5	60	0.1000	2.21		**Shallow Concentrated Flow, B-->C** Short Grass Pasture Kv= 7.0 fps
1.9	140	0.0300	1.21		**Shallow Concentrated Flow, C-->D** Short Grass Pasture Kv= 7.0 fps
26.4	380	Total			

Summary for Subcatchment 9: Subcat 9

Runoff = 0.65 cfs @ 12.09 hrs, Volume= 2,253 cf, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
147	74	>75% Grass cover, Good, HSG C
67	98	Paved parking, HSG C
9,414	61	>75% Grass cover, Good, HSG B
213	98	Paved parking, HSG B
159	98	Paved parking, HSG B
240	98	Paved parking, HSG B
67	98	Paved parking, HSG B
316	98	Paved parking, HSG B
259	98	Paved parking, HSG B
272	98	Paved parking, HSG B
354	98	Paved parking, HSG B
221	98	Paved parking, HSG B
135	80	>75% Grass cover, Good, HSG D
5	98	Paved parking, HSG D
212	98	Paved parking, HSG D
638	80	>75% Grass cover, Good, HSG D
225	98	Paved parking, HSG D
2	98	Paved parking, HSG D
112	98	Paved parking, HSG D
30	98	Paved parking, HSG D
12	74	>75% Grass cover, Good, HSG C
224	80	>75% Grass cover, Good, HSG D
6	61	>75% Grass cover, Good, HSG B
13,330		Weighted Average
10,577		79.35% Pervious Area
2,753		20.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 10: Subcat 10

Runoff = 1.15 cfs @ 12.08 hrs, Volume= 4,093 cf, Depth= 3.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
1	77	Woods, Good, HSG D
3,178	39	>75% Grass cover, Good, HSG A
10,750	98	Paved parking, HSG A
13,930		Weighted Average
3,180		22.83% Pervious Area
10,750		77.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.80		**Sheet Flow, A-->B** Smooth surfaces n= 0.011 P2= 3.15"
0.4	100	0.0400	4.06		**Shallow Concentrated Flow, B-->C** Paved Kv= 20.3 fps
0.4	250	0.0600	11.11	8.73	**Pipe Channel, C-->D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013 Corrugated PE, smooth interior
1.7	450	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 11: Subcat 11

Runoff = 0.76 cfs @ 12.26 hrs, Volume= 3,723 cf, Depth= 0.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

	Area (sf)	CN	Description
	16	98	Paved parking, HSG C
	365	74	>75% Grass cover, Good, HSG C
	1,298	70	Woods, Good, HSG C
	6,811	70	Woods, Good, HSG C
	185	74	>75% Grass cover, Good, HSG C
	57	74	>75% Grass cover, Good, HSG C
	373	74	>75% Grass cover, Good, HSG C
	380	98	Paved parking, HSG B
	184	98	Paved parking, HSG B
*	107	0	Paved parking
*	144	0	Paved parking
*	171	0	Paved parking
	585	98	Paved parking, HSG B
	182	98	Paved parking, HSG B
	201	98	Paved parking, HSG B
	3,172	61	>75% Grass cover, Good, HSG B
	18	61	>75% Grass cover, Good, HSG B
	504	55	Woods, Good, HSG B
	3,217	77	Woods, Good, HSG D
	106	98	Paved parking, HSG D
	18	98	Paved parking, HSG D
	770	80	>75% Grass cover, Good, HSG D
	4	77	Woods, Good, HSG D
	1	80	>75% Grass cover, Good, HSG D
	241	55	Woods, Good, HSG B
	13,644	30	Woods, Good, HSG A
	754	98	Paved parking, HSG A
	13,310	39	>75% Grass cover, Good, HSG A
*	107	0	Paved parking
*	144	0	Paved parking
*	171	0	Paved parking
	47,240		Weighted Average
	44,814		94.86% Pervious Area
	2,427		5.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.9	100	0.0600	0.12		**Sheet Flow, A-->B** Woods: Light underbrush n= 0.400 P2= 3.15"
4.1	300	0.0600	1.22		**Shallow Concentrated Flow, B-->C** Woodland Kv= 5.0 fps
18.0	400	Total			

Summary for Subcatchment 12: Subcat 12

Runoff = 1.30 cfs @ 12.26 hrs, Volume= 5,850 cf, Depth= 2.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

	Area (sf)	CN	Description
	573	80	>75% Grass cover, Good, HSG D
	236	77	Woods, Good, HSG D
	165	80	>75% Grass cover, Good, HSG D
	1,186	80	>75% Grass cover, Good, HSG D
	4,356	77	Woods, Good, HSG D
	139	74	>75% Grass cover, Good, HSG C
	40	70	Woods, Good, HSG C
	62	70	Woods, Good, HSG C
	2	74	>75% Grass cover, Good, HSG C
	9,982	70	Woods, Good, HSG C
	11,891	77	Woods, Good, HSG D
	2,215	80	>75% Grass cover, Good, HSG D
	17	80	>75% Grass cover, Good, HSG D
	13	80	>75% Grass cover, Good, HSG D
*	0	0	>75% Grass cover, Good
	30,878		Weighted Average
	30,878		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.1300	0.09		**Sheet Flow, A-->B** Woods: Dense underbrush n= 0.800 P2= 3.15"
0.8	100	0.1600	2.00		**Shallow Concentrated Flow, B-->C** Woodland Kv= 5.0 fps
18.6	200	Total			

Summary for Subcatchment 13: Subcat 13

Runoff = 0.99 cfs @ 12.20 hrs, Volume= 4,027 cf, Depth= 1.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
331	77	Woods, Good, HSG D
35	80	>75% Grass cover, Good, HSG D
3,195	77	Woods, Good, HSG D
21,330	70	Woods, Good, HSG C
4	74	>75% Grass cover, Good, HSG C
24,896		Weighted Average
24,896		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	150	0.1730	0.20		**Sheet Flow, A-->B** Woods: Light underbrush n= 0.400 P2= 3.15"
1.3	240	0.3540	2.97		**Shallow Concentrated Flow, B-->C** Woodland Kv= 5.0 fps
13.9	390	Total			

Summary for Subcatchment 14: Subcat 14

Runoff = 2.49 cfs @ 12.14 hrs, Volume= 8,986 cf, Depth= 1.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
1	98	Paved parking, HSG C
956	74	>75% Grass cover, Good, HSG C
239	70	Woods, Good, HSG C
565	80	>75% Grass cover, Good, HSG D
1,828	77	Woods, Good, HSG D
332	80	>75% Grass cover, Good, HSG D
26	80	>75% Grass cover, Good, HSG D
5,493	77	Woods, Good, HSG D
8	77	Woods, Good, HSG D
1,672	77	Woods, Good, HSG D
7,595	30	Woods, Good, HSG A
138	39	>75% Grass cover, Good, HSG A
165	39	>75% Grass cover, Good, HSG A
43,367	70	Woods, Good, HSG C
0	74	>75% Grass cover, Good, HSG C
137	74	>75% Grass cover, Good, HSG C
62,522		Weighted Average
62,521		100.00% Pervious Area
1		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	100	0.0800	0.29		**Sheet Flow, A-->B** Grass: Short n= 0.150 P2= 3.15"
2.5	50	0.1500	0.33		**Sheet Flow, B-->C** Grass: Short n= 0.150 P2= 3.15"
1.7	309	0.3500	2.96		**Shallow Concentrated Flow, C-->D** Woodland Kv= 5.0 fps
9.9	459	Total			

Summary for Subcatchment 15: Subcat 15

Runoff = 1.09 cfs @ 12.09 hrs, Volume= 3,367 cf, Depth= 2.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
1,539	80	>75% Grass cover, Good, HSG D
3,018	80	>75% Grass cover, Good, HSG D
0	98	Paved parking, HSG D
1,040	80	>75% Grass cover, Good, HSG D
1	98	Paved parking, HSG D
5,368	80	>75% Grass cover, Good, HSG D
0	98	Paved parking, HSG D
1,440	80	>75% Grass cover, Good, HSG D
19	77	Woods, Good, HSG D
85	61	>75% Grass cover, Good, HSG B
8	55	Woods, Good, HSG B
49	74	>75% Grass cover, Good, HSG C
82	70	Woods, Good, HSG C
942	80	>75% Grass cover, Good, HSG D
1,711	77	Woods, Good, HSG D
15,302		Weighted Average
15,301		100.00% Pervious Area
1		0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 16: Subcat 16

Runoff = 2.03 cfs @ 12.13 hrs, Volume= 7,579 cf, Depth= 2.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

	Area (sf)	CN	Description
	0	98	Paved parking, HSG D
	2,081	74	>75% Grass cover, Good, HSG C
	19,776	61	>75% Grass cover, Good, HSG B
	378	98	Paved parking, HSG B
	384	98	Paved parking, HSG B
	196	98	Paved parking, HSG B
	384	98	Paved parking, HSG B
	384	98	Paved parking, HSG B
	384	98	Paved parking, HSG B
	384	98	Paved parking, HSG B
	384	98	Paved parking, HSG B
	384	98	Paved parking, HSG B
	24	98	Paved parking, HSG B
	384	98	Paved parking, HSG B
	384	98	Paved parking, HSG B
	2,224	74	>75% Grass cover, Good, HSG C
	188	98	Paved parking, HSG C
	384	98	Paved parking, HSG C
	360	98	Paved parking, HSG C
	370	98	Paved parking, HSG C
	10,095	80	>75% Grass cover, Good, HSG D
	131	98	Paved parking, HSG D
	1,193	98	Paved parking, HSG D
*	0	0	>75% Grass cover, Good
	40,857		Weighted Average
	34,177		83.65% Pervious Area
	6,680		16.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	15	0.1200	1.91		**Sheet Flow, A-->B** Smooth surfaces n= 0.011 P2= 3.15"
7.4	120	0.0600	0.27		**Sheet Flow, B-->C** Grass: Short n= 0.150 P2= 3.15"
1.8	200	0.0700	1.85		**Shallow Concentrated Flow, C-->D** Short Grass Pasture Kv= 7.0 fps
9.3	335	Total			

Summary for Subcatchment 17: Subcat 17

Runoff = 1.35 cfs @ 12.12 hrs, Volume= 4,800 cf, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr (NRCC) Rainfall=4.76"

Area (sf)	CN	Description
1,279	77	Woods, Good, HSG D
26	80	>75% Grass cover, Good, HSG D
14	98	Paved parking, HSG C
760	70	Woods, Good, HSG C
337	74	>75% Grass cover, Good, HSG C
150	98	Paved parking, HSG C
768	98	Paved parking, HSG C
280	98	Paved parking, HSG C
384	98	Paved parking, HSG C
384	98	Paved parking, HSG C
384	98	Paved parking, HSG C
384	98	Paved parking, HSG C
383	98	Paved parking, HSG C
2,903	70	Woods, Good, HSG C
7,430	74	>75% Grass cover, Good, HSG C
768	98	Paved parking, HSG B
104	98	Paved parking, HSG B
119	55	Woods, Good, HSG B
3,042	61	>75% Grass cover, Good, HSG B
384	98	Paved parking, HSG D
736	77	Woods, Good, HSG D
1,956	80	>75% Grass cover, Good, HSG D
85	39	>75% Grass cover, Good, HSG A
8	39	>75% Grass cover, Good, HSG A
23,068		Weighted Average
18,681		80.98% Pervious Area
4,387		19.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	80	0.0200	0.16		**Sheet Flow, A-->B** Grass: Short n= 0.150 P2= 3.15"

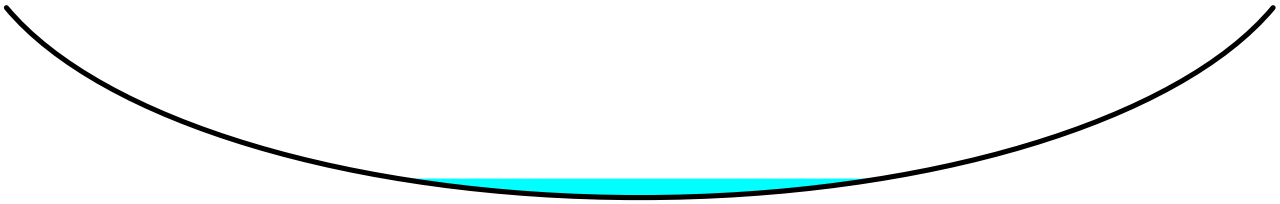
Summary for Reach 4R: Reach

Inflow Area = 236,108 sf, 28.00% Impervious, Inflow Depth = 2.06" for 10-yr (NRCC) event
Inflow = 3.45 cfs @ 12.56 hrs, Volume= 40,610 cf
Outflow = 3.45 cfs @ 12.56 hrs, Volume= 40,610 cf, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 5.59 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.37 fps, Avg. Travel Time= 0.6 min

Peak Storage= 56 cf @ 12.56 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 2.00' Flow Area= 20.0 sf, Capacity= 510.47 cfs

15.00' x 2.00' deep Parabolic Channel, n= 0.025 Earth, clean & winding
Length= 90.0' Slope= 0.1333 '/'
Inlet Invert= 84.00', Outlet Invert= 72.00'



‡

Summary for Pond 1P: Ex. Pond

Inflow Area = 13,930 sf, 77.17% Impervious, Inflow Depth = 3.53" for 10-yr (NRCC) event
Inflow = 1.15 cfs @ 12.08 hrs, Volume= 4,093 cf
Outflow = 0.45 cfs @ 12.31 hrs, Volume= 2,755 cf, Atten= 61%, Lag= 13.3 min
Discarded = 0.02 cfs @ 12.31 hrs, Volume= 1,562 cf
Primary = 0.43 cfs @ 12.31 hrs, Volume= 1,193 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 133.09' @ 12.31 hrs Surf.Area= 1,226 sf Storage= 2,120 cf

Plug-Flow detention time= 428.1 min calculated for 2,754 cf (67% of inflow)
Center-of-Mass det. time= 327.3 min (1,079.0 - 751.6)

Volume	Invert	Avail.Storage	Storage Description
#1	130.00'	3,417 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
130.00	252	71.0	0	0	252
132.00	817	116.0	1,015	1,015	947
134.00	1,631	155.0	2,402	3,417	1,831

Device	Routing	Invert	Outlet Devices
#1	Primary	133.00'	**6.0' long x 15.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Discarded	130.00'	**0.600 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'

Discarded OutFlow Max=0.02 cfs @ 12.31 hrs HW=133.09' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.43 cfs @ 12.31 hrs HW=133.09' TW=126.61' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.43 cfs @ 0.80 fps)

Summary for Pond 2P: Sed. forebay

Inflow Area = 236,108 sf, 28.00% Impervious, Inflow Depth = 2.10" for 10-yr (NRCC) event
Inflow = 9.35 cfs @ 12.10 hrs, Volume= 41,369 cf
Outflow = 9.28 cfs @ 12.11 hrs, Volume= 40,682 cf, Atten= 1%, Lag= 0.7 min
Primary = 9.28 cfs @ 12.11 hrs, Volume= 40,682 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3

Peak Elev= 103.49' @ 12.11 hrs Surf.Area= 835 sf Storage= 1,183 cf
Flood Elev= 104.00' Surf.Area= 1,029 sf Storage= 1,656 cf

Plug-Flow detention time= 21.4 min calculated for 40,671 cf (98% of inflow)
Center-of-Mass det. time= 11.2 min (815.6 - 804.4)

Volume	Invert	Avail.Storage	Storage Description
#1	100.20'	1,656 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
100.20	20	20.0	0	0	20
102.00	384	75.0	295	295	444
104.00	1,029	124.0	1,361	1,656	1,246

Device	Routing	Invert	Outlet Devices
#1	Primary	102.80'	**6.0' long x 6.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50
			Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=9.27 cfs @ 12.11 hrs HW=103.49' TW=100.02' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 9.27 cfs @ 2.24 fps)

Summary for Pond 3P: Bioretention Basin

Inflow Area = 236,108 sf, 28.00% Impervious, Inflow Depth = 2.07" for 10-yr (NRCC) event
Inflow = 9.28 cfs @ 12.11 hrs, Volume= 40,682 cf
Outflow = 3.45 cfs @ 12.56 hrs, Volume= 40,610 cf, Atten= 63%, Lag= 26.5 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Secondary = 3.45 cfs @ 12.56 hrs, Volume= 40,610 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 101.18' @ 12.56 hrs Surf.Area= 4,054 sf Storage= 11,208 cf
Flood Elev= 102.00' Surf.Area= 4,461 sf Storage= 14,690 cf

Plug-Flow detention time= 75.4 min calculated for 40,610 cf (100% of inflow)
Center-of-Mass det. time= 74.2 min (889.8 - 815.6)

Volume	Invert	Avail.Storage	Storage Description
#1	96.00'	14,690 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
96.00	1,706	172.7	0.0	0	0	1,706
97.50	1,706	172.7	40.0	1,024	1,024	1,965
98.50	1,943	174.4	100.0	1,823	2,847	2,145
99.00	2,253	191.0	100.0	1,048	3,895	2,636
100.00	3,500	221.8	100.0	2,854	6,749	3,669
102.00	4,461	269.0	100.0	7,942	14,690	5,576

Device	Routing	Invert	Outlet Devices
#1	Primary	101.20'	**8.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83
#2	Secondary	96.10'	**8.0" Round Underdrain outlet** L= 32.0' Ke= 0.500 Inlet / Outlet Invert= 96.10' / 95.50' S= 0.0188 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#3	Device 2	96.00'	**6.000 in/hr Exfiltration over Horizontal area** Phase-In= 0.01'
#4	Device 2	98.60'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.00' TW=84.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=3.45 cfs @ 12.56 hrs HW=101.18' TW=84.20' (Dynamic Tailwater)
└─**2=Underdrain outlet** (Passes 3.45 cfs of 3.49 cfs potential flow)
  ├─**3=Exfiltration** (Exfiltration Controls 0.56 cfs)
  └─**4=Orifice/Grate** (Orifice Controls 2.89 cfs @ 7.35 fps)

Summary for Pond CB1: CB#1

Inflow Area = 116,658 sf, 19.38% Impervious, Inflow Depth = 1.23" for 10-yr (NRCC) event
Inflow = 2.33 cfs @ 12.33 hrs, Volume= 12,004 cf
Outflow = 2.33 cfs @ 12.33 hrs, Volume= 12,004 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.33 cfs @ 12.33 hrs, Volume= 12,004 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 119.07' @ 12.32 hrs
Flood Elev= 126.10'

Device	Routing	Invert	Outlet Devices
#1	Primary	118.30'	**15.0" Round HDPE Storm Pipe** L= 99.7' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 118.30' / 117.20' S= 0.0110 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.32 cfs @ 12.33 hrs HW=119.07' TW=118.00' (Dynamic Tailwater)
└─**1=HDPE Storm Pipe** (Outlet Controls 2.32 cfs @ 4.17 fps)

Summary for Pond CB10: CB#10

Inflow Area = 4,316 sf, 86.15% Impervious, Inflow Depth = 4.11" for 10-yr (NRCC) event
Inflow = 0.42 cfs @ 12.08 hrs, Volume= 1,478 cf
Outflow = 0.42 cfs @ 12.08 hrs, Volume= 1,478 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.08 hrs, Volume= 1,478 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 127.22' @ 12.08 hrs
Flood Elev= 133.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	126.90'	**12.0" Round HDPE Storm Pipe** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 126.90' / 125.80' S= 0.0478 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.42 cfs @ 12.08 hrs HW=127.22' TW=126.04' (Dynamic Tailwater)
1=HDPE Storm Pipe (Inlet Controls 0.42 cfs @ 1.93 fps)

Summary for Pond CB11: CB#11

Inflow Area = 40,857 sf, 16.35% Impervious, Inflow Depth = 2.23" for 10-yr (NRCC) event
Inflow = 2.03 cfs @ 12.13 hrs, Volume= 7,579 cf
Outflow = 2.03 cfs @ 12.13 hrs, Volume= 7,579 cf, Atten= 0%, Lag= 0.0 min
Primary = 2.03 cfs @ 12.13 hrs, Volume= 7,579 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 120.79' @ 12.13 hrs
Flood Elev= 125.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	120.00'	**12.0" Round Culvert** L= 114.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 120.00' / 117.70' S= 0.0202 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.02 cfs @ 12.13 hrs HW=120.79' TW=118.12' (Dynamic Tailwater)
1=Culvert (Inlet Controls 2.02 cfs @ 3.03 fps)

Summary for Pond CB12: CB#12

Inflow Area = 23,068 sf, 19.02% Impervious, Inflow Depth = 2.50" for 10-yr (NRCC) event
Inflow = 1.35 cfs @ 12.12 hrs, Volume= 4,800 cf
Outflow = 1.35 cfs @ 12.12 hrs, Volume= 4,800 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.35 cfs @ 12.12 hrs, Volume= 4,800 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 117.35' @ 12.12 hrs
Flood Elev= 121.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	116.70'	**12.0" Round HDPE Storm Pipe** L= 100.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 116.70' / 115.80' S= 0.0090 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.35 cfs @ 12.12 hrs HW=117.35' TW=116.44' (Dynamic Tailwater)
1=HDPE Storm Pipe (Outlet Controls 1.35 cfs @ 3.53 fps)

Summary for Pond CB2: CB#2

Inflow Area = 42,158 sf, 15.86% Impervious, Inflow Depth = 1.56" for 10-yr (NRCC) event
Inflow = 0.94 cfs @ 12.38 hrs, Volume= 5,486 cf
Outflow = 0.94 cfs @ 12.38 hrs, Volume= 5,486 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 12.38 hrs, Volume= 5,486 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 121.62' @ 12.38 hrs
Flood Elev= 126.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	121.10'	**15.0" Round HDPE Storm Pipe** L= 132.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 121.10' / 119.10' S= 0.0152 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.94 cfs @ 12.38 hrs HW=121.62' TW=119.05' (Dynamic Tailwater)
↑**1=HDPE Storm Pipe** (Inlet Controls 0.94 cfs @ 1.94 fps)

Summary for Pond CB3: CB#3

Inflow Area = 61,170 sf, 21.54% Impervious, Inflow Depth = 0.96" for 10-yr (NRCC) event
Inflow = 1.17 cfs @ 12.28 hrs, Volume= 4,916 cf
Outflow = 1.13 cfs @ 12.33 hrs, Volume= 4,781 cf, Atten= 3%, Lag= 2.5 min
Discarded = 0.01 cfs @ 12.33 hrs, Volume= 516 cf
Primary = 1.13 cfs @ 12.33 hrs, Volume= 4,265 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 126.62' @ 12.33 hrs Surf.Area= 406 sf Storage= 899 cf
Flood Elev= 128.00' Surf.Area= 450 sf Storage= 1,276 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 65.6 min (900.4 - 834.8)

Volume	Invert	Avail.Storage	Storage Description
#1	124.00'	1,276 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
124.00	282	204.0	0	0	282
126.00	377	2,373.0	657	657	445,089
127.50	450	4,735.0	619	1,276	1,781,133

Device	Routing	Invert	Outlet Devices
#1	Primary	120.70'	**12.0" Round Culvert** L= 63.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 120.70' / 119.00' S= 0.0270 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	126.50'	**24.0" Horiz. Beehive Grate** C= 0.600 Limited to weir flow at low heads

#3	Primary	125.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Discarded	124.00'	**0.600 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.01 cfs @ 12.33 hrs HW=126.62' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.12 cfs @ 12.33 hrs HW=126.62' TW=119.07' (Dynamic Tailwater)
├**1=Culvert** (Passes 0.84 cfs of 8.69 cfs potential flow)
│└**2=Beehive Grate** (Weir Controls 0.84 cfs @ 1.12 fps)
└**3=Orifice/Grate** (Orifice Controls 0.29 cfs @ 5.88 fps)

Summary for Pond CB4: CB#4

Inflow Area = 7,907 sf, 83.24% Impervious, Inflow Depth = 4.03" for 10-yr (NRCC) event
Inflow = 0.76 cfs @ 12.08 hrs, Volume= 2,657 cf
Outflow = 0.76 cfs @ 12.08 hrs, Volume= 2,657 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.76 cfs @ 12.08 hrs, Volume= 2,657 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 126.04' @ 12.08 hrs
Flood Elev= 132.30'

Device	Routing	Invert	Outlet Devices
#1	Primary	125.60'	**12.0" Round HDPE Storm Pipe** L= 139.9' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 125.60' / 123.00' S= 0.0186 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.76 cfs @ 12.08 hrs HW=126.04' TW=121.46' (Dynamic Tailwater)
└**1=HDPE Storm Pipe** (Inlet Controls 0.76 cfs @ 2.26 fps)

Summary for Pond CB5: CB#5

Inflow Area = 13,878 sf, 88.35% Impervious, Inflow Depth = 4.17" for 10-yr (NRCC) event
Inflow = 1.37 cfs @ 12.08 hrs, Volume= 4,827 cf
Outflow = 1.37 cfs @ 12.08 hrs, Volume= 4,827 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.37 cfs @ 12.08 hrs, Volume= 4,827 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 121.46' @ 12.08 hrs
Flood Elev= 127.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	120.90'	**15.0" Round HDPE Storm Pipe** L= 103.7' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 120.90' / 117.70' S= 0.0309 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.37 cfs @ 12.08 hrs HW=121.46' TW=118.13' (Dynamic Tailwater)
└**1=HDPE Storm Pipe** (Inlet Controls 1.37 cfs @ 2.55 fps)

Summary for Pond CB6: CB#6

Inflow Area = 180,297 sf, 26.54% Impervious, Inflow Depth = 1.82" for 10-yr (NRCC) event
Inflow = 5.30 cfs @ 12.11 hrs, Volume= 27,292 cf
Outflow = 5.30 cfs @ 12.11 hrs, Volume= 27,292 cf, Atten= 0%, Lag= 0.0 min
Primary = 5.30 cfs @ 12.11 hrs, Volume= 27,292 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 118.15' @ 12.11 hrs
Flood Elev= 124.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**18.0" Round HDPE Storm Pipe** L= 111.7' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 117.00' / 115.50' S= 0.0134 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=5.29 cfs @ 12.11 hrs HW=118.15' TW=113.29' (Dynamic Tailwater)
1=HDPE Storm Pipe (Inlet Controls 5.29 cfs @ 3.65 fps)

Summary for Pond CB7: CB#7

Inflow Area = 220,806 sf, 29.94% Impervious, Inflow Depth = 2.07" for 10-yr (NRCC) event
Inflow = 8.28 cfs @ 12.10 hrs, Volume= 38,002 cf
Outflow = 8.28 cfs @ 12.10 hrs, Volume= 38,002 cf, Atten= 0%, Lag= 0.0 min
Primary = 8.28 cfs @ 12.10 hrs, Volume= 38,002 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 113.29' @ 12.10 hrs
Flood Elev= 121.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	112.00'	**24.0" Round Culvert** L= 49.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 112.00' / 110.00' S= 0.0408 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=8.27 cfs @ 12.10 hrs HW=113.29' TW=103.49' (Dynamic Tailwater)
1=Culvert (Inlet Controls 8.27 cfs @ 3.86 fps)

Summary for Pond CB8: CB#8

Inflow Area = 28,250 sf, 27.39% Impervious, Inflow Depth = 2.74" for 10-yr (NRCC) event
Inflow = 1.81 cfs @ 12.11 hrs, Volume= 6,461 cf
Outflow = 1.81 cfs @ 12.11 hrs, Volume= 6,461 cf, Atten= 0%, Lag= 0.0 min
Primary = 1.81 cfs @ 12.11 hrs, Volume= 6,461 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 116.45' @ 12.11 hrs
Flood Elev= 120.20'

Device	Routing	Invert	Outlet Devices
#1	Primary	115.70'	**12.0" Round HDPE Storm Pipe** L= 71.7' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 115.70' / 115.00' S= 0.0098 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.81 cfs @ 12.11 hrs HW=116.45' TW=113.29' (Dynamic Tailwater)
1=HDPE Storm Pipe (Barrel Controls 1.81 cfs @ 4.01 fps)

Summary for Pond CB9: CB#9

Inflow Area = 3,763 sf, 72.05% Impervious, Inflow Depth = 3.76" for 10-yr (NRCC) event
Inflow = 0.34 cfs @ 12.08 hrs, Volume= 1,178 cf
Outflow = 0.34 cfs @ 12.08 hrs, Volume= 1,178 cf, Atten= 0%, Lag= 0.0 min
Primary = 0.34 cfs @ 12.08 hrs, Volume= 1,178 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 116.79' @ 12.08 hrs
Flood Elev= 122.70'

Device	Routing	Invert	Outlet Devices
#1	Primary	116.50'	**12.0" Round Culvert** L= 35.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 116.50' / 116.00' S= 0.0141 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.34 cfs @ 12.08 hrs HW=116.79' TW=113.27' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.34 cfs @ 1.82 fps)

Summary for Link POA1: POA 1

Inflow Area = 266,986 sf, 24.76% Impervious, Inflow Depth = 2.09" for 10-yr (NRCC) event
Inflow = 4.46 cfs @ 12.33 hrs, Volume= 46,460 cf
Primary = 4.46 cfs @ 12.33 hrs, Volume= 46,460 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Summary for Link POA2: POA 2

Inflow Area = 87,418 sf, 0.00% Impervious, Inflow Depth = 1.79" for 10-yr (NRCC) event
Inflow = 3.41 cfs @ 12.16 hrs, Volume= 13,014 cf
Primary = 3.41 cfs @ 12.16 hrs, Volume= 13,014 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

APPENDIX D

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New Hampshire
Location	
Longitude	70.872 degrees West
Latitude	43.175 degrees North
Elevation	0 feet
Date/Time	Mon, 14 Sep 2020 16:51:19 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.50	0.65	0.81	1.03	**1yr**	0.70	0.98	1.20	1.55	2.00	2.61	2.87	**1yr**	2.31	2.76	3.15	3.88	4.45	**1yr**
2yr	0.32	0.49	0.61	0.81	1.02	1.29	**2yr**	0.88	1.17	1.50	1.92	2.45	3.15	3.50	**2yr**	2.79	3.37	3.87	4.60	5.23	**2yr**
5yr	0.37	0.57	0.72	0.96	1.23	1.58	**5yr**	1.06	1.45	1.85	2.39	3.08	3.99	4.49	**5yr**	3.53	4.32	4.94	5.81	6.57	**5yr**
10yr	0.40	0.63	0.80	1.09	1.42	1.85	**10yr**	1.22	1.69	2.18	2.83	3.67	4.76	5.42	**10yr**	4.21	5.21	5.95	6.94	7.81	**10yr**
25yr	0.46	0.74	0.94	1.30	1.72	2.27	**25yr**	1.49	2.09	2.70	3.53	4.62	6.03	6.95	**25yr**	5.33	6.69	7.61	8.79	9.82	**25yr**
50yr	0.52	0.83	1.06	1.48	2.00	2.67	**50yr**	1.73	2.46	3.18	4.19	5.50	7.20	8.40	**50yr**	6.38	8.08	9.17	10.51	11.69	**50yr**
100yr	0.58	0.94	1.21	1.71	2.32	3.12	**100yr**	2.00	2.89	3.75	4.97	6.55	8.62	10.16	**100yr**	7.63	9.77	11.05	12.57	13.91	**100yr**
200yr	0.64	1.05	1.36	1.95	2.70	3.67	**200yr**	2.33	3.40	4.43	5.90	7.82	10.31	12.28	**200yr**	9.12	11.80	13.33	15.04	16.56	**200yr**
500yr	0.75	1.24	1.62	2.35	3.30	4.54	**500yr**	2.85	4.22	5.50	7.39	9.85	13.07	15.78	**500yr**	11.57	15.18	17.08	19.07	20.88	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.24	0.37	0.45	0.60	0.74	0.90	**1yr**	0.64	0.88	0.92	1.27	1.59	2.14	2.46	**1yr**	1.89	2.37	2.87	3.31	4.00	**1yr**
2yr	0.31	0.49	0.60	0.81	1.00	1.18	**2yr**	0.86	1.16	1.36	1.83	2.36	3.04	3.40	**2yr**	2.69	3.27	3.75	4.47	5.04	**2yr**
5yr	0.35	0.54	0.67	0.91	1.16	1.40	**5yr**	1.00	1.37	1.61	2.15	2.77	3.72	4.13	**5yr**	3.29	3.97	4.61	5.42	6.12	**5yr**
10yr	0.38	0.59	0.73	1.02	1.31	1.60	**10yr**	1.13	1.56	1.81	2.44	3.12	4.28	4.79	**10yr**	3.79	4.60	5.32	6.26	7.03	**10yr**
25yr	0.44	0.66	0.82	1.18	1.55	1.91	**25yr**	1.34	1.86	2.11	2.84	3.64	4.90	5.80	**25yr**	4.33	5.58	6.49	7.58	8.46	**25yr**
50yr	0.48	0.73	0.91	1.30	1.75	2.18	**50yr**	1.51	2.13	2.35	3.19	4.08	5.58	6.69	**50yr**	4.94	6.44	7.54	8.75	9.71	**50yr**
100yr	0.53	0.81	1.01	1.46	2.00	2.50	**100yr**	1.73	2.44	2.63	3.57	4.56	6.34	7.72	**100yr**	5.61	7.42	8.75	10.12	11.14	**100yr**
200yr	0.59	0.89	1.13	1.63	2.28	2.85	**200yr**	1.96	2.79	2.93	3.99	5.08	7.20	8.90	**200yr**	6.37	8.56	10.15	11.70	12.80	**200yr**
500yr	0.69	1.02	1.32	1.91	2.72	3.43	**500yr**	2.35	3.35	3.40	4.62	5.88	8.50	10.74	**500yr**	7.52	10.32	12.35	14.19	15.34	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.87	1.08	**1yr**	0.75	1.05	1.24	1.74	2.22	2.89	3.08	**1yr**	2.56	2.96	3.44	4.24	4.84	**1yr**
2yr	0.33	0.51	0.63	0.85	1.04	1.25	**2yr**	0.90	1.22	1.48	1.96	2.51	3.30	3.62	**2yr**	2.92	3.48	4.00	4.75	5.46	**2yr**
5yr	0.39	0.61	0.75	1.03	1.31	1.59	**5yr**	1.13	1.55	1.86	2.51	3.21	4.25	4.85	**5yr**	3.76	4.67	5.27	6.23	7.00	**5yr**
10yr	0.46	0.70	0.87	1.22	1.57	1.92	**10yr**	1.36	1.88	2.24	3.06	3.87	5.23	6.06	**10yr**	4.63	5.82	6.65	7.65	8.54	**10yr**
25yr	0.56	0.85	1.05	1.50	1.98	2.48	**25yr**	1.71	2.43	2.89	3.98	4.98	7.17	8.14	**25yr**	6.34	7.82	8.89	10.08	11.13	**25yr**
50yr	0.64	0.98	1.22	1.75	2.36	3.00	**50yr**	2.03	2.94	3.50	4.86	6.06	8.87	10.19	**50yr**	7.85	9.80	11.10	12.39	13.62	**50yr**
100yr	0.75	1.13	1.42	2.05	2.81	3.63	**100yr**	2.42	3.55	4.25	5.95	7.37	10.99	12.77	**100yr**	9.72	12.28	13.84	15.27	16.67	**100yr**
200yr	0.87	1.31	1.66	2.40	3.34	4.41	**200yr**	2.89	4.31	5.18	7.29	8.97	13.64	16.02	**200yr**	12.07	15.40	17.29	18.80	20.42	**200yr**
500yr	1.06	1.58	2.04	2.96	4.21	5.67	**500yr**	3.63	5.54	6.69	9.55	11.64	18.18	21.61	**500yr**	16.09	20.78	23.21	24.78	26.73	**500yr**

Powered by ACIS Northeast Regional Climate Center

APPENDIX E

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Occum	1	0.6	2.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	mesic	loamy	no	loamy over loamy sand
Suncook	2	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	mesic	sandy	no	occasionally flooded
Lim	3	0.6	2.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	mesic	loamy	no	
Pootatuck	4	0.6	6.0	6.00	20.0	B	3	Flood Plain (Bottom Land)	mesic	loamy	no	single grain in C
Rippowam	5	0.6	6.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	mesic	loamy	no	
Saco	6	0.6	2.0	6.00	20.0	D	6	Flood Plain (Bottom Land)	mesic	silty	no	strata
Hadley	8	0.6	2.0	0.60	6.0	B	2	Flood Plain (Bottom Land)	mesic	silty	no	strata of fine sand
Winooski	9	0.6	6.0	0.60	6.0	B		Flood Plain (Bottom Land)	mesic	silty over loamy	no	
Merrimac	10	2.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	mesic	gravelly sand	no	loamy cap
Gloucester	11	6.0	20.0	6.00	20.0	A	1	Sandy Till	mesic	sandy-skeletal	no	loamy cap
Hinckley	12	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	
Sheepscot	14	6.0	20.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly coarse sand
Searsport	15	6.0	20.0	6.00	20.0	D	6	Outwash and Stream Terraces	frigid	sandy	no	organic over sand
Saugatuck	16	0.06	0.2	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	yes	ortstein
Colton, gravelly	21	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	gravelly surface
Colton	22	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	
Masardis	23	6.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	slate, loamy cap
Agawam	24	6.0	20.0	20.00	100.0	B	2	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Windsor	26	6.0	20.0	6.00	20.0	A	1	Outwash and Stream Terraces	mesic	sandy	no	
Groveton	27	0.6	2.0	0.60	6.0	B	2	Outwash and Stream Terraces	frigid	loamy	yes	loamy over sandy
Madawaska	28	0.6	2.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
Woodbridge	29	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	mesic	loamy	no	sandy loam in Cd
Unadilla	30	0.6	2.0	2.00	20.0	B	2	Terraces and glacial lake plains	mesic	silty	no	silty over gravelly
Hartland	31	0.6	2.0	0.20	2.0	B	2	Terraces and glacial lake plains	mesic	silty	no	very fine sandy loam
Boxford	32	0.1	0.2	0.00	0.2	C	3	Silt and Clay Deposits	mesic	fine	no	silty clay loam
Scitico	33	0.0	0.2	0.00	0.2	C	5	Silt and Clay Deposits	mesic	fine	no	
Wareham	34	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	no	
Champlain	35	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	gravelly sand	no	
Adams	36	6.0	20.0	20.00	99.0	A	1	Outwash and Stream Terraces	frigid	sandy	yes	
Melrose	37	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	silty clay loam in C
Eldridge	38	6.0	20.0	0.06	0.6	C	3	Sandy/loamy over silt/clay	mesic	sandy over loamy	no	
Millis	39					C	3	Firm, platy, sandy till	frigid	loamy	yes	loamy sand in Cd
Canton	42	2.0	6.0	6.00	20.0	B	2	Loose till, sandy textures	mesic	loamy over sandy	no	loamy over loamy sand
Montauk	44	0.6	6.0	0.06	0.6	C	3	Firm, platy, sandy till	mesic	loamy	no	loamy sand in Cd
Henniker	46	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	no	loamy sand in Cd
Madawaska, aquentic	48	0.6	2.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	loamy over sandy	yes	sandy or sandy-skeletal
Whitman	49	0.0	0.2	0.00	0.2	D	6	Firm, platy, loamy till	mesic	loamy	no	mucky loam
Hermon	55	2.0	20.0	6.00	20.0	A	1	Sandy Till	frigid	sandy-skeletal	yes	loamy cap
Becket	56	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	yes	gravelly sandy loam in Cd
Waumbeck	58	2.0	20.0	6.00	20.0	B	3	Loose till, sandy textures	frigid	sandy-skeletal	yes	very cobbly loamy sand
Charlton	62	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	mesic	loamy	no	fine sandy loam
Paxton	66	0.6	2.0	0.00	0.2	C	3	Firm, platy, loamy till	mesic	loamy	no	
Sutton	68	0.6	6.0	0.60	6.0	B	3	Loose till, loamy textures	mesic	loamy	no	
Berkshire	72	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	yes	fine sandy loam
Marlow	76	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Peru	78	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	
Thorndike	84	0.6	2.0	0.60	2.0	C/D	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	less than 20 in. deep
Hollis	86	0.6	6.0	0.60	6.0	C/D	4	Loose till, bedrock	mesic	loamy	no	less than 20 in. deep
Winnecook	88	0.6	2.0	0.60	2.0	C	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Chatfield	89	0.6	6.0	0.60	6.0	B	4	Loose till, bedrock	mesic	loamy	no	20 to 40 in. deep
Hogback	91	2.0	6.0	2.00	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Lyman	92	2.0	6.0	2.00	6.0	A/D	4	Loose till, bedrock	frigid	loamy	yes	less than 20 in. deep
Woodstock	93	2.0	6.0	2.00	6.0	C/D	4	Loose till, bedrock	frigid	loamy	no	less than 20 in. deep
Rawsonville	98	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep
Tunbridge	99	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	yes	20 to 40 in. deep

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Ondawa	101	0.6	6.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	frigid	loamy	no	loamy over loamy sand
Sunday	102	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	frigid	sandy	no	occasionally flooded
Winooski	103	0.6	6.0	0.60	6.0	B	3	Flood Plain (Bottom Land)	mesic	silty	no	very fine sandy loam
Podunk	104	0.6	6.0	6.00	20.0	B	3	Flood Plain (Bottom Land)	frigid	loamy	no	loamy to coarse sand in C
Rumney	105	0.6	6.0	6.00	20.0	C	5	Flood Plain (Bottom Land)	frigid	loamy	no	
Hadley	108	0.6	2.0	0.60	6.0	B	2	Flood Plain (Bottom Land)	mesic	silty	no	strata of fine sand, occ flooded
Limerick	109	0.6	2.0	0.60	2.0	C	5	Flood Plain (Bottom Land)	mesic	silty	no	
Scarboro	115	6.0	20.0	6.00	20.0	D	6	Outwash and Stream Terraces	mesic	sandy	no	organic over sand, non stony
Finch	116					C	3	Outwash and Stream Terraces	frigid	sandy	yes	cemented (ortstein)
Sudbury	118	2.0	6.0	2.00	20.0	B	3	Outwash and Stream Terraces	mesic	sandy	no	loam over gravelly sand
Telos	123	0.6	2.0	0.02	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Chesuncook	126	0.6	2.0	0.02	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Allagash	127	0.6	2.0	6.00	20.0	B	2	Outwash and Stream Terraces	frigid	loamy over sandy	yes	loamy over sandy
Elliottsville	128	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	frigid	loamy	yes	20 to 40 in. deep
Hitchcock	130	0.6	2.0	0.06	0.6	B	3	Terraces and glacial lake plains	mesic	silty	no	silt loam to silt in C
Burnham	131	0.2	6.0	0.02	0.2	D	6	Firm, platy, silty till, schist & phylitte	frigid	loamy	no	organic over silt
Dartmouth	132	0.6	2.0	0.06	0.6	B	3	Terraces and glacial lake plains	mesic	silty	no	thin strata silty clay loam
Monson	133	0.6	2.0	0.60	2.0	D	4	Friable till, silty, schist & phyllite	frigid	loamy	yes	less than 20 in. deep
Maybid	134	0.0	0.2	0.00	0.2	D	6	Silt and Clay Deposits	mesic	fine	no	silt over clay
Shapleigh	136					C/D	4	Sandy Till	mesic	sandy	yes	less than 20 in. deep
Monadnock	142	0.6	2.0	2.00	6.0	B	2	Loose till, sandy textures	frigid	loamy over sandy, sandy-skeletal	yes	gravelly loamy sand in C
Acton	146	2.0	20.0	2.00	20.0	B	3	Loose till, sandy textures	mesic	sandy-skeletal	no	cobbly loamy sand
Vassalboro	150					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Success	154	2.0	6.0	6.00	20.0	A	1	Sandy Till	frigid	sandy-skeletal	yes	cemented
Canterbury	166	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Sunapee	168	0.6	2.0	0.60	6.0	B	3	Loose till, loamy textures	frigid	loamy	yes	
Waskish	195					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Ondawa	201	0.6	6.0	6.00	20.0	B	2	Flood Plain (Bottom Land)	frigid	loamy	no	occ flood, loamy over l. sand
Sunday	202	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	frigid	sandy	no	frequently flooded
Fryeburg	208	0.6	2.0	2.00	6.0	B	2	Flood Plain (Bottom Land)	frigid	silty	no	very fine sandy loam
Charles	209	0.6	100.0	0.60	100.0	C	5	Flood Plain (Bottom Land)	frigid	silty	no	
Warwick	210	2.0	6.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	loamy-skeletal	no	loamy over slate gravel
Naumburg	214	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	frigid	sandy	yes	
Boscawen	220	6.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	frigid	sandy-skeletal	no	loamy cap
Bemis	224	0.6	0.2	0.00	0.2	C	5	Firm, platy, loamy till	cryic	loamy	no	
Bice	226	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	no	sandy loam
Lanesboro	228	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	channery silt loam in Cd
Poocham	230	0.6	2.0	0.20	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	silt loam in C
Buxton	232	0.1	0.6	0.00	0.2	C	3	Silt and Clay Deposits	frigid	fine	no	silty clay
Scantic	233	0.0	0.2	0.00	0.2	D	5	Silt and Clay Deposits	frigid	fine	no	
Biddeford	234	0.0	0.2	0.00	0.2	D	6	Silt and Clay Deposits	frigid	fine	no	organic over clay
Buckland	237	0.6	2.0	0.06	0.2	C	3	Firm, platy, loamy till	frigid	loamy	no	loam in Cd
Elmridge	238	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	mesic	loamy over clayey	no	
Brayton	240	0.6	2.0	0.06	0.6	C	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Lyme	246	0.6	6.0	0.60	6.0	C	5	Loose till, sandy textures	frigid	loamy	no	
Millsite	251	0.6	6.0	0.60	6.0	C	4	Loose till, bedrock	frigid	loamy	no	20 to 40 in. deep
Macomber	252	0.6	2.0	0.60	2.0	C	4	Friable till, silty, schist & phyllite	frigid	loamy-skeletal	yes	20 to 40 in. deep
Lombard	259	0.6	6.0	2.00	20.0	C/D	2	Weathered bedrock, phyllite	frigid	loamy	no	very channery
Sunapee var	269	0.6	2.0	0.60	6.0	B	3	Loose till, loamy textures	frigid	loamy	yes	frigid dystrudept
Chatfield Var.	289	0.6	6.0	0.60	6.0	B	3	Loose till, bedrock	mesic	loamy	no	mwd to swpd
Greenwood	295					A/D	6	Organic Materials - Freshwater	frigid	hemic	no	deep organic
Catden	296					A/D	6	Organic Materials - Freshwater	mesic	sapric	no	deep organic
Lovewell	307	0.6	2.0	0.60	2.0	B	3	Flood Plain (Bottom Land)	frigid	silty	no	very fine sandy loam
Quonset	310	2.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	shale
Deerfield	313	6.0	20.0	20.00	100.0	B	3	Outwash and Stream Terraces	mesic	sandy	no	single grain in C

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Pipestone	314					B	5	Outwash and Stream Terraces	mesic	sandy	yes	
Mashpee	315	6.0	20.0	6.00	20.0	B	5	Outwash and Stream Terraces	mesic	sandy	yes	
Bernardston	330	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	channery silt loam in Cd
Roundabout	333	0.2	2.0	0.06	0.6	C	5	Terraces and glacial lake plains	frigid	silty	no	silt loam in the C
Pittstown	334	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	channery silt loam in Cd
Elmwood	338	2.0	6.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	frigid	loamy over clayey	no	
Stissing	340	0.6	2.0	0.06	0.2	C	5	Firm, platy, silty till, schist & phyllite	mesic	loamy	no	
Cardigan	357	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy	no	20 to 40 in. deep
Kearsarge	359	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy	no	less than 20 in. deep
Dutchess	366	0.6	2.0	0.60	2.0	B	2	Friable till, silty, schist & phyllite	mesic	loamy	no	very channery
Dixfield	378	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	fine sandy loam in Cd
Timakwa	393			6.00	100.0	D	6	Organic Materials - Freshwater	mesic	sandy or sandy-skeletal	no	organic over sand
Chocorua	395			6.00	20.0	D	6	Organic Materials - Freshwater	frigid	sandy or sandy-skeletal	no	organic over sand
Ipswich	397					D	6	Tidal Flat	mesic	hemic/sapric	no	deep organic
Suncook	402	6.0	20.0	6.00	20.0	A	1	Flood Plain (Bottomland)	mesic	sandy	no	frequent flooding
Metallak	404	6.0	100.0	6.00	100.0	B	3	Flood Plain (Bottom Land)	frigid	loamy over sandy	no	sandy or sandy-skeletal
Medomak	406	0.6	2.0	0.60	2.0	D	6	Flood Plain (Bottom Land)	frigid	silty	no	organic over silt
Haven	410	0.6	2.0	20.00	100.0	B	2	Outwash and Stream Terraces	mesic	loamy over sandy	no	loamy over sand/gravel
Duane	413	6.0	20.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	cemented (ortstein)
Moosilauke	414	6.0	20.0	6.00	20.0	C	5	Loose till, sandy textures	frigid	sandy	no	
Grange	433	0.6	2.0	0.60	2.0	C	5	Outwash and Stream Terraces	frigid	co. loamy over sandy (skeletal)	no	
Swanton	438	2.0	6.0	0.00	0.2	C	5	Sandy/loamy over silt/clay	frigid	co. loamy over clayey	no	
Shaker	439	2.0	6.0	0.00	0.2	C	5	Sandy/loamy over silt/clay	mesic	co. loamy over clayey	no	
Chichester	442	0.6	2.0	2.00	6.0	B		Loose till, sandy textures	frigid	loamy over sandy	no	loamy over loamy sand
Newfields	444	0.6	2.0	0.60	2.0	B	3	Loose till, sandy textures	mesic	loamy over sandy	no	sandy or sandy-skeletal
Scituate	448	0.6	2.0	0.06	0.2	C	3	Firm, platy, sandy till	mesic	loamy	no	loamy sand in Cd
Metacomet	458	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	no	loamy sand in Cd
Pennichuck	460	0.6	2.0	0.60	2.0	B	4	Friable till, silty, schist & phyllite	mesic	loamy-skeletal	no	20 to 40 in. deep
Gilmanton	478	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	no	fine sandy loam in Cd
Ossipee	495			0.20	2.0	D	6	Organic Materials - Freshwater	frigid	loamy	no	organic over loam
Natchaug	496			0.20	2.0	D	6	Organic Materials - Freshwater	mesic	loamy	no	organic over loam
Pawcatuck	497			20.00	100.0	D	6	Tidal Flat	mesic	sandy or sandy-skeletal	no	organic over sand
Abenaki	501	0.6	2.0	6.00	99.0	B	2	Outwash and Stream Terraces	frigid	loamy over sandy-skeletal	no	loamy over gravelly
Cohas	505	0.6	2.0	0.60	100.0	C	5	Flood Plain (Bottom Land)	frigid	co. loamy over sandy (skeletal)	no	
Hoosic	510	2.0	20.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	sandy-skeletal	no	slate, loamy cap
Ninigret	513	0.6	6.0	6.00	20.0	B	3	Outwash and Stream Terraces	mesic	loamy over sandy	no	sandy or sandy-skeletal
Leicester	514	0.6	6.0	0.60	20.0	C	5	Loose till, loamy textures	mesic	loamy	no	
Au Gres	516					B	5	Outwash and Stream Terraces	frigid	sandy	yes	single grain, loose
Machias	520	2.0	6.0	6.00	20.0	B	3	Outwash and Stream Terraces	frigid	sandy or sandy-skeletal	yes	strata sand/gravel in C
Stetson	523	0.6	6.0	6.00	20.0	B	2	Outwash and Stream Terraces	frigid	sandy-skeletal	yes	loamy over gravelly
Caesar	526	20.0	100.0	20.00	100.0	A	1	Outwash and Stream Terraces	mesic	coarse sand	no	
Scio	531	0.6	2.0	0.60	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	gravelly sand in 2C
Belgrade	532	0.6	2.0	0.06	2.0	B	3	Terraces and glacial lake plains	mesic	silty	no	strata of fine sand
Raynham	533	0.2	2.0	0.06	0.2	C	5	Terraces and glacial lake plains	mesic	silty	no	
Binghamville	534	0.2	2.0	0.06	0.2	D	5	Terraces and glacial lake plains	mesic	silty	no	
Suffield	536	0.6	2.0	0.00	0.2	C	3	Sandy/loamy over silt/clay	mesic	silty over clayey	no	deep to clay C
Squamscott	538	6.0	20.0	0.06	0.6	C	5	Sandy/loamy over silt/clay	mesic	sandy over loamy	yes	
Raypol	540	0.6	2.0	6.00	100.0	D	5	Outwash and Stream Terraces	mesic	co. loamy over sandy (skeletal)	no	
Walpole	546	2.0	6.0	6.00	20.0	C	5	Outwash and Stream Terraces	mesic	sandy	no	
Peacham	549	0.6	2.0	0.00	0.2	D	6	Firm, platy, silty till, schist & phylitte	frigid	loamy	no	organic over loam
Skerry	558	0.6	2.0	0.06	0.6	C	3	Firm, platy, sandy till	frigid	loamy	yes	loamy sand in Cd
Plaisted	563	0.6	2.0	0.06	0.6	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	channery silt loam in Cd
Howland	566	0.6	2.0	0.06	0.2	C	3	Firm, platy, silty till, schist & phyllite	frigid	loamy	yes	silt loam, platy in Cd
Monarda	569	0.2	2.0	0.02	0.2	D	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Bangor	572	0.6	2.0	0.60	2.0	B	2	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam

Soil Series	legend number	Ksat low - B in/hr	Ksat high - B in/hr	Ksat low - C in/hr	Ksat high - C in/hr	Hyd. Grp.	Group	Land Form	Temp.	Soil Textures	Spodosol ?	Other
Dixmont	578	0.6	2.0	0.60	2.0	C	3	Friable till, silty, schist & phyllite	frigid	loamy	yes	silt loam, platy in C
Cabot	589	0.6	2.0	0.06	0.2	D	5	Firm, platy, silty till, schist & phyllite	frigid	loamy	no	
Westbrook	597			0.00	2.0	D	6	Tidal Flat	mesic	loamy	no	organic over loam
Mundal	610	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	gravelly sandy loam in Cd
Croghan	613	20.0	100.0	20.00	100.0	B	3	Outwash and Stream Terraces	frigid	sandy	yes	single grain in C
Kinsman	614	6.0	20.0	6.00	20.0	C	5	Outwash and Stream Terraces	frigid	sandy	yes	
Salmon	630	0.6	2.0	0.60	2.0	B	2	Terraces and glacial lake plains	frigid	silty	yes	very fine sandy loam
Nicholville	632	0.6	2.0	0.60	2.0	C	3	Terraces and glacial lake plains	frigid	silty	yes	very fine sandy loam
Pemi	633	0.6	2.0	0.06	0.6	C	5	Terraces and glacial lake plains	frigid	silty	no	
Pillsbury	646	0.6	2.0	0.06	0.2	C	5	Firm, platy, loamy till	frigid	silty	no	
Ridgebury	656	0.6	6.0	0.00	0.2	C	5	Firm, platy, loamy till	mesic	loamy	no	
Canaan	663	2.0	20.0	2.00	20.0	C	4	Weathered Bedrock Till	frigid	loamy-skeletal	yes	less than 20 in. deep
Redstone	665	2.0	6.0	6.00	20.0	A	1	Weathered Bedrock Till	frigid	fragmental	yes	loamy cap
Sisk	667	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	cryic	loamy	yes	sandy loam in Cd
Surplus	669	0.6	2.0	0.00	0.6	C	3	Firm, platy, loamy till	cryic	loamy	yes	mwd, sandy loam in Cd
Glebe	671	2.0	6.0	2.00	6.0	C	4	Loose till, bedrock	cryic	loamy	yes	20 to 40 in. deep
Saddleback	673	0.6	2.0	0.60	2.0	C/D	4	Loose till, bedrock	cryic	loamy	yes	less than 20 in. deep
Ricker	674	2.0	6.0	2.00	6.0	A	4	Organic over bedrock (up to 4" of mineral)	cryic	fibric to hemic	no	well drained, less than 20 in. deep
Houghtonville	795	0.6	6.0	0.60	6.0	B	2	Loose till, loamy textures	frigid	loamy	yes	cobbly fine sandy loam
Matunuck	797			20.00	100.0	D	6	Tidal Flat	mesic	sandy	no	organic over sand
Meadowsedge	894					D	6	Organic Materials - Freshwater	frigid	peat	no	deep organic
Bucksport	895					D	6	Organic Materials - Freshwater	frigid	sapric	no	deep organic
Colonel	927	0.6	2.0	0.06	0.6	C	3	Firm, platy, loamy till	frigid	loamy	yes	loam in Cd
Pondicherry	992			6.00	20.0	D	6	Organic Materials - Freshwater	frigid	sandy or sandy-skeletal	no	organic over sand
Wonsqueak	995			0.20	2.0	D	6	Organic Materials - Freshwater	frigid	loamy	no	organic over loam
Glover	NA	0.6	2.0	0.60	2	D	4	Friable till, silty, schist & phyllite	frigid	loamy	no	less than 20 in. deep

no longer recognized
organic materials

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Strafford County, New Hampshire

September 15, 2020

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

Preface.....2
How Soil Surveys Are Made.....5
Soil Map.....8
Soil Map.....9
Legend.....10
Map Unit Legend.....11
Map Unit Descriptions.....11
Strafford County, New Hampshire.....13
GlB—Gloucester fine sandy loam, 3 to 8 percent slopes.....13
HgD—Hollis-Gloucester very rocky fine sandy loams, 15 to 25 percent slopes.....14
SfC—Suffield silt loam, 8 to 15 percent slopes.....15
W—Water.....16
References.....17

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

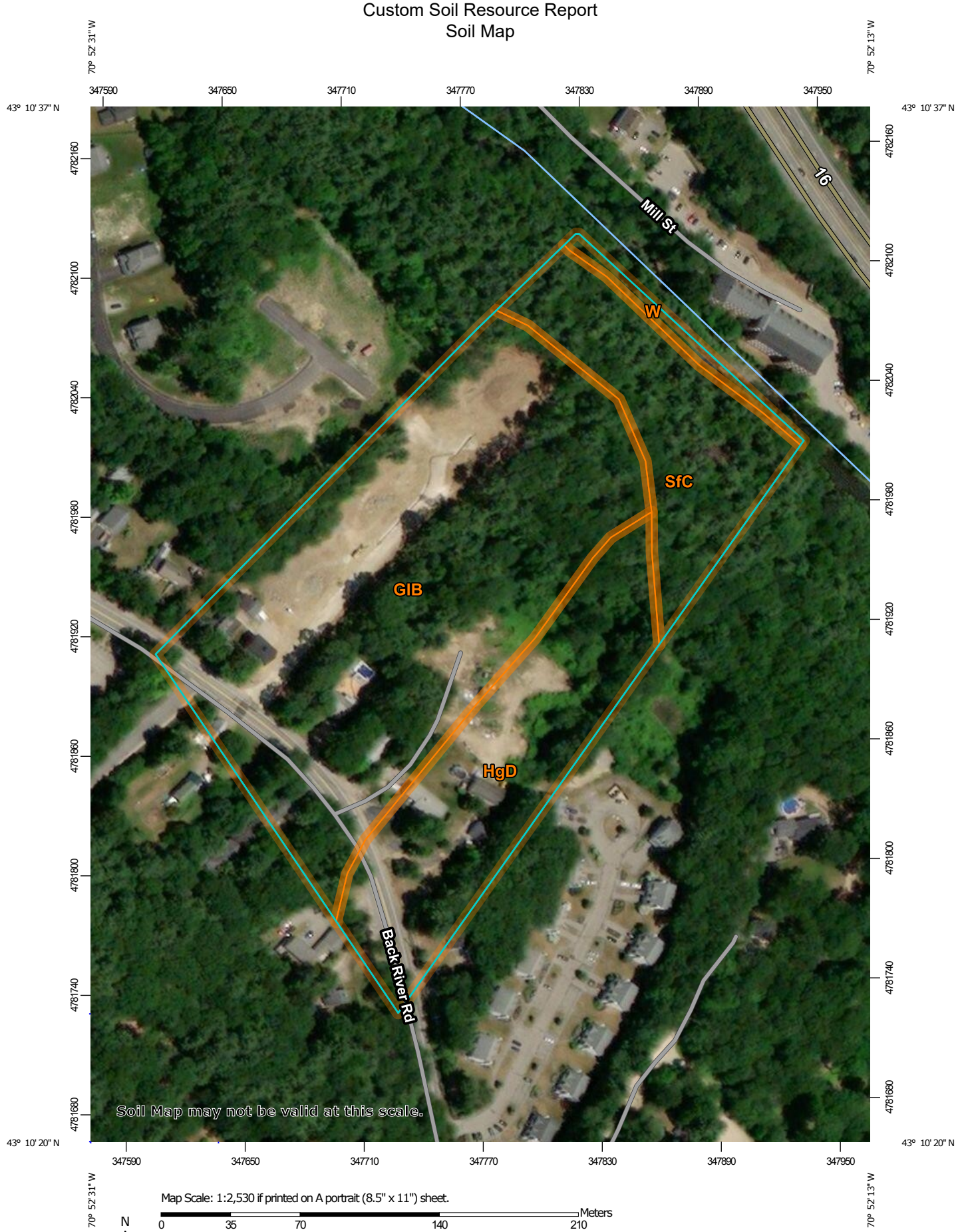
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,530 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Strafford County, New Hampshire
Survey Area Data: Version 20, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Sep 9, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GlB	Gloucester fine sandy loam, 3 to 8 percent slopes	8.6	58.4%
HgD	Hollis-Gloucester very rocky fine sandy loams, 15 to 25 percent slopes	3.5	23.6%
SfC	Suffield silt loam, 8 to 15 percent slopes	2.4	16.4%
W	Water	0.2	1.6%
Totals for Area of Interest		**14.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Strafford County, New Hampshire

GIB—Gloucester fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d73
Elevation: 70 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Gloucester and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gloucester

Setting

Parent material: Till

Typical profile

H1 - 0 to 14 inches: fine sandy loam
H2 - 14 to 28 inches: very gravelly loamy sand
H3 - 28 to 40 inches: very gravelly coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F144AY032NH - Dry Till Uplands
Hydric soil rating: No

Minor Components

Not named pan

Percent of map unit: 5 percent
Hydric soil rating: No

Hollis

Percent of map unit: 5 percent
Hydric soil rating: No

Acton
Percent of map unit: 5 percent
Hydric soil rating: No

HgD—Hollis-Gloucester very rocky fine sandy loams, 15 to 25 percent slopes

Map Unit Setting
National map unit symbol: 9d7x
Elevation: 0 to 1,230 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Hollis and similar soils: 50 percent
Gloucester and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting
Parent material: Till

Typical profile
H1 - 0 to 14 inches: very stony fine sandy loam
H2 - 14 to 18 inches: bedrock

Properties and qualities
Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 2.0 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Ecological site: F144AY033MA - Shallow Dry Till Uplands
Hydric soil rating: No

Description of Gloucester

Setting

Parent material: Till

Typical profile

H1 - 0 to 14 inches: very stony fine sandy loam
H2 - 14 to 28 inches: very gravelly loamy sand
H3 - 28 to 40 inches: very gravelly coarse sand

Properties and qualities

Slope: 15 to 25 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Ecological site: F144AY032NH - Dry Till Uplands
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Not named

Percent of map unit: 10 percent
Hydric soil rating: No

SfC—Suffield silt loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9d8v
Elevation: 0 to 250 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Suffield and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Suffield

Typical profile

H1 - 0 to 19 inches: silt loam
H2 - 19 to 28 inches: silt loam
H3 - 28 to 41 inches: silty clay

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: F144AY017NH - Well Drained Lake Plain
Hydric soil rating: No

Minor Components

Not named

Percent of map unit: 9 percent
Hydric soil rating: No

Buxton

Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 1 percent
Hydric soil rating: No

W—Water

Map Unit Composition

Water (less than 40 acres): 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf

Drawing Name: P:\20pro\20-011\Internal\Drawing Files\Cover Sheet 4.dwg
Mon, 01 Feb 2021 - 2:25pm

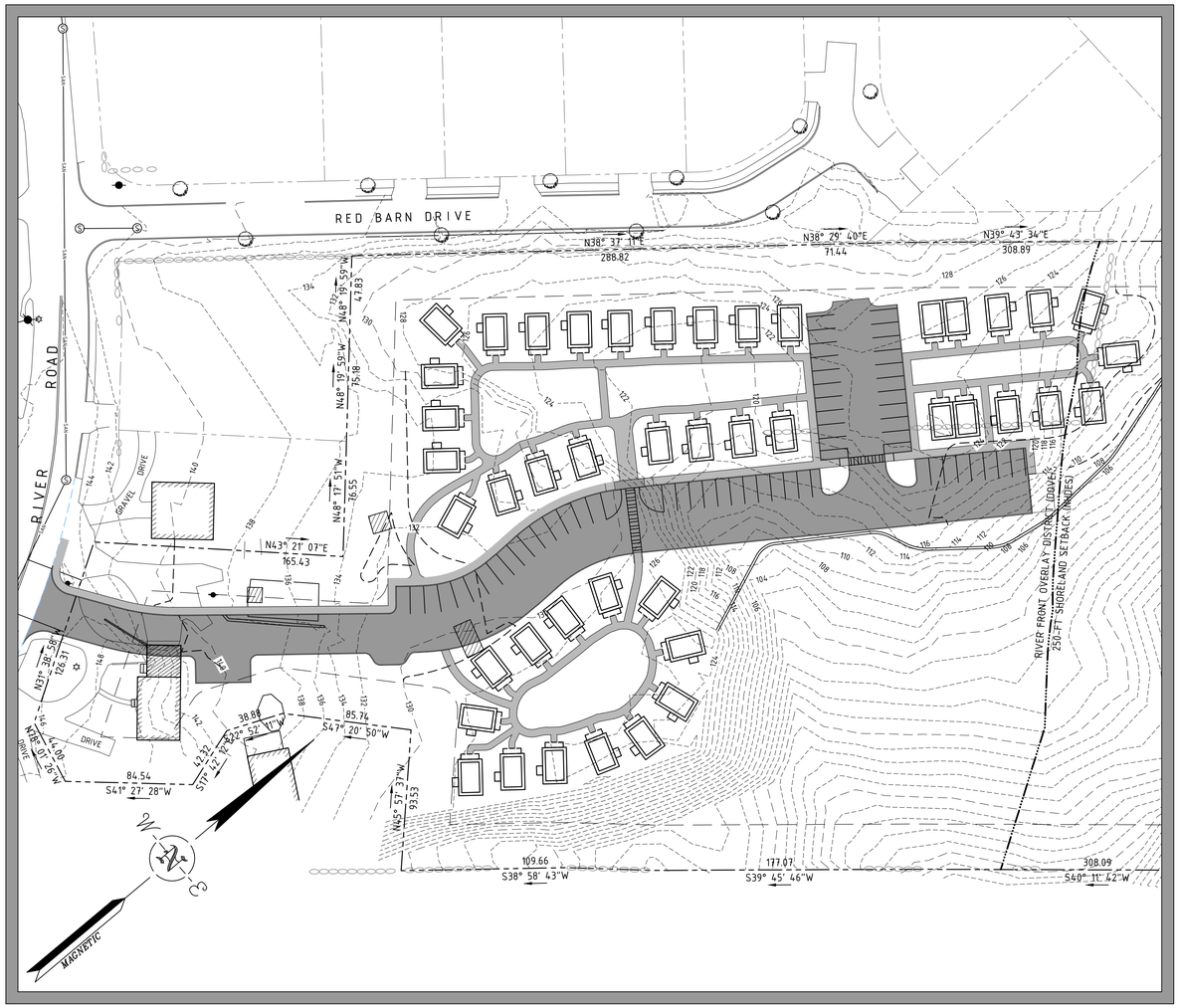
SITE PLAN

for

54 BRR, LLC

COTTAGES AT BACK RIVER ROAD

54 BACK RIVER ROAD
DOVER, NH
SEPTEMBER 17, 2020
REV. FEBRUARY 1, 2021



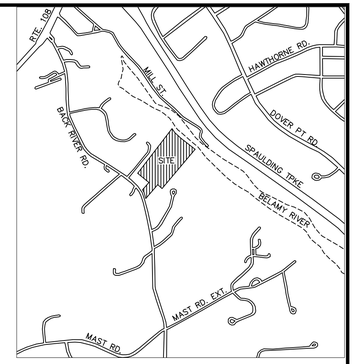


TABLE OF CONTENTS

TITLE	SHEET
EXISTING CONDITIONS PLAN	EX-1
YIELD PLAN	Y-1
SITE PLAN	C101
GRADING AND EROSION CONTROL PLAN	C102
UTILITY PLAN	C103
ROAD PLAN AND PROFILE	C104
NEIGHBORHOOD PLAN	C301
CONSTRUCTION DETAILS	C501-508
LIGHTING PLAN	LT101
LANDSCAPING PLAN	LA101
ARCHITECTURAL PLAN	A1.1

OWNER

54 BRR, LLC
1 STAGECOACH RD
DURHAM, NH 03824

CIVIL ENGINEER

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-4979, Fax: (603) 659-4627
E-mail: mjs@mjs-engineering.com

SURVEYOR

TRITECH
ENGINEERING CORPORATION
755 CENTRAL AVENUE
DOVER, NEW HAMPSHIRE 03820
TELEPHONE 603 742 8107
FAX 603 742 3830

LANDSCAPE ARCHITECT

woodburn &company
LANDSCAPE ARCHITECTURE
103 Kent Place Newmarket, New Hampshire Phone: 603.659.5949

SOIL SCIENTIST

JOSEPH W. NOEL
P.O. BOX 174
SOUTH BERWICK, ME 03908

NO.	REVISIONS	DATE	INT.
2.	REVISIONS PER TRC #2	2/1/21	MJS
1.	REVISIONS PER TRC #1	1/4/21	MJS
0.	INITIAL SUBMISSION TO DOVER	9/17/20	MJS

(P20-60)

NOTES

1.) INTENT: TO SHOW THE EXISTING CONDITIONS OF DOVER TAX MAP I LOT 6.

2.) CURRENT OWNER OF RECORD: 54 BRR, LLC
1 STAGECOACH ROAD
DURHAM, N.H.

3.) SUBJECT PARCEL IS LOCATED IN THE CITY OF DOVER, COUNTY OF STRAFFORD AND THE STATE OF NEW HAMPSHIRE.

4.) TOTAL LOT AREA: 311,970 SQ.FT. – 7.162 ACRES

5.) TAX MAP I LOTS 6

6.) PROJECT DEED REFERENCE: BOOK 4764 PAGE 977

7.) ZONING: R–12

MIN. LOT SIZE: 12,000 SQ. FT.	OPEN SPACE REQUIREMENTS MIN. LOT SIZE: 8,000 SQ.FT.
MIN. FRONTAGE: 100 FT	MIN. FRONTAGE: 20 FT
MIN. SETBACKS:	MIN. SETBACKS:
FRONT: 30 FT	FRONT: 10 FT
SIDE: 15 FT	SIDE: 10 FT
REAR: 15 FT	REAR: 10 FT
MAX BUILDING HEIGHT: 35 FT	EXTERIOR BOUNDARY: 30 FT
LOT COVERAGE: 30 %	EXISTING STRUCTURES: 50 FT
	FRONTAGE BUFFER:100 FT

8.) THIS PROPERTY FALLS WITHIN THE FOLLOWING ZONING OVERLAY DISTRICTS: WETLANDS, CONSERVATION, TIDAL

9.) THE RAW UNADJUSTED CLOSURE OF OUR RANDOM POINT TRAVERSE WAS 1 PART IN 35,000, AND WAS ACCOMPLISHED USING A TOPCON 500 GT TOTAL STATION, DURING THE MONTH OF SEPTEMBER, 2018.

10.) IN THE MONTH OF OCTOBER, 2018 MICHAEL MARIANO, STATE OF NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST, NH CERTIFIED WETLAND SCIENTIST, CONDUCTED

11.) AN ON–SITE WETLANDS DELINEATION OF THE SUBJECT PARCEL. WETLANDS WERE IDENTIFIED BASED ON THE CITY OF DOVER ZONING ORDINANCE (170–27.1) AND ON STATE & FEDERAL CRITERIA OUTLINED IN THE "CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL" (DEPT. OF THE ARMY, 1987) ON THIS SITE, WETLANDS BASED ON LOCAL CRITERIA SHARE THE SAME BOUNDARIES WITH THOSE BASED ON STATE AND FEDERAL CRITERIA. NO VERY POORLY DRAINED SOILS WERE FOUND.

PROJECT PLAN REFERENCE:

OPEN SPACE SUBDIVISION PLAN BELLAMY RIDGE 46 BACK RIVER ROAD DOVER, NEW HAMPSHIRE TRITECH ENGINEERING CORPORATION DECEMBER 24, 2014 SCRD 110–35	PLAN OF LAND OF ROBERT & MURIEL NESMAN BACK RIVER ROAD DOVER, N.H. McENEANEY & O'NEIL SURVEY ASSOCIATES MAY 6, 1988 SCRD 34–66
PLAN OF LAND OF BRUCE G. & OLIVE E. STAPLES BACK RIVER ROAD DOVER, NEW HAMPSHIRE K.E. MOORE & B.G. STAPLES JAN. 1985 SCRD 25–65	PLAN OF LAND FOR EDWARDS REALTY INC SAWYERS LOWER MILL DOVER, NEW HAMPSHIRE GRANT L. DAVIS APRIL 1954 SCRD Po 2 Fo 21 PLAN #26
BOUNDARY LINE ADJUSTMENT FOR LOUISE SWEATT DOVER, NEW HAMPSHIRE EMERY ENGINEERING SEPTEMBER 26, 1991 SCRD 39–79	SUBDIVISION PLAN FOR LOUISE M. SWEATT DOVER, NEW HAMPSHIRE EMERY ENGINEERING JUNE 6, 1991 SCRD 39–24

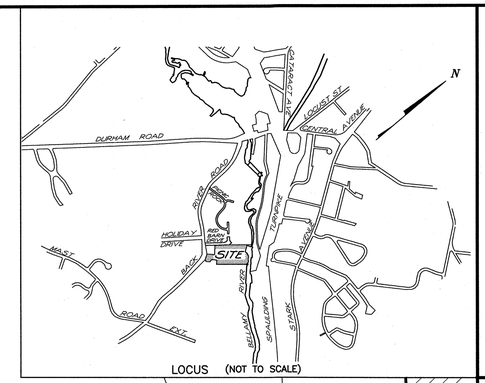
12.) BASIS OF BEARING: BEARING SYSTEM BASED ON GPS FIELD OBSERVATIONS ON AUGUST 21, 2018 USING TOPCON HIPER SR RECEIVERS AND OPUS CORRECTED ON AUGUST 24, 2018. DATUM BASED ON NEW HAMPSHIRE STATE PLANE COORDINATES SPC (2800 NH), (VERTICAL DATUM: NAVD 88). (DOVER GIS)

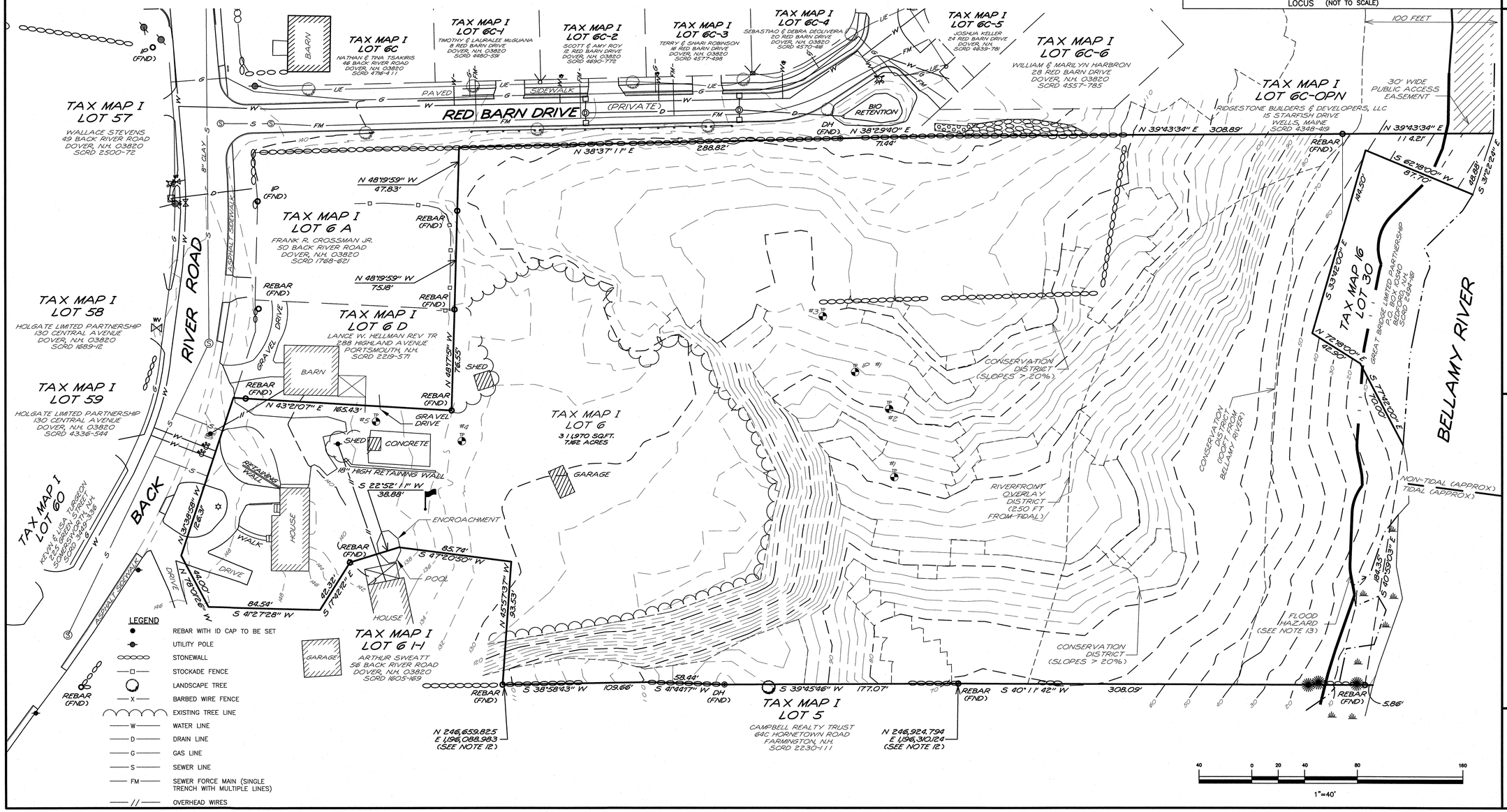
13.) A PORTION OF THE SUBJECT PARCEL IS WITHIN A FEDERALLY DESIGNATED SPECIAL FLOOD HAZARD ZONE (FLOOD HAZARD ZONE A – PANEL 0340E, MAP No. 33017C0340E, DATE: 9–30–2015).

14.) MAP I LOT 6C MAY BE SUBJECT TO FLOWAGE RIGHTS AND MILL PRIVILEGE RIGHTS.

15.) LOTS ARE SERVICED BY CITY WATER AND MUNICIPAL SEWER.

16.) A PORTION OF THE BELLAMY RIVER ADJACENT TO THE SUBJECT PROPERTY IS SUBJECT TO TIDAL ACTION. THE RIVER FRONT OVERLAY DISTRICT DOES APPLY TO A PORTION OF THE SUBJECT PARCEL.





LEGEND

- REBAR WITH ID CAP TO BE SET
- UTILITY POLE
- STONEWALL
- STOCKADE FENCE
- LANDSCAPE TREE
- BARBED WIRE FENCE
- EXISTING TREE LINE
- WATER LINE
- DRAIN LINE
- GAS LINE
- SEWER LINE
- SEWER FORCE MAIN (SINGLE TRENCH WITH MULTIPLE LINES)
- OVERHEAD WIRES

TRITECH
ENGINEERING CORPORATION
765 CENTRAL AVENUE
DOVER, NEW HAMPSHIRE 03820
TELEPHONE 603 742 8107
FAX 603 742 3830

REVISIONS
DATE: DESCRIPTION:

LICENSED LAND SURVEYOR NO. 894 ROBERT J. MASTRANGELO STATE OF NEW HAMPSHIRE

EXISTING CONDITIONS PLAN
54, BRR, LLC
54 BACK RIVER ROAD
DOVER, NEW HAMPSHIRE
STRAFFORD COUNTY
SEPTEMBER 17, 2020 JOB No. 18129
SCALE: 1" = 40'

SHEET NO. EX-1

P20-060

NOTES

1.) INTENT: TO SHOW THE CONVENTIONAL SUBDIVISION OF DOVER TAX MAP I LOT 6.

2.) CURRENT OWNER OF RECORD: 54 BRR, LLC
1 STAGECOACH ROAD
DURHAM, N.H.

3.) SUBJECT PARCEL IS LOCATED IN THE CITY OF DOVER, COUNTY OF STRAFFORD AND THE STATE OF NEW HAMPSHIRE.

4.) TOTAL LOT AREA: 311,970 SQ.FT. – 7.162 ACRES

5.) TAX MAP I LOTS 6

6.) PROJECT DEED REFERENCE: BOOK 4764 PAGE 977

7.) ZONING: R–12

MIN. LOT SIZE: 12,000 SQ. FT.	OPEN SPACE REQUIREMENTS
MIN. FRONTAGE: 100 FT	MIN. LOT SIZE: 8,000 SQ.FT.
MIN. SETBACKS:	MIN. FRONTAGE: 20 FT
FRONT: 30 FT	MIN. SETBACKS:
SIDE: 15 FT	FRONT: 10 FT
REAR: 15 FT	SIDE: 10 FT
MAX BUILDING HEIGHT: 35 FT	REAR: 10 FT
LOT COVERAGE: 30 %	EXTERIOR BOUNDARY: 30 FT
	EXISTING STRUCTURES: 50 FT
	FRONTAGE BUFFER:100 FT

8.) THIS PROPERTY FALLS WITHIN THE FOLLOWING ZONING OVERLAY DISTRICTS: WETLANDS, CONSERVATION, TIDAL

9.) THE RAW UNADJUSTED CLOSURE OF OUR RANDOM POINT TRAVERSE WAS 1 PART IN 35,000, AND WAS ACCOMPLISHED USING A TOPCON 500 GT TOTAL STATION, DURING THE MONTH OF SEPTEMBER, 2018.

10.) IN THE MONTH OF OCTOBER, 2018 MICHAEL MARIANO, STATE OF NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST, NH CERTIFIED WETLAND SCIENTIST, CONDUCTED AN ON–SITE WETLANDS DELINEATION OF THE SUBJECT PARCEL. WETLANDS WERE IDENTIFIED BASED ON THE CITY OF DOVER ZONING ORDINANCE (170–27.1) AND ON STATE & FEDERAL CRITERIA OUTLINED IN THE "CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL" (DEPT. OF THE ARMY, 1987) ON THIS SITE, WETLANDS BASED ON LOCAL CRITERIA SHARE THE SAME BOUNDARIES WITH THOSE BASED ON STATE AND FEDERAL CRITERIA. NO VERY POORLY DRAINED SOILS WERE FOUND.

11.) PROJECT PLAN REFERENCE:

OPEN SPACE SUBDIVISION PLAN BELLAMY RIDGE 46 BACK RIVER ROAD DOVER, NEW HAMPSHIRE TRITECH ENGINEERING CORPORATION DECEMBER 24, 2014 SCRD 110–35	PLAN OF LAND OF ROBERT & MURIEL NESMAN BACK RIVER ROAD DOVER, N.H. McENEANEY & O'NEIL SURVEY ASSOCIATES MAY 6, 1988 SCRD 34–66
PLAN OF LAND OF BRUCE G. & OLIVE E. STAPLES BACK RIVER ROAD DOVER, NEW HAMPSHIRE K.E. MOORE & B.G. STAPLES JAN. 1985 SCRD 25–65	PLAN OF LAND FOR EDWARDS REALTY INC SAWYERS LOWER MILL DOVER, NEW HAMPSHIRE GRANT L. DAVIS APRIL 1954 SCRD Po 2 Fo 21 PLAN #26
BOUNDARY LINE ADJUSTMENT FOR LOUISE SWEATT DOVER, NEW HAMPSHIRE EMERY ENGINEERING SEPTEMBER 26, 1991 SCRD 39–79	SUBDIVISION PLAN FOR LOUISE M. SWEATT DOVER, NEW HAMPSHIRE EMERY ENGINEERING JUNE 6, 1991 SCRD 39–24

12.) BASIS OF BEARING: BEARING SYSTEM BASED ON GPS FIELD OBSERVATIONS ON AUGUST 21, 2018 USING TOPCON HIPER SR RECEIVERS AND OPUS CORRECTED ON AUGUST 24, 2018. DATUM BASED ON NEW HAMPSHIRE STATE PLANE COORDINATES SPC (2800 NH), (VERTICAL DATUM: NAVD 88). (DOVER GIS)

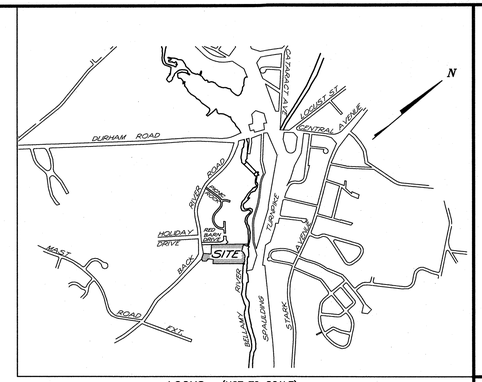
13.) A PORTION OF THE SUBJECT PARCEL IS WITHIN A FEDERALLY DESIGNATED SPECIAL FLOOD HAZARD ZONE (FLOOD HAZARD ZONE A – PANEL 0340E, MAP No. 33017C0340E, DATE: 9–30–2015).

14.) THE LOTS TO BE SERVED BY MUNICIPAL WATER AND SEWER.

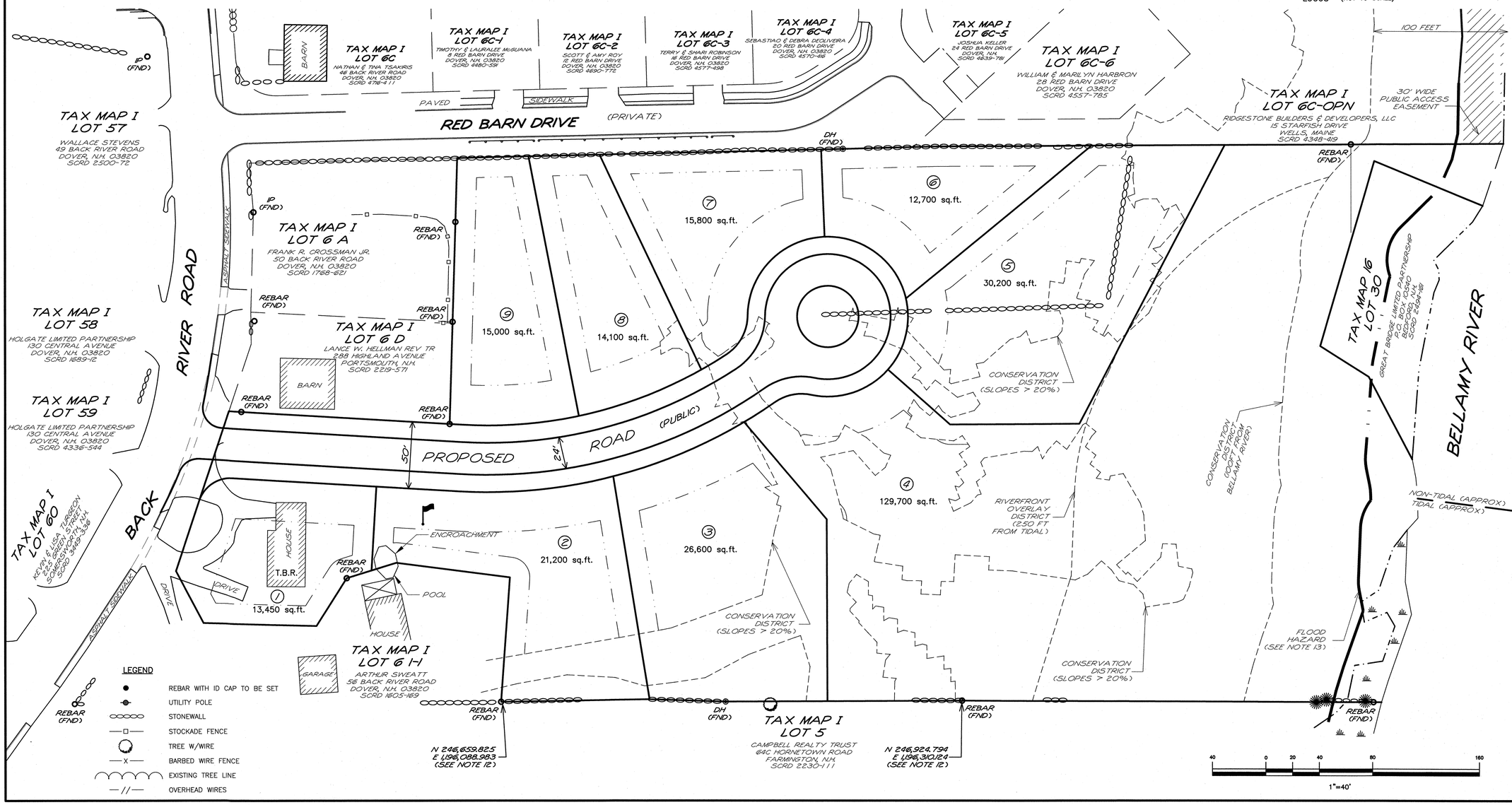
15.) ALL PROPOSED LOTS CONTAIN A MINIMUM OF 12,000 SQ.FT. OF CONTIGUOUS UPLAND, AND MORE THAN 8,000 SQ.FT. OF CONTIGUOUS NON–BUFFER UPLAND.

16.) MAP I LOT 6 MAY BE SUBJECT TO FLOWAGE RIGHTS AND MILL PRIVILEGE RIGHTS.

17.) A PORTION OF THE BELLAMY RIVER ADJACENT TO THE SUBJECT PROPERTY IS SUBJECT TO TIDAL ACTION. THE RIVER FRONT OVERLAY DISTRICT DOES APPLY TO A PORTION OF THE SUBJECT PARCEL.



LOCUS (NOT TO SCALE)



TRITECH
ENGINEERING CORPORATION
735 CENTRAL AVENUE
DOVER, NEW HAMPSHIRE 03820
TELEPHONE 603 742 8107
FAX 603 742 3630

REVISIONS
DATE: DESCRIPTION:

YIELD PLAN
54 BRR, LLC
"COTTAGES"
54 BACK RIVER ROAD
DOVER, NEW HAMPSHIRE
STRAFFORD COUNTY
SEPTEMBER 17, 2020 JOB No. 18129
SCALE: 1" = 40'

SHEET NO. Y-1

P20-060

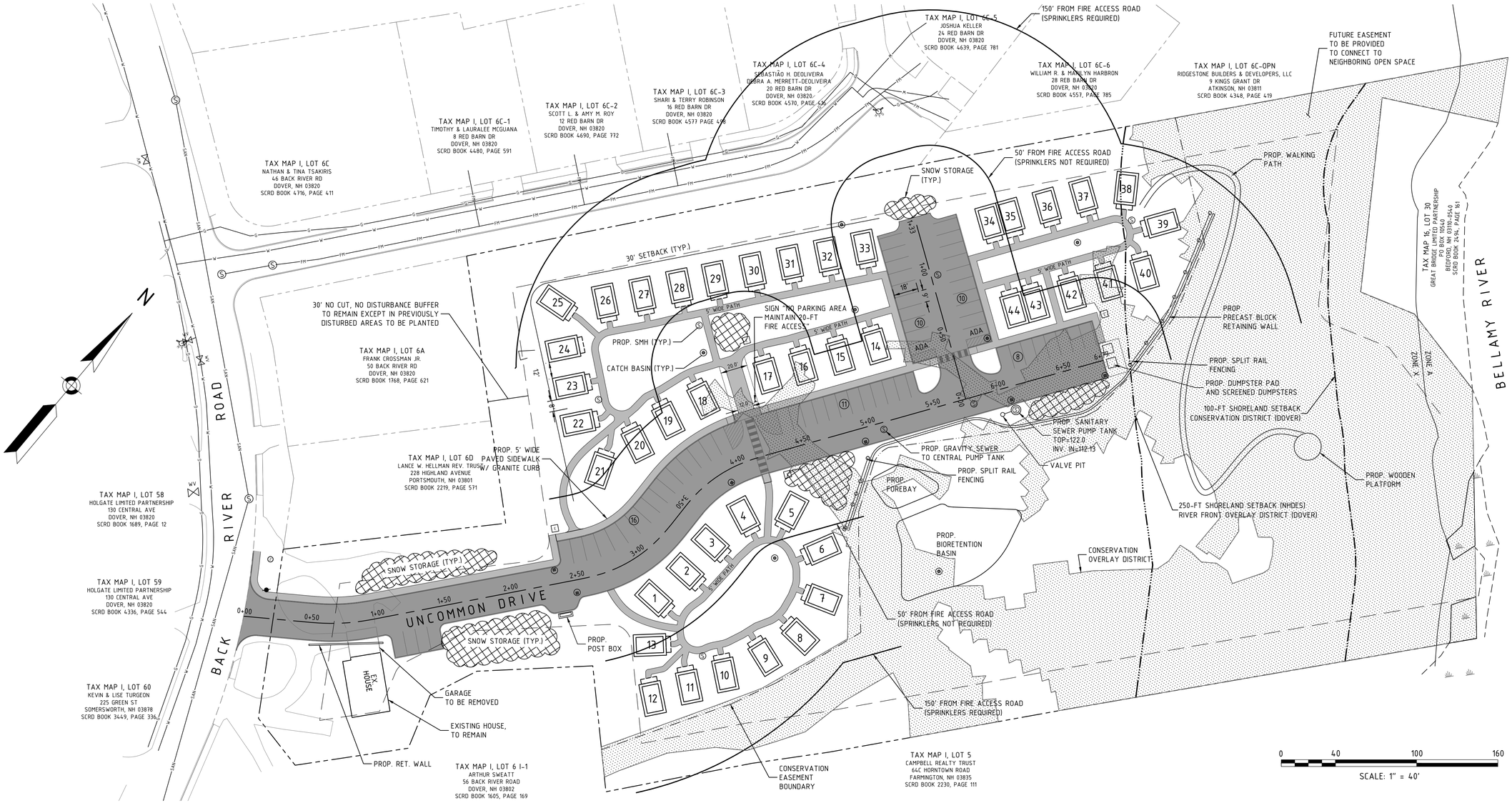
P:\20proj\20-011\Internal\Drawing Files\20011 Civil_K.dwg
2021-20-0113:20

NOTES:

1. INTENT: TO SHOW THE PROPOSED CONDITIONS OF TAX MAP I, LOT 6.
2. CURRENT OWNER OF RECORD: 54 BRR, LLC
   1 STAGECOACH RD
   DURHAM, NH 03824
   OWNER SIGNATURE: _____
3. SUBJECT PARCEL IS LOCATED IN THE CITY OF DOVER, COUNTY OF STRAFFORD AND THE STATE OF NEW HAMPSHIRE.
4. TOTAL LOT AREA: 320,602 SQ. FT ± 7.36 ACRES
5. TAX MAP I, LOT 6 OF THE CITY OF DOVER TAX ASSESSOR'S MAPS.
6. PROJECT DEED REFERENCE: STRAFFORD COUNTY REGISTRY OF DEEDS BOOK NO. 1605, PAGE NO. 169
7. ZONING: R-12
   MIN. LOT SIZE: 12,000 SQ. FT
   MIN. FRONTAGE: 100 FT
   MIN. SETBACKS:
   FRONT: 30 FT
   SIDE: 15 FT
   REAR: 15 FT
   MAX. BUILDING HEIGHT: 35 FT
   MAX. LOT COVERAGE: 30%
   OPEN SPACE REQUIREMENTS
   MIN. LOT SIZE: 8,000 SQ. FT
   MIN. SETBACKS:
   FRONT: 10 FT
   SIDE: 10 FT
   REAR: 10 FT
   EXTERIOR BOUNDARY: 30 FT
   EXISTING STRUCTURES: 50 FT
   FRONTAGE BUFFER: 100 FT
8. THIS PROPERTY FALLS WITHIN THE FOLLOWING ZONING OVERLAY DISTRICTS: WETLANDS, CONSERVATION, TIDAL.
9. IN THE MONTH OF OCTOBER, 2018 MICHAEL MARIANO, STATE OF NEW HAMPSHIRE CERTIFIED SOIL SCIENTIST, NH CERTIFIED WETLAND SCIENTIST, CONDUCTED AN ON-SITE WETLANDS DELINEATION OF THE SUBJECT PARCEL. WETLANDS WERE IDENTIFIED BASED ON THE CITY OF DOVER ZONING ORDINANCE (170-27.1) AND ON STATE AND FEDERAL CRITERIA OUTLINES IN THE "CORPS OF ENGINEERS WETLANDS DELINEATION MANUAL" (DEPT. OF THE ARMY 1987) ON THIS SITE. WETLANDS BASED ON LOCAL CRITERIA SHARE THE SAME BOUNDARIES WITH THOSE BASED ON STATE AND FEDERAL CRITERIA. NO VERY POORLY DRAINED SOILS WERE FOUND.
10. ON JUNE 22, 2020 JOSEPH W. NOEL, CERTIFIED SOIL SCIENTIST COMPLETED A SITE SPECIFIC SOIL MAP IN ACCORDANCE WITH "SITE SPECIFIC SOIL MAPPING STANDARDS FOR NEW HAMPSHIRE AND VERMONT" (SOCIETY OF SOIL SCIENTISTS OF NORTHERN NEW ENGLAND, VERSION 5.0, DECEMBER 2017).
11. A PORTION OF THE SUBJECT PARCEL IS WITHIN A FEDERALLY DESIGNATED SPECIAL FLOOD HAZARD ZONE (FLOOD ZONE A - PANEL 0340E, MAP NO. 33017C0340E, DATE 9-30-2015)
12. MAP I, LOT 6C MAY BE SUBJECT TO FLOWAGE RIGHTS AND MILL PRIVILEGE RIGHTS.
13. LOTS ARE SERVICED BY CITY WATER AND MUNICIPAL SEWER.
14. A PORTION OF THE BELLAMY RIVER ADJACENT TO THE SUBJECT PROPERTY IS SUBJECT TO TIDAL ACTION. THE RIVER FRONT OVERLAY DISTRICT DOES APPLY TO A PORTION OF THE SUBJECT PARCEL.
15. AS-BUILT PLANS OF THE SUBDIVISION SHALL BE SUBMITTED ON PAPER AND IN DIGITAL FORMAT AUTOCAD DWG, AUTOCAD DXF OR ESRI FORMAT TO THE CITY OF DOVER ENGINEERS OFFICE UPON COMPLETION OF PROJECT IF A STREET IS PROPOSED FOR CITY ACCEPTANCE. AS-BUILT PLANS SHALL BE PREPARED AND CERTIFIED CORRECT BY A L.L.S. OR P.E. DIGITAL FILES SHALL BE GEO-REFERENCED TO NEW HAMPSHIRE STATE PLANE COORDINATES NAD83 AND SHALL BE EXPRESSED IN FEET.
16. THE INSTALLATION OF THE ELECTRICAL POWER, CABLE TELEVISION AND TELEPHONE LINES SHALL BE UNDERGROUND THROUGHOUT THE SITE FOR WHICH DEVELOPMENT IS PROPOSED.
17. ALL CONSTRUCTION SHALL CONFORM WITH THE STATE OF NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION (NHDOT) "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" AND WITH THE CITY OF DOVER COMMUNITY SERVICES REGULATIONS AND STANDARD SPECIFICATION FOR CONSTRUCTION. THE MORE STRINGENT SPECIFICATION SHALL APPLY.
18. THE LIMITS OF CONSTRUCTION DISTURBANCE THAT ARE LOCATED IN OR WITHIN THE 50 FT OF CONSERVATION AND WETLAND DISTRICTS SHALL BE STAKED, FLAGGED AND CLEARLY IDENTIFIED PRIOR TO ANY EARTH DISTURBING ACTIVITY OCCURS.
19. ALL TREATMENT SWALES TO BE CONSTRUCTED SHALL HAVE SOD BOTTOMS.
20. A LETTER OF CREDIT FOR THE COST OF REVEGETATING ALL DISTURBED AREAS ON THE SITE SHALL BE SUBMITTED, AND THE APPROVED CONSTRUCTION SIGN INSTALLED PRIOR TO ANY EARTH DISTURBING ACTIVITY.
21. A PRE-CONSTRUCTION CONFERENCE WITH THE DEVELOPER, THE DESIGN ENGINEER, THE EARTHWORK CONTRACTOR AND THE CITY ENGINEER SHALL OCCUR PRIOR TO ANY EARTH DISTURBING ACTIVITY.
22. SITE CONSTRUCTION HOURS SHALL BE LIMITED TO MONDAY-FRIDAY 7 AM-6 PM AND SATURDAY 9 AM-4 PM. HOURS OF CONSTRUCTION MUST BE DOCUMENTED ON A SITE CONSTRUCTION SIGN ALONG WITH THE CONTACT INFORMATION FOR THE GENERAL CONTRACTOR. SAID SIGNAGE MUST BE LOCATED AND APPROVED BY THE CITY ENGINEER OR ASSISTANT CITY MANAGER.
23. BUILDING ADDRESSES (INCLUDING APT/UNIT NUMBERS IF APPLICABLE) SHALL BE ASSIGNED BY THE BUILDING OFFICIAL AT THE TIME OF ISSUANCE OF A BUILDING PERMIT.
24. THE PROPOSED USE FOR THE SITE IS SINGLE FAMILY COTTAGES FOR WORK FORCE HOUSING. 44 TOTAL 1 BEDROOM UNITS.
25. THE FOLLOWING FEDERAL AND STATE PERMITS HAVE BEEN ISSUED FOR THE SUBJECT PROPERTY:
   A. ALTERATION OF TERRAIN
   B. NHDES SEWER DISCHARGE
   C. NHDES SHORELAND
26. COMMERCIAL VEHICLE ROUTE DURING CONSTRUCTION SHALL CONFORM TO DOVER CITY CODE OR BE COORDINATED WITH THE COMMUNITY SERVICES DIRECTOR.
27. ANY RETAINING WALL OVER FOUR FEET (4') REQUIRES THE ISSUANCE OF A BUILDING PERMIT FROM INSPECTION SERVICES.
28. AND FENCE TALLER THAN SEVEN FEET (7') REQUIRES THE ISSUANCE OF A BUILDING PERMIT FROM INSPECTION SERVICES.
29. THE OWNER OF RECORD SHALL RECORD AT THE REGISTRY OF DEEDS DOCUMENTATION SUFFICIENT TO PROVIDE NOTICE TO ALL PERSONS/ENTITIES THAT MAY ACQUIRE ANY PROPERTY SUBJECT TO THE REQUIREMENTS AND RESPONSIBILITIES DESCRIBED IN THE APPROVED STORMWATER MANAGEMENT PLAN. THE NOTICE SHALL COMPLY WITH THE APPLICABLE REQUIREMENTS FOR RECORDING CONTAINED IN RSA 477 AND 478. THE NOTICE NEED NOT SET FORTH THE REQUIREMENTS AT LENGTH, SO LONG AS SUFFICIENT TO PROVIDE NOTICE TO ALL PROSPECTIVE PURCHASERS TO THE REQUIREMENTS FOR MAINTENANCE AND REPORTING.
30. FIRE DEPARTMENT ACCESS ROADS SHALL BE INSTALLED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF FIRE APPARATUS IN ALL WEATHER CONDITIONS AT ALL TIMES.
31. MAXIMUM ALLOWED PARKING SPACE CALCULATION:

USE	UNITS	STANDARD	ALLOWED	PROVIDED
RESIDENTIAL	43	1.4 SPACES/ UNIT + 0.5 GUEST SPACES/UNIT	82	55

32. EXTERIOR LIGHTING SHALL BE CUT-OFF TYPE FIXTURES PER CHAPTER 153-14-E AND SHALL PROVIDE LIGHTING DIRECTED ON-SITE ONLY.
33. TOPOGRAPHIC SURVEY PERFORMED BY TRITECH ENGINEERING IN AUGUST, 2018.
34. ELEVATIONS ARE BASED ON NEW HAMPSHIRE STATE PLANE COORDINATES SPC (2800 NH). (VERTICAL DATUM: NAVD 88). (DOVER GIS)
35. APPROVED BACKFLOW PREVENTERS SHALL BE PROVIDED FOR BOTH FIRE AND DOMESTIC WATER.
36. A LETTER OF CREDIT FOR THE COST OF REVEGETATING ALL DISTURBED AREAS ON THE SITE SHALL BE SUBMITTED, AND THE APPROVED CONSTRUCTION SIGN INSTALLED PRIOR TO ANY EARTH DISTURBING ACTIVITY OCCURS.
37. EXISTING BUILDING ON BACK RIVER ROAD TO BE USED AS COMMUNITY CENTER.
38. PROPOSED COTTAGES HAVE APPROXIMATELY 12' OF SPACE BETWEEN THEM.
39. RIDESHARE PROGRAM TO BE OFFERED TO EMPLOYEES OF HARMONY HOMES ASSISTED LIVING; AN ANTICIPATED MINIMUM OF 20% OF RESIDENTS WOULD RIDESHARE OR CARPOOL. CARPOOLING IS COMMON AMONG CURRENT EMPLOYERS
40. RESIDENTS WORKING AT OTHER COMPANIES WOULD ALSO BE ABLE TO CAR POOL; COMPANIES WOULD BE ENCOURAGED TO PROVIDE RIDESHARING OPPORTUNITIES FOR THEIR EMPLOYEES AS WELL.
41. IT IS ANTICIPATED THAT APPROXIMATELY 10% OF RESIDENTS WOULD WORK FROM HOME.
42. ALL REMAINING UNDEVELOPED LAND TO THE EAST WILL BE PLACED IN CONSERVATION.
43. ANY MODIFICATION TO OWNERSHIP RIGHTS, SUCH AS THE CREATION OF CONDOMINIUMS, WOULD REQUIRE PLANNING BOARD APPROVAL.
44. ANY INTERIOR STONE WALLS WILL BE REUSED ON SITE.
45. APPLICANT SHALL COMPLETE LAND USE DEVELOPMENT TRACKING FORM, MOST RECENTLY REVISED VERSION, UTILIZING THE ONLINE POLLUTION TRACKING AND ACCOUNTING PILOT PROJECT (PTAPP) PORTAL. HTTPS://WWW.UNH.EDU/UNHSC/PTAPP



NO.	DATE	REVISIONS	BY
2.	2/1/21	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21	MCS
1.	1/4/21	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20	MCS
0.	11/25/20	PRELIMINARY SUBMISSION	MCS

SEAL

MICHAEL C. SIEVERT No. 9397 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

DATE ISSUED: 11/25/20
SCALE: 1"=40'
DESIGNED BY: MJS
DRAWN BY: MCS
APPROVED BY: MJS
DWG FILE: 20011 Civil_K.dwg

SITE PLAN
prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP I, LOT 6
54 BACK RIVER ROAD, DOVER, NH

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone (603) 659-2970 Fax (603) 659-4627
E-mail: mjs@mjs-engineering.com

JOB: 20-011

C-101

(P20-60)

P:\20proj\20-011\Internal\Drawing Files\20011 Civil_K.dwg
2021-1-9 01:13:19

N

TAX MAP I, LOT 6C
NATHAN & TINA TSAKIRIS
46 BACK RIVER RD
DOVER, NH 03820
SCRD BOOK 4716, PAGE 411

TAX MAP I, LOT 6C-1
TIMOTHY & LAURALEE MCGUANA
8 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4480, PAGE 591

TAX MAP I, LOT 6C-2
SCOTT L. & AMY M. ROY
12 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4690, PAGE 772

TAX MAP I, LOT 6C-3
SHARI & TERRY ROBINSON
16 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4577 PAGE 498

TAX MAP I, LOT 6C-4
SEBASTIÃO H. DEOLIVEIRA
DEBRA A. MERRETT-DEOLIVEIRA
20 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4570, PAGE 416

TAX MAP I, LOT 6C-5
JOSHUA KELLER
24 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4639, PAGE 781

TAX MAP I, LOT 6C-6
WILLIAM R. & MARILYN HARBRON
28 REB BARN DR
DOVER, NH 03820
SCRD BOOK 4557, PAGE 785

TAX MAP I, LOT 6C-OPN
RIDGESTONE BUILDERS & DEVELOPERS, LLC
9 KINGS GRANT DR
ATKINSON, NH 03811
SCRD BOOK 4348, PAGE 419

TAX MAP I, LOT 6A
FRANK CROSSMAN JR.
50 BACK RIVER RD
DOVER, NH 03820
SCRD BOOK 1768, PAGE 621

TAX MAP I, LOT 6D
LANCE W. HELLMAN REV. TRUST
228 HIGHLAND AVENUE
PORTSMOUTH, NH 03801
SCRD BOOK 2219, PAGE 571

BACK RIVER ROAD

UNCOMMON DRIVE

EX. HOUSE

P.CB1
RIM = 125.00
(NW) 12" INV. IN = 120.50
(SW) 12" INV. IN = 119.75
(SE) 18" INV. OUT = 119.50

P.CB2
RIM = 126.50
(NE) 12" INV. OUT = 121.50

P.CB3
RIM = 126.80
(SE) 12" INV. OUT = 121.80

P.CB4
RIM = 132.30
(W) 12" INV. IN = 127.30
(N) 12" INV. OUT = 126.80

P.CB5
RIM = 127.50
(S) 12" INV. IN = 123.00
(NE) 15" INV. OUT = 122.25

P.CB7
RIM = 120.67
(SW) 18" INV. IN = 116.00
(NE) 18" INV. IN = 115.00
(NW) 12" INV. IN = 115.90
(S) 24" INV. OUT = 114.00

P.CB8
RIM = 120.47
(NW) 12" INV. IN = 115.80
(SW) 18" INV. OUT = 115.70

P.CB9
RIM = 120.94
(SE) 12" INV. OUT = 117.00

P.CB10
RIM = 133.40
(E) 12" INV. OUT = 128.00

P.CB11
RIM = 126.00
(N) 12" INV. OUT = 120.00

P.CB12
RIM = 0.73
(SE) 12" INV. OUT = 116.70

CB#6
RIM = 124.58
(SW) 15" INV. IN = 120.58
(NW) 18" INV. IN = 118.00
(S) 12" INV. IN = 117.70
(NE) 18" INV. OUT = 117.70

12" HDPE L = 63.5' S = 2.0%
12" HDPE L = 116.5' S = 1.5%
18" HDPE L = 360' S = 1.5%
18" HDPE L = 111.7' S = 1.5%
12" HDPE L = 103.5' S = 3.4%
12" HDPE L = 44.8' S = 2.7%
12" HDPE L = 23.4' S = 3.0%
8" HDPE L=32', S=1.9%
12" HDPE L = 100.5' S = 0.9%
18" HDPE S = 1.0% L = 11.8'

PROP. RET. WALL WITH GUARDRAIL
PUMP STATION
VALVE PIT
RIPRAP WITH GEOTEXTILE
IRON SEDG FOREBAY
PROP. SILT SOCK OR SILT FENCE
PROP. BIORETENTION BASIN
6" UNDERDRAIN INV. = 96.3
RIPRAP SPILLWAY WITH GEOTEXTILE
OUTLET CONTROL DEVICE
BEEHIVE INV. (TOP) = 100.2
6" UNDERDRAIN INV. IN = 96.3
6" INV. OUT = 96.0
INV. = 95.5
RIPRAP SPILLWAY WITH GEOTEXTILE
WALKING PATH
5' WIDE PATH

0 30 60 100
SCALE: 1" = 30'

NO.	DATE	INT.
2.	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21	2/1/21	MCS
1.	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20	1/4/21	MCS
0.	PRELIMINARY SUBMISSION	11/25/20	MCS

REVISIONS

SEAL
MICHAEL C. SIEVERT No. 8397 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

DATE ISSUED: 11/25/20
SCALE: 1"=40'
DESIGNED BY: MJS
DRAWN BY: MCS
APPROVED BY: MJS
DWG FILE: 20011 Civil_K.dwg

GRADING, DRAINAGE, & EROSION CONTROL PLAN
prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP I, LOT 6
54 BACK RIVER ROAD, DOVER, NH

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad Sr., P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-5956 Fax: (603) 659-4427
E-mail: mjs@mjs-engineering.com

JOB: 20-011

C-102

(P20-60)

P:\20proj\20-011\Internal\Drawing Files\20011 Civil_K.dwg
2021-10-01T13:19

TAX MAP I, LOT 6C
NATHAN & TINA TSAKIRIS
46 BACK RIVER RD
DOVER, NH 03820
SCRD BOOK 4716, PAGE 411

TAX MAP I, LOT 6C-1
TIMOTHY & LAURALEE MCGUANA
8 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4480, PAGE 591

TAX MAP I, LOT 6C-2
SCOTT L. & AMY M. ROY
12 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4690, PAGE 772

TAX MAP I, LOT 6C-3
SHARI & TERRY ROBINSON
16 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4577 PAGE 498

TAX MAP I, LOT 6C-4
SEBASTIÃO H. DEOLIVEIRA
DEBRA A. MERRETT-DEOLIVEIRA
20 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4570, PAGE 476

TAX MAP I, LOT 6C-5
JOSHUA KELLER
24 RED BARN DR
DOVER, NH 03820
SCRD BOOK 4639, PAGE 781

TAX MAP I, LOT 6C-6
WILLIAM R. & MARILYN HARBRON
28 REB BARN DR
DOVER, NH 03820
SCRD BOOK 4557, PAGE 785

TAX MAP I, LOT 6C-OPN
RIDGESTONE BUILDERS & DEVELOPERS, LLC
9 KINGS GRANT DR
ATKINSON, NH 03811
SCRD BOOK 4348, PAGE 419

TAX MAP I, LOT 6A
FRANK CROSSMAN JR.
50 BACK RIVER RD
DOVER, NH 03820
SCRD BOOK 1768, PAGE 621

TAX MAP I, LOT 6D
LANCE W. HELLMAN REV. TRUST
228 HIGHLAND AVENUE
PORTSMOUTH, NH 03801
SCRD BOOK 2219, PAGE 571

TAX MAP I, LOT 6 I-1

TAX MAP I, LOT 5
CAMPBELL REALTY TRUST
66 UPTOWN ROAD

BACK RIVER ROAD

UNCOMMON DRIVE

EX. SMH
RIM = 144.9
EX. INV. OUT = 137.65
PROP. INV. IN = 137.9
APPROXIMATE, VERIFY IN FIELD

PROP. SMH
RIM = 144.1
FORCEMAIN INV. IN = 137.65
8" INV. OUT = 138.6

PROP. GAS LINE

PROP. 12X6 SS
TAPPING AND GATE

EX HOUSE

P.CB10
RIM = 133.40
(E) 12" INV. OUT = 128.00

SMH5
RIM = 0.00
(S) 6" INV. IN = 120.58
(NE) 6" INV. OUT = 120.48

P.CB2
RIM = 126.50
(NE) 12" INV. OUT = 121.50

SEWER SERVICE (TYP.)
4" SDR 35
MIN. S=0.01

P.CB1
RIM = 125.00
(NW) 12" INV. IN = 120.50
(SW) 12" INV. IN = 119.75
(SE) 18" INV. OUT = 119.50

WATER SERVICE (TYP.)
3/4" CTS HDPE

6" HDPE WATER

P.CB3
RIM = 126.80
(SE) 12" INV. OUT = 121.80

SMH1 (OUTSIDE DROP)
RIM = 126.10
(SW) 6" INV. IN = 118.78
(NE) 6" INV. IN = 113.50
(SE) 8" INV. OUT = 113.40

P.CB12
RIM = 0.33
(SE) 12" INV. OUT = 116.70

SMH7
RIM = 121.90
(SW) 6" INV. OUT = 115.00

SEWER SERVICE (TYP.)
4" SDR 35
MIN. S=0.01
SEE TYP. BUILDING SEWER
CONNECTION FOR DETAILS

P.CB9
RIM = 120.94
(SE) 12" INV. OUT = 117.06

P.CB8
RIM = 120.47
(NW) 12" INV. IN = 115.80
(SW) 18" INV. OUT = 115.70

P.CB7
RIM = 120.67
(SW) 18" INV. IN = 116.00
(NE) 18" INV. IN = 115.00
(NW) 12" INV. IN = 115.90
(S) 24" INV. OUT = 114.00

SMH2
RIM = 124.00
(S) 6" INV. IN = 114.20
(NE) 6" INV. OUT = 113.80

CB#6
RIM = 124.50
(SW) 15" INV. IN = 119.00
(NW) 18" INV. IN = 118.00
(S) 12" INV. IN = 118.30
(NE) 18" INV. OUT = 117.70

P.CB5
RIM = 127.50
(S) 12" INV. IN = 123.00
(NE) 15" INV. OUT = 122.25

SMH6
RIM = 127.00
(N) 6" INV. OUT = 121.50

P.CB4
RIM = 132.30
(W) 12" INV. IN = 127.30
(N) 12" INV. OUT = 126.80

6" DI TO
6" HDPE

CURB STOP (TYP.)

P.CB11
RIM = 126.00
(N) 12" INV. OUT = 120.00

8" HDPE
L=32', S=1.9%

OUTLET CONTROL DEVICE
BEEHIVE INV. (TOP) = 100.2
6" UNDERDRAIN INV. IN = 96.3
6" INV. OUT = 96.0

SMH4
RIM = 123.08
(N) 6" INV. OUT = 119.73

PROP. GRAVITY SEWER
TO CENTRAL PUMP TANK

6" UNDERDRAIN
INV. = 96.3

PROP. SANITARY SEWER PUMP TANK
W/ TRANSFER SWITCH AND
EMERGENCY GEN. TIE IN
TOP=122.0
INV. IN=112.13

SMH3
RIM = 121.70
(NW) 8" INV. IN = 112.48
(SW) 6" INV. IN = 112.50
(NE) 8" INV. OUT = 112.38

PROP. DUMPSTER PAD
AND SCREENED DUMPSTERS

12" HDPE
L = 100.5'
S = 0.9%

6" DI TO
6" HDPE

HYD

0 30 60 100
SCALE: 1" = 30'

NO.	DATE	INT.
2.	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21	2/1/21	MCS
1.	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20	1/4/21	MCS
0.	PRELIMINARY SUBMISSION	11/25/20	MCS

REVISIONS

SEAL
MICHAEL C. SIEVERT No. 9397 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

DATE ISSUED: 11/25/20
SCALE: 1"=30'
DESIGNED BY: MJS
DRAWN BY: MCS
APPROVED BY: MJS
DWG FILE: 20011 Civil_K.dwg

UTILITIES PLAN
prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP I, LOT 6
54 BACK RIVER ROAD, DOVER, NH

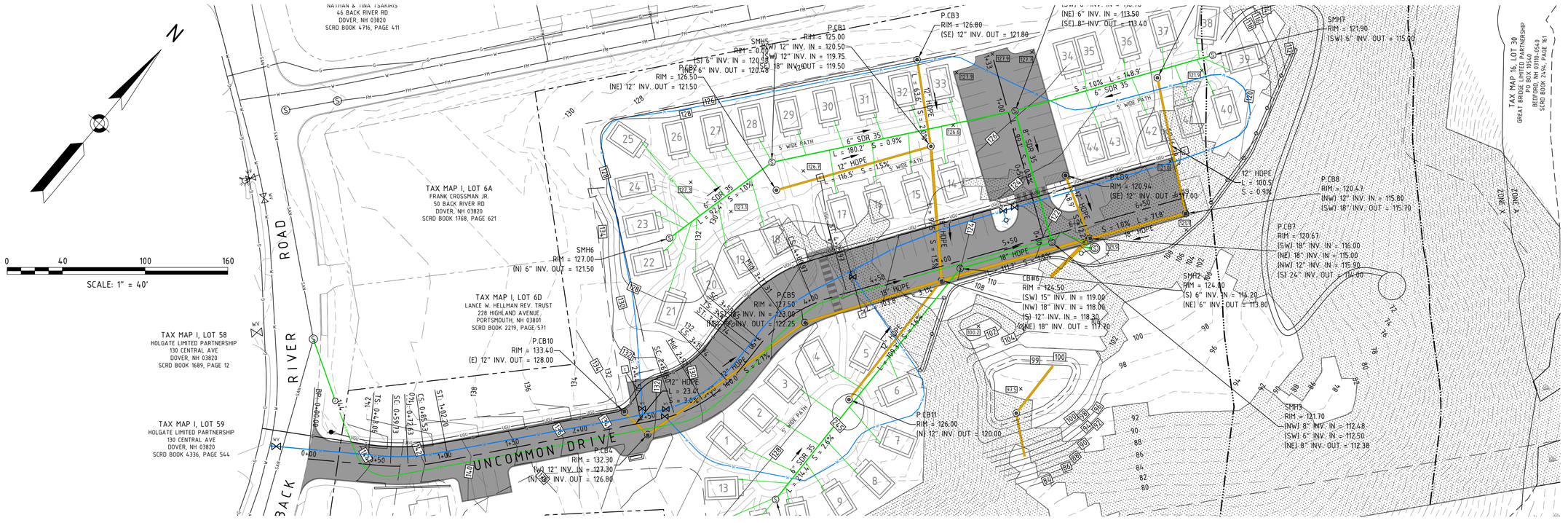
MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-5945 Fax: (603) 659-4627
E-mail: mjs@mjs-engineering.com

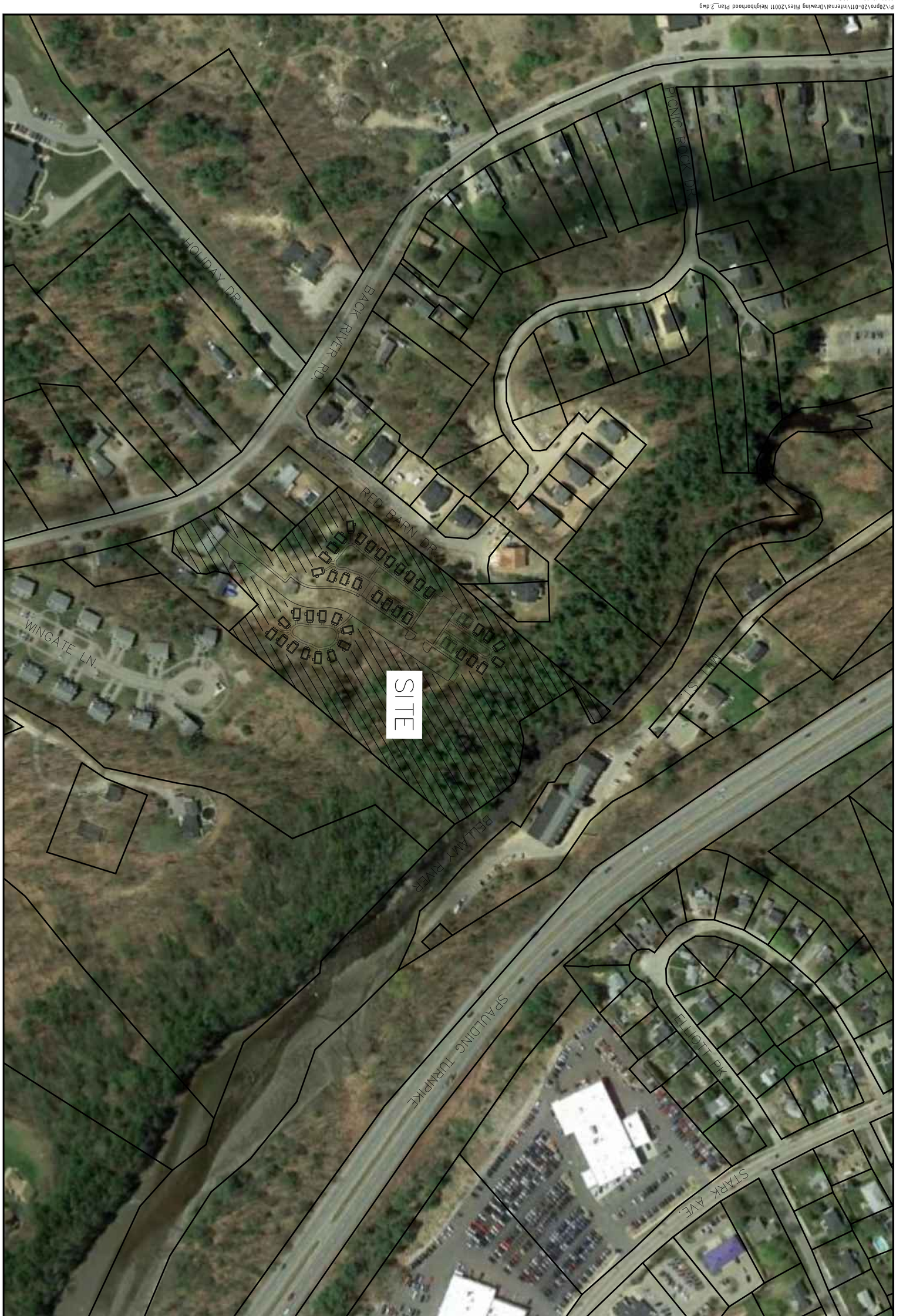
JOB: 20-011

C-103

(P20-60)

P:\20proj\20-011\Internal\Drawing Files\20011 Civil_K.dwg
2021-10-01T13:18


N
0
40
100
160
SCALE: 1" = 40'
NATHAN & TINA ISAAKIS
46 BACK RIVER RD
DOVER, NH 03820
SCRD BOOK 4716, PAGE 411
TAX MAP I, LOT 6A
FRANK CROSSMAN JR.
50 BACK RIVER RD
DOVER, NH 03820
SCRD BOOK 1768, PAGE 621
TAX MAP I, LOT 6D
LANCE W. HELLMAN REV. TRUST
228 HIGHLAND AVENUE
PORTSMOUTH, NH 03801
SCRD BOOK 2219, PAGE 571
TAX MAP I, LOT 58
HOLGATE LIMITED PARTNERSHIP
130 CENTRAL AVE
DOVER, NH 03820
SCRD BOOK 1689, PAGE 12
TAX MAP I, LOT 59
HOLGATE LIMITED PARTNERSHIP
130 CENTRAL AVE
DOVER, NH 03820
SCRD BOOK 4336, PAGE 544
TAX MAP 16, LOT 30
GREAT BRIDGE LIMITED PARTNERSHIP
PO BOX 5545
BEDFORD, NH 03110-0540
SCRD BOOK 2494, PAGE 161
BACK RIVER ROAD
UNCOMMON DRIVE
COTTAGE DRIVE
ZONE X
SMH5
RIM = 0.00
(NW) 12" INV. IN = 120.50
(W) 12" INV. IN = 119.75
(S) 6" INV. IN = 120.58
(SE) 18" INV. OUT = 119.50
P.CB1
RIM = 125.00
P.CB2
RIM = 126.50
(NE) 12" INV. OUT = 121.50
P.CB3
RIM = 126.80
(SE) 12" INV. OUT = 121.80
SMH6
RIM = 127.00
(N) 6" INV. OUT = 121.50
P.CB5
RIM = 127.50
(S) 6" INV. IN = 123.00
(NW) 6" INV. OUT = 122.25
P.CB10
RIM = 133.40
(E) 12" INV. OUT = 128.00
P.CB4
RIM = 132.30
(W) 12" INV. IN = 127.30
(N) 12" INV. OUT = 126.80
P.CB11
RIM = 126.00
(N) 12" INV. OUT = 120.00
CB6
RIM = 124.50
(SW) 15" INV. IN = 119.00
(NW) 18" INV. IN = 118.00
(S) 12" INV. IN = 118.30
(NE) 18" INV. OUT = 117.20
SMH2
RIM = 124.40
(S) 6" INV. IN = 114.20
(NE) 6" INV. OUT = 113.80
P.CB7
RIM = 120.67
(SW) 18" INV. IN = 116.00
(NE) 18" INV. IN = 115.00
(NW) 12" INV. IN = 115.90
(SE) 24" INV. OUT = 114.60
P.CB8
RIM = 120.47
(NW) 12" INV. IN = 115.80
(SW) 18" INV. OUT = 115.70
SMH7
RIM = 121.90
(S) 6" INV. OUT = 115.50
SMH3
RIM = 121.70
(NW) 8" INV. IN = 112.48
(SW) 6" INV. IN = 112.50
(NE) 8" INV. OUT = 112.38
12" HDPE
L = 23.4'
S = 3.0%
12" HDPE
L = 116.5'
S = 1.5%
12" HDPE
L = 100.5'
S = 0.9%
18" HDPE
L = 71.8'
S = 1.0%
6" SDR 35
L = 148.9'
S = 1.0%
6" SDR 35
L = 180.2'
S = 0.9%
6" SDR 35
L = 97.4'
S = 1.0%
6" SDR 35
L = 63.4'
S = 2.8%
6" SDR 35
L = 89.4'
S = 2.4%
6" SDR 35
L = 89.4'
S = 2.4%
6" SDR 35
L = 89.4'
S = 2.4



P:\20pro\20-011\Internal\Drawing Files\20011 Neighborhood Plan_2.dwg
2020-12-29 02:34 pm

C-301

(P20-60)

JOB: 20-011

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-4979, Fax: (603) 659-4627
E-mail: mjs@mjs-engineering.com

NEIGHBORHOOD PLAN

prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP I, LOT 6

DATE ISSUED:	12/29/20
SCALE:	1"=100'
DESIGNED BY:	MJS
DRAWN BY:	AWS
APPROVED BY:	MJS
DWG FILE:	20011 Neighborhood Plan_2

SEAL

STATE OF NEW HAMPSHIRE
MICHAEL J. SIEVERT
No. 8307
LICENSED PROFESSIONAL ENGINEER

NO.	REVISIONS	DATE	INT.
1.	REVISIONS PER TRC #1	12/29/20	MJS
0.	INITIAL SUBMISSION TO DOVER	9/17/20	MJS

P:\20proj\20-011\Internal\Drawing Files\Civil Details c.dwg
2021.02.01 10:37 am

CONSTRUCTION SEQUENCING AND EROSION CONTROL NOTES:

AREA OF DISTURBANCE/STABILIZATION
A. THE SMALLEST PRACTICAL AREA SHALL BE DISTURBED DURING CONSTRUCTION, BUT IN NO CASE SHALL THE AREA OF UNSTABILIZED SOIL EXCEED 5 ACRES AT ANY ONE TIME BEFORE THE AREA IS STABILIZED.
B. AN AREA SHALL BE CONSIDERED STABLE IF ONE OF THE FOLLOWING HAS OCCURRED:
1. IN AREAS TO BE PAVED, BASE COURSE GRAVELS MEETING THE GRADATION REQUIREMENTS OF NHDOT STANDARD SPECIFICATION FOR ROAD AND BRIDGE CONSTRUCTION, 2006, ITEM NO. 304.1 OR 304.2 HAVE BEEN INSTALLED;
2. IN AREAS NOT TO BE PAVED
2.A. A MINIMUM OF 85% VEGETATED GROWTH HAS BEEN ESTABLISHED;
2.B. A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIPRAP HAS BEEN INSTALLED;
2.C. EROSION CONTROL BLANKETS HAVE BEEN INSTALLED IN ACCORDANCE WITH ENV-WQ 1506.03.
C. DISTURBED AREAS SHALL BE TEMPORARILY STABILIZED WITHIN 45 DAYS AND PERMANENTLY STABILIZED NO LATER THAN 3 DAYS AFTER FINAL GRADING.

EROSION CONTROL PRACTICES:
A. INSTALLATION:
1. INSTALL ALL EROSION CONTROLS AS SHOWN ON THE GRADING PLAN, TYPICAL DETAILS, AND IN CONFORMANCE WITH THE EROSION AND SEDIMENT CONTROL NOTES ON THIS PAGE. MANUFACTURER'S SPECIFICATIONS SHALL BE FOLLOWED.
B. INSPECTION:
1. INSPECT ALL EROSION CONTROLS WEEKLY AND AFTER EVERY RAIN EVENT OF 0.5 INCHES OR GREATER UNLESS OTHERWISE NOTED.
2. TEMPORARY STABILIZATION PRACTICES SHALL BE INSPECTED ONCE PER WEEK DURING CONSTRUCTION UNTIL EXPOSED SURFACES ARE STABILIZED.
3. ANY SIGNS OF RILL OR GULLY EROSION SHALL BE IMMEDIATELY REPAIRED.
C. MAINTENANCE:
1. MAINTAIN EROSION CONTROLS PER THE TYPICAL DETAILS AND IN CONFORMANCE WITH THE EROSION AND SEDIMENT CONTROL NOTES ON THIS PAGE.
D. REMOVAL
1. ALL TEMPORARY EROSION CONTROL MEASURES SHALL BE REMOVED ONCE 85% VEGETATIVE COVER HAS BEEN ESTABLISHED.
2. AFTER REMOVAL, ALL DISTURBED AREAS SHALL BE REGRADED, FERTILIZED, AND RESEEDED. MONITOR TO ENSURE VEGETATIVE GROWTH IS ESTABLISHED AND REPAIR AS NEEDED UNTIL MINIMUM OF 85% VEGETATIVE COVER IS ESTABLISHED.

PROTECTED SHORELAND REQUIREMENTS

A. ALL WORK SHALL CONFORM TO THE COMPREHENSIVE SHORELAND PROTECTION ACT AND CITY OF DOVER SHORELAND PROTECTION OVERLAY DISTRICT.
B. WITHIN 3 DAYS OF FINAL GRADING OR TEMPORARY SUSPENSION OF WORK IN AN AREA THAT IS IN THE PROTECTED SHORELAND, ALL EXPOSED SOIL AREAS SHALL BE STABILIZED BY:
1. SEEDING AND MULCHING, IF DURING THE GROWING SEASON
2. MULCHING WITH TACK OR NETTING IF NOT WITHIN THE GROWING SEASON
3. A MINIMUM OF 3" OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIPRAP HAS BEEN INSTALLED;
4. EROSION CONTROL BLANKETS HAVE BEEN INSTALLED IN ACCORDANCE WITH ENV-WQ 1506.03.
C. FERTILIZER
1. LOW PHOSPHATE, SLOW RELEASE NITROGEN FERTILIZER (NOT MORE THAN 2% PHOSPHORUS AND A NITROGEN COMPONENT WHICH IS AT LEAST 50% SLOW RELEASE NITROGEN COMPONENTS) SHALL BE USED BEYOND 25 FEET FROM THE REFERENCE LINE.
2. APPLY 10-0-10 LOW PHOSPHATE FERTILIZER AT A RATE OF 600 lb./Ac.
3. APPLY LIMESTONE (EQUIVALENT TO 50% CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF 3 TONS/ACRE.

COLD WEATHER SITE STABILIZATION

A. ALL PROPOSED VEGETATED AREAS THAT DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY NOVEMBER 30TH, OR WHICH ARE DISTURBED AFTER OCTOBER 15TH, SHALL BE STABILIZED BY SEEDING AND INSTALLING EROSION CONTROL BLANKETS ON SLOPES GREATER THAN 3:1, AND SEEDING AND PLACING 3 TO 4 TONS OF MULCH PER ACRE, SECURED WITH ANCHORED NETTING, ELSEWHERE. THE INSTALLATION OF EROSION CONTROL BLANKETS OR MULCH AND NETTING SHALL NOT OCCUR OVER ACCUMULATED SNOW OR ON FROZEN GROUND AND SHALL BE COMPLETED IN ADVANCE OF THAW OR SPRING MELT EVENTS.
B. ALL DITCHES OR SWALES WHICH DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15TH, OR WHICH ARE DISTURBED AFTER OCTOBER 15TH, SHALL BE STABILIZED TEMPORARILY WITH STONE OR EROSION CONTROL BLANKETS APPROPRIATE FOR THE DESIGN FLOW CONDITIONS.
C. AFTER NOVEMBER 15TH, INCOMPLETE ROAD OR PARKING SURFACES, WHERE WORK HAS STOPPED FOR THE WINTER SEASON, SHALL BE PROTECTED WITH A MINIMUM OF 3 INCHES OF CRUSHED GRAVEL PER NHDOT ITEM 304.3.

TEMPORARY VEGETATION
(REFER TO PROTECTED SHORELAND REQUIREMENTS FOR WORK WITHIN THE PROTECTED SHORELAND)

A. SITE PREPARATION
1. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AS SPECIFIED ABOVE.
2. ENSURE RUNOFF IS DIVERTED FROM SEEDED AREA.
3. ON SLOPES OF 4:1 OR STEEPER, CREATE HORIZONTAL GROOVES PERPENDICULAR TO THE DIRECTION OF THE SLOPE TO CATCH SEED AND REDUCE RUNOFF.
B. SEED BED PREPARATION
1. REMOVE STONES AND TRASH FROM AREA TO BE SEEDED.
2. COMPACTED SOIL SHALL BE LOOSENED TO A DEPTH OF 2 INCHES BEFORE APPLYING FERTILIZER, LIME, AND SEED.
3. APPLY FERTILIZER AT A RATE OF 600 LBS PER ACRE OF 10-10-10. APPLY LIMESTONE (EQUIVALENT TO 50 PERCENT CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF 3 TONS PER ACRE.
C. SEEDING
1. SEED PER THE FOLLOWING RECOMMENDATIONS

SEASON	APPLICATION DATE	MIXTURE TYPE	QUANTITY (lb./Ac.)
EARLY SPRING	NO LATER THAN 5/15	OATS	80
LATE SPRING/ FALL	4/1 TO 6/1 & 8/15 TO 9/15	PERENNIAL RYE	30
EARLY SPRING/ FALL	4/1 TO 5/15 & 8/15 TO 9/15	ANNUAL RYE	40
FALL	8/15 TO 9/15	WINTER RYE	112

2. APPLY SEED UNIFORMLY BY HAND, CYCLONE SEEDER, DRILL, CULTIPACKER TYPE SEEDER OR HYDROSEEDER (SLURRY INCLUDING SEED AND FERTILIZER). NORMAL SEEDING DEPTH IS FROM ¼ TO ½ INCH. HYDROSEEDING THAT INCLUDES MULCH MAY BE LEFT ON SOIL SURFACE. SEEDING RATES MUST BE INCREASED 10% WHEN HYDROSEEDING.
3. TEMPORARY SEEDING SHOULD TYPICALLY OCCUR PRIOR TO SEPTEMBER 15TH.
4. AREAS SEEDED BETWEEN MAY 15TH AND AUGUST 15TH SHOULD BE COVERED WITH HAY OR STRAW MULCH.
5. VEGETATED GROWTH COVERING AT LEAST 85% OF THE DISTURBED AREA SHOULD BE ACHIEVED PRIOR TO OCTOBER 15TH. IF THIS CONDITION IS NOT ACHIEVED, IMPLEMENT OTHER TEMPORARY STABILIZATION MEASURES FOR OVERWINTER PROTECTION.
D. MAINTENANCE
1. TEMPORARY SEEDING SHOULD BE INSPECTED WEEKLY AND AFTER ANY RAINFALL EXCEEDING ½ INCH IN 24 HOURS ON ACTIVE CONSTRUCTION SITES. TEMPORARY SEEDING SHOULD ALSO BE INSPECTED JUST PRIOR TO SEPTEMBER 15, TO ASCERTAIN WHETHER ADDITIONAL SEEDING IS REQUIRED TO PROVIDE STABILIZATION OVER THE WINTER PERIOD.
2. BASED ON INSPECTION, AREAS SHOULD BE RESEEDED TO ACHIEVE FULL STABILIZATION OF EXPOSED SOILS. IF IT IS TOO LATE IN THE PLANTING SEASON TO APPLY ADDITIONAL SEED, THEN OTHER TEMPORARY STABILIZATION MEASURES SHOULD BE IMPLEMENTED.
3. AT A MINIMUM, 85% OF THE SOIL SURFACE SHOULD BE COVERED BY VEGETATION.
4. IF ANY EVIDENCE OF EROSION OR SEDIMENTATION IS APPARENT, REPAIRS SHOULD BE MADE AND AREAS SHOULD BE RESEEDED, WITH OTHER TEMPORARY MEASURES (E.G., MULCH) USED TO PROVIDE EROSION PROTECTION DURING THE PERIOD OF VEGETATION ESTABLISHMENT.

PERMANENT VEGETATION
(REFER TO PROTECTED SHORELAND REQUIREMENTS FOR WORK WITHIN THE PROTECTED SHORELAND)

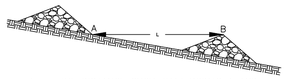
A. SITE PREPARATION
1. REFER TO SITE PREPARATION FOR TEMPORARY SEEDING.
B. SEED BED PREPARATION
1. WORK LIME AND FERTILIZER INTO THE SOIL AS NEARLY AS PRACTICAL TO A DEPTH OF 4 INCHES WITH A DISC, SPRING TOOTH HARROW OR OTHER SUITABLE EQUIPMENT. THE FINAL HARROWING OPERATION SHOULD BE ON THE GENERAL CONTOUR. CONTINUE TILLAGE UNTIL A REASONABLY UNIFORM, FINE SEEDBED IS PREPARED. ALL BUT CLAY OR SILTY SOILS AND COARSE SANDS SHOULD BE ROLLED TO FIRM THE SEEDBED WHEREVER FEASIBLE.
2. REMOVE FROM THE SURFACE ALL STONES 2 INCHES OR LARGER IN ANY DIMENSION. REMOVE ALL OTHER DEBRIS, SUCH AS WIRE, CABLE, TREE ROOTS, CONCRETE, CLODS, LUMPS, TRASH OR OTHER UNSUITABLE MATERIAL.
3. INSPECT SEEDBED JUST BEFORE SEEDING. IF TRAFFIC HAS LEFT THE SOIL COMPACTED; THE AREA MUST BE TILLED AND FIRMED AS ABOVE.
4. WHERE THE SOIL HAS BEEN COMPACTED BY CONSTRUCTION OPERATIONS, LOOSEN SOIL TO A DEPTH OF 2 INCHES BEFORE APPLYING FERTILIZER, LIME AND SEED.
5. APPLY FERTILIZER AT A RATE OF 600 LBS PER ACRE OF 10-10-10. APPLY LIMESTONE (EQUIVALENT TO 50 PERCENT CALCIUM PLUS MAGNESIUM OXIDE) AT A RATE OF 3 TONS PER ACRE.
C. SEEDING
1. UNLESS OTHERWISE NOTED, GRASS SEED MIXTURE 'C' SHALL BE APPLIED AT THE SPECIFIED RATE AS NOTED IN THE 'SEED MIXTURES FOR PERMANENT VEGETATION' TABLE.
2. APPLY SEED UNIFORMLY BY HAND, CYCLONE SEEDER, DRILL, CULTIPACKER TYPE SEEDER OR HYDROSEEDER (SLURRY INCLUDING SEED AND FERTILIZER). NORMAL SEEDING DEPTH IS FROM ¼ TO ½ INCH. HYDROSEEDING THAT INCLUDES MULCH MAY BE LEFT ON SOIL SURFACE. SEEDING OPERATIONS SHOULD BE ON THE CONTOUR.
3. WHERE FEASIBLE, EXCEPT WHERE EITHER A CULTIPACKER TYPE SEEDER OR HYDROSEEDER IS USED, THE SEEDBED SHOULD BE FIRMED FOLLOWING SEEDING OPERATIONS WITH A ROLLER, OR LIGHT DRAG.
4. WHEN HYDROSEEDING (HYDRAULIC APPLICATION), PREPARE THE SEEDBED AS SPECIFIED ABOVE OR BY HAND RAKING TO LOOSEN AND SMOOTH THE SOIL AND TO REMOVE SURFACE STONES LARGER THAN 2 INCHES IN DIAMETER.
5. SLOPES MUST BE NO STEEPER THAN 2 TO 1.
6. LIME AND FERTILIZER MAY BE APPLIED SIMULTANEOUSLY WITH THE SEED. THE USE OF FIBER MULCH ON CRITICAL AREAS IS NOT RECOMMENDED (UNLESS IT IS USED TO HOLD STRAW OR HAY). BETTER PROTECTION IS GAINED BY USING STRAW MULCH AND HOLDING IT WITH ADHESIVE MATERIALS OR 500 POUNDS PER ACRE OF WOOD FIBER MULCH.
7. SEEDING RATES MUST BE INCREASED 10% WHEN HYDROSEEDING.
D. MAINTENANCE
1. PERMANENTLY SEEDED AREAS SHOULD BE INSPECTED MONTHLY.
2. MOW SEEDED AREAS AS NECESSARY.
3. BASED ON INSPECTION, AREAS SHOULD BE REPAIRED AND/OR RESEEDED TO ENSURE 85% OF THE SOIL SURFACE IS COVERED BY VEGETATION.

MULCHING & EROSION CONTROL MATTING
A. GENERAL
1. APPLY PRIOR TO A STORM EVENT. CLOSELY MONITOR THE WEATHER TO HAVE ADEQUATE WARNING OF SIGNIFICANT STORMS.
2. MULCHING WITHIN A SPECIFIED TIME PERIOD FROM ORIGINAL SOIL EXPOSURE
2.A. WITHIN 100 FEET OF WETLANDS THE TIME PERIOD SHOULD BE NO GREATER THAN 7 DAYS.
2.B. IN OTHER AREAS IT SHALL BE NO GREATER THAN 14 DAYS.
B. TEMPORARY MULCHING
1. HAY OR STRAW MULCHES
1.A. ORGANIC MULCHES INCLUDING HAY AND STRAW SHALL BE AIR-DRIED, FREE OF UNDESIRABLE SEEDS AND COARSE MATERIALS.
1.B. APPLICATION RATE SHALL BE 2 BALES/1,000 SF (70-90 POUNDS) OR 1.5-2.0 TONS/ACRE TO COVER 75-90% OF THE GROUND.
1.C. ANCHORING
1.C.1. EROSION CONTROL BLANKETS SHALL BE OF A WOVEN ORGANIC MATERIAL SUCH AS COCO MATTING. IT SHALL NOT CONSIST OF WELDED PLASTIC OR BIODEGRADABLE NETTING. INSTALL PER MANUFACTURERS SPECIFICATIONS.
1.C.2. TACKIFIER: APPLY POLYMER OR ORGANIC TACKIFIER TO ANCHOR HAY OR STRAW MULCH. APPLY PER MANUFACTURER'S SPECIFICATIONS. TYPICAL APPLICATION RATES ARE 40-60 LBS/ACRE FOR POLYMER MATERIAL AND 80-120 LBS/ACRE FOR ORGANIC LIQUID.
1.D. WINTER APPLICATION: APPLY TO A DEPTH OF 4 INCHES OR DOUBLE THE ABOVE LISTED APPLICATION RATE. NOTE THAT IF SEEDING IS NECESSARY, MULCH WILL NEED TO BE REMOVED AND THE AREA SEEDED AND MULCHED IN THE SPRING.
1.E. MAINTENANCE
1.E.1. INSPECT PERIODICALLY AND AFTER RAIN STORMS FOR RILLS OR DISPLACEMENT OF MULCH. REPAIR AS NECESSARY. CONTINUE INSPECTIONS UNTIL 85% VEGETATIVE COVER IS ESTABLISHED.
2. EROSION CONTROL BLANKET OR MATTING
2.A. EROSION CONTROL BLANKETS SHALL BE OF A WOVEN ORGANIC MATERIAL SUCH AS COCO MATTING. IT SHALL NOT CONSIST OF WELDED PLASTIC OR BIODEGRADABLE NETTING.
2.B. REFER TO PLANS FOR TYPICAL EROSION CONTROL MATTING DETAIL. INSTALL PER MANUFACTURERS SPECIFICATIONS.
2.C. APPLICATION AND TIMING
2.C.1. DURING THE GROWING SEASON (APRIL 15 – SEPTEMBER 15) USE ON THE BASE OF GRASSED WATERWAYS, STEEP SLOPES (15% OR GREATER), ANY DISTURBED SOIL WITHIN 100 FEET OF LAKES, STREAMS, AND WETLANDS.
2.C.2. DURING THE LATE FALL AND WINTER (SEPTEMBER 15 – APRIL 15) IN ADDITION TO THOSE LISTED ABOVE USE ON SIDE SLOPES OF GRASSED WATERWAYS AND MODERATE SLOPES (GREATER THAN 8%).
3. MAINTENANCE
3.A. INSPECT PERIODICALLY AND BEFORE AND AFTER STORM EVENTS TO ENSURE CONTACT WITH THE SOIL UNTIL 85% VEGETATIVE COVER IS ESTABLISHED. REPAIR AND RESTAPLE AS NECESSARY.
C. PERMANENT MULCHING
1. WOOD CHIPS OR GROUND BARK
1.A. APPLY TO A THICKNESS OF 2 TO 6 INCHES. TYPICAL APPLICATION RATES ARE 10-20 TONS/ACRE OR 460-920 POUNDS/1,000 SF.
1.B. MAINTENANCE: INSPECT ANNUALLY AND AFTER RAIN EVENTS OF 2.5 INCHES OR MORE IN A 24 HOUR PERIOD. REPAIR/REPLACE AS NECESSARY.
2. EROSION CONTROL MIX
2.A. COMPOSITION OF THE MIX SHALL BE AS FOLLOWS:
2.A.1. ORGANIC MATTER CONTENT SHALL BE BETWEEN 25-65% DRY WEIGHT BASIS.
2.A.2. PARTICLE SIZE BY WEIGHT SHOULD BE 100% PASSING THE 3" SCREEN, 90-100% PASSING THE 1" SCREEN, 70-100% PASSING THE 0.75 INCH SCREEN, AND 30-75% PASSING THE 0.25 INCH SCREEN.
2.A.3. THE ORGANIC PORTION SHALL BE ELONGATED AND FIBROUS. IT SHALL NOT CONTAIN WOOD AND BARK CHIPS, GROUND CONSTRUCTION DEBRIS, OR REPROCESSED WOOD PRODUCTS.
2.A.4. THE MIX SHALL NOT CONTAIN SILTS, CLAYS, OR FINE SANDS.
2.A.5. SOLUBLE SALTS CONTENT SHALL BE < 4.0MMHOS/CM AND A pH OF 5.0-8.0.
2.B. PLACEMENT OF BERM
2.B.1. PLACE BERM ALONG A LEVEL CONTOUR. BERM MUST BE A MINIMUM OF 12" HIGH ON THE UPHILL SIDE AND 2 FEET WIDE.
2.C. MAINTENANCE: INSPECT PERIODICALLY AND AUGMENT AS NEEDED TO MAINTAIN INITIAL THICKNESS. REPLACE IF NO LONGER FUNCTIONING AS INTENDED.

SOIL STOCKPILES
A. GENERAL
1. STOCKPILES MUST BE LOCATED 50 FEET FROM DITCHES AND CULVERT INLETS.
B. PROTECTION OF STOCKPILES
1. PROTECT SOIL AND AGGREGATE STOCKPILES WITH TEMPORARY PERIMETER SEDIMENT BARRIER SUCH AS SILT FENCE OR SILT SOCK.
2. COVER ACTIVE STOCKPILES WITH ANCHORED PROTECTIVE COVERING PRIOR TO EXPECTED STORM EVENTS.
3. INACTIVE STOCKPILES SHALL BE COVERED WITH ANCHORED TARPS OR TEMPORARILY SEEDED AND MULCHED PER THE TEMPORARY VEGETATION AND MULCHING NOTES ON THIS PAGE.
4. STOCKPILES THAT ARE A SOURCE OF DUST SHALL BE COVERED.

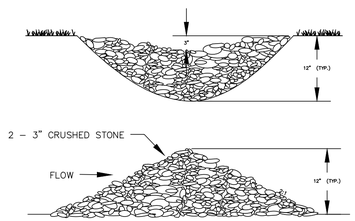
DUST CONTROL
A. DUST SHALL BE CONTROLLED ON SITE DURING CONSTRUCTION BY IMPLEMENTING THE FOLLOWING DUST CONTROL MEASURES
1. MULCHING AND VEGETATIVE COVER TO REDUCE DUST.
2. MECHANICAL SWEEPERS AND FINE WATER SPRAYS.
3. COVER SURFACES WITH CRUSHED STONE OR COARSE GRAVEL.

ADDITIONAL NOTES:
1. NO FUEL SHALL BE STORED ON SITE DURING CONSTRUCTION.
2. DURING CONSTRUCTION DUST SHALL BE PREVENTED FROM BECOMING A SAFETY OR HEALTH HAZARD BY THE IMPLEMENTATION OF ACCEPTED CONTROL METHODS SUCH AS WATERING.
3. ALL CONSTRUCTION MATERIALS THAT ARE SPILLED OR DEPOSITED ON THE PUBLIC ROADWAYS SHALL BE REMOVED BY THE CONTRACTOR.
4. DO NOT BEGIN CONSTRUCTION UNTIL ALL LOCAL, STATE, AND FEDERAL PERMITS HAVE BEEN APPLIED FOR AND RECEIVED.
5. THE GENERAL CONTRACTOR IS RESPONSIBLE TO VERIFY ALL DIMENSIONS, ELEVATIONS AND CONDITIONS AT THE SITE. ANY DISCREPANCIES SHALL BE BROUGHT TO THE ATTENTION OF THE DESIGN ENGINEER BEFORE PROCEEDING WITH THE AFFECTED PART OF THE WORK.



L = THE DISTANCE SUCH THAT POINTS A AND B ARE OF EQUAL ELEVATION.

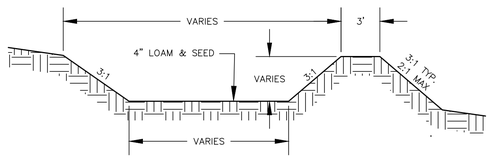
STONE CHECK DAM PROFILE VIEW
N.T.S



CONSTRUCTION SPECIFICATIONS:
1. STRUCTURES SHALL BE INSTALLED ACCORDING TO THE DIMENSIONS SHOWN ON THE PLANS AT THE APPROPRIATE SPACING.
2. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER SO THAT EROSION, AIR AND WATER POLLUTION WILL BE MINIMIZED.
5. STRUCTURES SHALL BE REMOVED FROM THE CHANNEL WHEN THEIR USEFUL LIFE HAS BEEN COMPLETED.

MAINTENANCE NOTES:
1. TEMPORARY GRADE STABILIZATION STRUCTURES SHOULD BE INSPECTED AFTER EACH STORM AND DAILY DURING PROLONGED STORM EVENTS. ANY DAMAGE TO THE STRUCTURES SHALL BE REPAIRED IMMEDIATELY.
2. PARTICULAR ATTENTION SHOULD BE GIVEN TO END RUN AND EROSION AT THE DOWNSTREAM TOE OF THE STRUCTURE.
3. WHEN REMOVING THE STRUCTURES, THE DISTURBED AREAS SHALL BE BROUGHT UP TO EXISTING CHANNEL GRADE AND THE AREAS PREPARED, SEEDED AND MULCHED.
4. SEDIMENT SHALL BE REMOVED FROM BEHIND THE STRUCTURES WHEN IT REACHES 1/2 THE ORIGINAL HEIGHT OF THE STRUCTURE.

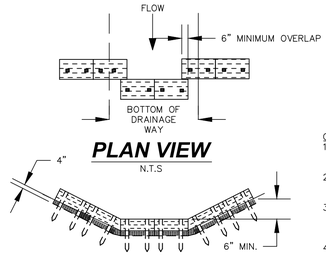
STONE CHECK DAM
N.T.S



CONVEYANCE SWALE DETAIL
N.T.S

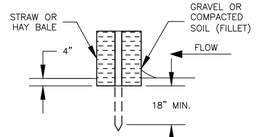
CONSTRUCTION NOTES:
1. REFER TO BERM CONSTRUCTION NOTES IN STORMWATER POND DETAIL FOR BERM CONSTRUCTION REQUIREMENTS.
2. SWALE SHALL HAVE GREATER THAN 85% VEGETATIVE GROWTH PRIOR TO RECEIVING RUNOFF.
3. REFER TO PERMANENT VEGETATION REQUIREMENTS FOR SEEDING REQUIREMENTS. SEED MIX 'C' SHALL BE APPLIED AT THE SPECIFIED RATE ON SHEET D1.

MAINTENANCE NOTES:
1. INSPECT ANNUALLY FOR EROSION, SEDIMENT ACCUMULATION, VEGETATION LOSS, AND PRESENCE OF INVASIVE SPECIES.
2. PERFORM PERIODIC MOWING. DO NOT MOW GRASS SHORTER THAN 4 INCHES.
3. REMOVE DEBRIS AND ACCUMULATED SEDIMENT BASED ON INSPECTION.
4. REPAIR ERODED AREAS, REMOVE INVASIVE SPECIES AND DEAD VEGETATION, AND RESEED WITH APPLICABLE GRASS MIX AS WARRANTED BY INSPECTION.



PLAN VIEW
N.T.S

DRAINAGE WAY CROSS-SECTION
N.T.S

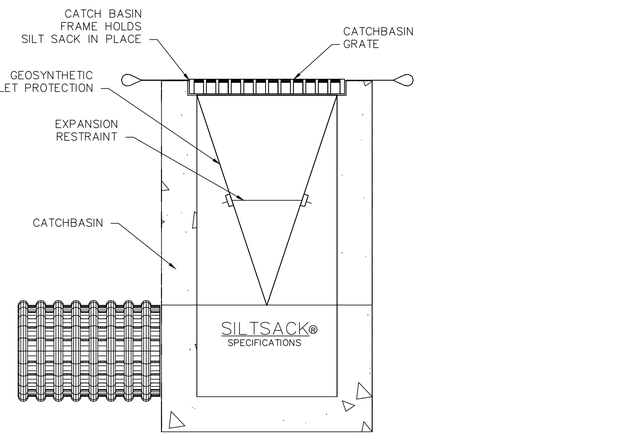


CROSS-SECTION
N.T.S

CONSTRUCTION SPECIFICATIONS:
1. STRUCTURES SHALL BE INSTALLED ACCORDING TO THE DIMENSIONS SHOWN ON THE PLANS AT THE APPROPRIATE SPACING.
2. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER SO THAT EROSION, AIR AND WATER POLLUTION WILL BE MINIMIZED.
3. HAY BALES SHALL BE PLACED IN ROWS WITH ENDS TIGHTLY ABUTTING. WHEN PLACED IN CHANNELS BALES SHALL BE STAGGERED AND OVERLAPPED AS SHOWN IN THE DETAIL.
4. HAY BALES SHALL BE EMBEDDED ONTO THE SOIL AT LEAST 4 INCHES.
5. HAY BALES SHALL BE ANCHORED INTO THE SOIL USING 2" X 2" STAKES DRIVEN THROUGH THE BALES AT LEAST 18" INTO THE SOIL.
6. STRUCTURES SHALL BE REMOVED FROM THE CHANNEL WHEN THEIR USEFUL LIFE HAS BEEN COMPLETED.

MAINTENANCE NOTES:
1. TEMPORARY GRADE STABILIZATION STRUCTURES SHOULD BE INSPECTED AFTER EACH STORM AND DAILY DURING PROLONGED STORM EVENTS. ANY DAMAGE TO THE STRUCTURES SHALL BE REPAIRED IMMEDIATELY.
2. PARTICULAR ATTENTION SHOULD BE GIVEN TO END RUN AND EROSION AT THE DOWNSTREAM TOE OF THE STRUCTURE.
3. WHEN REMOVING THE STRUCTURES, THE DISTURBED AREAS SHALL BE BROUGHT UP TO EXISTING CHANNEL GRADE AND THE AREAS PREPARED, SEEDED AND MULCHED.
4. SEDIMENT SHALL BE REMOVED FROM BEHIND THE STRUCTURES WHEN IT REACHES 1/2 THE ORIGINAL HEIGHT OF THE STRUCTURE.

HAY BALE INLET PROTECTION DETAIL
N.T.S

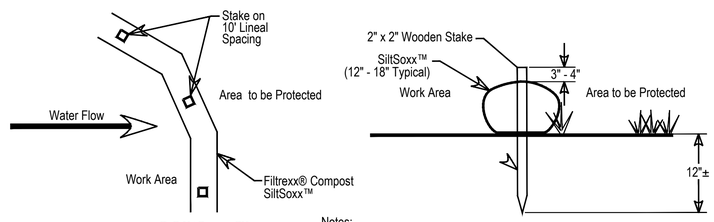


NOTES:

1. GEOSYNTHETIC SEDIMENT FILTER TRAP SHALL BE 'REGULAR FLOW SILTSACK®' OR APPROVED EQUAL. SPECIFICATIONS FOR SILTSACK® ARE DETAILED.

2. FILTER TRAPS SHALL BE INSPECTED AFTER EVERY RAIN EVENT OF 0.25" OR GREATER AND SEDIMENTS SHALL BE REMOVED FROM TRAP WHEN SEDIMENT HAS REACHED TWO THIRDS OF THE DEPTH OF THE TRAP, OR IF PONDING OF WATER AT SURFACE BEGINS TO OCCUR. DO NOT PUNCTURE FILTER TRAP TO MITIGATE PONDING.

CATCH BASIN GEOSYNTHETIC SEDIMENT TRAP
N.T.S.



®SiltSoxx™ Plan View

Notes:
1. All material to meet Filtrexx® specifications .
2. Compost material to be dispersed on site up slope from protected area.

SILTSOXX DETAIL
N.T.S.

NO.	DATE	DESCRIPTION
2.	2/1/21	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21
1.	1/5/21	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20
0.	9/17/20	INITIAL SUBMISSION TO DOVER

REVISIONS | DATE | INT.

SEAL
MICHAEL C. SIEVERT No. 9397 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

DATE ISSUED: 6/12/20
SCALE: 1"=40'
DESIGNED BY: XXX
DRAWN BY: XXX
APPROVED BY: MJS
DWG FILE: Civil Details c.dwg

CONSTRUCTION DETAILS

prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP I, LOT 6

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St. P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-6560 Fax: (603) 659-4627
E-mail: mjs@mjs-engineering.com

JOB: 20-011

C-501

(P20-60)

P:\20proj\20-011\Internal\Drawing Files\Civil Details c.dwg
2021-02-01 10:37 am

SEED MIXTURE SELECTION BASED ON SOIL TYPE				
	SOIL DRAINAGE			
USE	SEEDING MIXTURE	DROUGHTY	WELL DRAINED	MODERATELY WELL DRAINED
STEEP CUTS AND FILLS, BORROW AND DISPOSAL AREAS	A B C D	FAIR POOR POOR FAIR	GOOD GOOD GOOD EXCELLENT	GOOD FAIR EXCELLENT EXCELLENT
WATERWAYS, EMERGENCY SPILLWAYS, AND OTHER CHANNELS WITH FLOWING WATER.	A C	GOOD GOOD	GOOD EXCELLENT	GOOD EXCELLENT
LIGHTLY USED PARKING LOTS, ODD AREAS, UNUSED LANDS, AND LOW INTENSITY USE RECREATION SITES.	A B C	GOOD GOOD GOOD	GOOD GOOD EXCELLENT	GOOD FAIR EXCELLENT
PLAY AREAS AND ATHLETIC FIELDS. (TOPSOIL IS ESSENTIAL FOR GOOD TURF.)	E F	FAIR FAIR	EXCELLENT EXCELLENT	EXCELLENT EXCELLENT
NOTE: POORLY DRAINED SOILS ARE NOT DESIRABLE FOR USE AS PLAYING AREAS AND ATHLETIC FIELDS.				

SEED MIXTURES FOR PERMANENT VEGETATION			
MIXTURE	SPECIES	POUNDS PER ACRE	POUNDS PER 1,000 SF
A	TALL FESCUE CREEPING RED FESCUE REDTOP *TOTAL*	20 20 2 *42*	0.45 0.45 0.05 *0.95*
B	TALL FESCUE CREEPING RED FESCUE CROWN VETCH OR FLATPEA *TOTAL*	15 10 15 – 30 *40 OR 55*	0.35 0.25 0.35 – 0.75 *0.95 OR 1.35*
C	TALL FESCUE CREEPING RED FESCUE BIRDSFOOT TREFOIL *TOTAL*	20 20 8 *48*	0.45 0.45 0.20 *1.10*
D	TALL FESCUE FLATPEA *TOTAL*	20 30 *50*	0.45 0.75 *1.20*
E	CREPPING RED FESCUE KENTUCKY BLUEGRASS *TOTAL*	50 50 *100*	1.15 1.15 *2.30*
F	TALL FESCUE	*150*	*3.60*

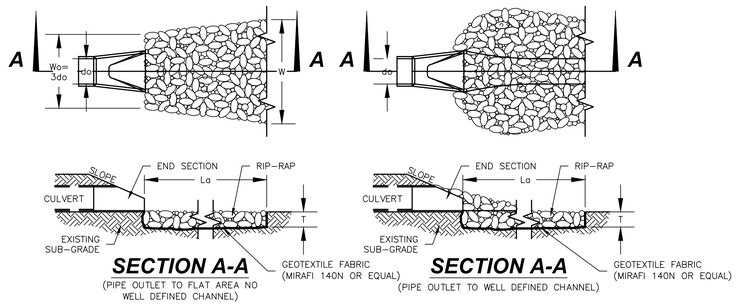
CONSTRUCTION SEQUENCING:

THE ESTIMATED START OF CONSTRUCTION IS SUMMER 2021 AND THE ESTIMATED END OF CONSTRUCTION IS SUMMER 2022. THE FOLLOWING CONSTRUCTION SEQUENCING SHALL BE FOLLOWED;

1. SCHEDULE A PRE–CONSTRUCTION MEETING WITH CITY OFFICIALS, OWNER, AND CONTRACTORS IF REQUIRED BY THE CONDITIONS OF APPROVAL PRIOR TO BEGINNING CONSTRUCTION.
2. CONTACT DIG–SAFE, INDIVIDUAL UTILITIES, AND CITY DEPARTMENTS TO GET ALL UTILITIES MARKED PRIOR TO START OF CONSTRUCTION.
3. THE OWNER OR SITE GENERAL CONTRACTOR SHALL FILE A NOTICE OF INTENT (NOI) FOR COVERAGE UNDER THE EPA'S CONSTRUCTION GENERAL PERMIT (CGP). A STORMWATER POLLUTION PREVENTION PLAN (SWPPP) SHALL BE AVAILABLE ON SITE.
4. CONSTRUCT STABILIZED CONSTRUCTION ENTRANCES IN ACCORDANCE WITH THE STABILIZED CONSTRUCTION ENTRANCE DETAIL. A CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED AT THE BACK ROAD AND MCKONE LANE ACCESS POINTS.
5. CONSTRUCT AND STABILIZE ALL TEMPORARY AND PERMANENT SEDIMENT AND EROSION CONTROLS INCLUDING SWALES AND SEDIMENT TRAPS.
   5.1. SEDIMENT AND EROSION PERIMETER CONTROLS SHALL BE INSTALLED PRIOR TO EARTH MOVING OPERATIONS AND SHALL FULLY ENCOMPASS ALL WORK COMPLETED DURING EACH PHASE.
   5.2. INSTALL SWALES AND TEMPORARY SEDIMENT TRAPS PRIOR TO ROUGH GRADING. THE LOCATION OF THE SEDIMENT TRAPS ARE SHOWN ON THE GRADING PLANS. A SEDIMENT TRAP DETAIL, INCLUDING SIZING INFORMATION, IS SHOWN ON SHEET D2.
   5.3. CONSTRUCTION OF THE STORMWATER PONDS AND TREATMENT SWALES SHALL BEGIN AFTER ALL CONTRIBUTING DISTURBED AREAS HAVE BEEN STABILIZED.
6. THIS PROJECT SHALL BE MANAGED IN A MANNER THAT MEETS THE REQUIREMENTS AND INTENT OF RSA 450:53 AND CHAPTER Agr 3800 RELATIVE TO INVASIVE SPECIES.
7. INSTALL TEMPORARY CONSTRUCTION GATE AT NEW ENTRANCE ROAD FOR SAFETY PURPOSES.
8. CLEAR AND GRUB THE ROADWAY AND PARKING AREAS, AND THE HOUSING AREA TO THE SOUTHWEST. REMOVE ORGANICS ONLY FROM THOSE AREAS THAT CAN BE WORKED AND STABILIZED WITHIN 45 DAYS OF REMOVAL. LOAM STOCKPILES SHALL BE STORED ON THE EXISTING CLEARED AREA TO THE SOUTHEAST OF THE ROADWAY. STOCKPILES SHALL BE TEMPORARILY STABILIZED WITH MULCH. STUMPS MAY BE DISPOSED OF ON OR OFFSITE IN ACCORDANCE WITH LOCAL AND STATE REGULATIONS.
9. MINIMIZE DISTURBANCE OF PREVIOUSLY STABILIZED SOILS ON SITE, THAT ARE OUTSIDE OF THE ROADWAY AND STORMWATER CONTROL AREAS.
10. TOTAL SITE DISTURBANCE DEPICTED ON THESE PLANS IS APPROXIMATELY 197,000 SF (4.5 AC.).
    10.1. REFER TO VEGETATION AND EROSION CONTROL NOTES ON THIS PLAN DURING CONSTRUCTION.
    10.2. THE ROAD CONSTRUCTION FOR THIS PROJECT WILL BE CONSTRUCTED IN ONE PHASE.
    10.3. ALL CONSTRUCTION SHALL FOLLOW EROSION CONTROL REQUIREMENTS AND CONSTRUCTION SEQUENCE AND SHALL BE STABILIZED WITHIN 45 DAYS OF COMPLETION.

11. ROAD CONSTRUCTION
    11.1 PROCEED WITH ROAD CONSTRUCTION IN THE LOCATION AND TO GRADES AS SHOWN ON THE PLANS. EXCAVATE ROADWAY TO SUBGRADE.
    11.2 PLACE SELECT FILLS IN LOCATIONS AND TO THE GRADES SHOWN ON PLANS PER THE APPLICABLE DETAILS AND THE FOLLOWING:
    11.2.1. PLACE FILL MATERIAL MEETING THE SPECIFICATION OF NHDOT 304.1 IN MAXIMUM 12" LIFTS AND COMPACT TO 95% MAXIMUM DRY DENSITY.
    11.2.2. ALL MATERIAL SHALL BE FREE OF DELETERIOUS MATERIALS SUCH AS LOAM, STUMPS, BRUSH, AND ROCKS LARGER THAN 3/4 THE DEPTH OF THE LIFT BEING PLACED.
    11.2.3 LOAM AND SEED SLOPES WITHIN 72 HOURS OF ACHIEVING FINISHED GRADE.
    11.3 BASE MATERIALS:
    11.3.1. BANK RUN AND CRUSHED GRAVEL SHALL BE PLACED IN 6" LIFTS AND COMPACTED TO 95% MAXIMUM DRY DENSITY TO THE DEPTHS SPECIFIED IN THE ROAD CROSS–SECTION DETAILS.
    11.4 PAVEMENT:
    11.4.1. PLACE AS SOON AS POSSIBLE AFTER THE SELECT MATERIALS ARE INSTALLED AND ACCEPTED TO ELIMINATE SOIL EROSION.
    11.4.2. STABILIZE ALL ROADWAYS WITHIN 72 HOURS OF ACHIEVING FINISHED GRADE.
    11.4.3. DRIVEWAY APRONS SHALL BE INCLUDED IF BASE GRAVELS HAVE BEEN PLACED.
12. UNDERGROUND UTILITIES SHALL BE INSTALLED WITH THE PROGRESS OF THE ROAD CONSTRUCTION. ELECTRICAL AND COMMUNICATION CONDUITS SHALL BE INSTALLED BY LICENSED PROFESSIONALS AND IN ACCORDANCE WITH THE SPECIFIC STANDARDS. THE SEWER FORCEMAIN AND WATER LINES SHALL BE INSTALLED IN ACCORDANCE WITH THE PLANS AND SPECIFICATIONS HEREIN.
13. INSPECT, MAINTAIN, AND IF NECESSARY REPAIR ALL EROSION AND SEDIMENT CONTROL MEASURES AS STATED IN THE EROSION CONTROL NOTES ON THIS SHEET. PROVIDE AN EROSION CONTROL LOG INDICATING THE DATE INSPECTED, WHO INSPECTED, WHAT WAS FOUND, AND WHAT WAS DONE (IF ANYTHING).
14. REMOVE ALL TEMPORARY EROSION CONTROL MEASURES AFTER SITE IS STABILIZED AND RESEED ANY AREAS DISTURBED BY REMOVAL. THE APPROXIMATE DATE FOR REMOVAL OF EROSION CONTROLS IS AUGUST 2018.
15. IF NECESSARY, ALL DRAINAGE STRUCTURES AND PIPES SHALL BE FLUSHED/PUMPED FREE OF SEDIMENT AFTER STABILIZATION IS COMPLETE.
16. LOT DISTURBANCE, OTHER THAN THAT SHOWN ON THE APPROVED PLANS, SHALL NOT COMMENCE UNTIL AFTER THE ROADWAY HAS THE BASE COURSE TO DESIGN ELEVATION AND THE ASSOCIATED DRAINAGE IS COMPLETE AND STABLE.

16. UNIT CONSTRUCTION
    16.1 UNITS WILL BE CONSTRUCTED IN GROUPS OF 10–15.
    16.2 CONSTRUCTION OF UNITS WILL BEGIN ON THE GROUP ON THE EAST SIDE AND PROCEED TO THE WEST SIDE, FROM SOUTH TO NORTH.
    16.3 UTILITY CONNECTIONS SHALL BE COORDINATED WITH FOUNDATION CONSTRUCTION



SECTION A-A
(PIPE OUTLET TO FLAT AREA NO WELL DEFINED CHANNEL)

SECTION A-A
(PIPE OUTLET TO WELL DEFINED CHANNEL)

RIP-RAP GRADATION

d50 = 6"	% OF WEIGHT SMALLER THAN THE GIVEN SIZE	SIZE OF STONE (INCHES)		
	100	9	TO	12
	85	7.8	TO	10.8
	50	6	TO	9
	15	1.8	TO	3

d50 = 8"	% OF WEIGHT SMALLER THAN THE GIVEN SIZE	SIZE OF STONE (INCHES)		
	100	12	TO	16
	85	10.4	TO	14.4
	50	8	TO	12
	15	2.4	TO	4

RIP RAP APRON DIMENSION TABLE

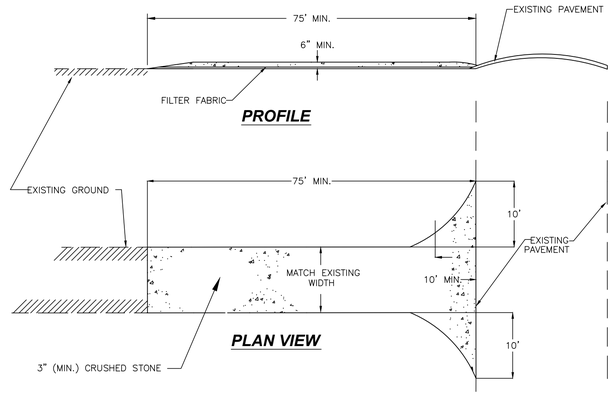
LOCATION	Wo	W	La	T	d50
RIP RAP #1 – SWP #1 OUTLET	3.75'	19'	16'	24"	8"
RIP RAP #2 – SWP #2 OUTLET	4.5'	23'	19'	24"	8"
RIP RAP #3 – 15" HDPE CULVERT AT STA 20+34	VARIES SEE PLAN			18"	6"
RIP RAP #4 – 18" HDPE CULVERT AT STA 33+47	VARIES SEE PLAN			24"	8"

CONSTRUCTION SPECIFICATIONS:
1. PREPARE THE SUB–GRADE FOR THE FILTER MATERIAL, GEOTEXTILE FABRIC, AND RIP–RAP TO THE GRADES SHOWN ON THE PLANS.
2. MINIMUM 6" SAND/GRAVEL BEDDING OR GEOTEXTILE FABRIC (MIRAFI 140N OR EQUAL) REQUIRED UNDER ALL ROCK RIP–RAP.
3. THE ROCK OR GRAVEL USED FOR FILTER OR RIP–RAP SHALL CONFORM TO THE SPECIFIED GRADATION.
4. GEOTEXTILE FABRICS SHALL BE PROTECTED FROM PUNCTURE OR TEARING DURING THE PLACEMENT OF ROCK RIP–RAP. DAMAGED AREAS IN THE FABRIC SHALL BE REPAIRED BY PLACING A PIECE OF FABRIC OVER THE DAMAGED AREA OR BY COMPLETE REPLACEMENT OF THE FABRIC. ALL OVERLAPS REQUIRED FOR REPAIRS OR JOINING TWO (2) PIECES OF FABRIC SHALL BE A MINIMUM OF 12 INCHES.
5. STONE FOR THE RIP–RAP MAY BE PLACED BY EQUIPMENT AND SHALL BE CONSTRUCTED TO THE FULL LAYER THICKNESS IN ONE OPERATION AND IN SUCH A MANNER AS TO PREVENT SEGREGATION OF THE STONE SIZES.

MAINTENANCE NOTES:
1. OUTLETS SHALL BE INSPECTED AND CLEANED ANNUALLY AND AFTER ANY MAJOR STORM EVENT. ANY EROSION OR DAMAGE TO THE RIP–RAP SHALL BE REPAIRED IMMEDIATELY.
2. THE CHANNEL IMMEDIATELY DOWNSTREAM FROM THE OUTLET SHOULD BE CHECKED TO SEE THAT NO EROSION IS OCCURRING.
3. THE DOWNSTREAM CHANNEL SHOULD BE KEPT CLEAR OF OBSTRUCTIONS SUCH AS FALLEN TREES, DEBRIS, AND SEDIMENT THAT COULD CHANGE FLOW PATTERNS AND/OR TAILWATER DEPTHS ON THE PIPES. REPAIRS MUST BE CARRIED OUT IMMEDIATELY TO AVOID ADDITIONAL DAMAGE TO THE OUTLET PROTECTION APRON.

PIPE OUTLET PROTECTION DETAIL

NOT TO SCALE



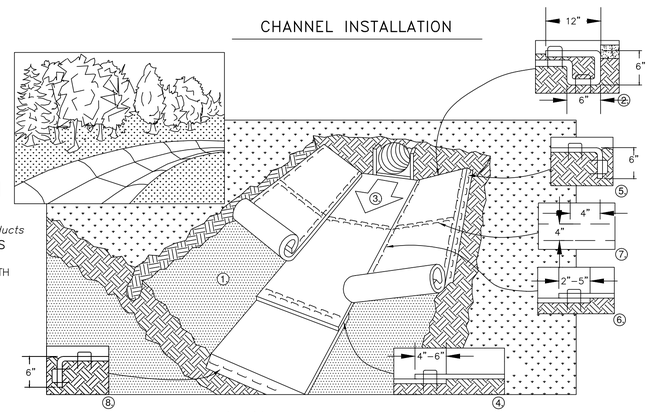
STABILIZED CONSTRUCTION ENTRANCE DETAIL

N.T.S

STABILIZED CONSTRUCTION ENTRANCE NOTES:
1. GRADE AND COMPACT ACCESS ROAD ENTRANCE AS NECESSARY. PLACE FILTER FABRIC (MIRAFI OR EQUAL) AND PLACE 6" OF 3" CRUSHED STONE TO MATCH SLOPE OF EXISTING ROAD.
2. PROVIDE NECESSARY SWALES OR DIVERSIONS TO MINIMIZE DIRECT FLOW OF WATER ONTO STONE AREA.
3. CONSTRUCTION ENTRANCE SHALL BE MAINTAINED AS NECESSARY TO REMOVE SILT FROM TIRES PRIOR TO ENTERING PUBLIC ROADS. A SMALL SWALE SHALL BE CONSTRUCTED ON THE DOWN GRADIENT SIDE TO TRAP ANY SILT WASHED FROM THE STONE ENTRANCE.

NORTH AMERICAN GREEN
EROSION CONTROL *Products Guaranteed* SOLUTIONS
14649 HIGHWAY 41 NORTH
EVANSVILLE, IN 47725
800–772–2040
www.nagreen.com

CHANNEL INSTALLATION



1. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP's), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED. NOTE: WHEN USING CELL–O–SEED DO NOT SEED PREPARED AREA. CELL–O–SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE RECP'S IN A 6" (15 CM) DEEP X 6" (15 CM) WIDE TRENCH WITH APPROXIMATELY 12" (30 CM) OF RECP's EXTENDED BEYOND THE UP–SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP's WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30 CM) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30 CM) PORTION OF RECP's BACK OVER SEED AND COMPACTED SOIL. SECURE RECP's OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30 CM) ACROSS THE WIDTH OF THE RECP's.
3. ROLL CENTER RECP's IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. RECP's WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP's MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING THE DOT SYSTEM™, STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. PLACE CONSECUTIVE RECP's END OVER END (SHINGLE STYLE) WITH A 4" – 6" (10 CM –15 CM) OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10 CM) APART AND 4" (10 CM) ON CENTER TO SECURE RECP's.
5. FULL LENGTH EDGE OF RECP's AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30 CM) APART IN A 6" (15 CM) DEEP X 6" (15 CM) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.
6. ADJACENT RECP's MUST BE OVERLAPPED APPROXIMATELY 2" – 5" (5 CM –12.5 CM) (DEPENDING ON RECP's TYPE) AND STAPLED.
7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT (9 M – 12 M) INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" (10 CM) APART AND 4" (10 CM) ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.
8. THE TERMINAL END OF THE RECP's MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30 CM) APART IN A 6" (15 CM) DEEP X 6" (15 CM) WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.

* IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 CM) MAY BE NECESSARY TO PROPERLY ANCHOR THE RECP's.

CRITICAL POINTS
A. OVERLAPS AND SEAMS
B. PROJECTED WATER LINE
C. CHANNEL BOTTOM/SIDE SLOPE VERTICES

NOTE:
* HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.

** IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 cm) MAY BE REQUIRED.

TYPICAL TURF REINFORCEMENT MATTING DETAIL

N.T.S

NOTES:
1. ALL SEDIMENT FOREBAY SPILLWAYS FOR TREATMENT SWALES AND ALL 2:1 SLOPES SHALL BE LINED WITH NORTH AMERICAN GREEN SC150BN EROSION CONTROL BLANKET OR APPROVED EQUAL.
2. FOR SALES CONTACT:
   EJ PRESCOTT, INC.
   210 SHEEP DAVIS RD.
   CONCORD, NH
   603–224–9545

NO.	DATE	BY
2.	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21	2/1/21	MCS
1.	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20	1/5/21	MCS
0.	INITIAL SUBMISSION TO DOVER	9/17/20	AWS

REVISIONS

SEAL
MICHAEL C. SIEVERT No. 9397 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

DATE ISSUED: 6/12/20
SCALE: 1"=40'
DESIGNED BY: XXX
DRAWN BY: XXX
APPROVED BY: MJS
DWG FILE: Civil Details c.dwg

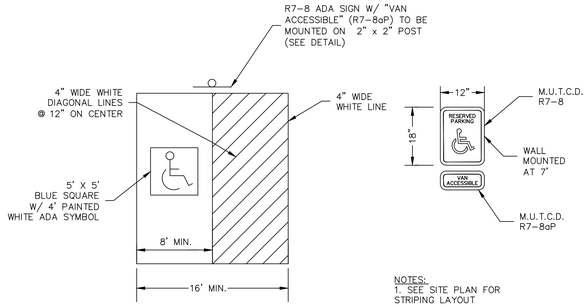
CONSTRUCTION DETAILS
prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP I, LOT 6

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St. P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-2560 Fax: (603) 659-4627
E-mail: mjs@mjs-engineering.com

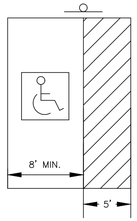
JOB: 20-011

C-502

(P20-60)



NOTES:
1. SEE SITE PLAN FOR STRIPING LAYOUT

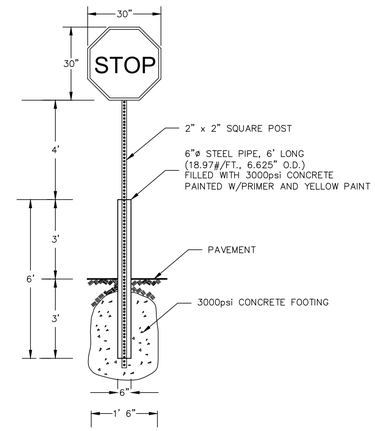


ADA STRIPING AND SIGN DETAIL

N.T.S

PAVEMENT MARKING NOTES:

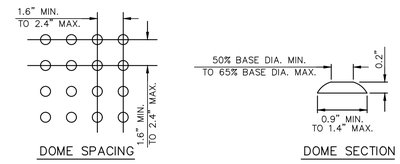
1. STRIPE PARKING AREAS AND DRIVES AS SHOWN, INCLUDING PARKING SPACES, HANDICAP SYMBOLS, AND PAINTED ISLANDS. ALL TRAFFIC PAINT SHALL MEET THE REQUIREMENTS OF THE NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION (NHDOT) AND AASHTO M248 TYPE "F". MEDIAN ISLANDS AND CENTERLINES TO BE CONSTRUCTED USING YELLOW TRAFFIC PAINT.
2. ALL PAVEMENT MARKINGS SHALL CONFORM TO THE LATEST EDITIONS OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", THE "STANDARD ALPHABETS FOR HIGHWAY SIGN AND PAVEMENT MARKINGS", AND THE AMERICANS WITH DISABILITIES ACT REQUIREMENTS.
3. PAINTED ISLANDS SHALL BE 4 INCH WIDE DIAGONAL LINES SPACED AT 3 FT. O.C. BORDERED BY 4 INCH WIDE LINES.
4. ALL CROSSWALKS SHALL MATCH THE CITY OF DOVER STANDARD AND SHALL BE PAINTED WITH THERMOPLASTIC PAINT.

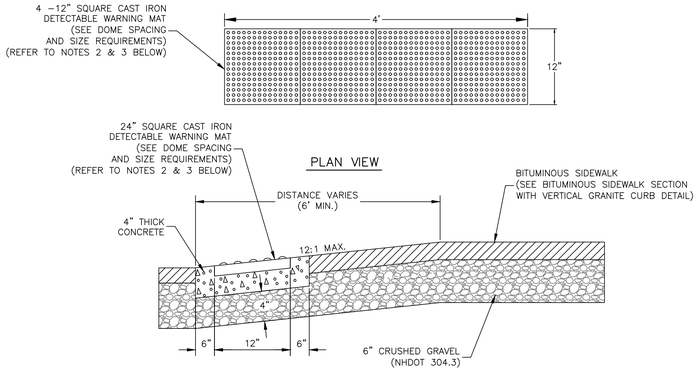


TYPICAL SIGN DETAIL

N.T.S.

NOTES:
1. SEE PLANS FOR SIGN PLACEMENT.

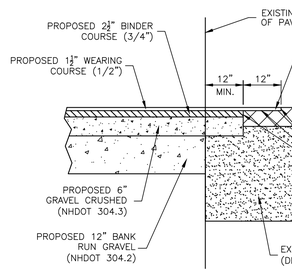




DETECTABLE WARNING MAT DETAIL

N.T.S

NOTES:
1. MAXIMUM CROSS SLOPE OF SIDEWALK TO BE 2%.
2. CONCRETE TO BE 4,000 PSF.
3. REFER TO MANUFACTURER'S SPECIFICATIONS FOR INSTALLATION OF DETECTABLE WARNING MATS.

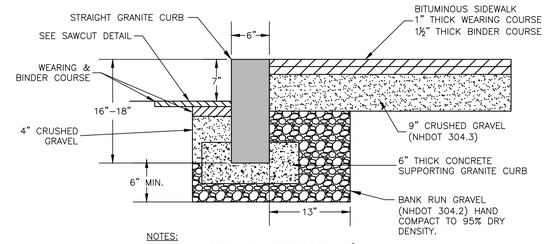


PAVEMENT SAWCUT NOTES

1. SAWCUT THROUGH DEPTH OF PAVEMENT AT LEAST 1 FT. FROM EDGE OR GREATER IF REQUIRED.
2. INSTALL AND COMPACT CRUSHED GRAVEL TO GRADE.
3. PLACE BINDER COURSE.
4. GRIND OR SAWCUT EXISTING PAVEMENT 1 FT. WIDE TO A DEPTH NECESSARY TO PROPERLY MATCH NEW WEARING COURSE PAVEMENT.
5. TACK COAT ALL EXISTING PAVEMENT SURFACES WITH EMULSIFIED ASPHALT (MS-1) PRIOR TO PLACING NEW PAVEMENT.

TYPICAL PAVEMENT SAWCUT DETAIL

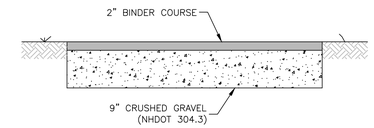
SCALE: N.T.S.



NOTES:
1. MINIMUM LENGTH OF CURB STONES = 3'
2. MAXIMUM LENGTH OF CURB STONES = 10'
3. ADJOINING STONES SHALL HAVE THE SAME OR APPROXIMATELY THE SAME LENGTH.

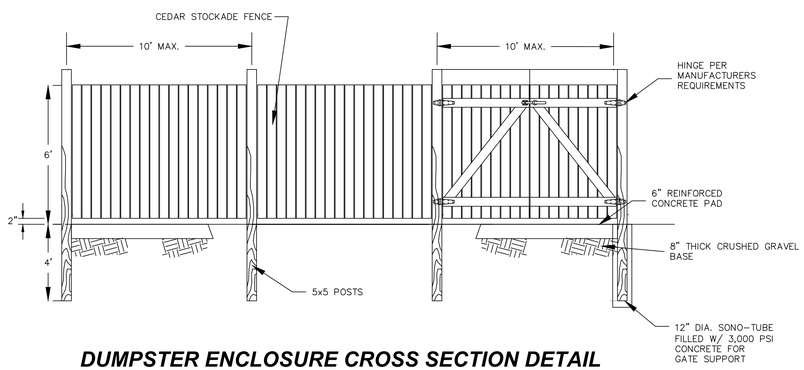
TYPICAL BITUMINOUS SIDEWALK SECTION WITH VERTICAL GRANITE CURB

N.T.S



TYPICAL WALKING PATH DETAIL

N.T.S



DUMPSTER ENCLOSURE CROSS SECTION DETAIL

N.T.S

INT.	DATE	REVISIONS
AWS	9/17/20	0. INITIAL SUBMISSION TO DOVER
MCS	1/5/21	1. REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20
MCS	2/1/21	2. REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21

SEAL

MICHAEL J. SIEVERT No. 8397 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

DATE ISSUED: 6/12/20
SCALE: AS SHOWN
DESIGNED BY: MJS
DRAWN BY: JLG
APPROVED BY: MJS
DWG FILE: Civil Details c.dwg

CONSTRUCTION DETAILS

prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP 1, LOT 6

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-6560 Fax: (603) 659-4627
E-mail: mjs@mjs-engineering.com

JOB: 20-011

C-503

(P20-60)

P:\20proj\20-011\Internal\Drawing Files\Civil Details c.dwg
2021-02-01 02:33 pm

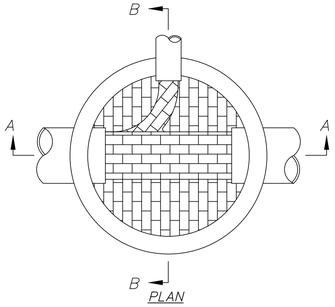
P:\20proj\20-011\Internal\Drawing Files\Civil Details c.dwg
2021-02-01 10:37 am

MANHOLE CONSTRUCTION MATERIAL REQUIREMENTS (PER Env-Wq 704.10 NUMERATION)

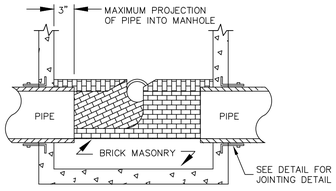
(A) ALL COMPONENT PARTS OF MANHOLE STRUCTURES SHALL HAVE THE STRENGTH, LEAK RESISTANCE, AND SPACE NECESSARY FOR THE INTENDED SERVICE.
(B) MANHOLE STRUCTURES SHALL HAVE A LIFE EXPECTANCY IN EXCESS OF 25 YEARS.
(C) MANHOLE STRUCTURES SHALL BE DESIGNED TO WITHSTAND H-20 LOADING AND SHALL NOT LEAK IN EXCESS OF 1 GPD PER VERTICAL FOOT OF MANHOLE FOR THE LIFE OF THE STRUCTURE.
(D) BARRELS AND CONE SECTIONS SHALL BE CONSTRUCTED OF PRECAST REINFORCED CONCRETE.
(E) BASE SECTIONS SHALL BE MONOLITHIC CONSTRUCTION TO A POINT AT LEAST SIX INCHES ABOVE THE CROWN OF THE INCOMING PIPE.
(F) HORIZONTAL JOINTS BETWEEN SECTIONS OF PRECAST CONCRETE BARRELS SHALL BE OF AN OVERLAPPING TYPE, SEALED FOR WATER TIGHTNESS USING A DOUBLE ROW OF AN ELASTOMERIC OR MASTIC-LIKE SEALANT.
(G) PIPE TO MANHOLE JOINTS SHALL BE AS FOLLOWS:
  (1) ELASTOMERIC, RUBBER SLEEVE WITH WATER TIGHT JOINTS AT THE MANHOLE OPENING AND PIPE SURFACES;
  (2) CAST INTO THE WALL OR SECURED WITH STAINLESS STEEL CLAMPS;
  (3) ELASTOMERIC SEALING RING CAST IN THE MANHOLE OPENING WITH SEAL FORMED ON THE SURFACE OF THE PIPE BY COMPRESSION OF THE RING; AND
  (4) NON-SHRINK GROUTED JOINTS WHERE WATERTIGHT BONDING TO THE MANHOLE AND PIPE CAN BE OBTAINED.
(H) MANHOLE CONE SECTIONS SHALL BE ECCENTRIC IN SHAPE.
(I) ALL PRECAST SECTIONS AND BASES SHALL HAVE THE DATE OF MANUFACTURE AND THE NAME OF THE TRADEMARK OF THE MANUFACTURER IMPRESSED OR INDELIBLY MARKED ON THE INSIDE OF THE WALL.
(J) MANHOLES SHALL HAVE A BRICK PAVED SHELF AND INVERT, CONSTRUCTED TO CONFORM TO THE SIZE OF THE PIPE AND FLOW. AT CHANGES IN DIRECTIONS, THE INVERTS SHALL BE LAID OUT IN CURVES OF THE LONGEST RADIUS POSSIBLE TANGENT TO THE CENTER LINE OF THE SEWER PIPES. SHELVES SHALL BE CONSTRUCTED TO THE ELEVATION OF THE HIGHEST PIPE CROWN AND SLOPE TO DRAIN TOWARD THE FLOWING THROUGH CHANNEL.
  UNDERLAYMENT OF INVERT AND SHELF SHALL CONSIST OF BRICK MASONRY. INVERTS AND SHELVES SHALL BE PLACED AFTER TESTING.
(K) MATERIALS FOR CONSTRUCTION FOR MANHOLES SHALL BE AS FOLLOWS:
  (1) CONCRETE FOR CAST-IN-PLACE OR COMPLETE MANHOLES SHALL CONFORM TO THE REQUIREMENTS FOR CLASS AA CONCRETE IN THE NH DOT'S "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION."
  (2) REINFORCING FOR CAST-IN-PLACE CONCRETE SHALL BE STEEL OR STRUCTURAL FIBERS THAT CONFORM TO THE REQUIREMENTS OF THE NH DOT'S "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION."
  (3) PRECAST CONCRETE BARREL SECTIONS, CONES, AND BASES SHALL CONFORM TO ASTM C478-06;
  (4) THE MANHOLE FRAME AND COVER SHALL PROVIDE A 30-INCH DIAMETER CLEAR OPENING;
  (5) THE MANHOLE COVER SHALL HAVE THE WORD "SEWER" IN 3-INCH LETTERS CAST INTO THE TOP SURFACE;
  (6) THE CASTINGS SHALL BE OF EVEN-GRAINED CAST IRON, SMOOTH, AND FREE FROM SCALE, LUMPS, BLISTERS, SAND HOLES AND DEFECTS;
  (7) CONTACT SURFACES OF COVERS AND FRAMES SHALL BE MACHINED AT THE FOUNDRY TO PREVENT ROCKING OF COVERS IN ANY ORIENTATION;
  (8) CASTINGS SHALL BE EQUAL TO CLASS 30, CONFORMING TO ASTM A48/48M-03;
  (9) BRICK MASONRY FOR SHELF, INVERT AND GRADE ADJUSTMENT SHALL COMPLY WITH ASTM C32-05, CLAY OR SHALE, FOR GRADE SS HARD BRICK;
  (10) MORTAR SHALL BE COMPOSED OF PORTLAND CEMENT AND SAND WITH OR WITHOUT HYDRATED LIME ADDITION;
  (11) PROPORTIONS IN MORTAR OF PARTS BY VOLUME SHALL BE:
    (a) 4.5 PARTS SAND AND 1.5 PARTS CEMENT; OR
    (b) 4.5 PARTS SAND, 1.0 PART CEMENT AND 0.5 PART HYDRATED LIME;
  (12) CEMENT SHALL BE TYPE II PORTLAND CEMENT CONFORMING TO ASTM C150-05;
  (13) HYDRATED LIME SHALL BE TYPE S CONFORMING TO THE ASTM C207-06 "STANDARD SPECIFICATIONS FOR HYDRATED LIME FOR MASONRY PURPOSES";
  (14) SAND SHALL CONSIST OF INERT NATURAL SAND CONFORMING TO THE ASTM C33-03 "STANDARD SPECIFICATIONS FOR CONCRETE, FINE AGGREGATES";
(N) THE MINIMUM INTERNAL DIAMETER OF MANHOLE SHALL BE 48 INCHES.
(S) IN THE FLOW CHANNEL A DROP OF AT LEAST 0.1 FEET SHALL BE PROVIDED BETWEEN THE INGOING AND OUTGOING SEWERS ON ALL MANHOLES.

MANHOLE TESTING REQUIREMENTS (Env-Wq 704.10)

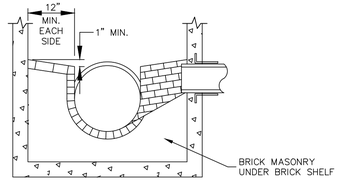
(X) MANHOLES SHALL BE TESTED FOR LEAKAGE USING A VACUUM TEST.*
(Y) THE MANHOLE VACUUM TEST SHALL CONFORM TO THE FOLLOWING:
  (1) THE INITIAL VACUUM GAUGE TEST PRESSURE SHALL BE 10 INCHES Hg: AND
  (2) THE MINIMUM ACCEPTABLE TEST HOLD TIME FOR A 1-INCH Hg PRESSURE DROP TO 9 INCHES Hg SHALL BE:
    (A) NOT LESS THAN 2 MINUTES FOR MANHOLES LESS THAN 10 FEET DEEP;
    (B) NOT LESS THAN 2.5 MINUTES FOR MANHOLES 10 TO 15 FEET DEEP
(Z) THE MANHOLE SHALL BE REPAIRED AND RETESTED IF THE TEST HOLD TIMES FAIL TO ACHIEVE THE ACCEPTANCE LIMITS SPECIFIED IN (Y) ABOVE.
*MANHOLE TESTING MUST BE CONDUCTED PRIOR TO INVERT AND SHELF PLACEMENT.



PLAN



SECTION A-A

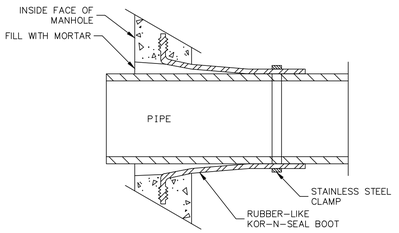


SECTION B-B

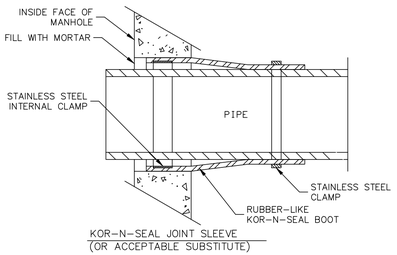
NOTE:
1. CARE SHALL BE TAKEN TO INSURE THAT THE BRICK INVERT IS A SMOOTH CONTINUATION OF THE SEWER INVERT. INVERT BRICKS SHALL BE LAID ON EDGE.
2. INVERT AND SHELF TO BE PLACED AFTER LEAKAGE TEST.
3. ALTERNATE INVERT DETAILS: REPLACE BRICK INVERT W/ CAST-IN-PLACE CONCRETE.

TYPICAL SEWER MANHOLE INVERT

N.T.S.



LOCK-JOINT FLEXIBLE MANHOLE SLEEVE
(OR ACCEPTABLE SUBSTITUTE)

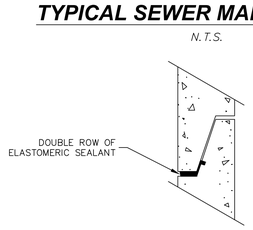


KOR-N-SEAL JOINT SLEEVE
(OR ACCEPTABLE SUBSTITUTE)

DETAIL "A" - PIPE TO MANHOLE JOINTS

N.T.S

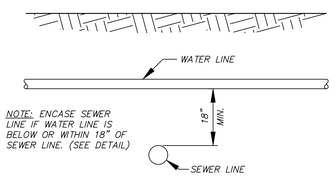
NOTES:
1. USE LOCK-JOINT FLEXIBLE MANHOLE SLEEVE FOR FACTORY INSTALLED APPLICATIONS AND KOR-N-SEAL SLEEVE FOR IN FIELD INSTALLATIONS.
2. ALL GASKETS, SEALANTS, MORTAR, ETC. SHALL BE INSTALLED IN ACCORDANCE W/ MANUFACTURERS' WRITTEN INSTRUCTIONS.



ELASTOMERIC SEALANT

NOTE:
ALL GASKETS AND SEALANTS SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURERS' WRITTEN INSTRUCTIONS

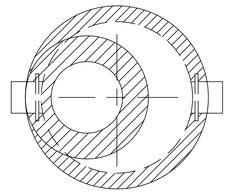
DETAIL "B" - HORIZONTAL JOINTS
N.T.S

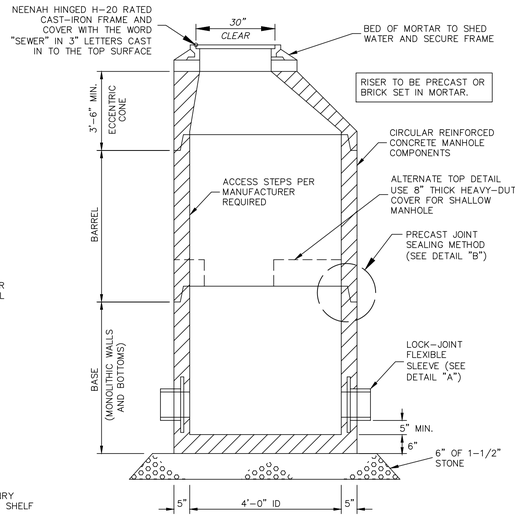


NOTE: ENCASE SEWER LINE IF WATER LINE IS BELOW OR WITHIN 18" OF SEWER LINE. (SEE DETAIL)

WATER/SEWER CROSSING

N.T.S.


PLAN VIEW



SECTION VIEW

NOTES:
1. SMH #1 IS A STANDARD MANHOLE WITH ECCENTRIC CONE TOP.
2. THERE SHALL BE NO STEPS INSTALLED WITHIN THE MANHOLE.

STANDARD MANHOLE

N.T.S.

SEWER NOTES:

PER THE REQUIREMENTS OF "STANDARDS OF DESIGN AND CONSTRUCTION FOR SEWERAGE AND WASTEWATER TREATMENT FACILITIES."

GRAVITY SEWER CONSTRUCTION MATERIALS (Env-Wq 704.05)

(A) PLASTIC GRAVITY SEWER PIPE AND FITTINGS SHALL BE 8 INCH PVC SDR 35 SEWER PIPE (EXCEPT SEWER SERVICE SHALL BE 6" SRD 35 PVC) AND SHALL COMPLY WITH ASTM D3034-04a.
(B) PLASTIC SEWER PIPE SHALL HAVE A PIPE STIFFNESS RATING OF AT LEAST 46 PSI AT 5 PERCENT PIPE DIAMETER DEFLECTION, AS MEASURED IN ACCORDANCE WITH ASTM D2412-02 DURING MANUFACTURE.
(C) JOINT SEALS FOR PVC PIPE SHALL BE OIL RESISTANT COMPRESSION RINGS OF ELASTOMERIC MATERIAL CONFORMING TO ASTM D3212-96(a)(2003)e1 AND SHALL BE PUSH-ON, BELL AND SPIGOT TYPE.

GRAVITY SEWER PIPE TESTING REQUIREMENTS (Env-Wq 704.07)

(A) ALL NEW SEWERS SHALL BE TESTED FOR WATER TIGHTNESS BY THE USE OF LOW-PRESSURE AIR TESTS.
(B) LOW-PRESSURE AIR TESTING SHALL BE IN CONFORMANCE WITH:
  (1) ASTM F1417-92(2005) "STANDARD TEST METHOD FOR INSTALLATION ACCEPTANCE OF PLASTIC GRAVITY SEWER LINES USING LOW-PRESSURE AIR"; OR
  (2) UNI-BELL PVC PIPE ASSOCIATION UNI-B-6, "LOW-PRESSURE AIR TESTING OF INSTALLED SEWER PIPE" (1998).
(C) ALL NEW GRAVITY SEWERS SHALL BE CLEANED AND VISUALLY INSPECTED AND SHALL BE TRUE TO LINE AND GRADE FOLLOWING INSTALLATION AND PRIOR TO USE.
(D) ALL PLASTIC SEWER PIPE SHALL BE DEFLECTION TESTED NOT LESS THAN 30 DAYS FOLLOWING INSTALLATION.
(E) THE MAXIMUM ALLOWABLE DEFLECTION OF FLEXIBLE SEWER PIPE SHALL BE 7½ PERCENT OF AVERAGE INSIDE DIAMETER.

PROTECTION OF WATER SUPPLIES (Env-Wq 704.12)

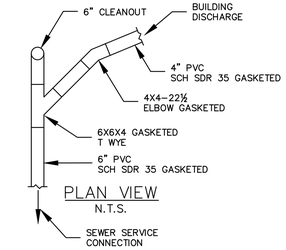
(A) SEWERS SHALL BE LOCATED AT LEAST 10 FEET HORIZONTALLY FROM ANY EXISTING OR PROPOSED WATER MAIN.
(B) A DEVIATION FROM THE SEPARATION REQUIREMENTS OF (A) ABOVE SHALL BE ALLOWED WHERE NECESSARY TO AVOID CONFLICT WITH SUBSURFACE STRUCTURES, UTILITY CHAMBERS, AND BUILDING FOUNDATIONS, PROVIDED THAT THE SEWER IS CONSTRUCTED IN ACCORDANCE WITH THE FORCE MAIN CONSTRUCTION REQUIREMENTS SPECIFIED IN Env-Wq 704.06.
(C) WHENEVER SEWERS MUST CROSS WATER MAINS, THE SEWER SHALL BE CONSTRUCTED AS FOLLOWS:
  (1) VERTICAL SEPARATION OF THE SEWER AND WATER MAIN SHALL BE NOT LESS THAN 18 INCHES, WITH WATER ABOVE SEWER; AND
  (2) SEWER PIPE JOINTS SHALL BE LOCATED AT LEAST 6 FEET HORIZONTALLY FROM THE WATER MAIN.

FORCE MAIN AND LOW PRESSURE SEWER CONSTRUCTION MATERIALS (PER Env-Wq 704.06 NUMERATION)

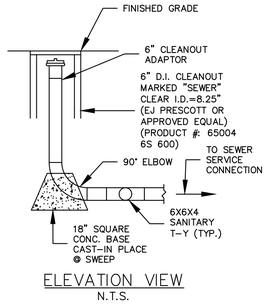
THIS SECTION REQUIRED TO MEET REQUIREMENTS OF Env-Wq 704.12 (d):
(A) FORCE MAINS SHALL BE CONSTRUCTED OF SDR 21 PVC MATERIAL.
(B) FORCE MAINS SHALL BE TREATED AS GRAVITY SEWERS FOR PURPOSES OF FOUNDATION BEDDING AND BACKFILL REQUIREMENTS.
(C) PVC PIPE USED FOR FORCE MAINS SHALL CONFORM TO ASTM D2241-05 OR ASTM D1785-05.

FORCE MAIN AND LOW PRESSURE SEWER TESTING (PER Env-Wq 704.08 NUMERATION)

FORCE MAINS SHALL BE TESTED IN ACCORDANCE WITH SECTION 4 OF AWWA C600-05 "INSTALLATION OF CAST IRON WATER MAINS AND THEIR APPURTENANCES", AT A PRESSURE EQUAL TO THE GREATER OF 150 PERCENT OF THE DESIGN OPERATING TOTAL DYNAMIC HEAD OR AT LEAST 100 PSI.

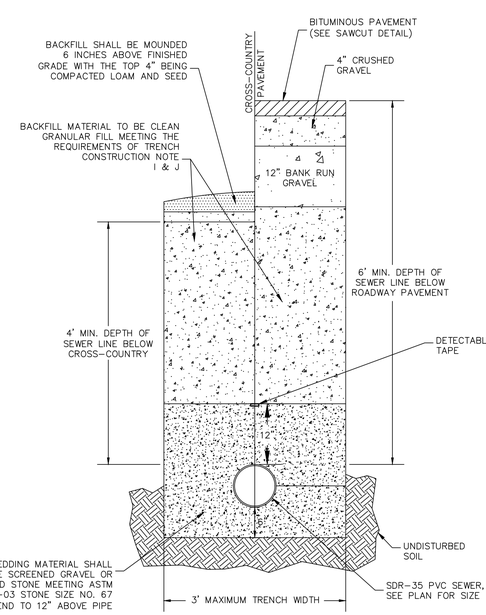


PLAN VIEW
N.T.S.

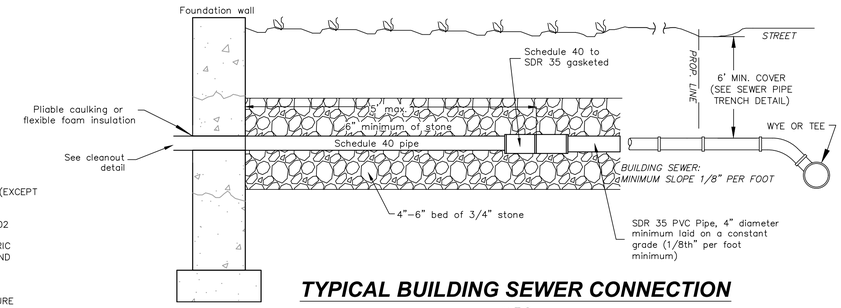


ELEVATION VIEW
N.T.S.

CLEANOUT DETAIL

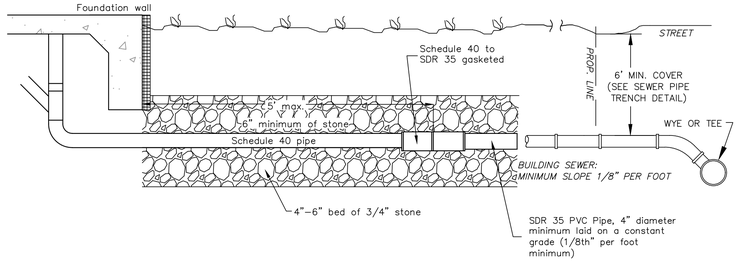


STANDARD SEWER PIPE TRENCH



TYPICAL BUILDING SEWER CONNECTION

N.T.S



TYPICAL BUILDING SEWER CONNECTION

N.T.S

DATE	INT.
2/1/21	MCS
1/5/21	MCS
9/17/20	AWS

REVISIONS

2. REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21
1. REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20
0. INITIAL SUBMISSION TO DOVER

SEAL: MICHAEL C. SIEVERT No. 9397 — NEW HAMPSHIRE — PROFESSIONAL ENGINEER

DATE ISSUED: 6/12/20
SCALE: AS SHOWN
DESIGNED BY: MJS
DRAWN BY: JLG
APPROVED BY: MJS
DWG FILE: Civil Details c.dwg

CONSTRUCTION DETAILS

prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP 1, LOT 6

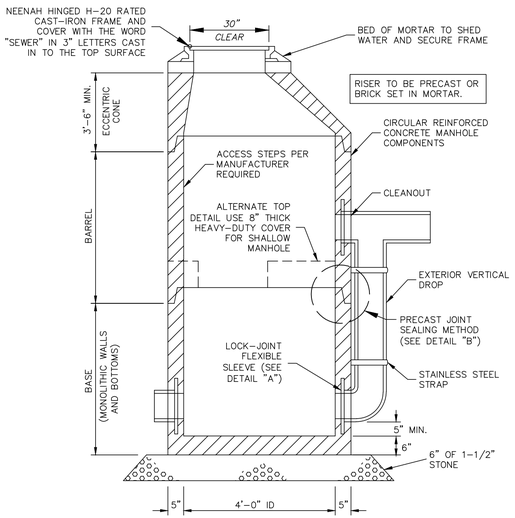
MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone (603) 659-6560 Fax (603) 659-4627
E-mail: mjs@mjs-engineering.com

JOB: 20-011

C-504

(P20-60)

P:\20proj\20-011\Internal\Drawing Files\Civil Details c.dwg
2021-02-01 11:20 am

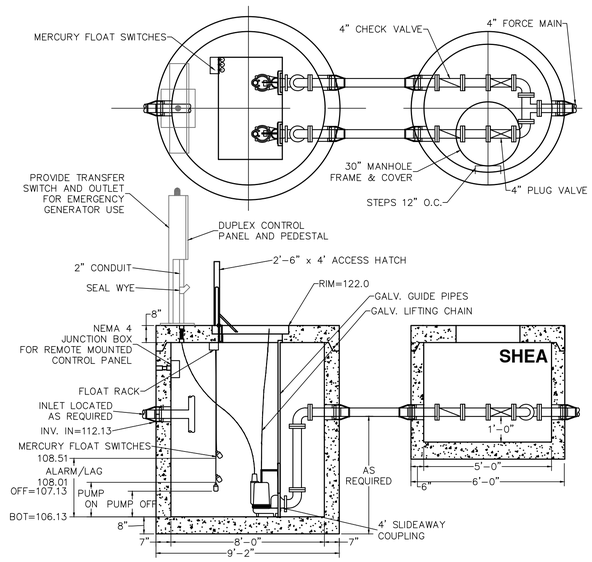


SECTION VIEW

NOTES:
1. SMH #1 IS A STANDARD MANHOLE WITH ECCENTRIC CONE TOP.
2. THERE SHALL BE NO STEPS INSTALLED WITHIN THE MANHOLE.

MANHOLE WITH EXTERIOR DROP

N. T. S.

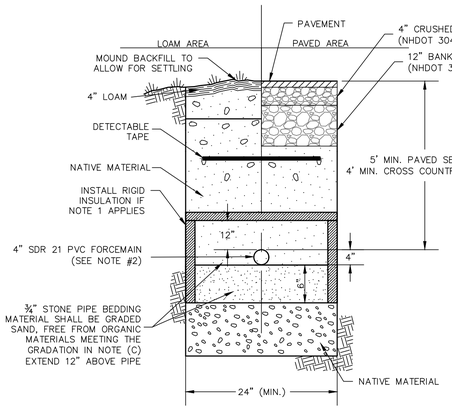


PROPOSED PUMP STATION & VALVE PIT DETAIL

NOT TO SCALE

NOTES:

1. CONCRETE: 4,000 PSI MINIMUM AFTER 28 DAYS.
2. REINFORCED STEEL CONFORMS TO LATEST ASTM A185
3. BUTYL RESIN SECTION JOINT CONFORMS TO LATEST ASTM C990 SPEC
4. PUMP MODEL – MYERS 3RH 3" SOLIDS HANDLING
5. OWNER SHALL SECURE A MAINTENANCE AGREEMENT FOR THE PUMP STATION



SEWER FORCEMAIN TRENCH

N.T.S

NOTES
1. USE RIGID INSULATION AS SHOWN IF PIPE COVER IS LESS THAN 4' UNDER PAVED SECTION OR 5' UNDER CROSS COUNTRY SECTION.
2. THERE SHALL BE NO GLUE JOINTS ON THE FORCEMAIN.

TRENCH CONSTRUCTION (PER Env-Wq 704.09 NUMERATION)

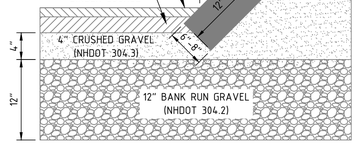
(A) TRENCH DIMENSIONS SHALL BE AS FOLLOWS:
  (1) FOR SEWER PIPE LESS THAN 15" IN DIAMETER, THE ALLOWABLE TRENCH WIDTH AT A PLANE 12 INCHES ABOVE THE PIPE SHALL BE NO MORE THAN 36".
(B) PIPE TRENCH BEDDING MATERIAL AND FILL MATERIAL FOR EXCAVATION BELOW GRADE SHALL BE SCREENED GRAVEL OR CRUSHED STONE TO ASTM C33-03 STONE SIZE NO. 67.
(C) THE PIPE SAND BLANKET MATERIAL SHALL BE GRADED SAND, FREE FROM ORGANIC MATERIALS, GRADED SUCH THAT 100% PASSES THROUGH A 1/2 INCH SIEVE AND A MAXIMUM OF 15% PASSES THROUGH A #200 SIEVE.
(E) PIPE BEDDING MATERIAL SHALL EXTEND FROM A HORIZONTAL PLANE THROUGH THE PIPE AXIS TO 6 INCHES BELOW THE BOTTOM OF THE OUTSIDE SURFACE OF THE PIPE.
(F) PIPE SAND MATERIAL SHALL COVER THE PIPE A MINIMUM OF 12 INCHES ABOVE THE CROWN OF THE OUTSIDE SURFACE.
(G) COMPACTION SHALL BE IN 12 INCH LAYERS FOR BEDDING AND BLANKET MATERIALS.
(H) BACKFILL MATERIALS SHALL BE COMPACTED IN 3-FOOT LAYERS TO THE GROUND SURFACE EXCEPT FOR ROAD CONSTRUCTION (OR OTHER PAVED AREAS) WHERE THE FINAL 3 FEET SHALL BE COMPACTED IN 12-INCH LAYERS TO THE ROAD BASE SURFACE.
(I) TRENCH BACKFILL MATERIAL IN ROADWAY LOCATIONS SHALL BE NATURAL MATERIALS EXCAVATED FROM THE TRENCH DURING CONSTRUCTION, EXCLUDING: DEBRIS, PIECES OF PAVEMENT, ORGANIC MATTER, TOP SOIL, ALL WET OR SOFT MUCK, PEAT OR CLAY, ALL EXCAVATED LEDGE MATERIAL, AND ALL ROCKS OVER SIX INCHES IN LARGEST DIMENSION, OR ANY MATERIAL WHICH AS DETERMINED BY THE ENGINEER, WILL NOT PROVIDE SUFFICENT SUPPORT OR MAINTAIN THE COMPLETED CONSTRUCTION IN A STABLE CONDITION.
(J) TRENCH BACKFILL AT CROSS-COUNTRY LOCATIONS SHALL BE AS DESCRIBED IN (I) ABOVE, EXCEPT THAT TOP SOIL, LOAM, MUCK OR PEAT, MAY BE USED PROVIDED THE COMPLETED CONSTRUCTION WILL BE STABLE, AND PROVIDED THAT ACCESS TO THE SEWER FOR MAINTENANCE AND RECONSTRUCTION IS PRESERVED.
(K) BACKFILL SHALL BE MOUNDED 6 INCHES ABOVE ORIGINAL GROUND AT CROSS-COUNTRY LOCATIONS.
(L) BASE COURSE FOR TRENCH REPAIR SHALL MEET THE REQUIREMENTS OF DIVISION 300 OF THE "STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION" OF THE NH DOT.
(O) PRECAUTIONS SHALL BE TAKEN TO AVOID GROUNDWATER POOLING AT THE SURFACE BY PROVIDING DRAINAGE TO A SUITABLE OUTLET AT CATCH BASINS OR RUNOFF SWALES.

FORCE MAIN AND LOW PRESSURE SEWER CONSTRUCTION MATERIALS (PER Env-Wq 704.06 NUMERATION)

THIS SECTION REQUIRED TO MEET REQUIREMENTS OF Env-Wq 704.12 (d):
(A) FORCE MAINS SHALL BE CONSTRUCTED OF SDR 21 PVC MATERIAL.
(B) FORCE MAINS SHALL BE TREATED AS GRAVITY SEWERS FOR PURPOSES OF FOUNDATION BEDDING AND BACKFILL REQUIREMENTS.
(C) PVC PIPE USED FOR FORCE MAINS SHALL CONFORM TO ASTM D2241-05 OR ASTM D1785-05.

FORCE MAIN AND LOW PRESSURE SEWER TESTING (PER Env-Wq 704.08 NUMERATION)

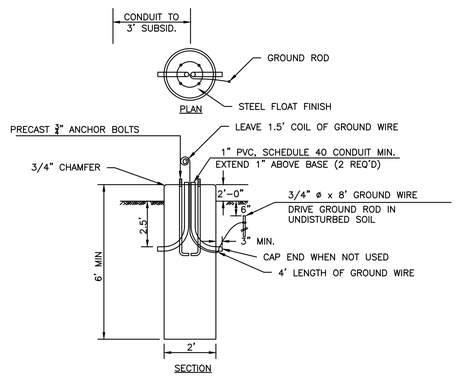
FORCE MAINS SHALL BE TESTED IN ACCORDANCE WITH SECTION 4 OF AWWA C600-05 "INSTALLATION OF CAST IRON WATER MAINS AND THEIR APPURTENANCES", AT A PRESSURE EQUAL TO THE GREATER OF 150 PERCENT OF THE DESIGN OPERATING TOTAL DYNAMIC HEAD OR AT LEAST 100 PSI.



NOTES:
1. REMOVE LOAM TO A MINIMUM DEPTH OF 8" BELOW SELECT MATERIALS.
2. COMPACT BASE, SUBBASE, AND SUBGRADE TO 95% OF STANDARD PROCTOR.
3. SEE PLAN FOR LOCATION

TYPICAL SLOPED GRANITE CURB

NTS



CONCRETE LIGHT POLE BASE

N.T.S

POLE MOUNTED LIGHTING SPECIFICATIONS:
1. ALL SITE WORK SHALL CONFORM TO TOWN OF DURHAM STANDARDS AND LOCAL AUTHORITIES HAVING JURISDICTION.
2. ALL MATERIAL WORKMANSHIP SHALL CONFORM TO THE LATEST EDITIONS OF THE FOLLOWING STANDARDS, NEW HAMPSHIRE ELECTRIC CODE, FIRE PROTECTION ASSOCIATION, NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION.
3. ALL EXTERIOR CONDUITS FOR LIGHTING SHALL BE 1" MIN. DIAMETER PVC SCHEDULE 40. ALL ELBOWS SHALL BE SCHEDULE 40. ALL CONDUITS UNDER ROADWAYS AND PARKING AREAS SHALL HAVE MINIMUM COVER OF THREE (3) FEET.
4. ALL UNDERGROUND CONDUITS WILL HAVE NYLON PULL ROPE TO FACILITATE PULLING IN CABLES.
5. ALL EQUIPMENT TO BE LITHONIA LIGHTING – MR2-LED SERIES.
6. LUMINARIES SHALL BE LITHONIA LIGHTING – MR2-LED SERIES.
7. ALL EXTERIOR CONDUITS SHALL BE PROVIDED WITH 6" WIDE, METALIZED CONTINUOUS WARNING TAPE.
8. POLES SHALL BE LITHONIA LIGHTIN OR EQUAL.
9. PROVIDE FUSING ON ALL LUMINARIES. FUSES TO BE LOCATED AT POLE HANDHOLE. ALL LUMINARIES 277 VOLT.
10. GROUND ALL POLES. PROVIDE 3/4" X 8'-0" GROUND ROD AT EACH POLE WITH #6 AWG COPPER GROUND CONNECTION.
11. PROVIDE SHIMS AS REQUIRED AND SET ALL POLES PLUMB. PROVIDE FULL ANCHOR BOLT COVERS.
12. ALL NO. 6 WIRE AND LARGER SHALL BE TYPE THHN COPPER. NO. 8 WIRE AND SMALLER SHALL BE THWN COPPER.
13. MOUNTING HEIGHT SHALL BE 17'±.
14. USE MR2 LED 60C LEDS, WITH DRIVE CURRENT OF 700 mA DISTANCE TYPE T3M.

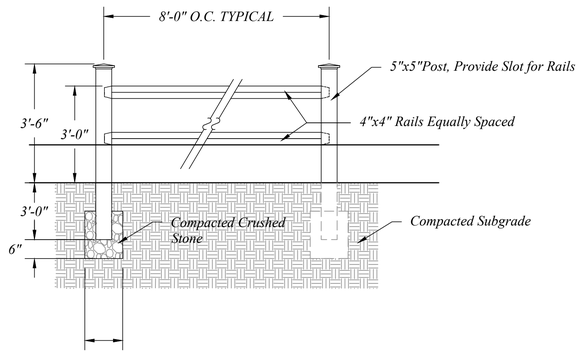
GENERAL LIGHTING NOTES:
1. LIGHTING SUPPLIER: VISIBLE LIGHT, INC. (603) 926-6049.
2. OWNER MAY ELECT TO USE ALTERNATIVE LIGHT FIXTURES IF FIRST APPROVED BY DESIGNER AND TOWN.
3. SITE LIGHTING WILL BE LOCATED AS SHOWN ON THE SITE PLAN.
4. ALL NON-ESSENTIAL LIGHTING WILL BE REQUIRED TO BE TURNED OFF AFTER BUSINESS HOURS, LEAVING ONLY THE NECESSARY LIGHTING FOR SECURITY.
5. ALL LIGHTING FOR SECURITY OR AESTHETICS WILL BE FULL CUT-OFF OR A SHIELDED TYPE, NOT ALLOWING ANY UPWARD DISTRIBUTION OF LIGHT.
6. PRECAST CONCRETE POLE BASE SHEA CONCRETE OR EQUAL.
7. LIGHT FIXTURE SHALL BE MOUNTED AT 16'-0" HIGH.
8. LIGHT POLE IS 12'-0".

Radean Post Top
LED Area Luminaire

RADEAN Bollard
LED Site Luminaire

LIGHT FIXTURES

NTS



2 RAIL DIAMOND RAIL CEDAR FENCE

NO.	DATE	REVISIONS	INT.
2.	2/1/21	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21	MCS
1.	1/5/21	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20	MCS
0.	9/17/20	INITIAL SUBMISSION TO DOVER	AWS

SEAL

NEW HAMPSHIRE · MICHAEL SIEVERT No. 9397 · PROFESSIONAL ENGINEER · SEVERE

DATE ISSUED: 6/12/20
SCALE: AS SHOWN
DESIGNED BY: MJS
DRAWN BY: JLG
APPROVED BY: MJS
DWG FILE: Civil Details c.dwg

CONSTRUCTION DETAILS

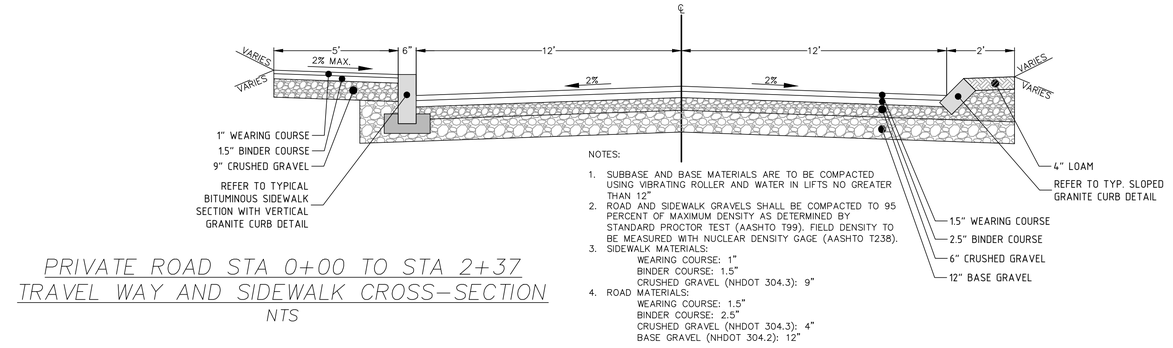
prepared for
54 BRR LLC
JOHN RANDOLPH
TAX MAP 1, LOT 6

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-6560 Fax: (603) 659-4627
E-mail: mjs@mjs-engineering.com

JOB: 20-011

C-505

(P20-60)

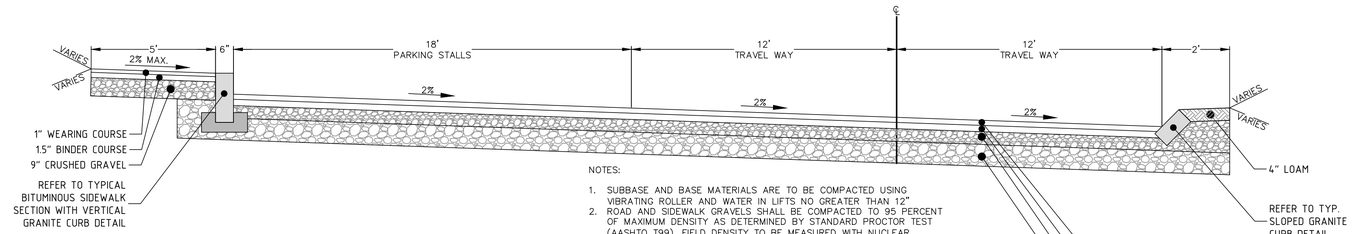


NOTES:

1. SUBBASE AND BASE MATERIALS ARE TO BE COMPACTED USING VIBRATING ROLLER AND WATER IN LIFTS NO GREATER THAN 12"
2. ROAD AND SIDEWALK GRAVELS SHALL BE COMPACTED TO 95 PERCENT OF MAXIMUM DENSITY AS DETERMINED BY STANDARD PROCTOR TEST (AASHTO T99). FIELD DENSITY TO BE MEASURED WITH NUCLEAR DENSITY GAGE (AASHTO T238).
3. SIDEWALK MATERIALS:
   WEARING COURSE: 1"
   BINDER COURSE: 1.5"
   CRUSHED GRAVEL (NHDOT 304.3): 9"
4. ROAD MATERIALS:
   WEARING COURSE: 1.5"
   BINDER COURSE: 2.5"
   CRUSHED GRAVEL (NHDOT 304.3): 4"
   BASE GRAVEL (NHDOT 304.2): 12"

PRIVATE ROAD STA 0+00 TO STA 2+37 TRAVEL WAY AND SIDEWALK CROSS-SECTION

NTS

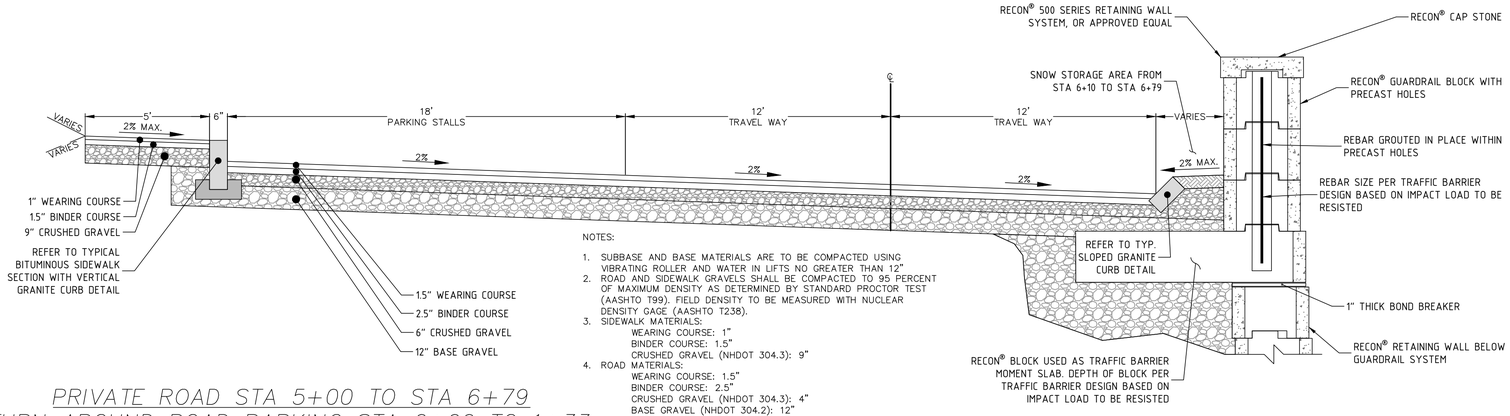


NOTES:

1. SUBBASE AND BASE MATERIALS ARE TO BE COMPACTED USING VIBRATING ROLLER AND WATER IN LIFTS NO GREATER THAN 12"
2. ROAD AND SIDEWALK GRAVELS SHALL BE COMPACTED TO 95 PERCENT OF MAXIMUM DENSITY AS DETERMINED BY STANDARD PROCTOR TEST (AASHTO T99). FIELD DENSITY TO BE MEASURED WITH NUCLEAR DENSITY GAGE (AASHTO T238).
3. SIDEWALK MATERIALS:
   WEARING COURSE: 1"
   BINDER COURSE: 1.5"
   CRUSHED GRAVEL (NHDOT 304.3): 9"
4. ROAD MATERIALS:
   WEARING COURSE: 1.5"
   BINDER COURSE: 2.5"
   CRUSHED GRAVEL (NHDOT 304.3): 4"
   BASE GRAVEL (NHDOT 304.2): 12"

PRIVATE ROAD STA 2+37 TO STA 5+00 TRAVEL WAY. PARKING, AND SIDEWALK CROSS-SECTION

NTS



NOTES:

1. SUBBASE AND BASE MATERIALS ARE TO BE COMPACTED USING VIBRATING ROLLER AND WATER IN LIFTS NO GREATER THAN 12"
2. ROAD AND SIDEWALK GRAVELS SHALL BE COMPACTED TO 95 PERCENT OF MAXIMUM DENSITY AS DETERMINED BY STANDARD PROCTOR TEST (AASHTO T99). FIELD DENSITY TO BE MEASURED WITH NUCLEAR DENSITY GAGE (AASHTO T238).
3. SIDEWALK MATERIALS:
   WEARING COURSE: 1"
   BINDER COURSE: 1.5"
   CRUSHED GRAVEL (NHDOT 304.3): 9"
4. ROAD MATERIALS:
   WEARING COURSE: 1.5"
   BINDER COURSE: 2.5"
   CRUSHED GRAVEL (NHDOT 304.3): 4"
   BASE GRAVEL (NHDOT 304.2): 12"

PRIVATE ROAD STA 5+00 TO STA 6+79 TURN AROUND ROAD PARKING STA 0+00 TO 1+33 TRAVEL WAY. PARKING, AND SIDEWALK CROSS-SECTION

NTS

NO.	DATE	REVISIONS	INT.
2.	2/1/21	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21	MCS
1.	1/5/21	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20	MCS
0.	9/17/20	INITIAL SUBMISSION TO DOVER	AWS

SEAL

MICHAEL J. SIEVERT No. 9397 LICENSED PROFESSIONAL ENGINEER STATE OF NEW HAMPSHIRE

DATE ISSUED: 6/12/20
SCALE: AS SHOWN
DESIGNED BY: MJS
DRAWN BY: JLG
APPROVED BY: MJS
DWG FILE: Civil Details c.dwg

CONSTRUCTION DETAILS

prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP I, LOT 6

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St. P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-5975 Fax: (603) 659-4627
E-mail: mj@mjs-engineering.com

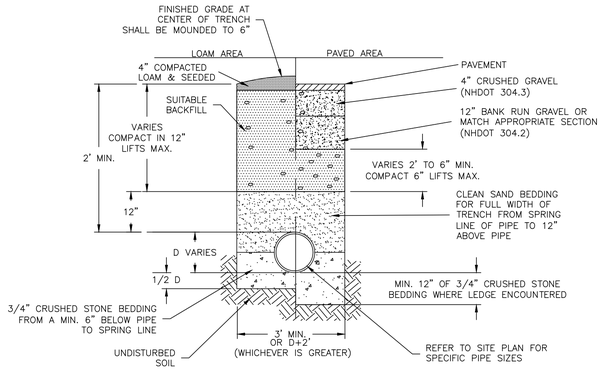
JOB: 20-011

C-506

(P20-60)

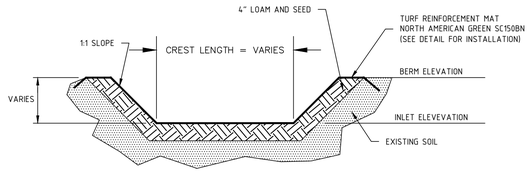
P:\20pro\20-011\Internal\Drawing Files\Civil Details c.dwg
2021-02-01 10:37 am

P:\20proj\20-011\Internal\Drawing Files\Civil Details c.dwg
2021-37-01T10:37



STANDARD DRAINAGE PIPE TRENCH

N.T.S



NOTES: CREST BREADTH IS WIDTH OF BERM AT SPILLWAY.

NOTE: SPILLWAY TO BE CONSTRUCTED TO THE DIMENSIONS AND SPECIFICATIONS SHOWN.

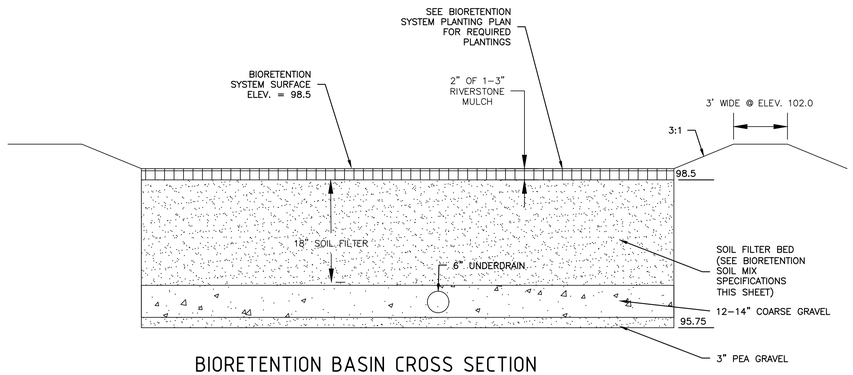
SPILLWAY DIMENSION TABLE

LOCATION	CREST ELEV.	BERM ELEV.	LENGTH*	WIDTH*
SPILLWAY #1 - SEDIMENT FOREBAY	101.2	102.1	6'	6'

*REFER TO DETAIL ABOVE FOR LOCATION OF WIDTH AND LENGTH

BIORETENTION SYSTEM SPILLWAY CROSS SECTION

NTS



BIORETENTION BASIN CROSS SECTION

CONSTRUCTION NOTES:

1. DO NOT PLACE BIORETENTION SYSTEM INTO SERVICE UNTIL THE BMP HAS BEEN PLANTED AND ITS CONTRIBUTING AREAS HAVE BEEN FULLY STABILIZED.
2. TO PREVENT DEGRADATION OF INFILTRATION FUNCTION: DO NOT DISCHARGE SEDIMENT-LADEN WATERS FROM CONSTRUCTION ACTIVITIES (RUNOFF, WATER FROM EXCAVATIONS) TO THE BIORETENTION SYSTEM DURING ANY STAGE OF CONSTRUCTION. DO NOT TRAFFIC EXPOSED SOIL SURFACE WITH CONSTRUCTION EQUIPMENT. IF FEASIBLE, PERFORM EXCAVATIONS WITH EQUIPMENT POSITIONED OUTSIDE THE LIMITS OF THE INFILTRATION COMPONENTS OF THE SYSTEM.
3. CLEAR AND GRUB THE AREA WHERE THE BIORETENTION SYSTEM IS TO BE LOCATED. STOCKPILE LOAM FOR REUSE LATER.
4. THE FOUNDATION AREA SHALL BE SCARIFIED PRIOR TO PLACING FILL. ALL UNSUITABLE MATERIAL UNDER THE BERM SHALL BE REMOVED AND REPLACED WITH SUITABLE FOUNDATION MATERIAL.
5. THE BERM SHALL BE CONSTRUCTED BEGINNING FROM THE LOWEST POINT UNIFORMLY ALONG ITS ENTIRE LENGTH. PLACE MATERIALS IN MAXIMUM 12" LOOSE LIFTS COMPACTED TO 95% MAXIMUM MODIFIED PROCTOR DENSITY. EMBANKMENT SOIL SHALL HAVE NO ORGANIC MATTER OR FROZEN MATERIAL AND NO STONES LARGER THAN 2/3 OF THE MAXIMUM LOOSE LIFT THICKNESS. STONES AROUND ANY STRUCTURES AND/OR CONDUITS SHALL NOT EXCEED 3 INCHES. EMBANKMENT FILL MATERIAL SHALL HAVE THE FOLLOWING GRADATION:

SIEVE SIZE:	% PASSING:
#4	80-90
#40	50-80
#100	30-45
#200	15-30

6. ALL PIPE TO PIPE CONNECTIONS SHALL BE WATER-TIGHT.
7. ALL DISTURBED AREAS NOT OTHERWISE LANDSCAPED SHALL RECEIVE FOUR INCHES OF LOAM AND SEED.

GENERAL MAINTENANCE:

1. THE BIORETENTION BASIN SHALL BE INSPECTED TWICE EACH YEAR WITH PREVENTATIVE MAINTENANCE PROVIDED.
2. SYSTEMS SHALL BE INSPECTED ANNUALLY AND FOLLOWING ANY RAINFALL EVENT EXCEEDING 2.5 INCHES IN A 24 HOUR PERIOD, WITH MAINTENANCE OR REHABILITATION CONDUCTED AS WARRANTED BY SUCH INSPECTION.
3. TRASH AND DEBRIS SHOULD BE REMOVED AT EACH INSPECTION.
4. AT LEAST ONCE ANNUALLY, SYSTEM SHOULD BE INSPECTED FOR DRAWDOWN TIME. IF BIORETENTION SYSTEM DOES NOT DRAIN WITHIN 72-HOURS FOLLOWING A RAINFALL EVENT, THEN A QUALIFIED PROFESSIONAL SHOULD ASSESS THE CONDITION OF THE FACILITY TO DETERMINE MEASURES REQUIRED TO RESTORE FILTRATION FUNCTION OR INFILTRATION FUNCTION (AS APPLICABLE), INCLUDING BUT NOT LIMITED TO REMOVAL OF ACCUMULATED SEDIMENTS OR RECONSTRUCTION OF THE FILTER MEDIA.
5. VEGETATION SHOULD BE INSPECTED AT LEAST ANNUALLY, AND MAINTAINED IN HEALTHY CONDITION, INCLUDING PRUNING, REMOVAL AND REPLACEMENT OF DEAD OR DISEASED VEGETATION, AND REMOVAL OF INVASIVE SPECIES.

PLANTING REQUIREMENTS

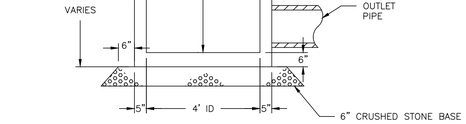
1. THE BIORETENTION BASIN AND SEDIMENT FOREBAY BERM, BOTTOM AND INTERIOR SIDE SLOPES SHALL BE PLANTED WITH A 50:50 MIX OF NEW ENGLAND EROSION CONTROL/RESTORATION MIX FOR DETENTION BASINS AND MOIST SITES AND NEW ENGLAND CONSERVATION/WILDLIFE MIX AT 1,500 SF/LB AVAILABLE FROM:

   NEW ENGLAND WETLAND PLANTS. INC.
   820 WEST AMHERST STREET
   AMHERST, MA 01002

BIORETENTION SYSTEM GENERAL NOTES:

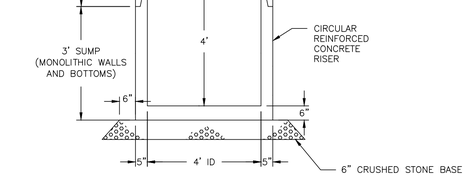
1. BIORETENTION SYSTEM FILTER SOIL MIX SHALL MEET THE FOLLOWING REQUIREMENTS OF FILTER MEDIA OPTION A OR OPTION B.

BIORETENTION SYSTEM SOIL MIX SPECIFICATIONS			
		GRADATION OF MATERIAL	
COMPONENT MATERIAL	PERCENT OF MIXTURE BY VOLUME	SIEVE NO.	% BY WEIGHT PASSING STANDARD SIEVE
FILTER MEDIA OPTION A			
ASTM C-33 CONCRETE SAND	50 TO 55		
LOAMY SAND TOPSOIL, WITH FINES AS INDICATED	20 TO 30	200	15 TO 25
MODERATELY FINE SHREDDED BARK OR WOOD FIBER MULCH, WITH FINES AS INDICATED	20 TO 30	200	< 5
FILTER MEDIA OPTION B			
MODERATELY FINE SHREDDED BARK OR WOOD FIBER MULCH, WITH FINES AS INDICATED	20 TO 30	200	< 5
LOAMY COARSE SAND	70 TO 80	10	85 TO 100
		20	70 TO 100
		60	15 TO 40
		200	8 TO 15



TYPICAL DRAIN MANHOLE

N.T.S

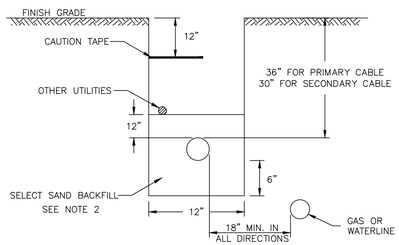


TYPICAL CATCH BASIN DETAIL

N.T.S

DRAINAGE STRUCTURE NOTES:

1. DRAINAGE STRUCTURE MATERIALS SHALL COMPLY WITH NHDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION, LATEST EDITION, DIVISION 600, SECTION 604.
2. SITE CONTRACTOR SHALL BACKFILL AROUND DRAINAGE STRUCTURES IN 6 TO 8 INCH LIFTS, ATTAINING 95% MAXIMUM PROCTOR DENSITY FOR EACH LIFT.
3. PIPE OPENINGS SHALL BE FULLY MORTARED ON OUTSIDE PRIOR TO BACK FILLING. INSIDE OF PIPE OPENINGS SHALL BE MORTARED AND ALLOWED TO CURE PER MANUFACTURERS REQUIREMENTS PRIOR TO RECEIVING RUNOFF.
4. JOINTS BETWEEN ADJACENT RISERS SHALL BE FULLY SEALED WITH ELASTOMERIC SEALANT PER MANUFACTURERS REQUIREMENTS.
5. WHEN FRAME/GRATE ARE LOCATED IN A PAVED AREA, THEY SHALL BE BROUGHT TO FINISH GRADE AFTER BINDER COURSE PAVEMENT IS PLACED. THE EXCAVATION REQUIRED AROUND THE GRATE AND FRAME SHALL BE BACKFILLED FLUSH WITH THE TOP OF BINDER COURSE WITH NHDOT CLASS B CONCRETE.
6. FRAME AND GRATE:
   CATCH BASINS:
   NEENAH LIFTMATE OR PAMREX

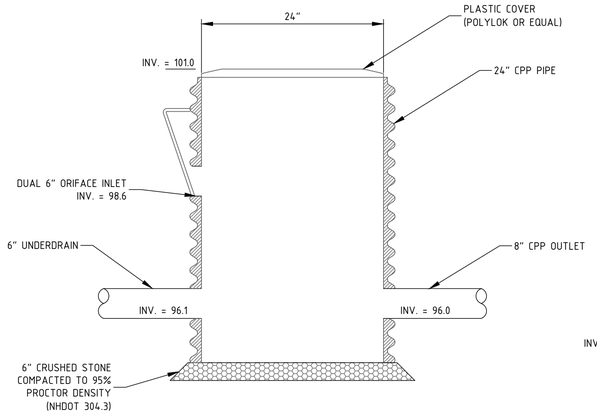


TELEPHONE & ELECTRIC TRENCH

N.T.S

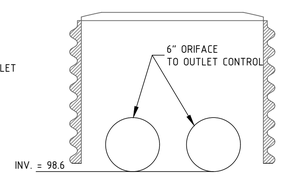
NOTES:

1. CONSTRUCTION TO BE IN ACCORDANCE WITH PSNH CONSTRUCTION STANDARDS FOR NEW ELECTRICAL SERVICE WORK BY CONTRACTORS, MOST RECENT EDITION.
2. SELECT SAND BACKFILL SHALL CONSIST OF A FINE GRANULAR MATERIAL OF WHICH 100% SHALL PASS THROUGH A 1/4" SIEVE. EXCEPT NATURALLY OCCURING SMOOTH ROUND PEBBLES NO GREATER THAN 3/8" IN DIAMETER ARE PERMITTED AS LONG AS THEIR TOTAL VOLUME PER CUBIC FOOT OF SAND DOES NOT EXCEED 1%. THE SAND SHALL BE COMPLETELY FREE OF FROZEN LUMPS, ROCKS, STONES, DEBRIS AND RUBBISH. BACKFILL SHALL BE THOROUGHLY COMPACTED IN 6" LIFTS.
3. CONDUIT SIZES TO BE 5" 3-PHASE PRIMARY AND 4" 3-PHASE SECONDARY. ALL CONDUIT SIZES TO BE VERIFIED BY PSNH.
4. ALL CONDUIT INSTALLATIONS MUST CONFORM TO THE CURRENT EDITION OF THE NATIONAL ELECTRIC SAFETY CODE, STATE AND LOCAL CODES AND ORDINANCES, AND WHERE APPLICABLE THE NATIONAL ELECTRIC CODE.



OUTLET CONTROL STRUCTURE DETAIL

NTS



ORIFACE DIMENSIONS

NO.	DATE	REVISIONS	INT.
2.	2/1/21	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21	MCS
1.	12/29/20	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20	MCS

SEAL

MICHAEL C. SIEVERT No. 8397 Licensed Professional Engineer STATE OF NEW HAMPSHIRE

DATE ISSUED: 1/5/20
SCALE: AS SHOWN
DESIGNED BY: MJS
DRAWN BY: MCS
APPROVED BY: MJS
DWG FILE:

CONSTRUCTION DETAILS
prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP 1, LOT 6
54 BACK RIVER ROAD, DOVER, NH

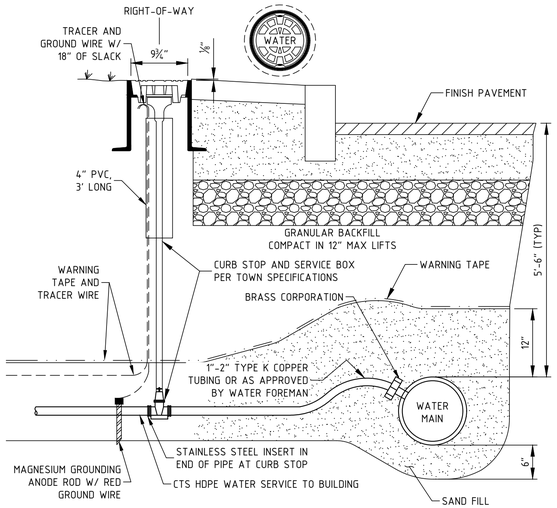
MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-4579 Fax: (603) 659-4627
E-mail: mjs@mjs-engineering.com

JOB: 20-011

C-507

(P20-60)

P:\20pro\20-011\Internal\Drawing Files\Civil Details c.dwg
2021-02-01 10:37 am

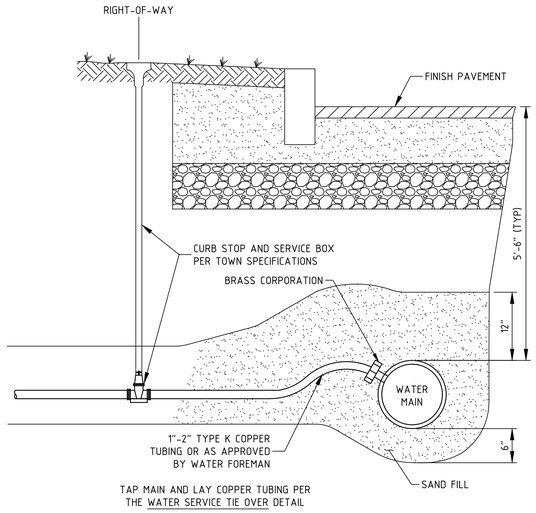


LOCATOR BOX:
1. LOCATOR BOX AND COVER SHALL BE CAST IRON.
2. LOCATOR BOXES SHALL BE SET AT 500' INTERVALS AND AT BENDS.
3. PROVIDE 18" WIRE LOOP INSIDE THE LOCATOR BOX.
4. LOCATOR BOXES SHALL BE SET AT GRADE IN CROSS COUNTRY LOCATIONS AND ⅛" BELOW PAVEMENT, TAPERED OVER 2'.

TRACER WIRE:
1. CONTINUOUS, DIRECT BURIAL RATED.
2. 12 AWG HIGH STRENGTH SOLID CORE COPPER CLAD STEEL.
3. COATING COLOR SHALL CONFORM TO THE APWA UNIFORM COLOR CODE.

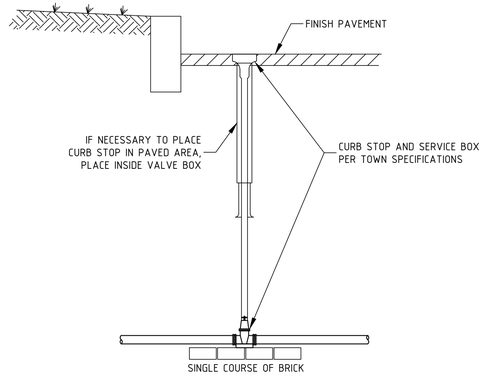
REPAIRS:
1. SPLICES SHALL BE MADE WITH CORROSION PROOF, LOCKABLE WIRE CONNECTORS.

WATER SERVICE TRACER WIRE INSTALLATION
N.T.S.

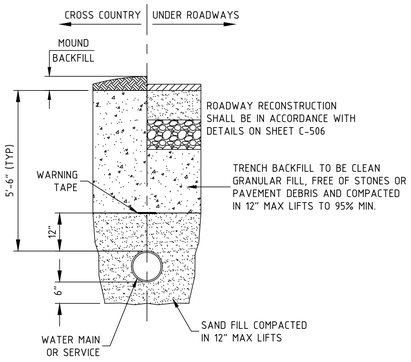


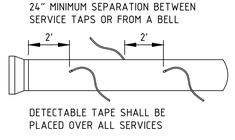
TAP MAIN AND LAY COPPER TUBING PER THE WATER SERVICE TIE OVER DETAIL

WATER SERVICE INSTALLATION
N.T.S.

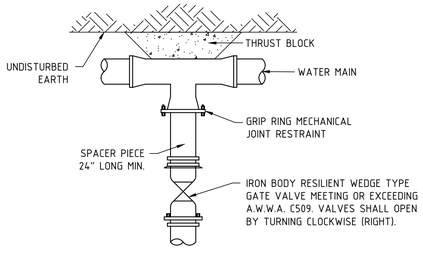


CURB STOP IN PAVEMENT
N.T.S.

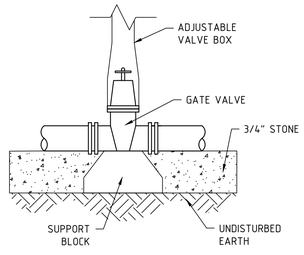




WATER MAIN TRENCH DETAIL
N.T.S.



PLAN VIEW



ELEVATION VIEW

TYPICAL VALVE CONNECTION
N.T.S

NO.	DATE	INT.
2.	2/1/21	MCS
1.	1/5/21	MCS
0.	9/17/20	AWS

REVISIONS

2. REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 1/14/21
1. REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20
0. INITIAL SUBMISSION TO DOVER

SEAL — NEW HAMPSHIRE — MICHAEL J. SIEVERT No. 9397 — LICENSED PROFESSIONAL ENGINEER

DATE ISSUED: 6/12/20
SCALE: AS SHOWN
DESIGNED BY: MJS
DRAWN BY: JLG
APPROVED BY: MJS
DWG FILE: Civil Details c.dwg

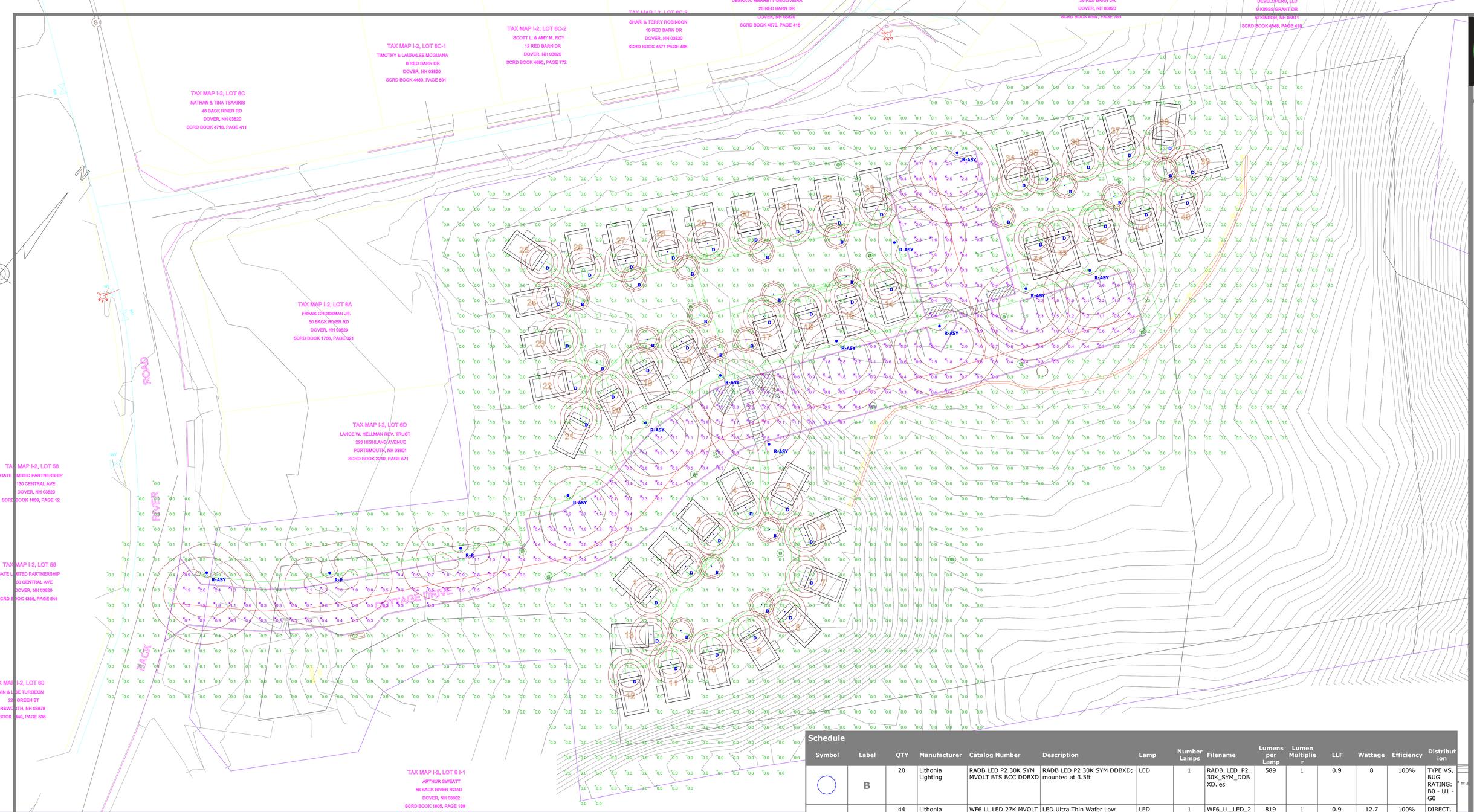
CONSTRUCTION DETAILS

prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP I, LOT 6

MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone (603) 659-5588 Fax (603) 659-4627
E-mail: mjs@mjs-engineering.com

JOB: 20-011

C-508



Statistics

Description	Symbol	Avg	Max	Min	Max/Min	Avg/Min
Ground	+	0.3 fc	10.9 fc	0.0 fc	N/A	N/A
Parking Lot	*	0.9 fc	3.1 fc	0.2 fc	15.5:1	4.5:1

Plan View
Scale - 1" = 30ft

Schedule

Symbol	Label	QTY	Manufacturer	Catalog Number	Description	Lamp	Number Lamps	Filename	Lumens per Lamp	Lumen Multiplier	LLF	Wattage	Efficiency	Distribution
	B	20	Lithonia Lighting	RADB LED P2 30K SYM MVOLT BTS BCC DDBXD	RADB LED P2 30K SYM DDBXD; mounted at 3.5ft	LED	1	RADB_LED_P2_30K_SYM_DDBXD.ies	589	1	0.9	8	100%	TYPE VS, BUG RATING: B0 - U1 - G0
	D	44	Lithonia Lighting	WF6 LL LED 27K MVOLT	LED Ultra Thin Wafer Low Lumen 2700K, 120 - 277V; mounted at 9ft	LED	1	WF6_LL_LED_27K_MVOLT.ies	819	1	0.9	12.7	100%	DIRECT, SC-0=1.24, SC-90=1.24
	R-ASY	11	Lithonia Lighting	RADPT LED P2 30K ASY MVOLT RADPT20 HS DDBXD with RSS 16 4B T20 DDBXD	RADEAN Post-Top with P2 3000K Asymmetric distribution with house-side shield; mounted at 16ft	LED	1	RADPT_P2_30K_ASY_HS.ies	4205	1	0.9	38.0107	100%	TYPE IV, VERY SHORT, BUG RATING: B1 - U2 - G2
	R-P	2	Lithonia Lighting	RADPT LED P2 30K PATH MVOLT RADPT20 HS DDBXD with RSS 16 4B T20 DDBXD	RADEAN Post-Top with P2 3000K Pathway distribution with house-side shield; mounted at 16ft	LED	1	RADPT_P2_30K_PATH_HS.ies	3509	1	0.9	38.0107	100%	TYPE IV, SHORT, BUG RATING: B1 - U2 - G2

VISUAL

54 BACK RIVER ROAD
DOVER, NH
Site Lighting Layout

Designer
Heidi G. Connors
Visible Light, Inc.
24 Stickney Terrace
Suite 6
Hampton, NH 03842
Date
02/01/2021
Scale
1"=30'
Drawing No.

Summary

LANDSCAPE NOTES

1. Design is based on drawings by MJS Engineering, P.C. dated 01/06/21 and may require adjustment due to actual field conditions.
2. The contractor shall follow best management practices during construction and shall take all means necessary to stabilize and protect the site from erosion.
3. Erosion Control shall be in place prior to construction.
4. Erosion Control shall be staked in place between the work and Water bodies, Wetlands and/or drainage ways prior to any construction.
5. The Contractor shall verify layout and grades and inform the Landscape Architect or Client's Representative of any discrepancies or changes in layout and/or grade relationships prior to construction.
6. It is the contractor's responsibility to verify drawings provided are to the correct scale prior to any bid, estimate or installation. A graphic scale bar has been provided on each sheet for this purpose. If it is determined that the scale of the drawing is incorrect, the landscape architect will provide a set of drawings at the correct scale, at the request of the contractor.
7. Trees to Remain within the construction zone shall be protected from damage for the duration of the project by snow fence or other suitable means of protection to be approved by Landscape Architect or Client's Representative. Snow fence shall be located at the drip line at a minimum and shall include any and all surface roots. Do not fill or mulch on the trunk flare. Do not disturb roots. In order to protect the integrity of the roots, branches, trunk and bark of the tree(s) no vehicles or construction equipment shall drive or park in or on the area within the drip line(s) of the tree(s). Do not store any refuse or construction materials or portalets within the tree protection area.
8. Location, support, protection, and restoration of all existing utilities and appurtenances shall be the responsibility of the Contractor.
9. The Contractor shall verify exact location and elevation of all utilities with the respective utility owners prior to construction. Call DIGSAFE at 1-888-344-7233.
10. The Contractor shall procure any required permits prior to construction.
11. Prior to any landscape construction activities Contractor shall test all existing loam and loam from off-site intended to be used for lawns and plant beds using a thorough sampling throughout the supply. Soil testing shall indicate levels of pH, nitrates, macro and micro nutrients, texture, soluble salts, and organic matter. Contractor shall provide Landscape Architect with test results and recommendations from the testing facility along with soil amendment plans as necessary for the proposed plantings to thrive. All loam to be used on site shall be amended as approved by the Landscape Architect prior to placement.
12. Contractor shall notify landscape architect or owner's representative immediately if at any point during demolition or construction a site condition is discovered which may negatively impact the completed project. This includes, but is not limited to, unforeseen drainage problems, unknown subsurface conditions, and discrepancies between the plan and the site. If a contractor is aware of a potential issue, and does not bring it to the attention of the landscape architect or owner's representative immediately, they may be responsible for the labor and materials associated with correcting the problem.
13. The Contractor shall furnish and plant all plants shown on the drawings and listed thereon. All plants shall be nursery-grown under climatic conditions similar to those in the locality of the project. Plants shall conform to the botanical names and standards of size, culture, and quality for the highest grades and standards as adopted by the American Association of Nurserymen, Inc. in the American Standard of Nursery Stock, American Standards Institute, Inc. 230 Southern Building. Washington, D.C. 20005.
14. A complete list of plants, including a schedule of sizes, quantities, and other requirements is shown on the drawings. In the event that quantity discrepancies or material omissions occur in the plant materials list, the planting plans shall govern.
15. All plants shall be legibly tagged with proper botanicall name.
16. The Contractor shall guarantee all plants for not less than one year from time of acceptance.
17. Owner or Owner's Representative will inspect plants upon delivery for conformity to Specification requirements. Such approval shall not affect the right of inspection and rejection during or after the progress of the work. The Owner reserves the right to inspect and/or select all trees at the place of growth and reserves the right to approve a representative sample of each type of shrub, herbaceous perennial, annual, and ground cover at the place of growth. Such sample will serve as a minimum standard for all plants of the same species used in this work.
18. No substitutions of plants may be made without prior approval of the Owner or the Owner's Representative for any reason.
19. All landscaping shall be provided with the following:
    a. Outside hose attachments spaced a maximum of 150 feet apart, and
    b. An underground irrigation system, or
    c. A temporary irrigation system designed for a two-year period of plant establishment.
20. If an automatic irrigation system is installed, all irrigation valve boxes shall be located within planting bed areas.
21. The contractor is responsible for all plant material from the time their work commences until final acceptance. This includes but is not limited to maintaining all plants in good condition, the security of the plant material once delivered to the site, and watering of plants. Plants shall be appropriately watered prior to, during and after planting. It is the contractor's responsibility to provide clean water suitable for plant health from off site, should it not be available on site.
22. All disturbed areas will be dressed with 8" of topsoil and planted as noted on the plans or seeded except plant beds. Plant beds shall be prepared to a depth of 12" with 75% loam and 25% compost.
23. Trees, ground cover, and shrub beds shall be mulched to a depth of 2" with one-year-old, well-composted, shredded native bark not longer than 4" in length and ½" in width, free of woodchips and sawdust. Mulch for ferns and herbaceous perennials shall be no longer than 1" in length. Trees in lawn areas shall be mulched in a 5' diameter min. saucer. Color of mulch shall be black.
24. In no case shall mulch touch the stem of a plant nor shall mulch ever be more than 3" thick total (including previously applied mulch) over the root ball of any plant.
25. Secondary lateral branches of deciduous trees overhanging vehicular and pedestrian travel ways shall be pruned up to a height of 8' to allow clear and safe passage of vehicles and pedestrians under tree canopy. Within the sight distance triangles at vehicle intersections the canopies shall be raised to 8' min.
26. Snow shall be stored a minimum of 5' from shrubs and trunks of trees.
27. Landscape Architect is not responsible for the means and methods of the contractor.

Plant List

TREES

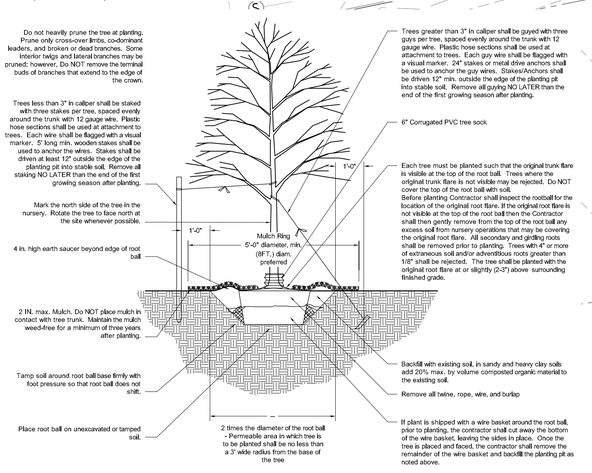
Symbol	Botanical Name	Common Name	Quantity	Size	Comments
Ar	*Acer rubrum 'Red Sunset'*	Red Sunset Red Maple	4	2.5-3" cal.	BB
As	*Acer saccharum 'Green Mountain'*	Gree Mountain Sugar Maple	4	2.5-3" cal.	BB
Cb	*Carpinusbetulus 'Frans Fontaine'*	Frans Fontaine Hornbeam	9	2.5-3" cal.	BB
Ls	*Liquidambar sytraciflua*	Sweetgum	6	2.5-3" cal.	BB
Mt	*Malus 'Tina'*	Tina Crabapple	4	2.5-3" cal.	BB
Psk	*Prunus serrulata 'Kwanzan'*	Kwanzan Cherry	1	2.5-3" cal.	BB
Qr	*Quercus rubra*	Red Oak	6	2.5-3" cal.	BB
Ua	*Ulmus americana 'Princeton'*	Princeton American Elm	5	2.5-3" cal.	BB
Zs	*Zelkova serrata 'Green Vase'*	Green Vase Zelkova	5	2.5-3" cal.	BB

EVERGREEN TREES FOR SCREENING

Jv	*Juniperus virginiana 'Emerald Sentinel'*	Emerald Sentinel Eastern Red Cedar	6	7-8' ht.	BB
Pa	Picea abies	Norway Spruce	9	8-10' ht	BB
Pg	Picea glauca	White Spruce	14	8-10' ht	BB
Pp	Picea pungens 'Glauca'	Colorado Blue Spruce	3	8-10' ht	BB
Po	Picea orientails	Oriental Spruce	6	7-8' ht.	BB
Th	Thuja plicata 'Green Giant'	Green Giant Western Red Cedar	14	8-10' ht	BB

SEEDING

Seed Mix "A"	*50% New England Roadside Matrix Upland Seed Mix/ 50% New England Conservation Mix, by New England Wetland Plants*	SF	
Lawn Areas	Pennington Smart Seed Tall Fescue Blend	SF	



TREE PLANTING DETAIL

NO.	REVISIONS	DATE	INT.
2.	PER REVISED SITE PLAN	02/01/21	VM
1.	REVISED SUBMISSION TO DOVER PER TECHNICAL REVIEW 10/8/20	01/07/21	VM
0.	INITIAL SUBMISSION	10/02/20	RW

SEAL

DATE ISSUED: 01/07/21
SCALE: 1"=30'
DESIGNED BY: RW
DRAWN BY: VM
APPROVED BY: RW
DWG FILE:

LANDSCAPE PLAN

prepared for
54 BRR, LLC
JOHN RANDOLPH
TAX MAP 1, LOT 6
54 BACK RIVER ROAD, DOVER, NH

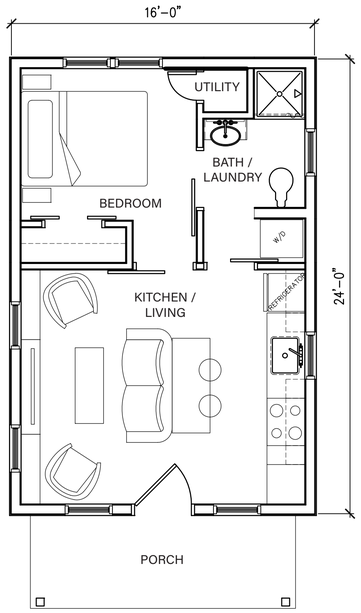
MJS ENGINEERING, P.C.
CIVIL • STRUCTURAL • ENVIRONMENTAL
5 Railroad St., P.O. Box 359
Newmarket, NH 03857
Phone: (603) 659-2013 Fax: (603) 659-4621
E-mail: mjs@mjs-engineering.com

woodburn & company
LANDSCAPE ARCHITECTURE
103 Kent Place Newmarket, New Hampshire Phone: 603.659.5949

JOB: 20-011

LA101

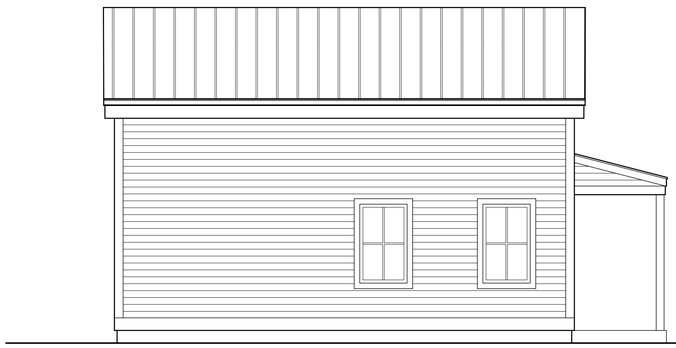
(P20-60)



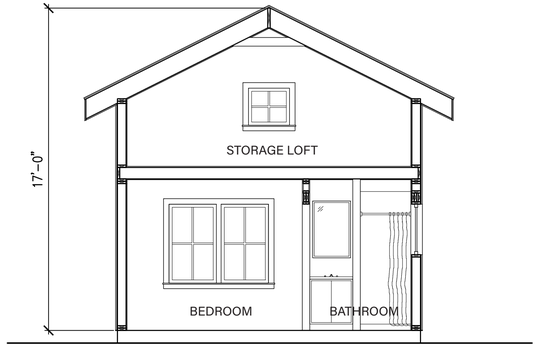
FLOOR PLAN - 384 SF (1)
SCALE: 1/4"=1'-0"

RENDERING & PROPOSED PALETTE

ELEVATION (2)
SCALE: 1/4"=1'-0"



ELEVATION (3)
SCALE: 1/4"=1'-0"



SECTION (4)
SCALE: 1/4"=1'-0"

BLEEKER BEIGE
Benjamin Moore or similar

COPLEY GRAY
Benjamin Moore or similar

NIMBUS
Benjamin Moore or similar

NORMANDY
Benjamin Moore or similar

SAYBROOK SAGE
Benjamin Moore or similar

DISTANT GRAY
Benjamin Moore or similar

STONINGTON GRAY
Benjamin Moore or similar

WHALE GRAY
Benjamin Moore or similar

NO.	DESCRIPTION	DATE

REVISIONS

NOT FOR CONSTRUCTION

SEAL

We GSD Studios
ARCHITECTURE | PLANNING
22 Jady Hill Ave
Exeter, NH 03833

DESIGNED BY: MWR
DRAWN BY: MWR

PROJECT: 200302.01

54 BACK RIVER ROAD
DOVER, NEW HAMPSHIRE

COTTAGE CONCEPT PLANS & RENDERINGS

SCALE: AS NOTED
DATE: 02.01.2021
DRAWING NO.:

A1.1

P21-01, P20-60, & P20-61 **54 Back River Road**

Property ID	Location	Owner 1	Owner 2	Owner Address 1	City	State	Zip
16020-000OPN	PICNIC ROCK DR	PICNIC RIVERS PARTNERS OF DOVER LLC	FOY WILLIAM T MEMBER	29 MENDUM AVE	PORTSMOUTH	NH	03801
16020-017000	47 PICNIC ROCK DR	LINVILLE JOHN THOMAS II & HEIMAN MALISA	LINVILLE JOHN T II REVOCABLE TRUST OF 20	PO BOX 956	DOVER	NH	03821
16020-018000	45 PICNIC ROCK DR	WU ZIWEI		GSS 13194 83 MAIN ST	DURHAM	NH	03824
16020-019000	43 PICNIC ROCK DR	WARREN STEVEN MICHAEL		43 PICNIC ROCK DR	DOVER	NH	03820-4709
16020-020000	41 PICNIC ROCK DR	HATFIELD DANIEL P &	HATFIELD ALISON L	41 PICNIC ROCK DR	DOVER	NH	03820-4709
16030-000000	50 MILL ST	GREAT BRIDGE DOVER LIMITED PARTNERSHIP	C/O STEWART PROPERTY MGMT INC	P O BOX 10540	BEDFORD	NH	03110-0540
16032-000000	39 40 MILL ST	GROSSMAN KENNETH W & HOLLY TRUSTEES	GROSSMAN FAMILY 2003 REVOCABLE TRUST	435 SCRUTON POND RD	BARRINGTON	NH	03825
I0005-000000	BACK RIVER RD	CAMPBELL WAYNE P TRUSTEE	CAMPBELL REALTY TRUST	64C HORNETOWN RD	FARMINGTON	NH	03835
I0005-000016	24 WINGATE LN	ECHO PROPERTY MANAGEMENT LLC		16 NASON RD	HAMPTON FALLS	NH	03844
I0005-000017	22 WINGATE LN	FLETCHER ROBIN G		22 WINGATE LN	DOVER	NH	03820
I0005-000018	20 WINGATE LN	HALPERN JUDITH ANN TRUSTEE	HALPERN JUDITH ANN LIVING TRUST	20 WINGATE LN	DOVER	NH	03820
I0005-000019	18 WINGATE LN	SMITH CHARLES R		18 WINGATE LN	DOVER	NH	03820
I0006-A00000	50 BACK RIVER RD	CROSSMAN FRANK JR		50 BACK RIVER RD	DOVER	NH	03820
I0006-B00000	44 BACK RIVER RD	PELCHAT WILLIAM H &	SAUCIER LINDA M	44 BACK RIVER RD	DOVER	NH	03820
I0006-C00000	46 BACK RIVER RD	TSAKIRIS NATHAN 95% &	TSAKIRIS TINA 5%	46 BACK RIVER ROAD	DOVER	NH	03820
I0006-C00001	8 RED BARN DR	MCGUANE TIMOTHY J &	LEBEL MCGUANE LAURALEE	8 RED BARN DR	DOVER	NH	03820
I0006-C00002	12 RED BARN DR	ROY SCOTT L &	ROY AMY M	12 RED BARN DR	DOVER	NH	03820
I0006-C00003	16 RED BARN DR	ROBINSON SHARI &	ROBINSON TERRY	16 RED BARN DR	DOVER	NH	03820
I0006-C00004	20 RED BARN DR	DEOLIVEIRA SEBASTIAO H &	MERRETT-DEOLIVEIRA DEBRA A	20 RED BARN DR	DOVER	NH	03820
I0006-C00005	24 RED BARN DR	KELLER JOSHUA		24 RED BARN DR	DOVER	NH	03820
I0006-C00006	28 RED BARN DR	HARBRON WILLIAM R &	HARBRON MARILYN	28 RED BARN DR	DOVER	NH	03820
I0006-C00DRV	RED BARN DR	RIDGESTONE BUILDERS & DEVELOPERS LLC		15 STARFISH DR	WELLS	ME	04090-4158
I0006-C00OPN	RED BARN DR	RIDGESTONE BUILDERS & DEVELOPERS LLC		9 KINGS GRANT DR	ATKINSON	NH	03811
I0006-D00000	BACK RIVER RD	HELLMAN LANCE W TRUSTEE	HELLMAN LANCE W REVOCABLE TRUST	228 HIGHLAND AVENUE	PORTSMOUTH	NH	03801
I0006-I00001	56 BACK RIVER RD	SWEATT ARTHUR		56 BACK RIVER RD	DOVER	NH	03820
I0057-000000	49 BACK RIVER RD	STEVENS WALLACE B		49 BACK RIVER RD	DOVER	NH	03820
I0058-000000	51 BACK RIVER RD	HOLGATE LIMITED PARTNERSHIP		130 CENTRAL AVE	DOVER	NH	03820
I0059-000000	53 BACK RIVER RD	HOLGATE LIMITED PARTNERSHIP		130 CENTRAL AVE	DOVER	NH	03820
I0060-000000	55 55A BACK RIVER RD	TURGEON KEVIN &	TURGEON LISA	225 GREEN ST	SOMERSWORTH	NH	03878
I0061-000000	57 BACK RIVER RD	SMITH MATTHEW J & FLEISCHMANN AMANDA A T	FLEISCHSMITH FAMILY REVOCABLE TRUST OF 2	57 BACK RIVER ROAD	DOVER	NH	03820
I0062-000000	58 BACK RIVER RD	DAVIS TIMOTHY A &	DAVIS ERIN M	58 BACK RIVER RD	DOVER	NH	03820
I0067-B00000	62 BACK RIVER RD	TOWLE JONATHAN P TRUSTEE	TOWLE JONATHAN P 2008 TRUST	62 BACK RIVER RD	DOVER	NH	03820
I0006-000000	54 BACK RIVER RD	54 BRR LLC		1 STAGECOACH RD	DURHAM	NH	03824
		MJS ENGINEERING	MICHAEL SIEVERT, P.E.	P.O. BOX 359	NEWMARKET	NH	03857
		TRITECH ENGINEERING CORP.	ROBERT STOWELL	755 CENTRAL AVENUE	DOVER	NH	03820
		GSD STUDIOS	ROBERTA WOODBURN	103 KENT PLACE	NEWMARKET	NH	03857
		WOODBURN & COMPANY	JOSEPH NOEL	P.O. BOX 174	SOUTH BERWICK	ME	03908

Central Business Street Tree Plan

Dover, NH

January 29, 2021

Acknowledgements

This Central Business District (CBD) Street Tree Plan was developed as part of a coastal resilience project funded by the New Hampshire Department of Environmental Services Coastal Program. The overall goal of the project includes strengthening the City of Dover's resilience to climate change by improving the City's urban landscape through various mechanisms and providing education on innovative approaches to stormwater design.

The project was overseen by a Project Team comprised of the following individuals:

Steve Bird, City Planner
Gretchen Young, Assistant City Engineer
Bill Boulanger, Deputy Director of Community Services
Kyle Pimental, Strafford Regional Planning Commission
Jackson Rand, Strafford Regional Planning Commission
Liz Durfee, EF | Design& Planning, LLC

The City's Forest Sub-committee members assisted with defining the scope of and reviewing the Plan:

Anna Boudreau
Robert Eckert
Steven Fellows
Amy Kramer Perry
Rick Schnable

This project would not have been possible without the time and effort of the volunteers who participated in the street tree inventory data collection. The following individuals assisted with the inventory:

Kristine Bowden
Anna Clark
Rebecca DiGirolomo
Daniel Eltringham
Barbara Ferrara
Dick Ferraro
Steven Frick
Heidi Henninger
Leslie Herd
Caroline Kanaskie
Kassandra Pearl
Tom Ryde
Rick Schnable
Dennis Shanahan

Strafford Regional Planning Commission staff Alaina Rogers and Stephen Geis also assisted with street tree data collection.

The Project Team would also like to thank the following individuals who reviewed and provided guidance on the recommended species list included in Appendix G of this Plan:

Rebecca DiGirolomo, Natural Resources Field Specialist, Forestry UNH Cooperative Extension
A.J. Dupere, Urban Forester, NH Division of Forests and Lands
Greg Jordan, Rockingham County Forester

The Plan was prepared by EF | Design & Planning, LLC and Strafford Regional Planning Commission.

Table of Contents

I. Introduction 1
A) Guiding Principles & Objectives of this Plan 3
B) Role & Value of Street Trees 4
II. CBD Street Tree Inventory 6
A) About the Inventory 6
B) Findings 7
III. Tree Canopy Cover Analysis 16
A) About the Tree Canopy Cover Analysis 16
B) Findings 16
C) Socio-Economic Analysis 20
IV. Street Tree Management 23
A) Tree Selection 23
B) Site-Specific Street Tree Design Considerations 25
C) Suggested Species for the CBD 27
D) Installation 29
E) Maintenance 31
V. Implementation 33
A) Prioritized list of planting locations in CBD 33
B) Management Needs 37

Appendices

Appendix A 2020 CBD Street Tree Survey Questions

Appendix B 2020 Street Tree Inventory Instructions

Appendix C 2020 Street Tree Inventory Species List

Appendix D 2020 Street Tree Inventory Map Set

Appendix E 2020 Tree Canopy & Socio-Economic Data Maps

Appendix F Pertinent Local Regulations and Guidelines

Appendix G Matrix of Recommended Street Tree Species (sortable Excel database)

Supplemental Data: GIS Database with Street Tree Inventory Data

Figures

Figure 1. Map of Dover and the Central Business District (CBD) 2
Figure 2. Map of trees surveyed during the 2020 CBD inventory 8
Figure 3. Most prevalent street tree species in the CBD 9
Figure 4. Diameter at breast height (DBH) of street trees in the CBD (Q=Quartile) 10
Figure 5. Height of street trees in the CBD (Q=Quartile) 10
Figure 6. Overall condition of sites surveyed 11
Figure 7. Overall condition trees by species 11
Figure 8. Map of overall condition of street trees in the CBD 12
Figure 9. Type of maintenance needs identified in the CBD 13
Figure 10. Number of maintenance needs identified per street tree 13
Figure 11. Size of street tree pits 14
Figure 12. Tree condition by tree pit size 14
Figure 13. Map of trees identified as being appropriate for the site they are located in 15
Figure 14. Side of building that tree is located on 16
Figure 15. City-wide estimated tree canopy cover (Source: USDA NAIP, US Census Bureau) 17
Figure 16. Estimated tree canopy cover in the CBD (Source: USDA NAIP) 18
Figure 17. Tree canopy cover and land cover (Source: USDA NAIP, NH GRANIT) 19
Figure 18. Tree canopy cover with overall social vulnerability index ranking of census tracts in Dover relative to other census tracts in New Hampshire (Source: USDA NAIP, CDC SOVI, US Census Bureau). 22
Figure 19. US Forest Service tree selection guidelines for maximizing stormwater runoff and improving air quality (Source: US Forest Service) 24
Figure 20. Regulations and guidelines for tree planting in Dover 26
Figure 21. CBD tree planting guidelines and spacing 29
Figure 22. Site preparation and planting checklists (Source: NH Division of Forests and Lands and US Forest Service State and Private Forestry Service) 30
Figure 23. Location of empty tree pits/planting sites 34
Figure 24. Location of tree pits with stumps 34
Figure 25. Location dead or dying trees 34
Figure 26. Location of ash trees in the vicinity of Central Avenue and Main Street 34
Figure 27. Street tree density map 36

Tables

Table 1. Tree canopy and socioeconomic data for Census tracts in Dover 21
Table 2. Basic principles of trees in urban design (Source: Adapted from CNU) 25
Table 3. CBD Street tree maintenance schedule 32
Table 4. CBD Street Tree Management Recommendations 37

I. Introduction

This Street Tree Plan includes:

Section 1: Guiding principles and objectives for the plan and a discussion of the role and value of street trees.

Section 2: Information about the CBD street tree inventory that was conducted in the summer of 2020 and an analysis of inventory results.

Section 3: A summary of a City-wide GIS-based canopy cover and socio-economic data assessment.

Section 4: A discussion of CBD street tree management, including species selection and street tree design considerations, installation, and maintenance.

Section 5: An implementation schedule to increase resiliency based on street tree inventory findings.

This Street Tree Plan also includes several appendices with the inventory survey questions, inventory instructions, list of species found in the CBD, CBD inventory map set, canopy cover and socio-economic data map set, a summary of pertinent local regulations and guidelines, and a matrix of recommended species for the CBD.

This Plan implements Action Item #45 from the Natural Resources Master Plan Chapter: *Maintain and accurate inventory of City tree and develop and urban tree plan that provides tree planting and removal guidelines.*

Figure 1 shows a map of the CBD and extent of the street tree inventory. Street trees are trees planted in the right-of-way, often in a tree pit in the sidewalk or in the grassy median between the sidewalk and street.

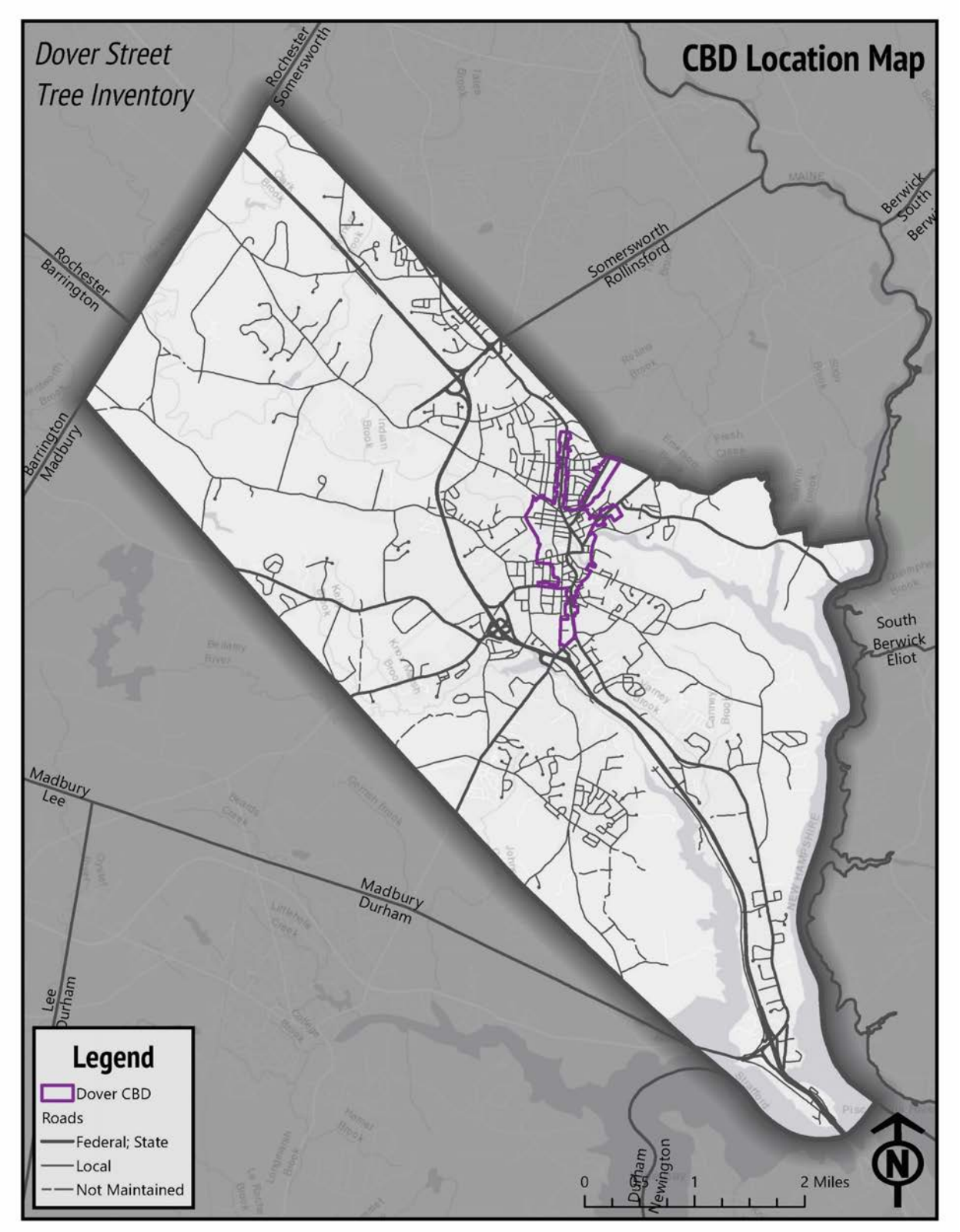


Figure 1. Map of Dover and the Central Business District (CBD)

A) Guiding Principles & Objectives of this Plan

- Stive for compatibility with complete streets practices
- Provide practices to mitigate and adapt to climate change
- Guide equitable tree planting across the city
- Serve a resource to inform day to day decisions of staff
- Improve integrated, efficient, and effective management of street trees and infrastructure
- Prioritize retention of existing trees when possible, but recognize the need to remove trees that are no longer appropriate for a site
- Adhere to goals, objectives, and findings documented in the City's Master Plan
- Implement Dover's vision for 2023, which includes: *enhanced environmental quality and sustainability are actively pursued and inherent in all the city's activities*

Excerpts from the City's Climate Master Plan

- By the end of the century average summer temperatures could be up to 11°F warmer than the historical average from 1980 to 2009. Extreme heat waves may also become more frequent, putting additional stresses on human health, infrastructure, and the electrical grid.
- Local impacts include drought
- The City recognizes increases in frequency and intensity of extreme precipitation due to climate change will exacerbate stormwater runoff and the grit-suspended solids that carry many of the pollutants of most concern, including bacteria, chloride, sediment, and nutrients.
- Infiltration is a low-impact way to replenish groundwater rather than convey runoff directly to surface water bodies.
- Climate change will cause warmer temperatures, which can increase ground-level ozone formation and may increase the number with days when air quality is poor.
- As temperatures rise, summer heat waves will become longer and more frequent. Faced with these longer hot stretches plus increased population and growing demand, the regional power grid and energy providers will be challenged to supply adequate power. Periods of extreme heat also decrease the efficiency of power plants and place additional stress on the system, especially when demand for electricity is highest. Dover's most urbanized areas, in the downtown core, may experience increases in the urban heat island effect (urban areas become significantly warmer than the surrounding rural areas due to human activities). That would create additional stresses for people living and working there.
- Underserved and vulnerable populations— including low-income persons and families, the elderly, and individuals with disabilities—may be more sensitive to climate change-related impacts.
- Incorporate additional trees and native vegetation, while also preserving mature trees, into the downtown landscape and other City-owned properties in order to help lower surface and air temperatures by providing shade.

B) Role & Value of Street Trees

The urban forest includes trees in parks, landscaped boulevards, gardens, greenways, river corridors, wetlands, preserves, and trees on residential, commercial, and industrial property within cities and towns. Street trees are a critical part of the urban forest. Street trees are a public resource that provide a wide range of ecological, social, and economic benefits.

If designed properly trees can provide a significant return on investment and become assets that increase with value over time.

-Congress for New Urbanism

Street trees provide an important ecological role in the urban environment. They create habitat for birds, insects, and wildlife and support conservation of urban biodiversity. Native, denser, and larger trees typically provide better habitat for species such as birds.[1]

In Dover's Central Business District, where forested land comprises less than 5% of the land area and over 90% of the district is developed, street trees are critical to cooling the urban environment. Enhancing the urban tree canopy is one strategy to adapt to climate change and increasingly warmer temperatures.

Another key role that street trees play is providing ecosystem services, which are benefits that people obtain from ecosystems. One ecosystem service that trees provide is temperature regulation. Tree planting is a highly effective strategy for cooling urban environments.[2] In the summer, leaves and branches typically reduce the amount of sunlight and solar radiation below the tree canopy by 70-90%, depending on the species.[3] By providing shade, street trees help to reduce the phenomenon referred to as the urban heat island effect, in which urbanized areas experience higher temperatures – 1 to 7°F higher in the day – than outlying areas due to the prevalence of buildings, roads, and other infrastructure that absorb and re-emit the sun's heat more than natural landscapes.[4] Shaded surfaces may be 20 to 45°F cooler than peak temperatures in non-shaded areas. Trees planted on the western side of a building typically offer greater cooling benefits than those located on other sides.[5,6]

Street trees shade Central Ave buildings

Evapotranspiration associated with trees can future reduce temperatures in urban areas. Evapotranspiration is the combination of evaporation from land and transpiration, or the opening of stomata and release of water vapor, from plants. This has a cooling effect on the atmosphere. Evapotranspiration increases as temperature increases and can lower peak summer temperatures by 2-9°F.[7]

Street trees provide benefits in winter as well by acting as a wind break. Properly placed trees that do not block southern facing windows can reduce winter heating bills by 20-50%.[8,9]

Trees also aid in stormwater management. By intercepting rainwater and reducing and filtering runoff in the canopy and root zone, street trees contribute to stormwater management and improve the water quality in receiving water bodies and groundwater.[10,11] By drawing moisture from the soil, trees increase the soil water storage capacity during rainfall events. They also enhance permeability of soils.[12] Tree

roots loosen soils as they grow, which increases infiltration. Trees with tap roots and deeper and more vertical roots have been found to promote greater infiltration than species with fibrous roots and more lateral, shallower roots.[13] Greater infiltration reduces stormwater runoff, helps to mitigate flooding, and promotes groundwater recharge. Increasing the prevalence of street trees enhances stormwater management in the City.

Trees filter air pollutants and capture and store carbon dioxide, which helps to improve local air quality and mitigate greenhouse gas (GHG) emissions.[14] In parking lots and along streets, trees that shade parked vehicles keep them cooler and reduce evaporative emissions of volatile organic compounds from gas tanks.[15] Leaves remove pollutants such as particulate matter, nitrogen oxides, sulfur dioxide, carbon monoxide, and ground-level ozone from the air through a process called dry deposition.[16]

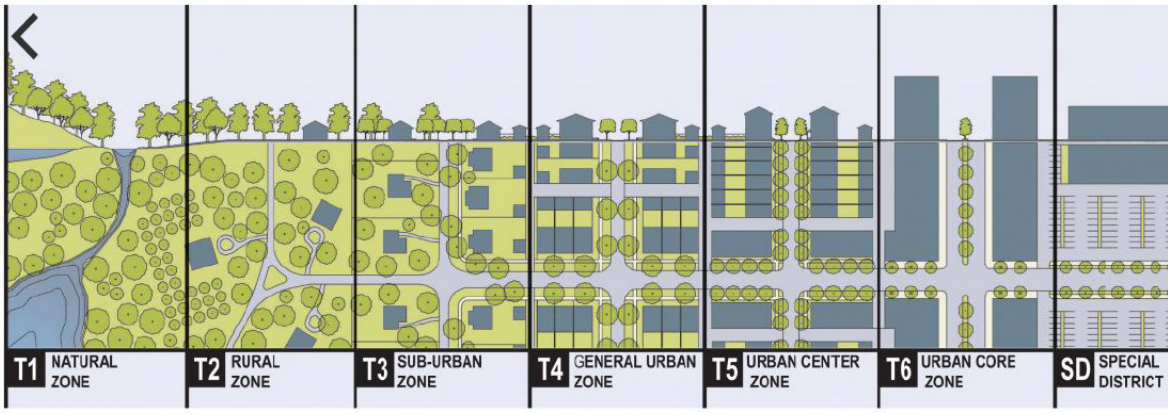
These regulating services have numerous social benefits, ranging from public health to enhancing the pedestrian realm. A reduction of pollution has been shown to reduce negative health consequences associated with poor air quality.[17] The cooling effect of trees can reduce heat-related illness, which is particularly important in urban areas where residents are at a greater risk of heat stress and will become increasingly at risk as extreme heat events occur more frequently.[18] In addition to cooling, the shade provided by trees reduces direct exposure to harmful ultraviolet rays. An even distribution of canopy cover throughout a community supports social equity.

Street trees contribute to placemaking and aesthetics of communities. They can soften the appearance of wide streets, large parking lots, utilities, and structures,[19] as well as reduce urban noise.[20] Planting trees in medians and along streets has been shown to help slow traffic and create safer conditions for motorists and pedestrians.[21] Trees also improve urban residents' connection with nature.

In addition to environmental and social benefits, street trees in urban environments provide economic benefits to individuals and the City. Trees and vegetation increase residential property values by around 3 to 10 percent.[22] Studies have shown that customers stay longer at shopping centers with landscaping, thus increasing revenue at local shops. Trees that shade buildings reduce the demand for air conditioning by 30 percent, providing property owners with energy savings, reducing energy demand by 20-50 percent, and reducing emissions associated with energy demand.[23,24] Research has shown that a young, healthy tree can provide a net cooling effect that is equivalent to 10 air conditioning units operating for 20 hours a day.[25] In addition to cooling, shading can also slow pavement deterioration, which reduces maintenance and can extend the life of roadways and other infrastructure.[26]

Integrating Nature into Context-Specific Urban Design

The Congress for New Urbanism (CNU) recommends using the rural-urban transect as a tool for integrating nature into context-specific urban design. This approach emphasizes that the primary role of trees in the suburban to urban core transect zones is to enhance the habitat of people. CNU notes that while environmental benefits are realized through the urban forest, compared to the natural and rural transect zones, the social and economic benefits of trees in urban areas are typically greater than the environmental benefits. Secondary benefits include managing stormwater, reducing urban heat island, reducing energy costs, and providing wildlife habitat. In this context, the CBD falls within the core urban landscape, or T6 zone, shown in the diagram below, where social and economic benefits are prioritized and maximized over environmental benefits. In surrounding suburban and rural districts, the reverse may apply.



A version of the rural-urban transect diagram with six successional zones from nature to urban core (Source: DPZ, Congress for New Urbanism)

II. CBD Street Tree Inventory

A) About the Inventory

An inventory of all street trees in the CBD was conducted from mid-July to mid-September 2020. The goal of the inventory was to map the location of street trees and compile information about the species, planting site, and health of each tree. This information will be used to inform future planting and management of street trees within the district.

The inventory consisted of a multi-step process. First, the Project Team reviewed data collected in several municipal street tree inventories in the U.S. and assembled an initial list of data to collect on each street tree in the CBD. This attribute list was further refined with input from City staff.

Next, SRPC built an online survey using ESRI's Survey123 app. This survey could be readily accessed by volunteers after downloading the app to a mobile device. Paper surveys were also made available to volunteers. A copy of the paper survey is included in Appendix A.

A comprehensive set of instructions was developed to provide volunteers and staff with information about the survey, how to obtain the app, and how to respond to each question. Both the list of survey questions and instructions created for the CBD street tree inventory were designed to allow the City to replicate the inventory in other zoning districts in the future. The CBD Street Tree Inventory Instructions are included in Appendix B.

Volunteers were recruited via the City's newsletter, distribution of a call for volunteers to boards and commissions, and through a posting on NatureGroupie. Over 20 individuals reached out to learn about the inventory. Sixteen volunteers participated in the inventory and contributed a total of 72.25 volunteer hours. Staff contributed 29.25 hours in the field.

After all streets in the CBD had been inventoried, staff processed and analyzed the data collected.

Volunteers submitted a photo of each tree they surveyed

B) Findings

Street tree inventory data was collected at a total of 378 sites within the CBD. Stumps and dead trees comprised nine and three of the sites, respectively, and were not identified by species. Eight empty planting sites were found. Figure 2 shows the location of the surveyed trees along streets in the CBD. The location of each tree was obtained using the Survey123 geolocate feature, which generally has a five-meter accuracy, and then edited by SRPC in ArcGIS to align with streets.

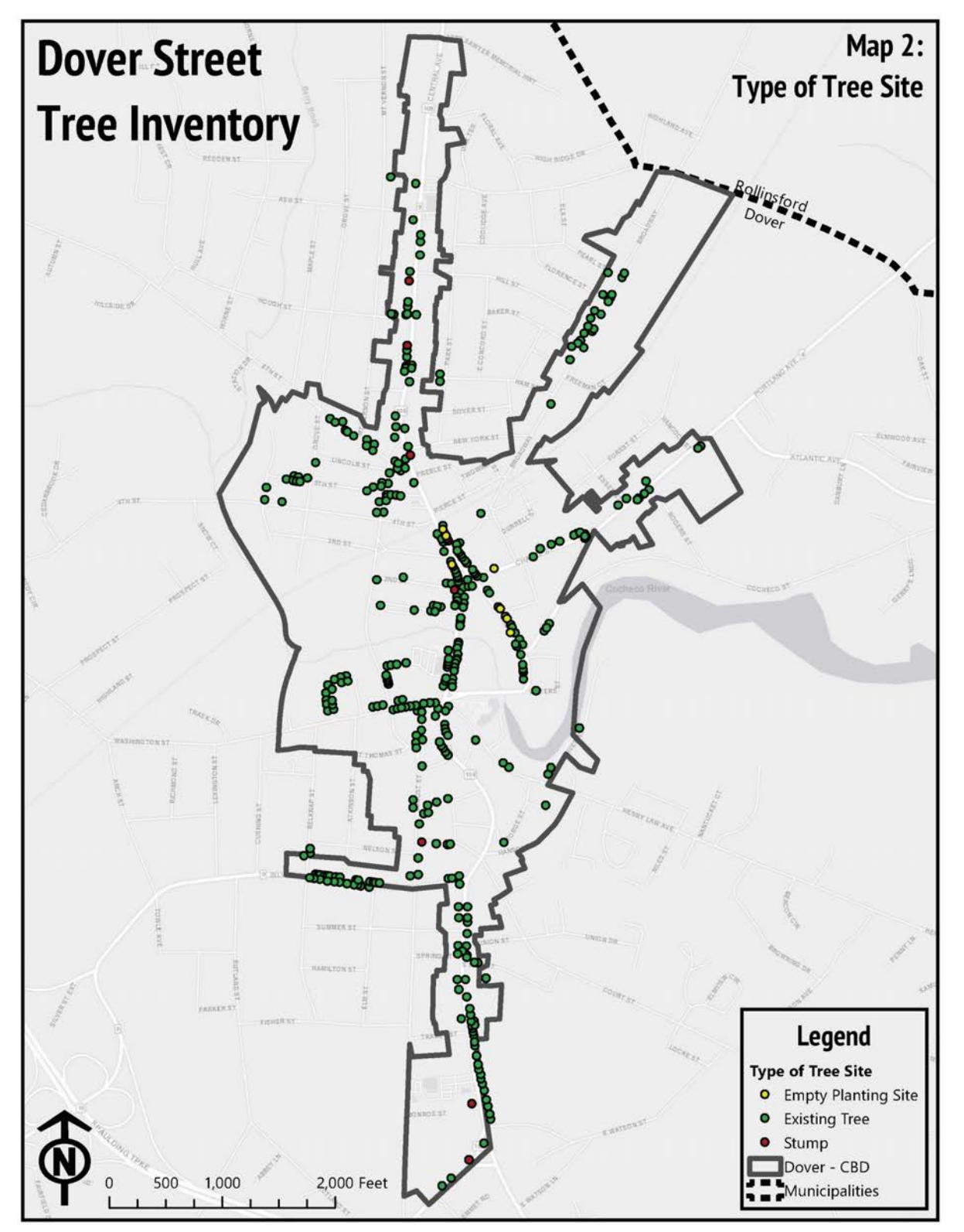


Figure 2. Map of trees surveyed during the 2020 CBD inventory

Staff performed a cursory QAQC on some trees that were identified as species that would not typically be found in the US Department of Agriculture's Plant Hardiness Zone 5, which is the zone that Dover is located in. The result was a list of 44 different species. The most common species were linden, also known as basswood (*Tilia americana*) and little leaf linden (*Tilia cordata)*, which accounted for a total of 68 of the living trees (19%) in the CBD. Norway maple (*Acer plantanoides*) (13%) followed by green ash (*Fraxinus pennsylvanica*) (11%) and red maple (*Acre rubrum*) (9%) were the next most common species. The 12 most prevalent species accounted for 289, or approximately 75%, of all living trees surveyed in the CBD. The remaining 25% consisted of 29 other species (Figure 3). A complete list of species is included in Appendix C.

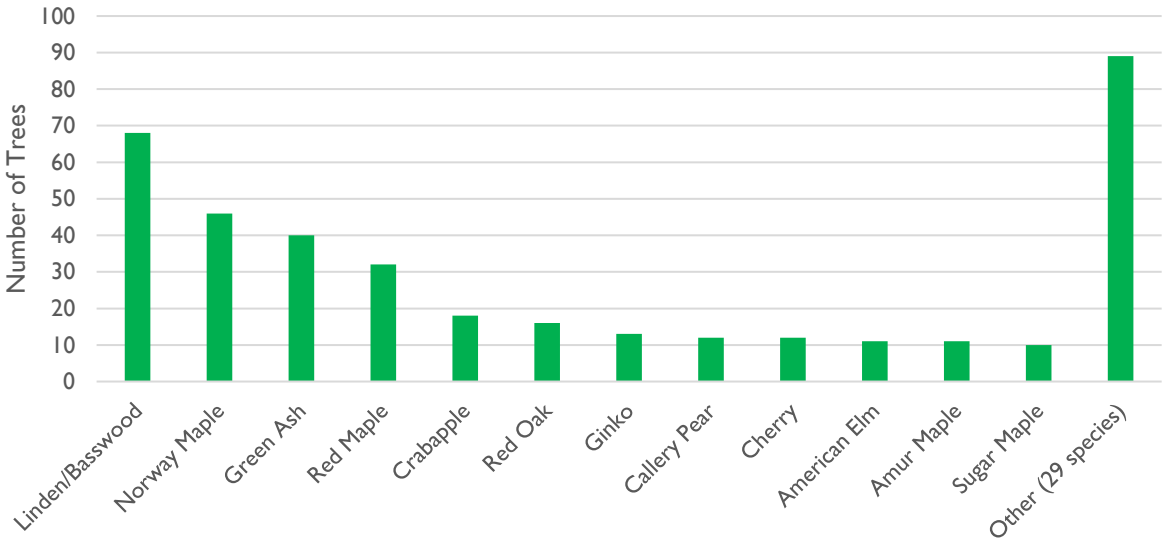


Figure 3. Most prevalent street tree species in the CBD

The diameter at breast height (DBH), or diameter of the trunk at approximately 4.5 feet from the ground, and the estimated tree height were collected for each tree. As expected, the size of trees in the CBD was variable. The box and whisker plot in Figure 4 shows the average DBH of 18.9 inches (indicated by the "x"), median DBH of 13.5 inches (indicated by the horizontal line in the middle of the shaded area), the interquartile range comprising the middle 50% of data points (indicated by the shaded box), and the outliers (shown as dots that extend beyond more than 1.5 times the upper (43 inches) and lower (1 inch) quartiles). As shown in Figure 4, there were numerous outliers, indicating that errors may have occurred when calculating the DBH or inputting the data.

Figure 5 shows the estimated tree height average, median, interquartile range, and outliers. The average tree height was 34.1 feet and the median height was 30.9 feet. Similar to DBH, it is assumed that outliers may be due to data collection and inputting errors.

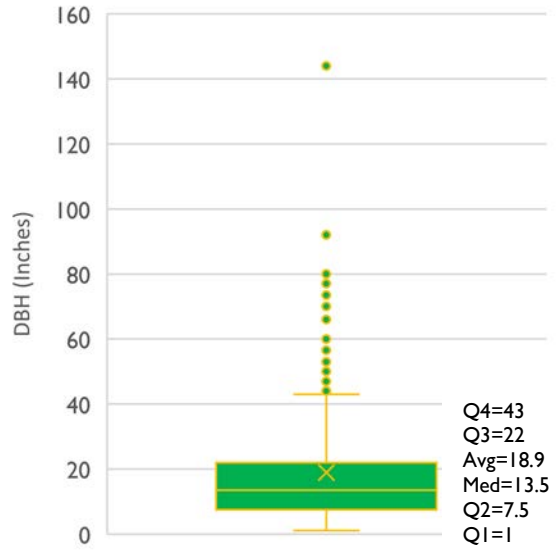


Figure 4. Diameter at breast height (DBH) of street trees in the CBD (Q=Quartile)

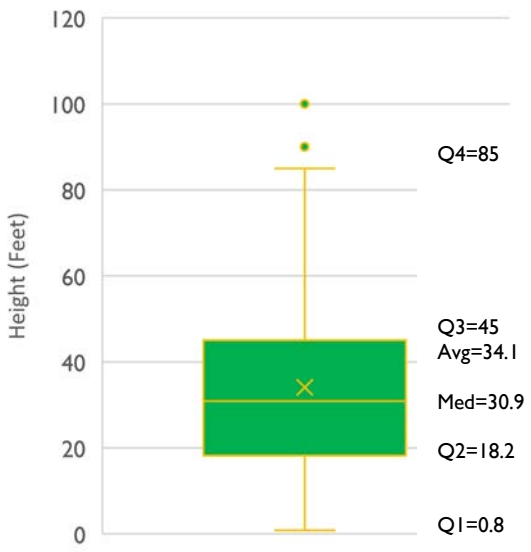


Figure 5. Height of street trees in the CBD (Q=Quartile)

Volunteers were asked to rate the overall condition of each tree, as well as provide input on a series of maintenance issues. The pie chart in Figure 6 displays the overall condition at each site surveyed. A majority (58%) of trees were ranked as being in good condition. Over one quarter of trees were in fair condition. The remaining 16% of sites had trees that were in poor condition, were dead or dying, or had stumps and empty planting sites. Figure 7 displays the overall condition of the trees surveyed by species. Of species with 10 or more trees within the CBD (shown in Figure 2), three species had over 50% of individuals ranked as dead or dying, poor, or fair condition: green ash, red oak, and amur maple. Each of the 11 American Elm trees were ranked as being in good condition. The geographic distribution of tree condition is shown in the map in Figure 8.

Data was collected on eight different categories of maintenance issues, including the presence of injury or damage; disease or pests; pruning, watering, and mulching needs; sidewalk or curb damage from roots; overhead utility wires; or adjacent or overhead streetlights. This information may be used by the City to allocate staff and contractor time to specific maintenance activities as well as prioritize trees that require the attention of professional arborist. Figures 9 and 10 display the findings from the maintenance needs data collection. Pruning, watering, and mulching were commonly identified maintenance needs (Figure 9). Forty percent of trees surveyed required pruning, while 37% required water and 29% needed more mulch. Little vandalism was recorded.

Additionally, there were overhead wires above 37% of the trees surveyed and streetlights near 22% of the street trees. An affirmative response to the questions on the presence of overhead wires and adjacent or overhead lights does not necessarily mean there is an immediate need for maintenance, rather it indicates the potential for greater pruning needs than a tree that is not located in proximity to this infrastructure. It also indicates that future replacement trees should be appropriately sized and maintained to avoid conflicts with utilities.

At approximately 16% of surveyed sites, there was evidence of damage to the sidewalk or curb due to root uplifting. This is an indication that the tree is too large for the street tree pit and available growing

space. It may also indicate that the root system of the particular species may not be appropriate given the constraints of the site.

Seventy-six percent of the trees surveyed were identified as having one to four maintenance needs. Sixteen percent required no maintenance in any of the nine maintenance needs categories (Figure 10)

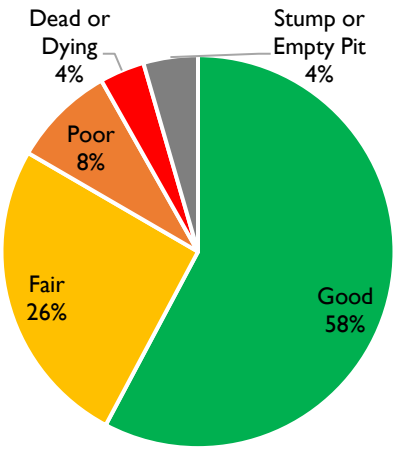


Figure 6. Overall condition of sites surveyed

Nine of the sites surveyed contained stumps.

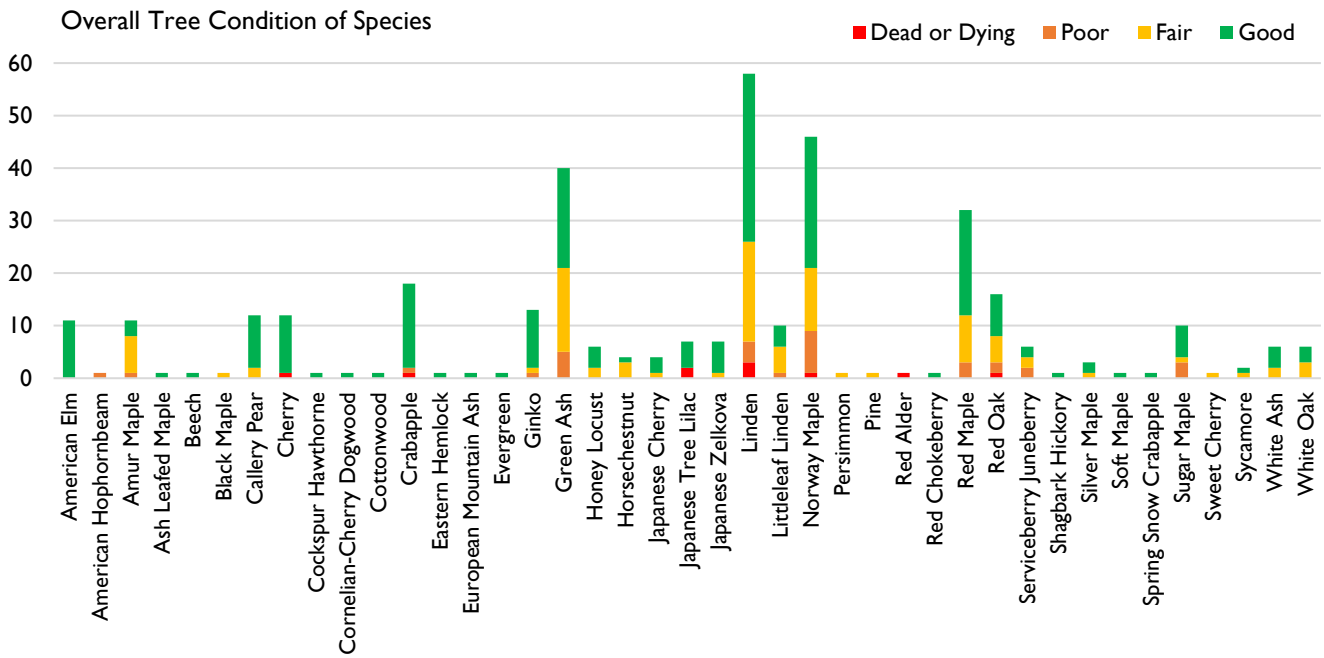


Figure 7. Overall condition trees by species

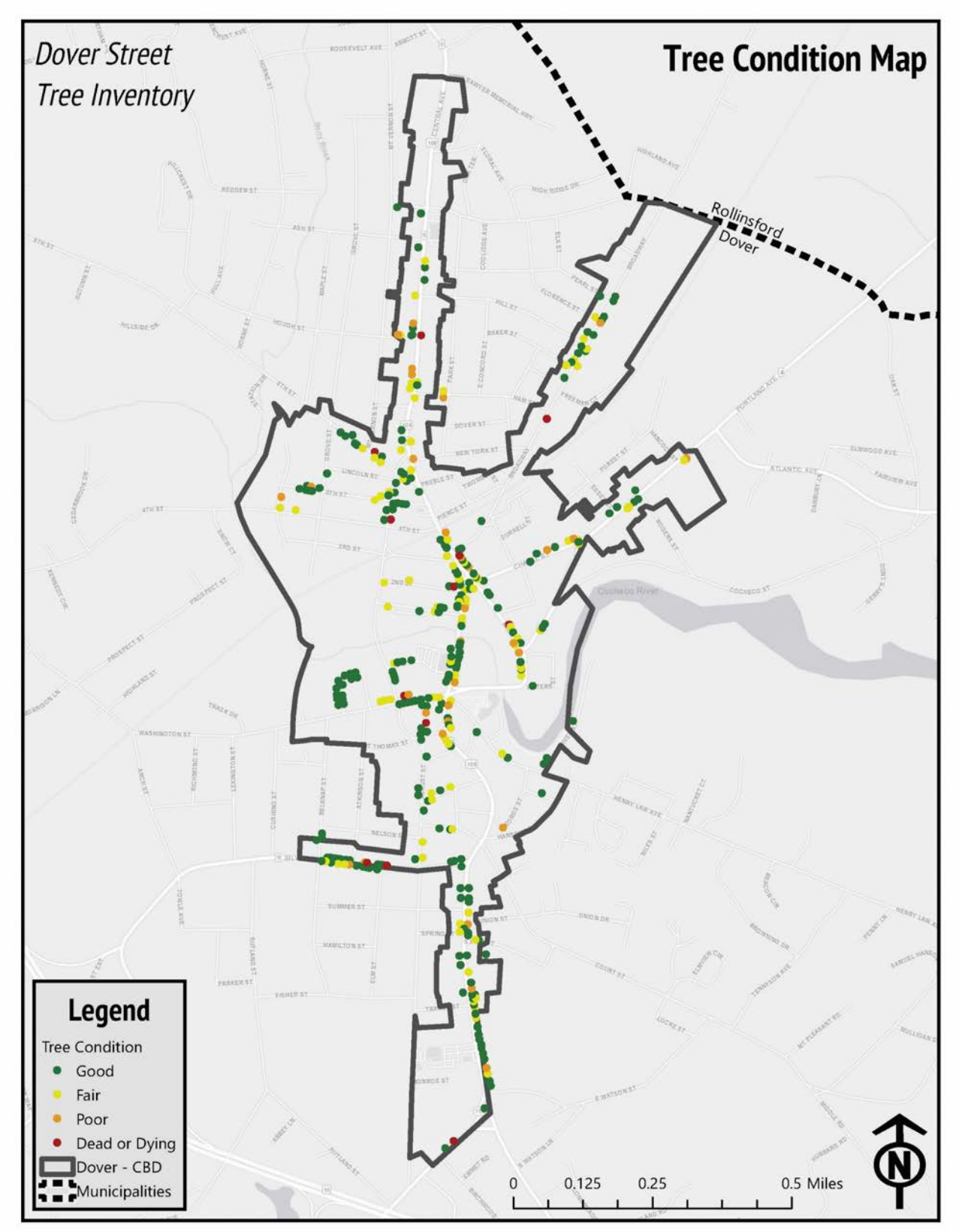


Figure 8. Map of overall condition of street trees in the CBD

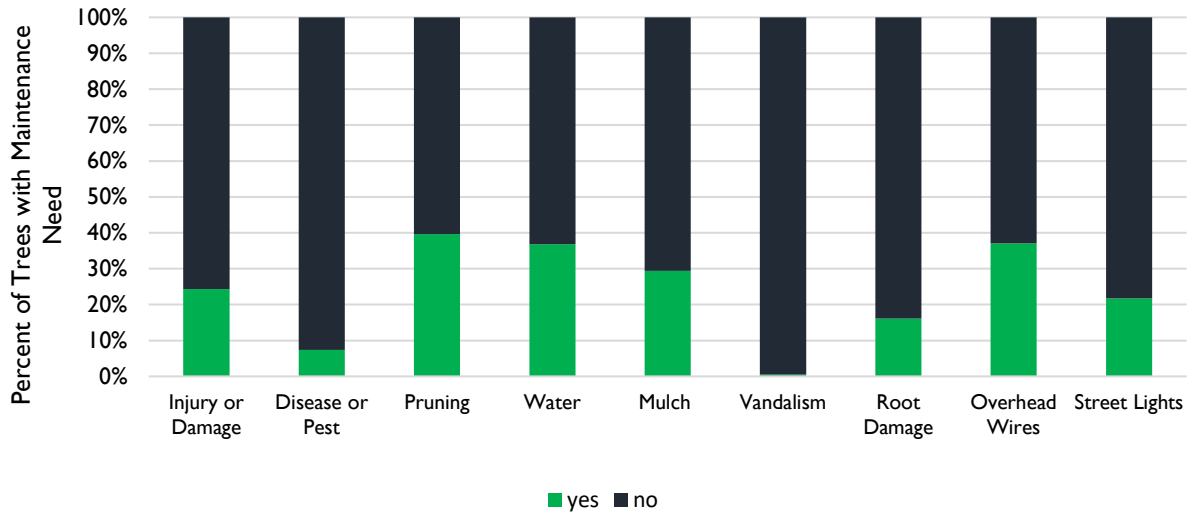


Figure 9. Type of maintenance needs identified in the CBD

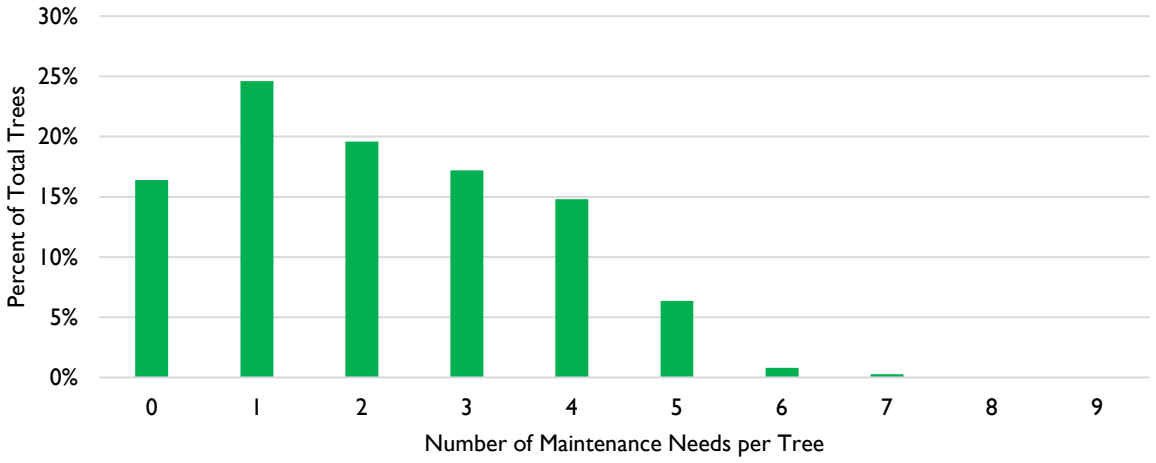


Figure 10. Number of maintenance needs identified per street tree

The geographic distribution of maintenance needs was variable throughout the CBD, with trees located in the more urban areas in street tree pits generally requiring more water and mulching than those located grassy medians in the CBD's slightly more suburban neighborhoods. Notably, many of the Green Ash located along Central Avenue were identified as needing pruning to remove dead or low hanging branches over the street.

Nearly all of the trees surveyed were identified as having sufficient clearance between the street tree pit and a building or other obstacle to comply with American Disabilities Act standards, or four feet of clear sidewalk width. A sidewalk width of less than 4 feet was identified in 12 locations.

Street tree pit size was recorded for each tree that was located in a street tree pit. Inventory participants were instructed to skip this question if the tree was planted in a grassy median or other location. Data was entered for 140 trees. One data point of 6,411 square feet was determined to be a data entry error and excluded from the data analysis. The median size of the tree pits was 24 square feet, while the average was much higher at 57 square feet. Similar to DBH and height measurements, it is likely that the outliers of this data set are the result of calculation errors or data entry errors (Figure 11). The larger areas may also be measurements of grassy strips or lawns, rather than exclusively street tree pits. However, variation in the size of street tree pits and the number of trees planted in each pit was evident.

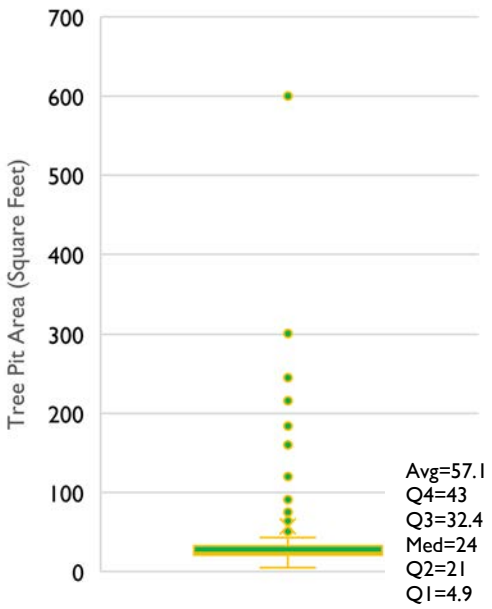


Figure 11. Size of street tree pits

Figure 12 displays the overall condition of street trees in the CBD by tree pit size. As shown in the chart, 6% of the trees in tree pits under 20 square feet and between 20 and 29 square feet were dead or dying. There were no dead or dying trees and few trees in poor condition located in tree pits larger than 30 square feet. Although the determination of overall tree condition was subjective and there are a number of variables that impact tree condition, this data suggests that tree pits over 30 square feet in size in the CBD may contribute to greater overall tree health.

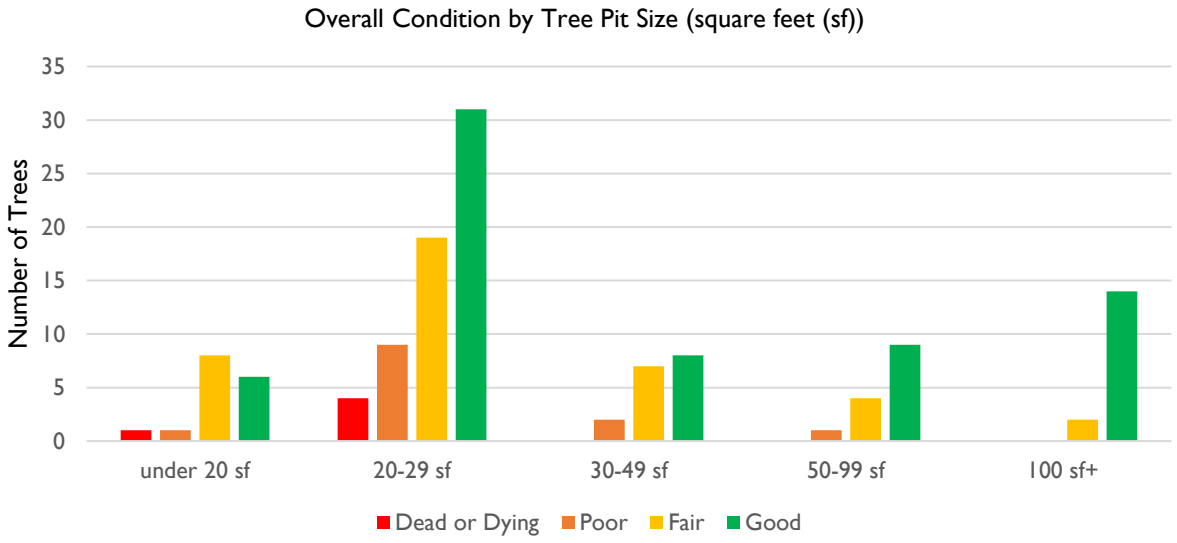


Figure 12. Tree condition by tree pit size

Inventory participants were also asked to assess the overall appropriateness of the site for the specific tree. Figure 13 displays a map of this data. Overall, 86% of planting sites were deemed to be appropriate for the tree. A response of "no" to this survey question typically indicated that the tree was either too large or too small for the site. This information may be used by the City to prioritize removal and replacement of specific street trees.

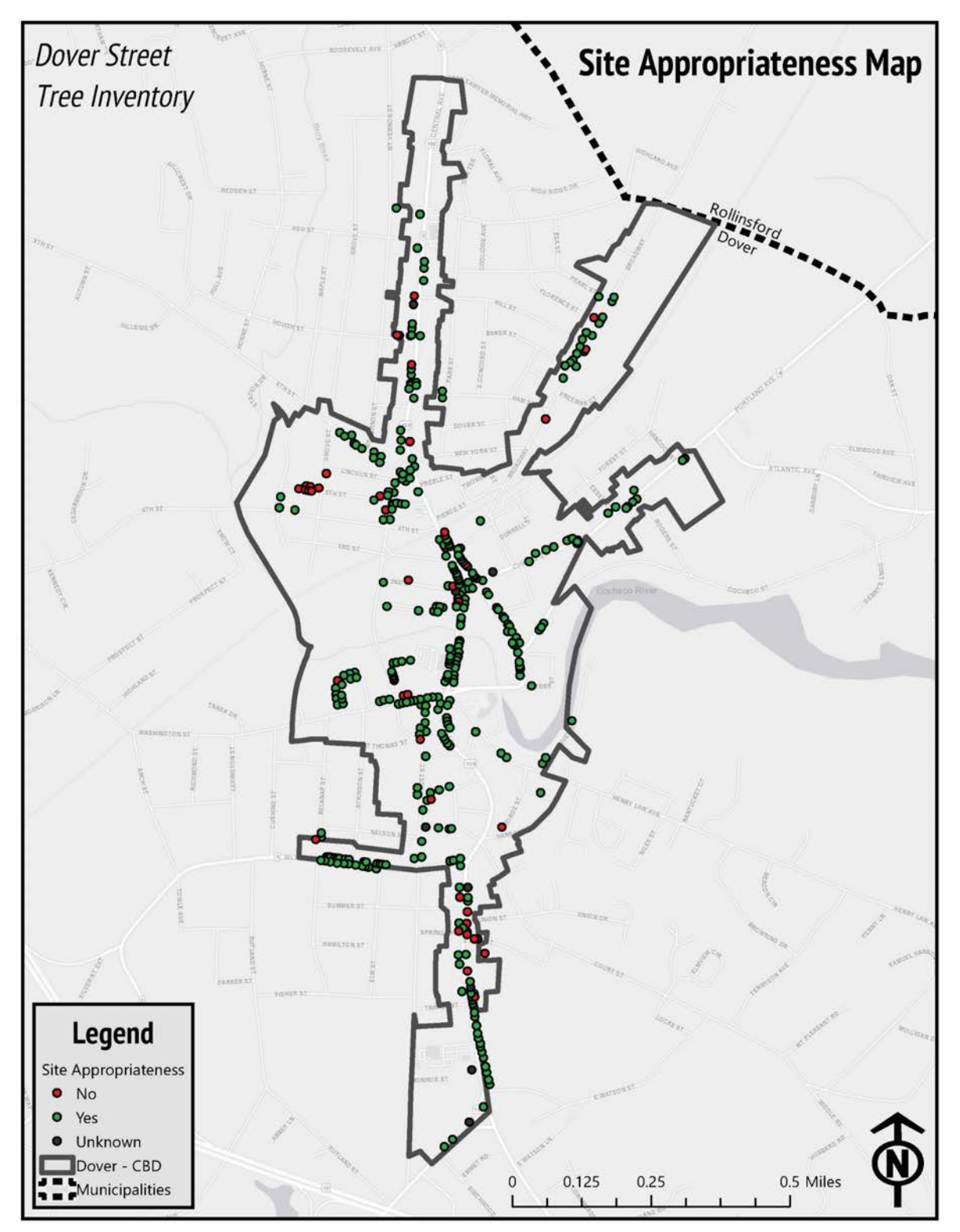


Figure 13. Map of trees identified as being appropriate for the site they are located in

While contributing to aesthetics and shading benefits, canopy shape can also influence site appropriateness. For example, oval or v-shaped trees may fit better in spaces that are closer to buildings than a round or umbrella shaped tree, which may be better suited for a larger space. Nearly half of all street trees in the CBD were identified as having an irregular crown shape. Round and oval shaped crowns accounted for 20 and 13%, respectively, of street trees.

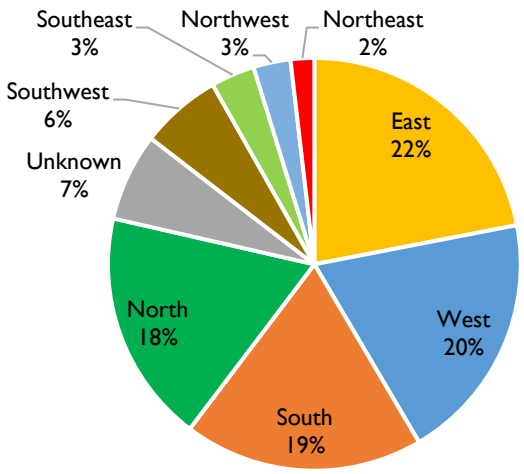


Figure 14. Side of building that tree is located on

Volunteers collected data on the planting aspect, or side of the building the tree was located on. Planting deciduous trees to the west of a building is considered to be most effective for cooling the building.[27,28] Twenty percent of trees surveyed were located on the west side of the adjacent building, indicating that they may provide increased cooling and energy savings benefits than trees located on alternative sides of the building (Figure 14). In instances where there is no street on the west side of a building to plant street trees along, property owners should seek opportunities to plant trees in western facing side and rear yards and other landscaped areas. The US Forest Service also indicates that planting trees around 10 to 20 feet south of a home will maximize summer shade while also minimizing winter shade.[29]

Appendix D contains a map set of the street tree inventory results.

III. Tree Canopy Cover Analysis

A) About the Tree Canopy Cover Analysis

A desktop analysis of tree canopy cover in Dover was conducted using LiDAR data available from the US Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP) to supplement the CBD street tree inventory data and better understand the distribution of tree canopy cover city-wide. This analysis is based on an estimate of the total tree cover and includes street trees as well as all other trees such as those in parks, forests, yards. The percentage of land covered by tree canopy cover city-wide and by census track was determined by dividing the canopy cover by the land area.

B) Findings

The estimated tree canopy cover for the City of Dover is approximately 14.7% (Figure 15). Tree canopy cover ranges from approximately 3.6% in Census tract 814 to 20.5% in tract 811. Within the CBD, the estimated canopy cover is about 2.9% (Figure 16).

When overlayed on land cover data, the distribution of canopy cover in developed areas of the City versus agricultural or forested areas is more apparent (Figure 17).

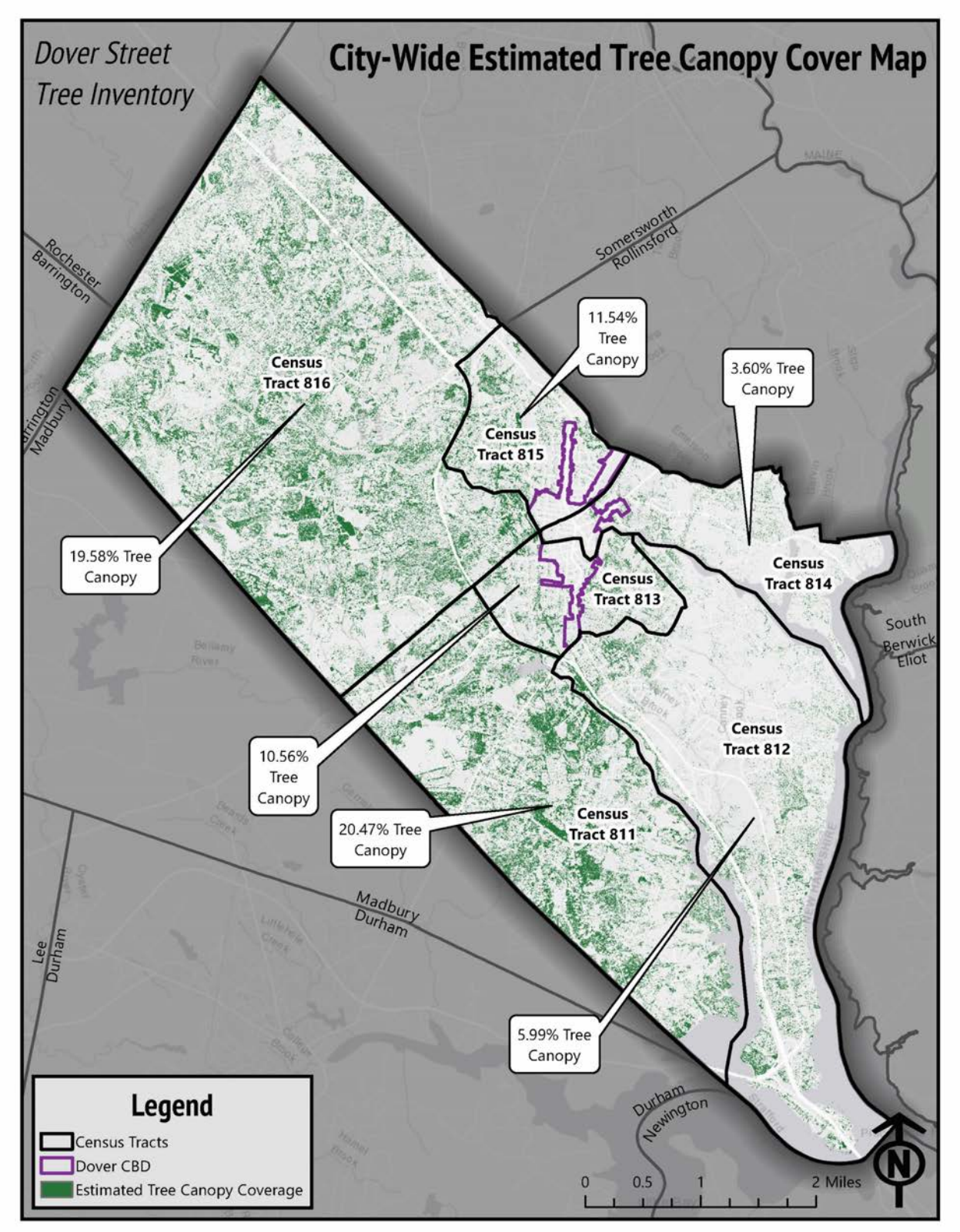


Figure 15. City-wide estimated tree canopy cover (Source: USDA NAIP, US Census Bureau)

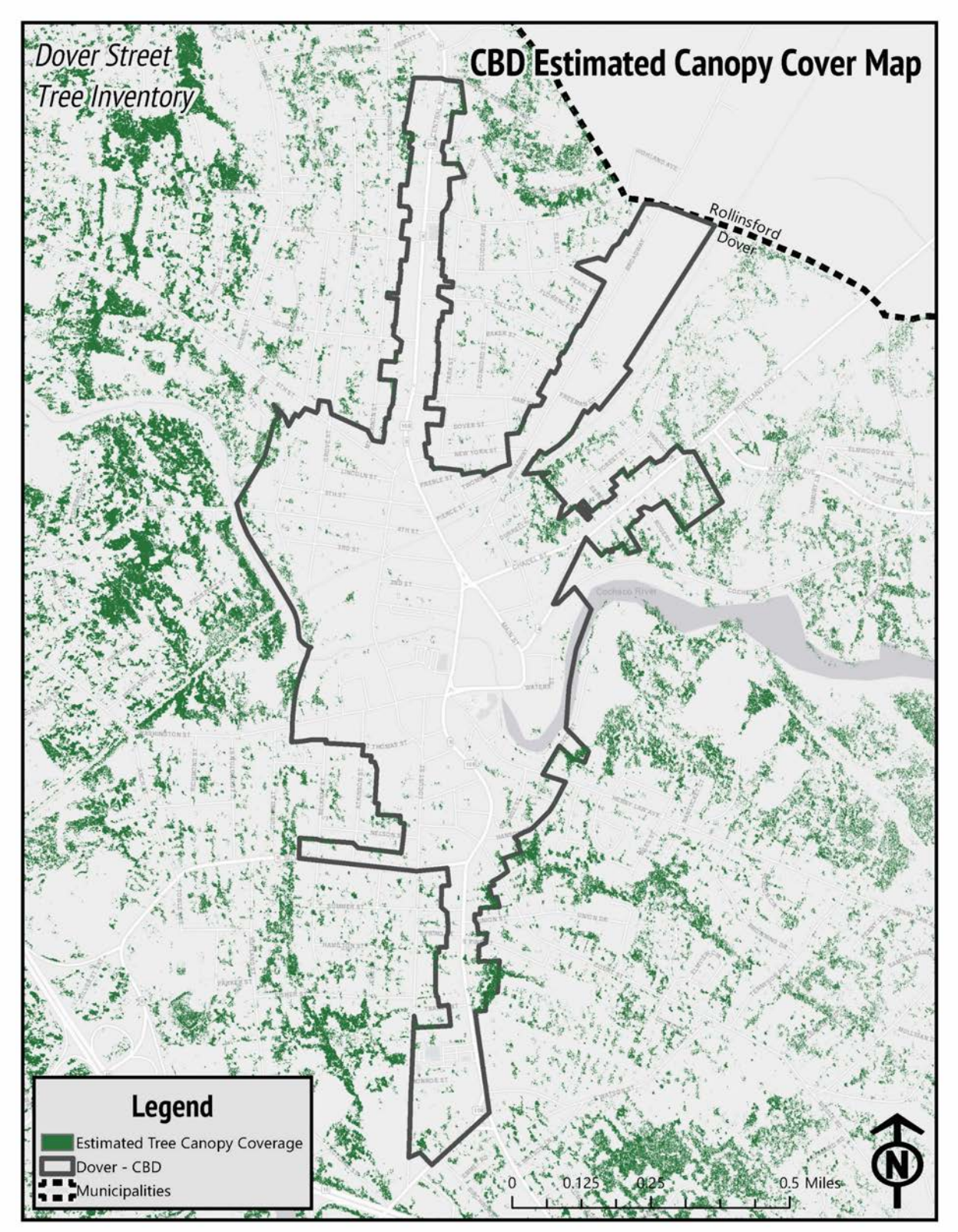


Figure 16. Estimated tree canopy cover in the CBD (Source: USDA NAIP)

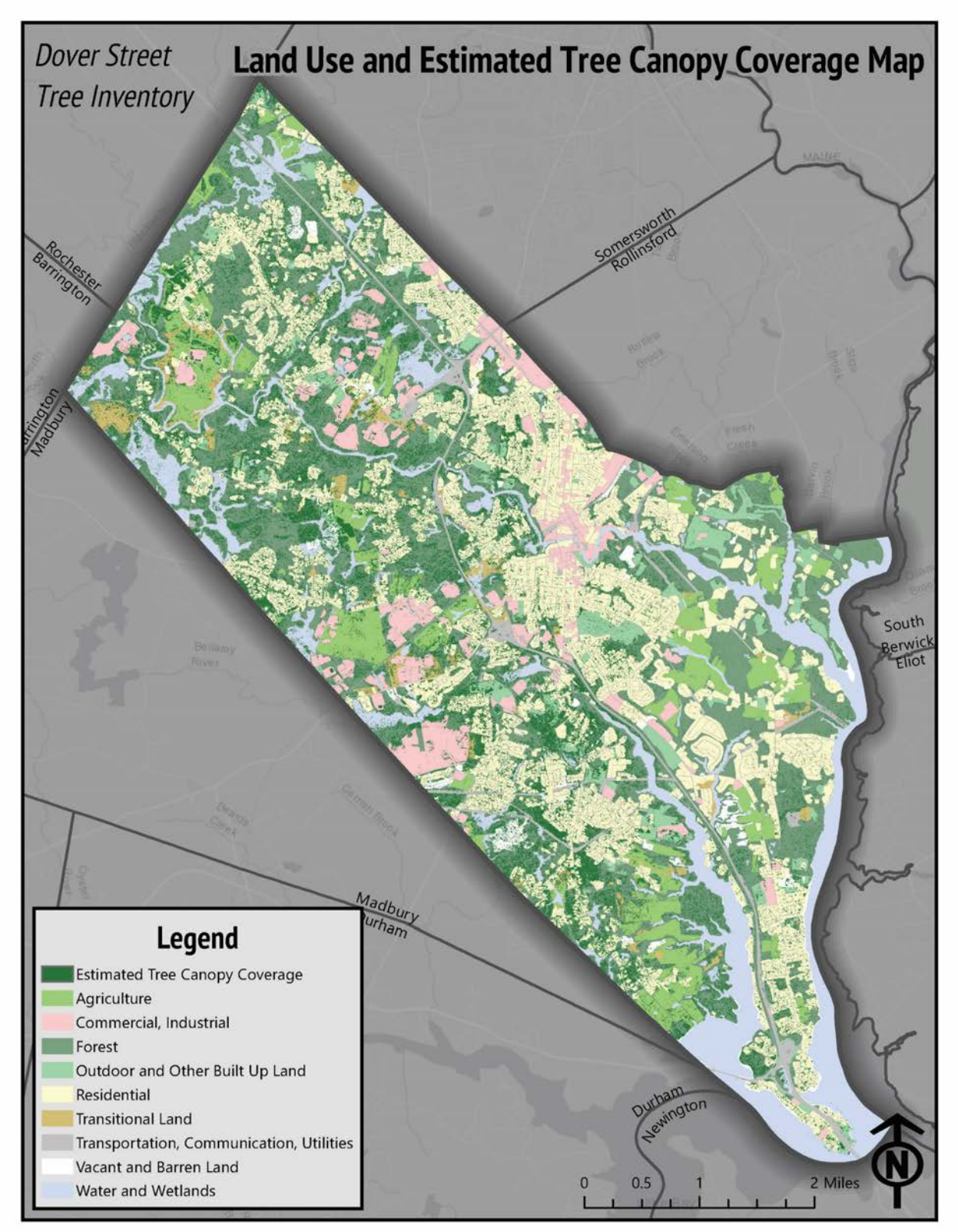


Figure 17. Tree canopy cover and land cover (Source: USDA NAIP, NH GRANIT)

A U.S. Forest Service report on urban and community forests of New England compiled data on the percent urban tree canopy cover of urban land for all available states that can be used as a rough benchmark of canopy cover. The percent canopy cover ranged from less than 5% to nearly 50%.[30] The canopy cover of urban land in New Hampshire accounted for 44.2 percent of urban land. Urban land makes up approximately 6.2% of the area of the state.[31] This data is based on US Census urbanized areas and National Land Cover Database data.

C) Socio-Economic Analysis

Studies have found a disparity in the distribution of urban tree canopy cover, with low income and minority neighborhoods often having less canopy cover than neighborhoods.[32] Equitable distribution of canopy cover is critical to ensuring that all populations are afforded the same access to the benefits of tree canopy and to reducing any environmental justice conditions that arise from inequitable access to these benefits. As Dover faces climate change impacts such as increasing temperatures, it will be particularly important to establish canopy cover throughout the city.

To better understand the equity of tree canopy cover in Dover, the percent canopy cover, socio-economic data from the American Community Survey (ACS) (population, median household income, and renter occupied residences), and the Center for Disease Control (CDC)'s Social Vulnerability Index (SVI) for each Census tract were compared (Table 1). The CDC's SVI ranks social vulnerability based on 15 factors that may impact a community's resilience or ability to prevent human suffering and financial loss in a disaster. The SVI uses US Census data to rank social vulnerability for the 15 individual factors and four themes: Socioeconomic, Household Composition & Disability, Minority Status & Language, and Housing Type. Census tracts are given an overall social vulnerability ranking compared to other tracts in New Hampshire. Figure 18 shows the overall SVI ranking with tree canopy cover. Additional maps are included in Appendix E.

While there are inherent limitations associated with assessing equitable distribution of canopy cover using these data sets – including the lack of socio-economic data at a finer scale and the use of densely vegetated areas as a proxy for tree canopy – it provides a high-level snapshot of the existing tree cover and reveals areas where canopy cover is more sparce. As shown in Table 1, the tracts with the highest overall social vulnerability ranking (811, 812, 813, and 815) have variable canopy cover ranging from the lowest in the City (3.6%) to the highest (20.5%). Census Tract 816 has the second greatest percent canopy cover (19.6%) along with the highest median household income, lowest share of renter occupied residences in the City, and an overall social vulnerability ranking among the lowest in the state.

Further research is necessary to determine the relationship and any correlation between socio-economic status and tree canopy distribution in Dover.

Table 1. Tree canopy and socioeconomic data for Census tracts in Dover

Census Tract	Population	Canopy Cover (% of total area)[1]	Median Household Income[2]	Renter Occupied Residences[2]	Social Vulnerability Index Ranking Relative to Other Tracts in NH[3]				
					Socio-economic	Household Composition & Disability	Minority Status &Language	Housing Type & Transportation	Overall Social Vulnerability
811	7,014	20.5%	$66,176	40%	Medium High	Medium High	Medium Low	Medium High	Medium High
812	4,665	6.0%	$79,813	20%	Medium High	Medium Low	Medium High	Medium High	Medium High
813	4,669	10.6%	$54,119	60%	Medium High	Medium Low	Medium High	Highest	Medium High
814	2,021	3.6%	$54,432	68%	Medium Low	Medium Low	Lowest	Medium High	Medium Low
815	5,874	11.5%	$64,387	64%	Medium High	Lowest	Highest	Highest	Medium High
816	7,073	19.6%	$92,781	18%	Lowest	Medium Low	Medium High	Highest	Lowest

[1]USDA NAIP; [2]ACS 2014-2018 5-Year Estimates; [3]CDC SVI Index

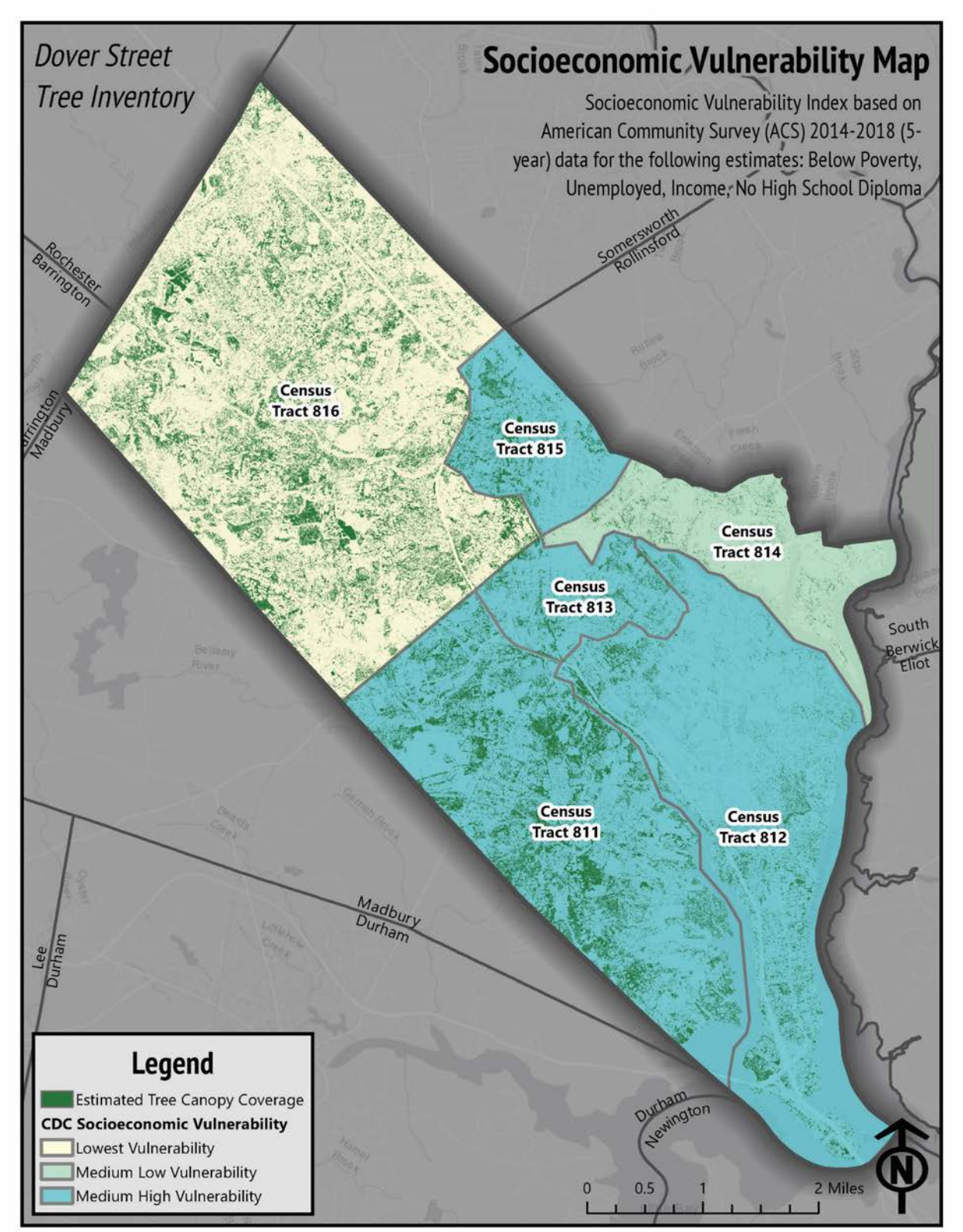


Figure 18. Tree canopy cover with overall social vulnerability index ranking of census tracts in Dover relative to other census tracts in New Hampshire (Source: USDA NAIP, CDC SOVI, US Census Bureau).

IV. Street Tree Management

A) Tree Selection

There are numerous resources available on urban species selection, planting, and maintenance. This section is intended to provide a synopsis of available guidance from an array of existing resources. It is intended to supplement but not replace existing local guidelines and regulations. It is recommended that the City consult a professional arborist prior to planting street trees.

University of New Hampshire Extension (UNH-E), U.S. Department of Agriculture (USDA), and eXtension identify a range of factors to consider when selecting street trees to plant. These include:[33,34]

- Growth habit and size
- Form
- Growth rate
- Wood strength
- Pest resistance
- Longevity and maintenance needs
- Leaf type
- Thorns, flowers, and fruits
- Native vs exotic
- Ice resistance
- Salt tolerance
- Drought tolerance.

In New Hampshire, species should be resistant to ice damage. Species such as American elm, hackberry, green ash, and honey locust, which form broad crowns, are more susceptible to ice storm damage.

(Source: UNH Extension)

The size and origin of the tree are also important to consider. Nursery grown trees that are of two-inch caliper have a greater likelihood of surviving the shock of being transplanted than larger trees.[35] Larger trees may be warranted in certain situations, however the smallest caliper tree appropriate for the job should be selected and planting trees larger than three-inch caliper trees is not recommended.[36] The healthiest stock should be selected.

According to the U.S. Forest Service, the ideal public tree:

- Is not susceptible to wind damage and branch drop
- Does not require frequent pruning
- Produces negligible litter
- Is deep-rooted
- Has few serious pest and disease problems
- Tolerates a wide range of soil conditions, irrigation regimes, and air pollutants.

Examples of solar-friendly deciduous trees include maples, hackberry, honey locust, Kentucky coffeetree, and Japanese pagoda tree.

(Source: US Forest Service)

It is important to select which of these traits are most important on a case-by-case basis because few species have all these traits.[37] Context-sensitive species selection will help to ensure survival and to maximize benefits. The better suited a tree is to the site, the greater chance it will have of surviving, growing faster, and maximizing benefits such as CO_2 sequestration.[38] For example, small growing species (under 25 feet) should be selected for under overhead power lines. Oval or columnar shaped trees are appropriate for narrow spaces.[39] Trees that are considered 'solar-friendly' that provide shading and cooling benefits in the summer while also allowing light to penetrate to buildings during the winter when warming is desired are often ideal.[40]

Among the City's goals for enhancing tree canopy cover is to improve stormwater management. The US Forest Service offers several guidelines for maximizing management of stormwater runoff at sites and for improving air quality (Figure 19) that can help the City achieve this goal.[41]

Tree Selection to Maximize Stormwater Management

- Select tree species with architectural features that maximize interception, such as large leaf surface area and rough surfaces that store water
- Increase interception by planting large trees where possible
- Plant trees that are in leaf when precipitation is greatest.
- Select conifers because they have high interception rates but avoid shading south-facing windows to maximize solar heat gain in winter.
- Plant low-water-use tree species where appropriate and native species that, once established, require little supplemental irrigation.
- In bioretention areas, such as roadside swales, select species that tolerate inundation, are long-lived, wide-spreading, and fast-growing (Metro 2002).
- Do not pave over street side planting strips for easier weed control; this can reduce tree health and increase runoff.

Tree Selection to Improve Air Quality

- Select species that tolerate pollutants that are present in harmful concentrations. For example, in areas with high ozone concentration, avoid sensitive species such as white and green ash, tulip poplar,
- Species with long leaf stems (e.g., ash, maple) and hairy plant parts (e.g., oak, birch, sumac) are especially efficient interceptors.
- Consider the local meteorology and topography to promote airflow that can "flush" pollutants out of the city along streets and greenspace corridors. Use columnar-shaped trees instead of spreading forms to avoid trapping pollutants under the canopy and obstructing airflow.
- In areas with unhealthy ozone concentrations, maximize use of plants that emit low levels of biogenic volatile organic compounds to reduce ozone formation.
- Sustain large, healthy trees; they produce the most benefits.
- To reduce emissions of volatile organic compounds and other pollutants, plant trees to shade parked cars and conserve

Figure 19. US Forest Service tree selection guidelines for maximizing stormwater runoff and improving air quality (Source: US Forest Service)

CNU offers several basic principles of trees in urban design, which are summarized in Table 2 and may be applied throughout Dover.[42]

Table 2. Basic principles of trees in urban design (Source: Adapted from CNU)

	URBAN DESIGN	ARBORICULTURE	RAINWATER MANAGEMENT
1	Plant tree species that will grow large and provide substantial shade.	Design the tree from the roots up and make space for roots by including root paths, soil trenches, soil vaults, engineered soil solutions, and suspended sidewalk systems.	Establish good place making to enhance the livability and delightfulness of places for people; Bioswales and bioretention basins should not disconnect people from on-street parking or buildings.
2	Limit tree species to those that can tolerate poor drainage, disturbed and compacted soils, limited sunlight, concentration of car exhaust and animal waste, polluted stormwater runoff, and abuse from humans.	Respect the base of the tree by providing space to accommodate the growth of the trunk flare and roots.	Invest in solution multipliers, such as using engineered soils systems that make room for tree roots, increase stormwater retention capacity, and allow durable hardscape surfaces to be used.
3	Plant trees close together using a geometric grid to maximize the contribution of each tree to the urban forest.	Plant the right tree in the right place.	Design for recognition to help people recognize and appreciate the environmental benefits of stormwater management practices.

B) Site-Specific Street Tree Design Considerations

Along with selecting species that are appropriate for Dover's climate and tolerant of urban settings, there are a number of additional considerations to take into account when developing a street tree landscape. These include, for example:[43]

- The character of the layout and species
- Whether a formal or informal configuration of trees is desired
- Soil type and volume
- The presence of public infrastructure, which can both limit tree growth and also incur damage from tree roots and branches
- Provisioning of biodiversity, habitat, and benefits to wildlife such as shelter, nesting sites, and food sources
- Site constraints such as vehicle clearance, building setbacks, and availability of sunlight.

Street trees should also conform with local regulations and guidelines including the City's Complete Streets Guidelines, CBD Architectural & Urban Design Guidelines, Streetscape and Urban Design/Downtown Streetscape Standards, and Site Plan Review Regulations. A brief summary of relevant local regulations and guidelines is included in Figure 20. Refer to Appendix F for additional pertinent local regulations and guidelines.

Relevant Local Regulations & Guidelines

Dover's **Complete Streets Guidelines** provide guidance on context and streetscape sensitivity:

During the planning, design, and review phases of projects every effort shall be made to reflect the context and character of the surrounding neighborhood. Where possible it is desirable to enhance the existing character of a street, and not replace it.

The number of street trees planted is one of the performance measures for evaluating complete streets.

The City's **CBD Architectural & Urban Design Guidelines** and **Streetscape and Urban Design/Downtown Streetscape Standards** also provide guidance on landscaping and species selection:

General guidance:

- **I.** Document the benefits of trees
- **II.** Provide new trees where there is an opportunity because of construction
- **III.** Preserve existing trees wherever possible
- **IV.** Select trees that complement the downtown's traditional appearance and be composed of trees that thrive in a New England urban environment.
- **V.** Complement the architecture and do not block important views of businesses.
- **VI.** Plant street trees at an average spacing of 25 to 30 feet on center. The planting method shall allow for maximum root zone space where possible. Existing healthy street tree shall be protected, if possible. These trees improve the pedestrian environment, compliment building facades, reduce heat island effect, assist with stormwater management, and provide many other benefits to the Downtown.

Guidance for specific locations:

Article I. Chestnut Street is a prime candidate for establishment of single large canopy tree species to help define the corridor. Recommended that *Zelkova serrata* is planted on both sides of the roadway no more than 50 feet apart. The location of the trees should not interfere with utility poles and/or lighting. Adequate distance should be left at the intersections to ensure sight lines for drivers.

Article II. Upper and Lower Squares- Selection of trees planted along the street and within the larger landscape areas should provide adequate shade for pedestrians, require little maintenance, and highlight the significance of the area. *Gledistia triacanthos var. inermis* is recommended as a shade tree along the street. *Pyrus calleryana* 'Chanticleer' is recommended as a shade tree within the larger landscaped beds. Plant no more than 40 feet apart along the street and plant in landscaped areas adjacent to seating. *Amelanchier canadensis* is recommended for planting in the larger landscaped beds.

Article III. Healthy, mature trees along Central Street, Main Street, Washington Street, and First through Sixth Streets should be preserved and infilled with appropriate tree species. *Quercus rubra, Ulmus americana 'American Liberty', and Acer rubrum* are recommended.

Article IV. In some locations, seasonal planting might be provided with containers that could be removed during winter months. Locations could include broad street corners in Upper and Lower Squares, along the approaches to in the center island of the mini round about at Portland Avenue, and along the sidewalks or approaches to the bridges within the downtown.

Figure 20. Regulations and guidelines for tree planting in Dover

With the exception of Silver Street, which has a streetscape plan and tailored list of species to plant, the street trees in the CBD are generally planted in an informal pattern. Certain areas along Central Street have groupings of one or two species, such a Callery Pears and Green Ash.

C) Suggested Species for the CBD

The City currently has three tree planting lists, including a Silver Street planting list, a list in the Downtown Dover Pedestrian and Vehicular Access and Streetscape Study, and a list of acceptable street trees for Dover. The species in these lists are included in the matrix of recommended street tree species in Appendix G. Information obtained from the Urban Horticulture Institute at Cornell University's *Recommended Urban Trees: Site Assessment and Tree Selection for Stress Tolerance*,[44] the Arbor Day Foundation,[45] as well as data collected during the 2020 CBD Street Tree Inventory is also included in this table.

Large silver maple on Grove St

This species matrix is intended to build off the existing street tree lists by providing information to determine the optimal species for a site based on the particular conditions and constraints of a street tree planting site. In the CBD, species that are shorter, more salt, drought, and heat tolerant, and have a narrower spread are likely to be more suitable for the majority of planting sites than larger and more sensitive species.

The matrix includes additional recommended species that the City may wish to include in future tree planting lists. One common street tree that was not included in Dover's existing street tree planting lists is Northern Catalpa.

Green Ash leaning over Central Ave

Some species that were identified in the CBD street tree inventory, such as silver maple and shagbark hickory, are not recommended for inclusion on the City's street tree list. Silver maples grow very large and would likely exceed the space available for a street tree. Shagbark hickories prefer for well-drained, large, landscapes, which may not be prevalent in a street tree setting.

Lastly, for various reasons, several species may warrant removal from Dover's street tree planting lists. Both Green and White Ash are susceptible to Emerald Ash Borer and other pests and diseases. Ash are also vulnerable to storm damage and therefore may require more pruning than other species. As evident along Central Avenue in the heart of the downtown, many individuals have dead limbs overhanging the road and parked cars that require pruning. Callery Pear and Norway Maple tend to be overused as street trees, and indeed, Norway Maple accounted for nearly 13% of all

The Urban Horticulture Institute's Site Assessment Checklist, available at http://www.hort.cornell.edu/uhi/outreach/recurbtree/pdfs/~recurbtrees.pdf, may be a useful resource for determining appropriate trees for a particular location.

street trees in the CBD. Both species are tolerant of urban landscapes but provide little value from an ecological perspective. Norway Maples are considered an invasive species that will spread to nearby natural areas, while Callery Pear offer little benefit to wildlife. Although few American Hophornbeam were identified in the CBD, the condition of these trees was poor. This species' high sensitivity to salt may be a contributing factor to its poor condition in the urban core. Maples and birch trees are susceptible to Asian Longhorned Beatle. While this invasive is not present in New Hampshire at this time, however Worcester, MA has an infestation. If these species are planted they should be closely monitored for this pest. Finally, *Tilia spp.*, including Linden and Littleleaf Linden accounted for a combined nearly 20% of all street trees surveyed in the CBD. To enhance the diversity of street trees, the City may wish to remove this species from its tree planting lists for several years.

Liberty elm have not been removed from the suggested planting list; however this species can be impacted by Dutch elm disease. The City could work with the Liberty Tree Society in Keene, NH, which offers a 10-year warranty against loss to Dutch elm disease.[46]

Two key considerations for future street tree species selection include drought tolerance and plant hardiness.[47] The USDA's plant hardiness zones have shifted and will likely shift again due to climate change. The Seacoast experienced one zone shift between 1990 and 2015. The 2014 National Climate Assessment shows Zone 7 moving northward.[48] Future street tree species lists may include more southern species, while others such as Sugar Maple – which is a species that is often a desirable street tree and one that is fairly prevalent in the CBD – may become less viable in the urban CBD and therefore is not recommended to be added to the City's planting list. Species with a southern most hardiness zone of 4b or lower should are not likely to thrive in the warmer conditions anticipated in the future.

Trees shading Central Ave buildings

Furthermore, changes in precipitation including more frequent and prolonged drought conditions and larger precipitation events, more severe winter storms, and an increase in the threat of invasive species, associated with climate change will likely impact the appropriateness of certain species in the CBD. Species that are already vulnerable to heat and drought, for example, may be less likely to survive as temperatures rise.

Diverse species should be selected and planted in an alternating pattern to reduce opportunities for pests to impact continuous stretches of street trees. Species vulnerable to Asian Longhorned Beatle include maples, birches, and hackberry. The spotted lanternfly, which has not yet reached the state, would be a threat to maple, oak, poplar, sycamore, walnut, and willow. (UNH Extension)

D) Installation

General recommended guidelines for spacing and avoiding conflicts with infrastructure in the CBD are shown in Figure 21. These are intended to supplement the City's existing land use regulations. It is recommended the City establish new street tree pits in areas where spacing requirements cannot be met by existing cuts in the sidewalk.

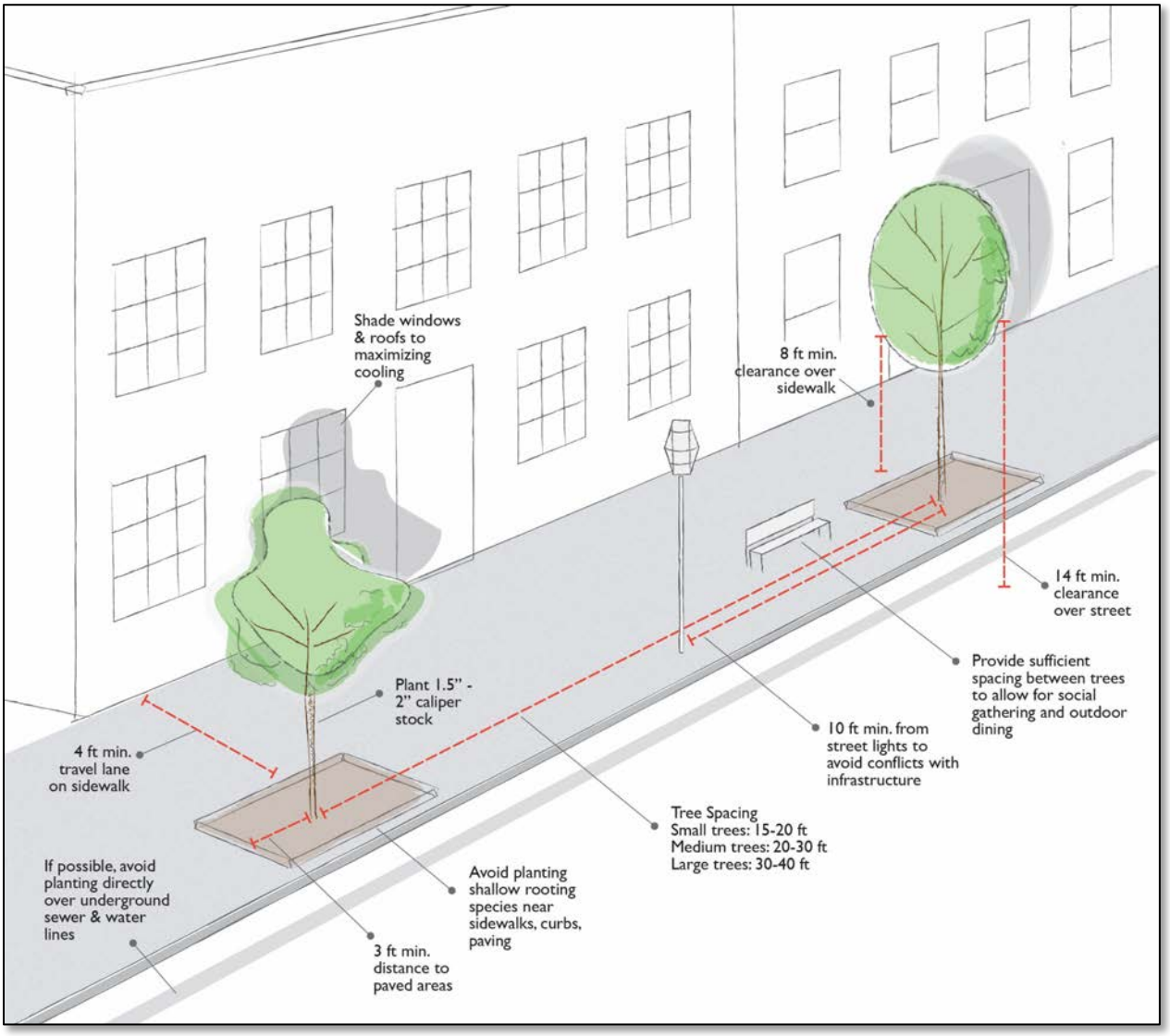


Figure 21. CBD tree planting guidelines and spacing

A number of resources are available with instructions on how to property plant street trees in urban environments. UNH's *Planting Trees in Designated and Built Community Landscapes, Checklists for Success*[49] is an excellent resource for choosing the right tree in the right place, planting it properly, and maintaining it. Another readily available resource for tree planting in New Hampshire is the *Planting and Mulching Trees and Shrubs Factsheet*,[50] developed by UNH Extension. The NH Division of Forests and Lands and US Forest Service State and Private Forestry Service offer several checklists for community tree planting in *Planting Trees in Designated Built and Community Landscapes*,[51] including Checklist #4 Preparing a Site and Checklist #5 Planting that provide basic guidance on how to plant trees (Figure 22).

Checklist #4 Prepping a Site

If possible, prepare the site before you bring in the tree. Keep the root ball well watered and keep the tree in a shaded place until you are ready to plant. It is imperative to expose the trunk flare on each balled and burlaped tree before the planting site is dug so that the depth of the planting site can be properly measured. The trunk flare is the point where roots begin to branch from the trunk. (The top of the root ball is not always the trunk flare.) Remove burlap from immediate trunk area of tree. Pull back excess soil around trunk of tree to locate trunk flare. Measure the height from the base of the trunk flare to the bottom of the root ball. Dig to the depth of the trunk flare.

- ❑ Trunk flare and top of root ball should be at grade.
- ❑ Dig the space at least 3 times the diameter of root ball.
- ❑ Break up compacted soil. Sides of planting space should not be packed. Leave bottom of space firm.
- ❑ Do not amend soil unless planting in building rubble, poor, or severely disturbed soils.

Checklist #5 Planting

- ❑ Lift tree into planting space by root ball, not the trunk.
- ❑ Balance tree upright in center of planting space.
- ❑ For trees in wire baskets, cut and remove wire.
- ❑ Cut away strings and burlap or plastic, exposing root ball. Do not remove soil from root ball.
- ❑ If tree is container grown, cut and remove container.
- ❑ Prune dead or crushed roots and straighten or cut circling roots. Make clean cuts.
- ❑ Begin refilling with soil, watering as you fill to firmly set tree. Gently tamp.
- ❑ Never plant too deep. Trunk flare and top of root ball should be at grade. (Trunk flare may be hidden within the root ball.) Fill soil up to tree base just to where roots begin to branch from trunk.
- ❑ Prune only dead or injured branches. Do not paint wounds.
- ❑ Remove tree wrap, tape, or string on trunk. Trunks should be wrapped only to protect them in transit to planting site.
- ❑ Stake and brace most trees at planting time. Support tree but allow it to move or sway.
- ❑ Use wide, belt-like strapping attached to two sturdy stakes. Do not use rope or wire through a hose.
- ❑ Mulch lightly and evenly with 2" of composted material at least to the diameter of crown of tree. Leave 3" circle of bare soil around the trunk. Deep layers of mulch can be harmful.
- ❑ Do not plant flowers under tree.
- ❑ Do not fertilize at planting time.

Figure 22. Site preparation and planting checklists (Source: NH Division of Forests and Lands and US Forest Service State and Private Forestry Service)

E) Maintenance

UNH Extension Tree Maintenance Resources

Protect a Tree During Construction

Repair Damage After a Storm

How to Mulch Trees & Shrubs

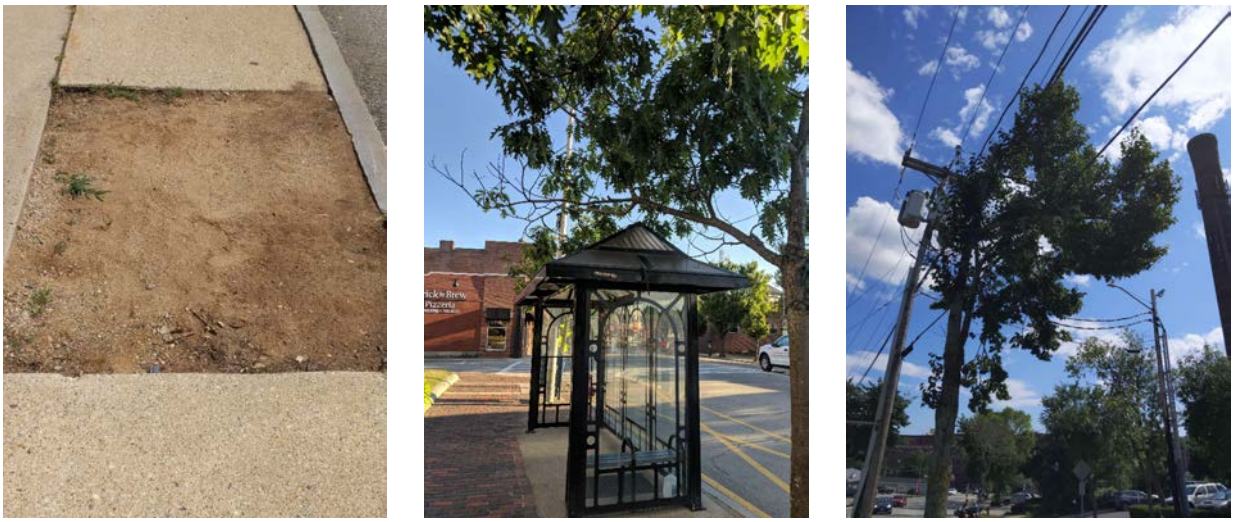
Planting and Mulching Trees & Shrubs

As discussed in Section II, less than one fourth of street trees inventoried in the CBD have no current maintenance needs. Pruning, required at 150 (40%) of sites, water required at 139 (37%) of sites, and mulch, required at 111 (29%) of sites, were the most prevalent maintenance needs.

Maintenance needs may change due to climate change. Additional watering, increased monitoring for pests and disease, and increased hazard limb removal following storm events are likely. Watering trees in urban environments is critical now and will likely become more important to tree survival in the future. Factors including elevated urban temperature, dry air and soils, and large radiative loads lead to high evaporative demand. Without irrigation, a street tree's ability to survive and capacity to provide cooling benefits in the urban environment are diminished.[52]

The overall condition of street trees in the CBD included 8% (32) poor, 4% (13) dead or dying, and 5% (17) stumps or empty pits, indicating that 16% (62) of street trees in the CBD may require replacing. At approximately 16% of the sites surveyed, there was evidence of damage to the sidewalk or curb due to root uplifting. Overall, 14% of trees were determined to be not appropriate for the site.

A general schedule for street tree maintenance is provided in Table 3. Additional considerations for street tree care include protecting drees during construction and repairing damage. The City should keep records that document maintenance of each tree. The GIS database created from the CBD street tree inventory may be a useful resource for tracking maintenance.



Photos taken by volunteers showing maintenance needs

Table 3. CBD Street tree maintenance schedule

Regular Street Tree Maintenance		Schedule					
				2-3 Year Cycle			
		At Planting	1st 3-5 years	Spring	Summer	Fall	Winter
Data entry	Document of date planted, type of stock, species and cultivar, map location, maintenance performed, maintenance needs.	X	X	X	X	X	X
Mulch	Evenly spread 3-5 inches throughout entire pit or minimum 2-foot radius from trunk; avoid placing mulch in direct contact with trunk.	X	X	X			
Stake & tie	As needed, place 2 wooden or metal stakes opposite each other about 1.5 ft away from the trunk and use canvas strapping or tree staking straps to attach loosely to tree.	X	X				
Water	Using tree bags or watering truck, provide 10-20 gallons/week for the first 3 years after planting and 8-10 gallons as needed after tree is established.	X	X	X	X	X	
General pruning	Remove limbs to shape canopy, avoid conflicts with overhead wires, streetlights, and street sign, and to remove undesired limbs and suckers; should be completed by trained staff or arborist.	X	X			X	
Crown lifting	Remove lower branches to provide sidewalk and street clearance; should be completed by trained staff or arborist.	X	X			X	
Hazard and dead limb identification and removal	Remove dead or hazard limbs on an as-needed, ongoing basis; should be completed by trained staff or arborist.					X	X
Pest & disease control	Inspect foliage and bark and treat as needed.				X		
Leaf litter collection	Remove fall leaf litter from street and sidewalk.		X			X	
Soil	Supplement or amend soil as needed.	X		X			
Litter/trash removal	Remove litter and trash from tree pit; coordinate with adjacent property owners for assistance.	X	X	X	X	X	X
Weed control	Remove weeds from tree pit or mulched area; coordinate with adjacent property owners for assistance.	X	X	X	X	X	X

The research on street tree longevity is variable and someone inconclusive. Research has shown that street trees planted in tree pits with approximately 150 cubic feet of soil live an estimated 7-10 years, while those planted in larger medians may live over 50 years.[53] Other resources indicate that 25 years is a short life span for a street tree.[54] One study of longevity studies found that the typical street tree mean life expectancy is 19-28 years and the annual mortality rate is 3.5-5.1%.[55]

Trees should be removed if they create hazards for pedestrians, vehicles, or infrastructure that cannot be mitigated through pruning. Trees that result in other hazards such as uplifted sidewalks may also require removal. Large trees that significantly infringe on buildings and infrastructure may have outgrown

their site and may require removal and replacement by a younger tree. Tree pits that are located closer that four feet from buildings or other physical barriers should be resized, if there is sufficient space to expand the pit in alternate directions, or relocated, in order to be ADA compliant. Another reason for street tree removal is the presence of invasive species or disease. Failure to remove these trees may create hazardous situations or increase the spread to other individuals. Finally, dead or dying trees should be removed and replaced.

The New Hampshire Municipal Association (NHMA) provides some guidance on tree removal. If a tree that is located in the right of way falls and obstructs a road, bridge, or sidewalk, it creates an "insufficiency" and exposes the municipality to liability if the municipality's response is deemed grossly negligent under NH RSA 231:90-231:92-a.[56] When a hazard cannot be addressed immediately, signage warning the public should be placed at the site. NHMA also notes the value of amending local regulations to clearly convey what constitutes "interference with public travel" or a "public nuisance by reason of danger to the traveling public" under NH RSA 31:51 and 231:145.

Excerpt from *Tree Maintenance Revisited*

Under RSA 231:150 municipalities have a duty and right to remove from highway rights of way all trees and bushes that may damage or pose a danger to the highways or traveling public so long as the vegetation has a circumference of less than 15 inches at a point four feet from the ground. However, for trees with a circumference of more than 15 inches at a point four feet off the ground, consent of the landowner must usually be obtained for pruning or removal. If the highway has been designated a "scenic road" by the town pursuant to RSA 231:157, trees along the scenic road shall not be cut, damaged, or removed without the prior written consent of the planning board or other designated municipal body. The municipality may proceed under RSA 231:145 to have a tree declared a public nuisance. Notice must be provided to the landowner, an opportunity for a local hearing provided, and the landowner is provided a further right to appeal the issue to the Superior Court within 30 days of the decision declaring the tree a public nuisance. All of these procedures are unnecessary in the case of an "imminent threat to safety or property."

Source: NH Municipal Association, Paul Sanderson. May 2011

V. Implementation

A) Prioritized list of planting locations in CBD

1. Replace trees in empty pits

Eight empty tree pits were documented during the inventory. Seven of these sites were located on Central Avenue/Rt 108 between Fourth Street and Portland Avenue and one was located on Chapel Street (Figure 23). Nine tree pits contained stumps (Figure 24). Half of these sites were located on Central Avenue/Route 108 between Fourth Street and Portland Avenue. Eleven sites had dead or dying trees. The location of these trees was distributed throughout the CBD (Figure 25). The City should prioritize installation of trees in existing street tree pits that are empty or have stumps or dead and dying trees.

2. Ash Tree Removal

The City should initiate removal of ash trees. Many of the ash trees that lean over Central Avenue and have dead branches may be potential hazards to pedestrians and vehicles. The fact that these trees are also vulnerable to Emerald Ash Borer is another reason that the City should start to remove and replace ash. UNH Cooperative Extension staff recommend that the City remove ash from its planting lists and determine which trees they would like to retain and which should be removed. Any trees that are retained should be treated with a systemic insecticide every one to three years to protect from pests. Figure 26 shows concentrations of ash trees along and near Central Avenue and Main Street.

Figure 23. Location of empty tree pits/planting sites

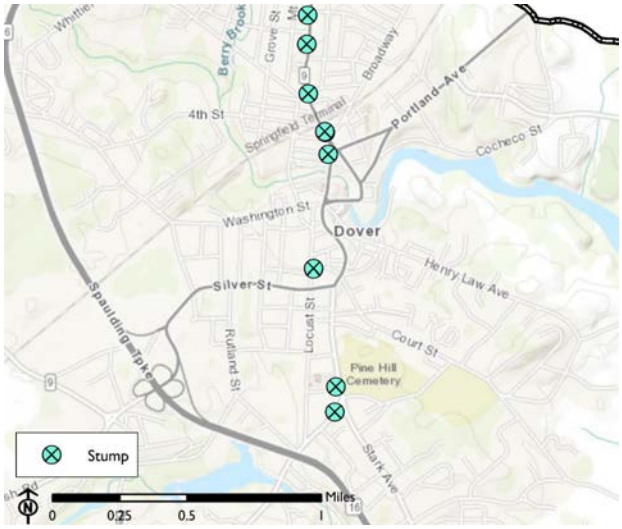


Figure 24. Location of tree pits with stumps

Figure 25. Location dead or dying trees

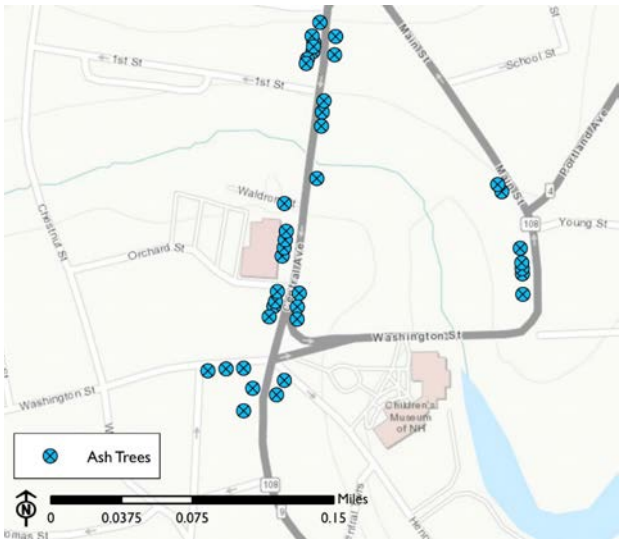


Figure 26. Location of ash trees in the vicinity of Central Avenue and Main Street

3. Establish tree pits in areas with low density of street trees

Figure 27 displays street tree locations with a heat map showing the distribution of street tree density. This map highlights areas with comparably fewer street trees (displayed in light green) than other locations (displayed in darker green) within the CBD. While there are opportunities to increase street tree plantings on nearly all streets in the CBD, several areas stand out as having fewer trees and therefore sparser canopy cover. These include:

- Residential neighborhood including First, Second, Third, Fourth, Fifth, Lincoln, and Grove Streets.
- Southern portion of Chestnut Street.
- Portions of Portland, Broadway, and Central Avenue, which serve as gateways to the CBD.
- Residential streets south of Henry Law Avenue.

Prioritizing plantings in these areas would help establish more equitable tree canopy cover throughout the CBD. Suggested size and minimum number of species is included on the density map.

4. Replace or maintain species in poor condition

Figure 8 displays the overall condition of street trees in the CBD. This map highlights trees that are in poor condition. Along with GIS data collected during the street tree inventory, can be used to identify trees that require maintenance or potential removal and replacement. It is recommended that the City review the street tree condition data in the vicinity of new development, redevelopment, and street repair projects to identify opportunities to install new trees when pavement is being disturbed.

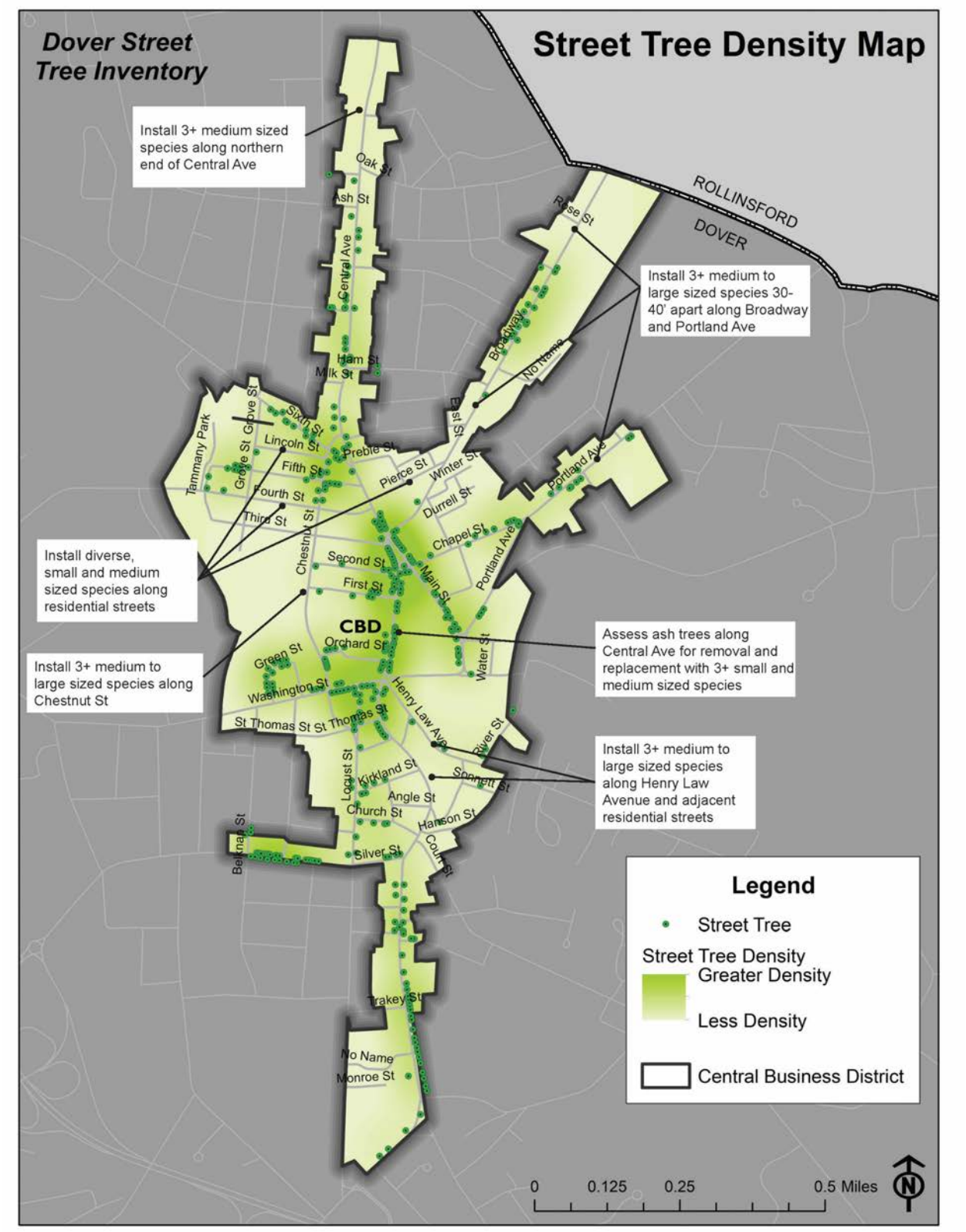


Figure 27. Street tree density map

B) Management Needs

Facilities and Grounds is responsible for maintenance of Dover's street trees. A list of recommended management strategies for CBD street trees is shown in Table 4. For planning purposes, an estimated cost is provided for each recommendation.

Table 4. CBD Street Tree Management Recommendations

Management Recommendations	Estimated Cost
Establish part-time arborist staff position	$25,000-$45,000/year
Hire/contract professional arborist to inspect trees that have identified maintenance needs or are in poor or dead and dying condition	$2,000-$5,000
Record all site inspections, maintenance actions, and maintenance needs in the street tree database that was created as part of the street tree inventory	$2,000/year (staff time)
Examine sidewalk and curb damage and determine whether tree needs to be replaced	$2,000 (staff time)
Establish protocols for street tree replacement during sidewalk or street construction to ensure trees are protected or, if warranted, removed and replaced during construction activities	$1,000- $2,000 (staff time)
Monitor street trees on an annual basis	$2000/year (staff time)
Develop a procurement plan with local nursery(ies) to ensure desired species are stocked and available	$500 (staff time)
Amend land use regulations and policies that pertain to street trees, as needed	$3,000-$5,000 (staff time)
Formalize operations and maintenance responsibilities	$500 (staff time)
Replace empty tree pits	$200/tree
Install new street trees	$400/tree
Coordinate with arborist to determine which ash trees should be retained and which should be removed. Trees that are retained should be treated with a systemic insecticide every 1-3 years.	$10,000

In addition to the above management recommendations, the City may wish to expand efforts to inventory trees by surveying trees in public parks and on other municipal property and by replicating the street tree inventory in other zoning districts. An additional next step is to collaborate with scientists to develop a long-term monitoring program to observe and record climate change impacts to street trees.

It is recommended that staff collaborate with the Forest Sub-committee explore opportunities to utilize revenue from forest management harvests to fund a range of urban tree activities, including street tree and park maintenance.

Appendix A 2020 CBD Street Tree Survey Questions

Appendix B 2020 Street Tree Inventory Instructions

Appendix C 2020 Street Tree Inventory Species List

Appendix D 2020 Street Tree Inventory Map Set

Appendix E 2020 Tree Canopy & Socio-Economic Data Maps

Appendix F Pertinent Local Regulations and Guidelines

Appendix G Matrix of Recommended Street Tree Species

Supplemental Data: GIS Database with Street Tree Inventory Data

[1] Wood, E., & Esaian, S. 2020. The importance of street trees to urban avifauna. Ecological Application. Volume 30, Issue 7. Available at: https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/eap.2149
[2] Lanza, K., and Stone, B. 2016. Climate adaptation in cities: What trees are suitable for urban heat management? Landscape and Urban Planning. 153. Pg 74-82.
[3] US Environmental Protection Agency. 2008. Trees and Vegetation. In "Reducing Urban Heat Islands: Compendium of Strategies. Draft. Available at: https://www.epa.gov/sites/production/files/2017-05/documents/reducing_urban_heat_islands_ch_2.pdf
[4] US Environmental Protection Agency. Heat Island Cooling Strategies. Accessed November 6, 2020. Available at: https://www.epa.gov/heatislands/heat-island-cooling-strategies
[5] US Environmental Protection Agency. Using Trees and Vegetation to Reduce Heat Islands. Accessed November 6, 2020. Available at: https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands;
[6] US Department of Agriculture Forest Service. 2007. Northeast Community Tree Guide. Benefits, Costs, and Strategic Planting. Available at: https://www.fs.fed.us/psw/publications/documents/psw_gtr202/psw_gtr202.pdf
[7] US Environmental Protection Agency. Using Trees and Vegetation to Reduce Heat Islands. Accessed November 6, 2020. Available at: https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands
[8] Food and Agriculture Organization of the United Nations. 2016. Building greener cities: nine benefits of urban trees. http://www.fao.org/zhc/detail-events/en/c/454543/
[9] Ibid.
[10] Ibid.
[11] Salmond, J.A., Tadaki, M., Vardoulakis, S. *et al.*. 2016. Health and climate related ecosystem services provided by street trees in the urban environment. Environmental Health 15, S36. Available at: https://doi.org/10.1186/s12940-016-0103-6
[12] Ibid.
[13] Zhang, Dashuai et al. 2019. Increase and Spatial Variation in Soils Infiltration Rates Associated with Fibrous and Tap Tree Roots. Water. www.mdpi.com/journal/water
[14] US Environmental Protection Agency. Using Trees and Vegetation to Reduce Heat Islands. Accessed November 6, 2020. Available at: https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands
[15] Ibid.
[16] US Environmental Protection Agency. 2008. Trees and Vegetation. In "Reducing Urban Heat Islands: Compendium of Strategies. Draft. Available at: https://www.epa.gov/sites/production/files/2017-05/documents/reducing_urban_heat_islands_ch_2.pdf
[17] Ibid.
[18] Salmond, J.A., Tadaki, M., Vardoulakis, S. et al.. 2016. Health and climate related ecosystem services provided by street trees in the urban environment. Environmental Health 15, S36. Available at: https://doi.org/10.1186/s12940-016-0103-6
[19] Burden, Dan. 2006. Urban Street Trees, 22 Benefits, Specific Applications. Available at: https://www.walkable.org/download/22_benefits.pdf
[20] US Environmental Protection Agency. 2008. Trees and Vegetation. In "Reducing Urban Heat Islands: Compendium of Strategies. Draft. Available at: https://www.epa.gov/sites/production/files/2017-05/documents/reducing_urban_heat_islands_ch_2.pdf
[21] Burden, Dan. 2006. Urban Street Trees, 22 Benefits, Specific Applications. Available at: https://www.walkable.org/download/22_benefits.pdf
[22] US Environmental Protection Agency. 2008. Trees and Vegetation. In "Reducing Urban Heat Islands: Compendium of Strategies. Draft. Available at: https://www.epa.gov/sites/production/files/2017-05/documents/reducing_urban_heat_islands_ch_2.pdf
[23] US Environmental Protection Agency. Using Trees and Vegetation to Reduce Heat Islands. Accessed November 6, 2020. Available at: https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands
[24] Arbor Day Foundation. Benefits of Trees. Accessed November 6, 2020. Available at: https://www.arborday.org/trees/benefits.cfm#:~:text=The%20Value%20of%20Trees%20to%20a%20Community&text=Having%20large%20trees%20in%20yards,3%20percent%20to%2015%20percent.
[25] Ibid.

[26] US Environmental Protection Agency. Using Trees and Vegetation to Reduce Heat Islands. Accessed November 6, 2020. Available at: https://www.epa.gov/heatislands/using-trees-and-vegetation-reduce-heat-islands
[27] Ibid.
[28] US Department of Agriculture Forest Service. 2007. Northeast Community Tree Guide. Benefits, Costs, and Strategic Planting. Available at: https://www.fs.fed.us/psw/publications/documents/psw_gtr202/psw_gtr202.pdf
[29] Ibid.
[30] US Department of Agricultural Forest Service. 2008. Urban and Community Forests of New England. https://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs38.pdf
[31] US Department of Agricultural Forest Service. 2008. Urban and Community Forests of New England. https://www.nrs.fs.fed.us/pubs/gtr/gtr_nrs38.pdf
[32] Danford, Rachel S. et al. (2014) "What does it take to achieve equitable urban tree canopy distribution. A Boston case study." *Cities and the Environment (CATE)*: Vol. 7 Issue 1. Article 2. Available at http://digitalcommons.lmu.edu/cate/vol7/iss1/2
[33] eXtension. Trees for energy conservation. Accessed November 6, 2020. Available at: https://trees-energy-conservation.extension.org/tree-planting-in-cities-part-3:-tree-selection-planting-guidelines/
[34] UNH Extension. 2017. Ice Resistant Tree Populations. Available at: https://extension.unh.edu/resource/ice-resistant-tree-populations
[35] eXtension. Trees for energy conservation. Accessed November 6, 2020. Available at: https://trees-energy-conservation.extension.org/tree-planting-in-cities-part-3:-tree-selection-planting-guidelines/
[36] Cornell University Urban Horticulture Institute. 2009. Recommended Urban Trees: Site Assessment and Tree Selection for Stress Tolerance. Available at: http://www.hort.cornell.edu/uhi/outreach/recurbtree/pdfs/~recurbtrees.pdf
[37] US Department of Agriculture Forest Service. 2007. Northeast Community Tree Guide. Benefits, Costs, and Strategic Planting. Available at: https://www.fs.fed.us/psw/publications/documents/psw_gtr202/psw_gtr202.pdf
[38] Ibid.
[39] Ibid.
[40] Ibid.
[41] Ibid.
[42] Crabtree, P. Crabtree Group Inc. Trees in Urban Design. Accessed November 6, 2020. Available at: https://www.cnu.org/sites/default/files/trees_in_urban_design.pdf
[43] Landcom. 2008. Street Tree Design Guidelines. Available at: https://www.yumpu.com/en/document/read/53651923/street-tree-design-guidelines
[44] Cornell University Urban Horticulture Institute. 2009. Recommended Urban Trees: Site Assessment and Tree Selection for Stress Tolerance. Available at: http://www.hort.cornell.edu/uhi/outreach/recurbtree/pdfs/~recurbtrees.pdf
[45] Arbor Day Foundation. Choose the Right Tree. Accessed November 6, 2020. Available at: https://www.arborday.org/trees/index-choosing.cfm?utm_source=Arborday.org&utm_medium=Top_Menu&utm_campaign=Dropdown_Menu&utm_term=Trees&utm_content=Choosing_a_Tree
[46] Jordan, Greg. County Forester. UNH Extension. Via email November 20, 2020.
[47] Arbor Day Foundation. Hardiness Zones. Accessed November 6, 2020. Available at: https://www.arborday.org/media/map_change.cfm
[48] National Climate Assessment. 2014. Shifts in Hardiness Zones. Available at: https://nca2014.globalchange.gov/report/appendices/climate-science-supplement/graphics/shifts-plant-hardiness-zones
[49] Reynolds, M. and Ossenbruggen, H. 1998. Planting Trees in Design and Built Community Landscapes, Checklists for Success. Available at: https://www.nh.gov/nhdfl/documents/community_landscape.pdf
[50] UNH Extension. 2016. Planting and Mulching Trees and Shrubs. Available at: https://extension.unh.edu/resources/files/resource000491_rep513.pdf
[51] Reynolds, M. and Ossenbruggen, H. 1998. Planting Trees in Design and Built Community Landscapes, Checklists for Success. Available at: https://www.nh.gov/nhdfl/documents/community_landscape.pdf
[52] Salmond, J.A., Tadaki, M., Vardoulakis, S. et al.. 2016. Health and climate related ecosystem services provided by street trees in the urban environment. Environmental Health 15, S36. Available at: https://doi.org/10.1186/s12940-016-0103-6

[53] Crabtree, P. Crabtree Group Inc. Trees in Urban Design. Accessed November 6, 2020. Available at: https://www.cnu.org/sites/default/files/trees_in_urban_design.pdf
[54] Cornell University Urban Horticulture Institute. 2009. Recommended Urban Trees: Site Assessment and Tree Selection for Stress Tolerance. Available at: http://www.hort.cornell.edu/uhi/outreach/recurbtree/pdfs/~recurbtrees.pdf
[55] Roman, L. 2014. How Many Trees are Enough? Tree Death and the Urban Canopy. Scenario Journal. Available at: https://www.fs.fed.us/nrs/pubs/jrnl/2014/nrs_2014_roman_001.pdf
[56] Sanderson, P. 2011. Tree Maintenance Revisited. New Hampshire Municipal Association. Available at: https://www.nhmunicipal.org/town-city-article/tree-maintenance-revisited